PHAKWE RICHARDS BAY GAS POWER 3 COMBINED CYCLE POWER PLANT (CCPP), RICHARDS BAY, KWAZULU-NATAL PROVINCE

Environmental Impact Assessment Report

June 2022

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PROJECT DETAILS

DFFE Reference	:	14/12/16/3/3/2/2117
Title	:	Environmental Impact Assessment Process: EIA Report for the Phakwe Richards Bay Gas Power 3 Combined Cycle Power Plant, Richards Bay, KwaZulu Natal
Authors	:	Savannah Environmental (Pty) Ltd Jo-Anne Thomas
Client	:	Phakwe Richards Bay Gas Power 3 (Pty) Ltd
Report Status	:	EIA Report for public review (from 06 June to 22 July 2022)
Date	:	June 2022

When used as a reference this report should be cited as: Savannah Environmental (2022) EIA Report for the Phakwe Richards Bay Gas Power 3 CCPP, Richards Bay, KwaZulu-Natal Province.

PURPOSE OF THE EIA REPORT AND INVITATION TO COMMENT

Phakwe Richards Bay Gas Power 3 (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Scoping and Environmental Impact Assessment Process for the Phakwe Richards Bay Gas Power 3 CCPP. The EIA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

This Environmental Impact Assessment (EIA) report represents the findings of the EIA process and contains the following chapters:

This EIA Report consists of the following chapters:

- **Chapter 1** provides background to the proposed project and the environmental impact assessment process.
- **Chapter 2** outlines the strategic legal context for energy planning in South Africa and the proposed project.
- **Chapter 3** provides a description of gas to power technology.
- **Chapter 4** provides a description of the proposed project, including feasible alternatives identified and considered.
- **Chapter 5** outlines the need and desirability of the proposed project.
- **Chapter 6** describes the existing biophysical and socio-economic environment affected by the proposed project.
- **Chapter 7** outlines the process which was followed during the EIA Phase of the EIA Process.
- **Chapter 8** provides a description and assessment of the potential issues and impacts associated with the proposed project
- **Chapter 9** provides a description and assessment of the potential cumulative impact associated with the proposed project
- **Chapter 10** provides the conclusions and recommendations of the EIA report
- **Chapter 11** provides a list of all references used in the compilation of the EIA Report.

The EIA report is available for review from **06 June – 22 July 2022** on the Savannah Environmental website (https://savannahsa.com/public-documents/energy-generation/prbgp3-2000mw-ccpp/)

Please submit your comments by **22 July 2022** to:
Nicolene Venter of **Savannah Environmental** PO Box 148, Sunninghill, 2157 Tel: 011-656-3237 Mobile: 060 978 8396 Fax: 086-684-0547 Email: publicprocess@savannahsa.com

Comments can be made as written submission via fax, post or email.

EXECUTIVE SUMMARY

Phakwe Richards Bay Gas Power 3 (Pty) Ltd (PRBGP3), an Independent Power Producer (IPP), proposes the development of a combined cycle (CC) gas to power plant, with a capacity of up to 2 000MW, on various erven within the Richards Bay IDZ Phase 1F, Richards Bay. The proposed project is to be known as the Phakwe Richards Bay Gas Power 3 (PRBGP3) CCPP. The project site is located approximately 5km north-east of Richards Bay and 1km north of the suburb of Alton, within the jurisdiction of the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality, KwaZulu-Natal Province (refer to **Figure 1**).

The Combined Cycle Power Plant and associated infrastructure is proposed in response to the provision for gas-to-power technology as part of the energy mix within the Integrated Resource Plan (IRP), 2019, and is planned to be bid into future procurement processes to be initiated by the Department of Mineral Resources and Energy (DMRE).

1. Overview of the Project

As a fast-emerging economy, South Africa needs to balance the competing need for continued economic growth with its social needs and the protection of the natural environment. South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price, and that climate change concerns are addressed in planning the energy mix into the future. Approximately 90% of South Africa's electricity currently comes from fossil fuels[1], with Eskom being the main electricity producing company.

The Integrated Resource Plan (IRP) 2019, developed by the Department of Mineral Resources and Energy (DMRE), states a need for a diversified energy mix to meet the requirements of the country's need for economic and social growth. The IRP (2019) considers natural gas to have significant potential to add to the energy mix, while also considering South Africa's commitment to reducing emissions to address climate change concerns on a global scale. In order to achieve this diversified mix and harvest the benefits of gas to energy, the IRP includes the allocation of 3000MW of new capacity using this technology by 2030. The extent of the gas contained in the IRP is within the imposed emissions reduction trajectory for the country.

The Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure is proposed to be constructed on erven 16820, 16819,1/16674 and a subdivision of erf 17442 within the Richards Bay IDZ Zone 1F, and will occupy approximately 11.8ha.

[1] Olusola M. Akinbami, Samuel R. Oke, Michael O. Bodunrin, 2021

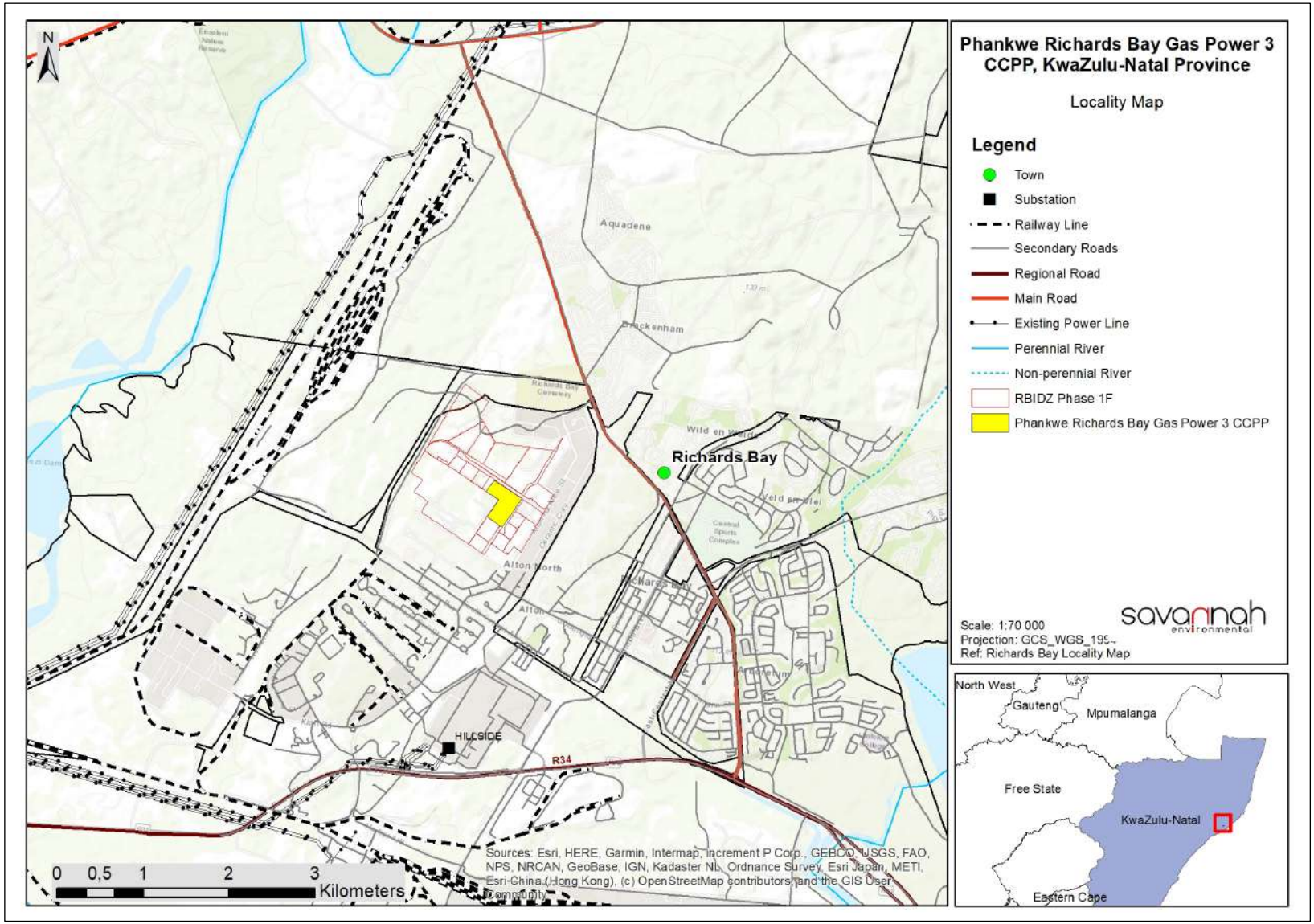

Figure 1: Locality map showing the area proposed for the establishment of the 2000MW PRBGP3 CCPP within the Richards Bay IDZ 1F, in the Richards Bay area

The power plant will operate at mid-merit to baseload duty and will include the following main infrastructure:

- Up to 4 gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- Up to 4 Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- Up to 4 steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
- Water retention pond
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines
- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, waste water
- Fire water (FW) storage and FW system
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal);
  - Warehousing and buildings;
  - Workshop building;
  - Fire water pump building;
  - Administration and Control Building;
  - Ablution facilities;
  - Storage facilities;
  - Guard House;
  - Fencing;
  - Maintenance and cleaning area;
  - Operational and maintenance control centre;
- Electrical facilities including:
  - Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
  - Generators and auxiliaries;

» Service infrastructure including:
  - Stormwater channels;
  - Water pipelines
  - Temporary work areas during the construction phase (laydown areas)

A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and Hydrogen. The pipeline will be connected to the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the Richards Bay Harbour. A separate EIA process will be undertaken for the dedicated fuel-supply pipeline.

The grid connection infrastructure will include an Eskom portion of the 275kV or 400kV GIS interface Substation, Underground 275kV or 400kV power cabling connecting the Power Plant GIS substation and Eskom GIS Interface substation and an overhead 275kV or 400kV power line connecting the Eskom interface substation to the selected Eskom grid connection point. A separate EIA process will be undertaken for the grid connection infrastructure.

2. Evaluation of the Project

No environmental fatal flaws were identified in the detailed specialist studies conducted It is recommended that mitigation measures are implemented to reduce impacts to acceptable levels. The potential environmental impacts associated with Phakwe Richards Bay Gas Power 3 CCPP identified and assessed through the EIA process include:

» Impacts on Terrestrial Biodiversity
» Impacts on Aquatic Ecology
» Impacts on Soils and Agricultural Potential
» Impacts on Air Quality
» Health Impacts
» Impacts on Climate Change
» Visual impacts
» Impacts on ambient Noise Levels
» Socio-Economic impacts
» Traffic impacts
» Impact due to unplanned events

2.1. Impacts on Terrestrial Biodiversity

The project under consideration is located within areas recognised as of national, provincial, district or municipal conservation significance (Valued Ecosystem Components (VECs)[2]) considered important in terms of habitats, species, ecosystems, and ecosystem services conservation that are required to meet national, provincial, district and municipal conservation targets. Despite the presence of VECs within Phase 1F, this area was incorporated into the Industrial Development Zone and received authorisation for industrial development in 2016.

[2] VECs are defined as elements of the environment that have scientific, ecological, economic, social, or cultural significance.

Phase 1F of the IDZ is still largely undeveloped but has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services infrastructure (i.e., water, sewer, stormwater, electricity, roads, artificial drainage canals), and the more recent infilling of the wetlands as authorised for the development of the IDZ. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO_2 Pilot plant which covers approximately a third of Phase 1F. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds.

The project site on Phase 1F has experienced past environmental disturbances that were judged to have had a negative influence on its biodiversity and ecology and included the following:

» Land clearance on the project site resulted in the direct loss of indigenous vegetation.
» The wetlands on the proposed development site were fragmented by the construction of a drainage line and roads.
» The wetlands on the project site were infilled to prepare the area for future development.

The site has been determined to have a moderate Ecological Importance. In this context, development activities of medium impact are considered acceptable followed by appropriate restoration activities. Many of the anticipated project-specific impacts during the construction and operational phases can be successfully mitigated to moderate, low, and minor levels of significance, and are thus considered acceptable.

2.2. Impacts on Aquatic Ecology

Three hydrogeomorphic (HGM) units were identified within the 500 m regulated area, of which two have been classified as unchanneled valley bottom wetlands and one classified as a hillslope seep. The HGM units consist of one dominant soil form was identified within the identified wetland, namely the Manguzi soil form.

The Richards Bay Industrial Development Zone received environmental authorisation, which includes the development of two of the wetland areas. The remaining third wetland is not in a position in the landscape to be affected by the development. Therefore, no additional authorisation or WUL is required for the proposed PRBGP3 project.

It is recommended that the conceptual wetland plan developed for the industrial zone (Royal Haskoning DHV, 2015) be implemented for the project.

2.3. Impacts on Soils and Agricultural Potential

Various soil forms have been identified which have been divided into four main land capability classes according to depth, texture, hydromorphic properties etc. (namely land capability class II, III, IV and V). From these four classes as well as the ideal climatic capability of "C1", three land potential levels were calculated, namely land potential 1, 2 and "vlei". Therefore, the overall land potential ranges from "Low" (for the wetland areas characterised by non-arable conditions) to "Very High".

The 50 m regulated area comprises of land potential resources characterised by "Very High" arable potential under natural conditions, owing to the ideal climatic conditions of the region as well as the physical

properties of the classified soil forms. The high sensitivity of these soils emphasises the potential loss of highly valued land. It is worth noting that the agricultural land use in the surrounding area needs to be considered holistically.

High potential arable land is only useful to agricultural land use, with limited significance outside of such a land use. It is worth considering the locality of the proposed project area being on the outskirts of the Richards Bay CBD. Therefore, regardless of whether or not the proposed activities proceed, the soil will not be used for agriculture due to the zoning of the area. Therefore, it is the specialist's opinion that even though significant impacts towards soil resources are expected, no impacts towards agricultural land use are foreseen. The soil resources will ultimately never be of value to farming practices reliant on high potential arable land. Therefore, the proposed activities should proceed as have been planned.

2.4. Impacts on Air Quality

The CALPUFF/CALMET model suite was selected for use in the Air Quality Impact Assessment investigation to predict maximum short-term (1 and 24-hour) and annual average ground-level concentrations at various receptor locations within the computational domain. The main findings of the simulated incremental assessment were:

1. The construction phase of the project could result in off-site exceedances of inhalable particulate matter of less than 10 µm in diameter - PM_{10} daily and annual National Ambient Air Quality Standards (NAAQS) over the 36-month construction phase.
    a. It is likely that the construction (and decommissioning) phase(s) may have a "low" impact on the ambient air quality before and after effective mitigation measures are implemented.
2. Compliance with hourly, daily and annual NAAQS under normal operations for hourly, daily and annual average pollutant concentrations as applicable to sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$ – inhalable and respirable particulate matter of less than 10 µm and 2.5 µm in diameter, respectively), carbon monoxide (CO) and total volatile organic compounds (TVOCs). Exceedances of the nitrogen dioxide (NO_2) NAAQ Limit Concentration could result from the normal operation of the facility using natural gas, but the frequency of exceedance is likely to be within that allowed by the NAAQS.
    a. The operational phase of the project will have a low impact significance (based on design mitigation measures) on ambient SO_2, PM, CO, and VOC concentrations, with no additional mitigation required.
    b. The operational phase is likely to have a "medium" impact significance for NO_2; however, if additional mitigation measures are implemented, the significance could be reduced to "low".
3. Due to the inherently low sulfur content of natural gas, SO_2 emissions from the turbines will not reach the emission standard and therefore the facility's impact on SO_2 was also assessed using mass balance calculations for combined cycle turbines using the default sulfur content of the emission factor (4600 g/lE+06 Nm^3).
    a. Compliance the NAAQS was simulated for hourly, daily, and annual average SO2 for the operational scenario based on emission factor calculations.
4. The impact of start-up on ambient nitrogen dioxide (NO_2) concentrations was estimated, and exceedances of the NAAQS could result at residential receptors, schools and medical facilities. The impacts can be reduced if the turbines reach Minimum Emission Standards in less than 30 minutes, and if the frequency of start-up events is reduced.

5. Annual SO_2 and NO_2 concentrations are unlikely to affect vegetation productivity or animal health off-site.
6. The impact of the facility was simulated to be below the National Dust Control Regulations (NDCR) acceptable dustfall rates for all project phases.
7. While hydrogen (or natural gas – hydrogen mixture) could significantly reduce emissions of SO2, CO, PM and VOCs from the facility, emissions of oxides of nitrogen (NOX) could potentially be similar to those from natural gas combustion.

From an air quality perspective, it is the opinion of the specialist that the Phakwe Richards Bay Gas Power 3 Combined Cycle Gas to Power Plant be authorised, on condition that:

» Emissions be monitored as per standard practice for the appropriate listed activity.
» Emissions are maintained at or lower than the Minimum Emission Standards appropriate for the listed activity.
» Conformance with the other environmental management programme requirements for air quality are met.

2.5. Health Impacts

A rapid appraisal health impact assessment (RAHIA) was undertaken for the proposed project, supported by a Baseline Health Assessment Report and a Human Health Risk Assessment. This assessment was informed by the outcomes of the Air Quality Impact Assessment. According to the Good Practice guidance of the IFC, a RAHIA is suitable for the project, because an influx of people settling in the area, due to the construction and operation of the facility, is not foreseen.

It was concluded that:

» The assessment has been conducted with consideration of the health vulnerabilities of certain age groups in the receptor population, as indicated in the community baseline health report.
» Impacts on health associated with PM2.5, SO2, NO2, CO and VOC emissions from the proposed Phakwe power plant project during the construction, operational and decommissioning phases are assessed as of low significance, with a neutral status.
» Implementation of the proposed power plant is associated with low impact on health, even in sensitive receptor communities.

2.6. Impacts on Climate Change

The assessment of the climate change impact of this project considered the impact of the project on climate change, the resilience of the project to climate change, as well as the options for mitigation of the impacts.

The impact of the project on climate change was assessed in the context of both GHG emissions from the project, as well as the potential positive impact the project can have through the avoidance of emissions. This was assuming natural gas is the only fuel used. The results are compared to South Africa's carbon budget for the NDC Low Emission Scenario, which was calculated as 7 760 million tons CO_2e.

The project will emit 82 ktCO_2e during the construction phase, 7 870 ktCO_2e/year during the operational phase and 236 000 ktCO_2e over its lifetime. The portion of these emissions emitted inside the borders of South Africa represents 1.9% of the low emission NDC carbon budget calculated, for the lifetime of the project.

When considering the potential positive impact of the proposed project, the expected GHG emissions from the project will avoid emissions through the displacement of coal. In addition to this, the project will enable an increased level of intermittent renewable energy capacity to be placed onto the South African grid. In the long-term, hydrogen can be a potential fuel source used to offset the projects carbon emissions. The total avoided emissions is 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget

The positive impact of the project on climate change with respect the avoided emissions from the coal baseline, and the potential avoided emissions through the increase of the grid to accept intermittent renewable energy far outweighs the contribution of the project to national inventory.
With respect to the resilience of the project to climate change, we found that there are no significant risk factors that should be considered in the environmental authorisation.

There are limited mitigation measures available to this proposed project, and as a result this project will be exposed to a low residual risk of lock in emissions, due to the combustion of natural gas.

In accordance with the findings of this CCIA, the specialist has concluded that the proposed Phakwe Richards Bay Gas Power 3 CCPP should not be refused environmental authorisation on climate change related issues.

2.7. Visual Impacts

The development and operation of the proposed Phakwe Richards Bay Gas Power 3 CCPP and its associated infrastructure is not expected to have a significant visual impact within the larger study area. The location of the proposed power plant within an established industrial area is in line with the principle of consolidating industrial infrastructure within allocated areas. It is also not expected to significantly increase the potential cumulative visual impacts of industrial developments within the region, given the existing industrial nature of the port of Richards Bay, the Alton industrial area and the RB IDZ Phase 1F developments, and the planned port expansion endeavours.

Overall, the significance of the visual impacts (should any occur) is expected to range from moderate to low as there are no known potential sensitive visual receptors within close proximity of the proposed development. There are no residences located within a 1km radius of the proposed development and no tourist attractions or tourist routes that would be significantly impacted.

A number of mitigation measures have been proposed. Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should be implemented and maintained throughout the construction, operational and decommissioning phases of the proposed power plant.

If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the development of the Phakwe Richards Bay Gas Power 3 CCPP would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

2.8. Noise Impacts

Potential scenarios were conceptualized for the future proposed construction and operational phases, with the output of the modelling exercise indicating a potential noise impact of low significance for both the day- and night-time periods for all the project phases. No mitigation or management measures are required or recommended to reduce noise levels (when considering Environmental Noise). The power generation facility still has to comply with the relevant Health and Safety Regulations and Guidelines that my stipulate periodic noise monitoring (Noise-Induced Hearing Loss Regulations [GNR 307 of 2020] as well as the Occupational Health and Safety Act, 1993 [Act 85 of 1993]).

Similarly, no additional acoustic studies are recommended for this development, and it will not be required to develop or implement an environmental noise monitoring programme considering:

» the developmental character of the area;
» the results from the night-time ambient sound level measurements;
» the projected low significance of the noise impacts

It is therefore recommended that the proposed 2 000MW Phakwe Gas to Power Project be authorized from an acoustic perspective.

2.9. Socio-economic Impacts

the proposed development will result in both negative and positive impacts. All identified economic impacts will be positive and some social identified impacts are negative in nature. The following main conclusions are reached from the specialist study undertaken:

» South Africa is experiencing high energy demand and as a result of the gap between the high demand and low supply there has been continued load-shedding and therefore a need for additional electricity supply.
» High dependence on coal as an energy source has attracted growing national and international criticism due to greenhouse gas emissions the contribute significantly to climate change and air pollution. Due to the impact of coals as energy source there is a need for South Africa to diversify the sources of electricity generation.
» The proposed Phakwe Richards Bay Gas Power 3 CCPP and its associated infrastructure which is to be located at the Richards Bay IDZ Phase 1F, aims to supply natural gas-based electricity which is less harmful to the environment when compared to coal produced energy.
» The socio-economic impact assessment in this report focuses on the social impacts which are likely to arise from the development of the proposed plant as well as the various economic impacts which might arise from the proposed development. Under the social impacts, several the impacts have been identified as being negative and these include air pollution, expected increase in noise levels, expected increase in traffic level and possible increases on the crime levels of the area.
» The mitigation measures are specific to a particular impact and these can be summarized as follows:

- Community Impact
  - The negative visual effect and the pollution levels can be mitigated by planting trees around the plant establishment.
- Population Levels Impact
  - To reduce the magnitude of the population levels, mitigation measures such as prioritising local workers for employment should be applied.
- Crime Levels Impact
  - The magnitude of potential crime levels can be reduced by ensuring that there is good security measure on the premises of the plant.
- Standard of Living Impact
  - To mitigate the magnitude of the impact occurring, proper employment procedures have to be followed with workers being part of a labour union to ensure that their concerns noted

» All identified economic impacts from the proposed development are expected to be of a positive nature and these include the following:
- Employment creation
  - A total of 2 484 jobs are expected to be created during the construction phase of the proposed PRBGP3 and a further 157 jobs are expected to be created during the operational phase of the project. This includes direct, indirect and induced job opportunities.
- Increase Gross Value Add
  - During the construction of and operational phases of the project, the total contribution to GVA from the plant is expected to be more than R25 Billion rands.
- Property Values
  - The operation of the highly technical power plant which uses an advanced method of energy generation will have a positive impact on the property values of surrounding establishments.

» The Phakwe Richards Bay Gas Power 3 CCPP development also has a larger positive economic contribution in terms of contributing energy towards the national electric grid which will ease load shedding and allow reduced power costs for the reopening of industry.

» The overall status of the proposed development is considered to be positive given the high demand for energy generation in South Africa as well as other factors such as the needed jobs which will be created by this project.

» All these findings support the proposal of proceeding with the development of the Phakwe Richards Bay Gas Power 3 CCPP at the identified site in Phase 1F of the Richards Bay IDZ.

2.10. Traffic Impacts

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Phakwe Richards Bay Gas Power 3 (PRBGP3) 2000 MW Combined Cycle Gas to Power Plant were identified and assessed.

» The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal load vehicles was estimated and found to be able to be accommodated by the road network.

» During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately 60 full-time employees will be stationed on site (subject to change). Based on experience with similar projects, the number of full-time employees is generally low and consequently, the associated trips are negligible. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation.
- The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.
- The proposed access point, located on the access road located off Alumina Alley, will need to be upgraded to cater for the construction vehicles and abnormal load vehicles.
- As traffic delays are experienced along the R619, the access roads located off the R619 should be avoided or if necessary, used during off peak hours.
- The preferred access roads to the site are the roads located off the R34 viz. Western Arterial, Alumina Alley and Bullion Road.

The construction and decommissioning phases are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is short term i.e., the impact on the surrounding road network is temporary and the facility, when operational, will not add any significant traffic to the road network.

The development is supported from a traffic and transport engineering perspective provided that the recommendations and mitigations contained in this report are adhered to.

The potential impacts associated with the facility and associated infrastructure are acceptable from a traffic and transport engineering perspective and it is therefore recommended that the proposed facility be authorised

2.11. Impact of Unplanned Events

As a result of the risk assessment study conducted for the proposed PRBGP3 facility in Richards Bay, a number of events were found to have risks beyond the site boundary. These risks could be mitigated to acceptable levels, as shown in the report.

No fatal flaws that would prevent the project proceeding to the detailed engineering phase of the project were identified, and the specialist would support the project under the following conditions most of which will be detailed in the MHI study:

- Compliance with all statutory requirements, i.e., pressure vessel designs.
- Compliance with applicable SANS codes, i.e., SANS 10087, SANS 10089, SANS 10108, etc.
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs.
- Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.
- Full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm:
  - Including demonstration from the designer that sufficient and reliable instrumentation would be specified and installed at the facility.

- Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment:
  - Including compliance to statutory laws, applicable codes and standards and world's best practice;
  - Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
  - Including the auditing of the built facility against the safety document;
  - Noting that codes such as IEC 61511 can be used to achieve these requirements;
- Demonstration by the PRBGP3 owner or their contractor that the final designs would reduce the risks posed by the installation to the South African requirements as prescribed in SANS 1461 (2018).
- Signature of all terminal designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs.
- Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (with input from local authorities).
- Any increases to the product list or product inventories must be with the approval of the authorities under NEMA.
- Final acceptance of the facility risks with an MHI risk assessment that must be completed in accordance with the MHI regulations;
  - Basing such a risk assessment on the final design and including engineering mitigation.

2.12. Assessment of Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Phakwe Richards Bay Gas Power 3 CCPP throughout all phases of the project life cycle. The main aim for the assessment of cumulative impacts is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The assessment of the cumulative impacts was undertaken through the consideration of impacts in isolation and compared to the cumulative impacts of the Phakwe Richards Bay Gas Power 3 CCPP and other industrial developments at a scale specifically identified by each specialist.

Based on the specialist cumulative assessment and findings, the development of the Phakwe Richards Bay Gas Power 3 CCPP, other industrial activities, and gas to power developments within a 10km radius, it can be concluded that cumulative impacts will be of a low to medium significance, depending on the impact being considered. Impacts associated with climate change are potentially high but can be mitigated through avoided emissions as the addition of the Phakwe Richards Bay Gas Power 3 CCPP to the national grid has the potential to enable the expansion of South Africa's renewables generation capacity in execution of South Africa's energy transition strategy. There are no impacts or risks identified as unacceptable with the development of Phakwe Richards Bay Gas Power 3 CCPP when considered together with other developments within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

The limited potential for cumulative impacts and risks makes the location of this project within the identified site of the Richards Bay IDZ Zone 1F a desirable location for the proposed project, provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

2.13. Assessment of the Do Nothing Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Phakwe Richards Bay Gas Power 3 CCPP. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a CCPP facility.

In terms of the cost-benefit analysis of the project it was concluded that, apart from impacts associated with GHG emissions, the costs associated with the project are anticipated to occur at a site-specific level, the significance of which can be largely reduced through the application of appropriate mitigation measures, and through the appropriate placement of infrastructure within areas of lower sensitivity. The inclusion of the Phakwe Richards Bay Gas Power 3 CCPP onto the grid could contribute to a potential net reduction in GHG emissions. The total avoided emissions are 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this, there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget.

Impacts of not implementing the project on the identified site largely relate to lost opportunities from a socio-economic perspective relating to employment, skills development, contribution to local and provincial development goals and the addition of 2000MW to the electricity grid and support for the introduction of more renewable energy into the technology mix.

Although a number of impacts of potential high significance have been identified, no environmental fatal flaws were identified to be associated with the Phakwe Richards Bay Gas Power 3 CCPP through the specialist studies undertaken. Where impacts cannot be avoided, appropriate mitigation has been identified to minimise impacts to acceptable levels. A number of negative impacts have been identified to be associated with the implementation of the do nothing alternative.

The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of Phakwe Richards Bay Gas Power 3 CCPP.

3. Environmental Sensitivity Mapping

As part of the specialist investigations undertaken within the project site, specific environmental features and areas were identified which will be impacted by the placement of the Phakwe Richards Bay Gas Power 3 CCPP (refer to **Figure 2**). These include wetland features and medium sensitivity vegetation (Maputaland Wooded Grassland) within the project site, as well as potentially sensitive noise and air quality receptors further afield (>2km).

Regarding the wetland features, Richards Bay Industrial Development Zone SoC Ltd received Environmental Authorisation (EA) for the IDZ Phase 1F in September 2016 (DFFE Ref No.: 14/12/16/3/3/3/665). This EA included the infilling of some of the wetlands on site to release the land for development. Other wetland features identified within the 500m regulated zone will not be impacted by the proposed development.

Impacts on sensitive noise and air quality receptors were determined to be of low significance.

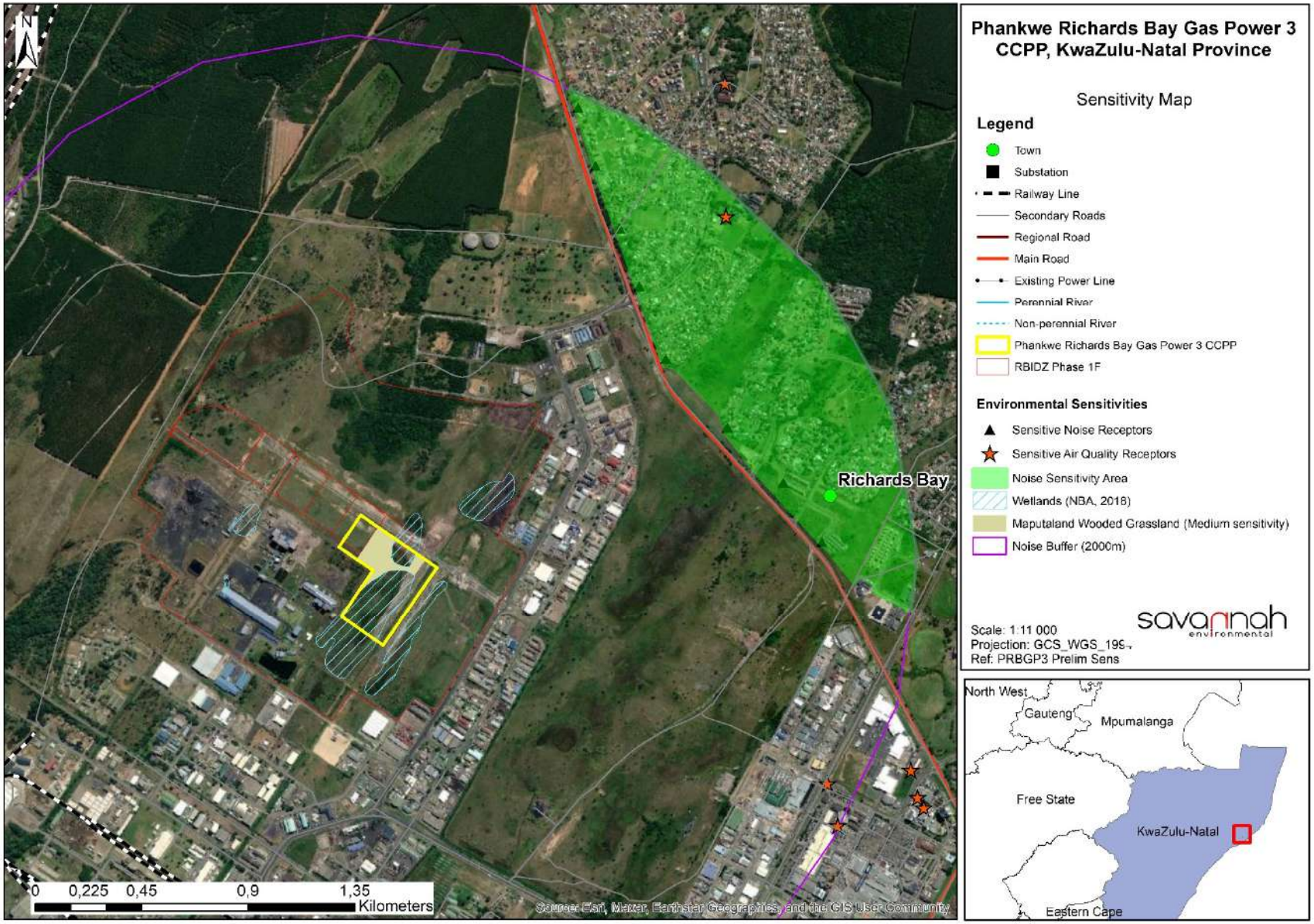

Figure 2: Environmental sensitivity map of the project site overlain by the layout assessed for Phakwe Richards Bay Gas Power 3 CCPP

4. Overall Conclusion (Impact Statement)

The construction and operation of the Phakwe Richards Bay Gas Power 3 CCPP on the project site located within the Richards Bay IDZ Phase 1F, Richards Bay in the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality has been proposed by Phakwe Richards Bay Gas Power 3 (Pty) Ltd. The preferred activity was determined by the developer to be the development of a gas to power combined cycle power plant. A technically viable project site and development footprint was proposed by the developer and assessed as part of the EIA process. The environmental assessment of the development footprint within the project site was undertaken by independent specialists and their findings have informed the results of this EIA Report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

From a biodiversity perspective, features in the study area include wetlands and medium sensitivity vegetation (Maputaland Wooded Grassland) within the project site. The site has been determined to have a moderate Ecological Importance. In this context, development activities of medium impact are considered acceptable followed by appropriate restoration activities. Many of the anticipated project-specific impacts during the construction and operational phases can be successfully mitigated to moderate, low, and minor levels of significance, and are thus considered acceptable.

The Richards Bay Industrial Development Zone received environmental authorisation, which includes the development of two of the wetland areas. The remaining third wetland is not in a position in the landscape to be affected by the development. Therefore, no additional authorisation or WUL is required for the proposed PRBGP3 project.

From a land use perspective, the site is located within the Richards Bay Industrial Development Zone, Phase 1F. The site is designated for noxious industry such as the proposed gas to power plant. The land potential resources of some areas within the site are characterised by "Very High" arable potential under natural conditions, owing to the ideal climatic conditions of the region as well as the physical properties of the classified soil forms. High potential arable land is however only useful to agricultural land use, with limited significance outside of such a land use. It is worth considering the locality of the proposed project area being on the outskirts of the Richards Bay CBD. Therefore, regardless of whether or not the proposed activities proceed, the soil will not be used for agriculture due to the zoning of the area. Therefore, even though significant impacts towards soil resources are expected, no impacts towards agricultural land use are foreseen. The soil resources will ultimately never be of value to farming practices reliant on high potential arable land.

From a social perspective, the project has the potential to impact negatively on ambient air quality, human health, ambient noise levels and sense of place. As a result of the nature of the proposed project and the location of the proposed development site in relation to sensitive receptors, impacts in this regard are expected to be limited. Positive socio-economic impacts of the project, including employment and skills development opportunities as well as the supply of reliable electricity to the grid, are expected at a regional and national level.

The project is expected to have a high impact on climate change. The inclusion of the Phakwe Richards Bay Gas Power 3 CCPP onto the grid could, however, contribute to a potential net reduction in GHG emissions. The total avoided emissions are 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this, there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Phakwe Richards Bay Gas Power 3 CCPP. All impacts associated with the project can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

Through the assessment of the development of the Phakwe Richards Bay Gas Power 3 CCPP within the project site it can be concluded that the development of the facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

5. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the development of the Phakwe Richards Bay Gas Power 3 CCPP is acceptable within the landscape and can reasonably be authorised. The recommended validity period for the environmental authorisation is **10 years**.

The authorisation would include the following key infrastructure and components:

- Up to 4 gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- Up to 4 Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- Up to 4 steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
- Water retention pond
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines
- Gas generator Lubrication Oil System.

- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, waste water
- Fire water (FW) storage and FW system
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal);
  - Warehousing and buildings;
  - Workshop building;
  - Fire water pump building;
  - Administration and Control Building;
  - Ablution facilities;
  - Storage facilities;
  - Guard House;
  - Fencing;
  - Maintenance and cleaning area;
  - Operational and maintenance control centre;
- Electrical facilities including:
  - Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
  - Generators and auxiliaries;
- Service infrastructure including:
  - Stormwater channels;
  - Water pipelines
  - Temporary work areas during the construction phase (laydown areas)

The following key conditions would be required to be included within an authorisation issued for the Phakwe Richards Bay Gas Power 3 CCPP:

- The Phakwe Richards Bay Gas Power 3 CCPP must be located within the Richards Bay IDZ Phase 1F on the following erven:
  - Erf 16820
  - Erf 16819
  - Erf 1/16674
  - Subdivision of Erf 17442
- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within **Appendices D to N**, are to be implemented.
- The EMPr as contained within **Appendix O** of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the Phakwe Richards Bay Gas Power 3 CCPP in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the project is considered key in achieving the appropriate environmental management standards as detailed for this project.

- A pre-construction walk-through of the final development footprint for species of conservation concern that may be affected and that can be translocated as well as comply with the KZN Nature Conservation Ordinance and DEDT&EA permit conditions, must be undertaken prior to the commencement of the construction phase.
- Before construction commences individuals of listed species within the development footprint that would be affected, must be counted, and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey, if required. Permits from the relevant provincial authorities, i.e. the KZN DEDT&EA, must be obtained before the individuals are disturbed.
- The project footprint must be kept as small as possible.
- An alien vegetation management plan should be compiled during the planning phase and implemented concurrently with the commencement of construction. Regular inspection for alien and invasive vegetation, to limit their spread into the wetland.
- Obtain all other mandatory and environmental permits for the project, as required.

DEFINITIONS AND TERMINOLOGY

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

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

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

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

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

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

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

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

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

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

Dust: Solid materials suspended in the atmosphere in the form of small irregular particles, many of which are microscopic in size

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

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

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

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

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

Environmental Authorisation (EA): means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental Assessment Practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental Control Officer (ECO): An individual appointed by the Owner prior to the commencement of any authorised activities, responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation

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

Environmental impact assessment (EIA): Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

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

Environmental Management Programme (EMPr): A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Environmental Officer (EO): The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

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

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

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

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

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

Method Statement: a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the 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.

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities.

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

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

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

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

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

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

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

Vulnerable species: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

Waste: Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Waste Amendment Act (as amended on June 2014); or any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*.

ACRONYMS

BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
DFFE	Department Forestry, Fisheries of the Environment (National)
DWS	Department of Water and Sanitation
CSIR	Council for Scientific and Industrial Research
DM	District Municipality
DMRE	Department of Mineral Resources Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EDTEA	KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development
EGIS	Environmental Geographic Information System
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
ESA	Ecological Support Area
GA	General Authorisation
GNR	Government Notice Regulation
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
I&AP	Interested and Affected Party
Km	Kilometre
LC	Least Concern
LM	Local Municipality
M	Metre
m^2	Square meters
m^3	Cubic meters
m amsl	Metres Above Mean Sea Level
MW	Megawatts
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)
NFA	National Forests Act (No. 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (No. 25 of 1999)
NT	Near Threatened
NWA	National Water Act (No. 36 of 1998)
ONA	Other Natural Area

PA	Protected Area
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
TOPS	Threatened or Protected Species
VECs	Valued Ecosystem Components
VU	Vulnerable
WUL	Water Use License

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APPENDICES LIST

CHAPTER 1: INTRODUCTION

Phakwe Richards Bay Gas Power 3 (Pty) Ltd (PRBGP3), an Independent Power Producer (IPP), proposes the development of a combined cycle (CC) gas to power plant, with a capacity of up to 2 000MW, on various erven within the Richards Bay IDZ Phase 1F, Richards Bay. The proposed project is to be known as the Phakwe Richards Bay Gas Power 3 (PRBGP3) CCPP. The project site is located approximately 5km north-east of Richards Bay and 1km north of the suburb of Alton, within the jurisdiction of the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality, KwaZulu-Natal Province (refer to **Figure 1.1**).

The Combined Cycle Power Plant and associated infrastructure is proposed in response to the provision for gas-to-power technology as part of the energy mix within the Integrated Resource Plan (IRP), 2019, and is planned to be bid into future procurement processes to be initiated by the Department of Mineral Resources and Energy (DMRE).

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction and operation of the project. The nature and extent of the 2000MW PRBGP3 CCPP and associated infrastructure, as well as potential environmental impacts associated with the construction, operation and decommissioning phases are assessed in more detail in this EIA Report.

This EIA Report consists of the following chapters:

- **Chapter 1** provides background to the proposed project and the environmental impact assessment process.
- **Chapter 2** outlines the strategic legal context for energy planning in South Africa and the proposed project.
- **Chapter 3** provides a description of gas to power technology.
- **Chapter 4** provides a description of the proposed project, including feasible alternatives identified and considered.
- **Chapter 5** outlines the need and desirability of the proposed project.
- **Chapter 6** describes the existing biophysical and socio-economic environment affected by the proposed project.
- **Chapter 7** outlines the process which was followed during the EIA Phase of the EIA Process.
- **Chapter 8** provides a description and assessment of the potential issues and impacts associated with the proposed project
- **Chapter 9** provides a description and assessment of the potential cumulative impact associated with the proposed project
- **Chapter 10** provides the conclusions and recommendations of the EIA report
- **Chapter 11** provides a list of all references used in the compilation of the EIA Report.

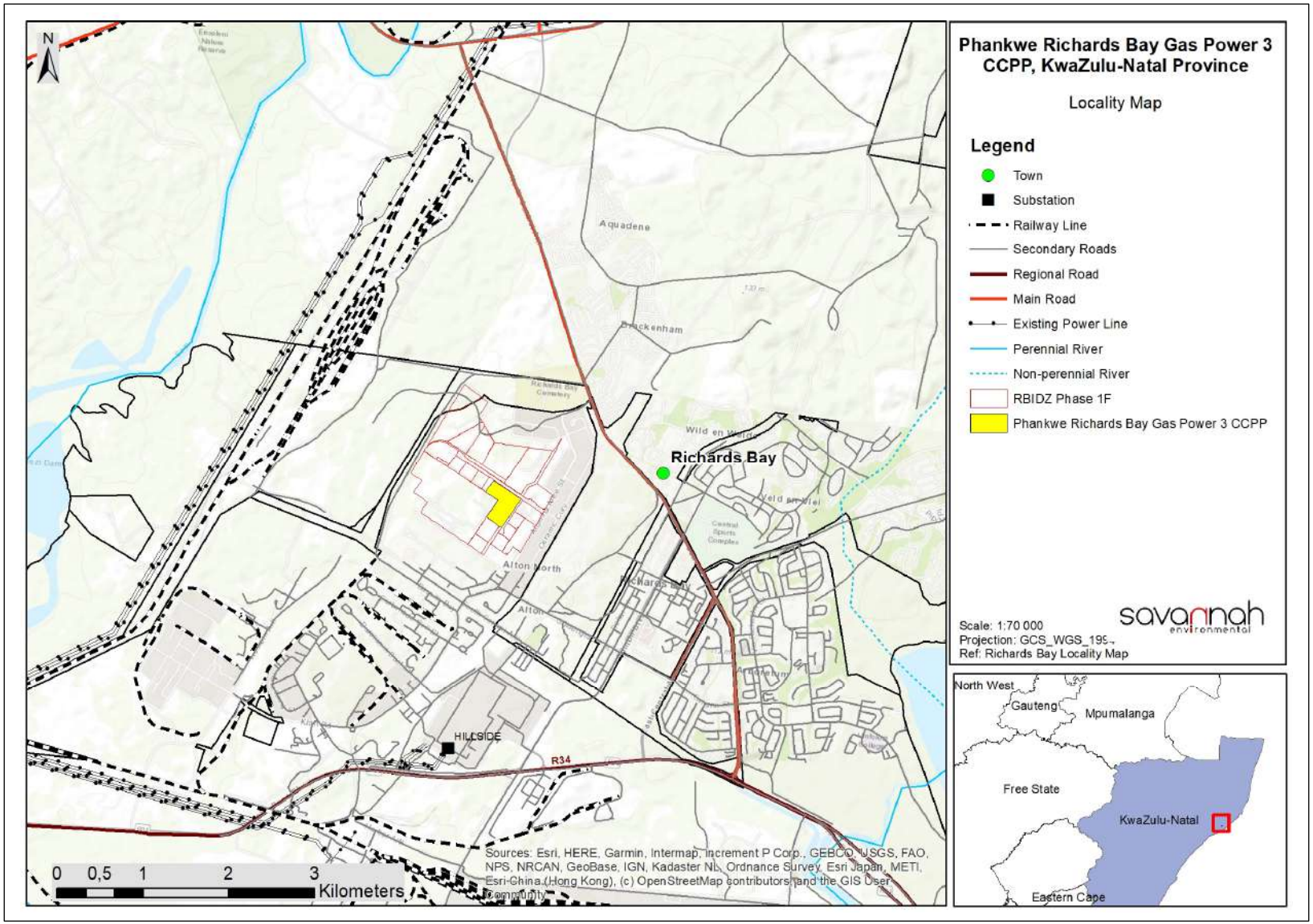

Figure 1.1: Locality map showing the area proposed for the establishment of the 2000MW PRBGP3 CCPP within the Richards Bay IDZ 1F, in the Richards Bay area (refer also to **Appendix P**)

1.1. Legal Requirements as per the EIA Regulations for the undertaking of a EIA Report, 2014 (as amended)

The EIA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (and amended on 07 April 2017) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the EIA Report includes the following information required in terms of Appendix 3: Content of the EIA Report:

Requirement	Relevant Section
(a)(i) the details of the EAP who prepared the report and (ii) the expertise of the EAP to carry out EIA procedures; including a curriculum vitae	The details of the EAP and the expertise of the EAP have been included in section 1.4 and **Appendix A**.
(b) the location of the development footprint of the activity on the approved sites as contemplated in the accepted scoping report, including (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties	The location of the project site proposed for the development of the Phakwe Richards Bay Gas Power 3 CCPP is included as **Figure 1.1**. The details of the affected properties including the property names and numbers, as well as the SG-codes are included in Table 1.1.
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken	The locality of the project site is illustrated on a locality map included as **Figure 1.1**. The corner point co-ordinates of the project site are included in **Table 1.1**.

1.2. Project Overview

As a fast-emerging economy, South Africa needs to balance the competing need for continued economic growth with its social needs and the protection of the natural environment. South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price, and that climate change concerns are addressed in planning the energy mix into the future. Approximately 90% of South Africa's electricity currently comes from fossil fuels[3], with Eskom being the main electricity producing company.

The Integrated Resource Plan (IRP) 2019, developed by the Department of Mineral Resources and Energy (DMRE), states a need for a diversified energy mix to meet the requirements of the country's need for economic and social growth. The IRP (2019) considers natural gas to have significant potential to add to the energy mix, while also considering South Africa's commitment to reducing emissions to address climate change concerns on a global scale. In order to achieve this diversified mix and harvest the benefits of gas to energy, the IRP includes the allocation of 3000MW of new capacity using this technology by 2030. The extent of the gas contained in the IRP is within the imposed emissions reduction trajectory for the country.

[3] Olusola M. Akinbami, Samuel R. Oke, Michael O. Bodunrin, 2021

The Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure is proposed to be constructed on erven 16820, 16819,1/16674 and a subdivision of erf 17442 within the Richards Bay IDZ Zone 1F, and will occupy approximately 11.8ha.

The power plant will operate at mid-merit to baseload duty and will include the following main infrastructure:

- Up to 4 gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- Up to 4 Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- Up to 4 steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
- Water retention pond
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines
- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, waste water
- Fire water (FW) storage and FW system
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal);
  - Warehousing and buildings;
  - Workshop building;
  - Fire water pump building;
  - Administration and Control Building;
  - Ablution facilities;
  - Storage facilities;
  - Guard House;
  - Fencing;

- Maintenance and cleaning area;
- Operational and maintenance control centre;

» Electrical facilities including:
- Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
- Generators and auxiliaries;

» Service infrastructure including:
- Stormwater channels;
- Water pipelines
- Temporary work areas during the construction phase (laydown areas)

A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and Hydrogen. The pipeline will be connected to the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the Richards Bay Harbour. A separate EIA process will be undertaken for the dedicated fuel-supply pipeline.

The grid connection infrastructure will include an Eskom portion of the 275kV or 400kV GIS interface Substation, Underground 275kV or 400kV power cabling connecting the Power Plant GIS substation and Eskom GIS Interface substation and an overhead 275kV or 400kV power line connecting the Eskom interface substation to the selected Eskom grid connection point. A separate EIA process will be undertaken for the grid connection infrastructure.

Table 1.1 provides a summary of proposed properties associated with proposed project. A comprehensive description of the key infrastructure components associated with the development of the Phakwe Richards Bay Gas Power 3 CCPP is provided in **Chapter 4** of this EIA Report.

Table 1.1: Summary of the preferred project site identified for the development of the Phakwe Richards Bay Gas Power 3 CCPP

Province	KwaZulu-Natal
District Municipality	King Cetshwayo District Municipality
Local Municipality	City of uMhlathuze Local Municipality
Ward number(s)	26
Nearest town(s)	Alton, Richards Bay, Arboretum, Empangeni, Ichubo
Farm name(s) and number(s)	» Erf 16820 » Erf 16819 » Erf 1/16674 » Subdivision of Erf 17442
SG 21 Digit Code (s)	N0GV04210001682000000 N0GV04210001681900000 N0GV04210001667400000 N0GV04210001744200000
Coordinate points for the proposed development site	28°44'31.5306"S, 32°1'39.4420"E 28°44'26.9614"S, 32°1'42.3432"E 28°44'31.6831"S; 32°1'51.9240"E 28°44'45.6445"S; 32°1'42.9759"E 28°44'43.0901"S; 32°1'38.0691"E 28°44'33.7688"S: 32°1'43.9819"E

Current zoning	Industrial
Current land use	Vacant / Industrial

1.3. Requirement for an Environmental Impact Assessment Process

The construction and operation of the proposed Phakwe Richards Bay Gas Power 3 CCPP is subject to the requirements of the 2014 EIA Regulations, as amended in April 2017, published in terms of Section 24(5) of the National Environmental Management Act (NEMA) 107 of 1998. This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of 'listed activities'. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of deciding on environmental authorisations. In terms of GN R779 of 1 July 2016, the Minister of the Department of Forestry, Fisheries and the Environment (DFFE) is the Competent Authority for all activities relating to the IRP of 2010 – 2030 (and any updates thereto) that require environmental authorisation. The DFFE is therefore the Competent Authority for this project, and the KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development (EDTEA) will act as a commenting authority.

The need to comply with the requirements of the EIA Regulations published under the NEMA ensures that proponents are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental specialist studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Phakwe Richards Bay Gas Power 3 (Pty) Ltd appointed Savannah Environmental as the independent environmental consulting company to conduct an EIA process for the proposed project and Application for Environmental Authorisation.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be fore-warned of potential environmental issues, and allows for the resolution of issues reported on in the Scoping and EIA Reports as well as a dialogue with interested and affected parties (I&APs).

The EIA process being undertaken for the proposed Phakwe Richards Bay Gas Power 3 CCPP comprises two phases – i.e. Scoping and Impact Assessment - and involves the identification and assessment of environmental impacts through specialist studies, as well as public participation. The process followed in these two phases is as follows:

» The **Scoping Phase** includes the identification and description of potential impacts associated with the proposed project through a desktop study and consultation with affected parties and key stakeholders. This phase considers the broader site in order to identify and delineate any environmental fatal flaws, no-go or sensitive areas, as well as project alternatives in order to determine which should be assessed in more detail in the EIA Phase. Following the public review period of the Scoping report, this phase culminates in the submission of a final Scoping Report and Plan of Study for EIA to the competent

authority for acceptance and approval to continue with the EIA phase of the process. The final Scoping Report and Plan of Study was submitted to DFFE on 13 January 2022 and acceptance received on 24 February 2022 thus marking the start of the EIA phase.

» The **EIA Phase** involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations (including field surveys), consideration of feasible alternatives and public consultation. Recommendations of practical and achievable mitigation and management measures are included in an Environmental Management Programme (EMPr) considering all phases of the project. Following the public review of the EIA report and EMPr, this phase culminates in the submission of a Final EIA Report and EMPr to the competent authority for review and decision-making.

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

In accordance with Regulation 12 of the 2014 EIA Regulations (GN R326), Phakwe Richards Bay Gas Power 3 has appointed Savannah Environmental (Pty) Ltd (Savannah Environmental) as the independent environmental consultant to undertake the Scoping and EIA process for the 2000MW PRBGP3 CCPP and its associated infrastructure. Neither Savannah Environmental nor any of its specialists are subsidiaries of/or are affiliated to Phakwe Richards Bay Gas Power 3. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed 2000MW PRBGP3 CCPP project.

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned) and is rated as a Level 2 Broad-Based Black Economic Empowerment (B-BBEE) Contributor. The company was established in 2006 with a clear objective to provide services to the infrastructure development sector. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The Savannah Environmental team has considerable experience in environmental impact assessments and environmental management and has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa, including those associated with electricity generation and transmission.

The Savannah Environmental team comprises:

» **Jo-Anne Thomas.** She holds a Master of Science Degree in Botany (M.S.c Botany) from the University of the Witwatersrand and is registered as a Professional Natural Scientist (400024/2000) with SACNASP and a registered Environmental Assessment Practitioner (EAP) with EAPASA (2019/726). She has over 20 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. During this time, she has managed and coordinated a multitude of large-scale infrastructure EIAs and is also well versed in the management

and leadership of teams of specialist consultants, and dynamic stakeholders. She has been responsible for providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, EIA studies, environmental permitting, public participation, EMPs and EMPrs, environmental policy, strategy and guideline formulation, and integrated environmental management (IEM). Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.

» **Nicolene Venter.** She is a Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

The specialist team for the proposed project is as follows:

Specialist Field	Specialist
Terrestrial Ecology	Anita Rautenbach of Rautenbach Biodiversity Consulting
Soils and Wetlands	Dale Kindler and Andrew Husted of The Biodiversity Company
Heritage (incl. palaeontology)	Jenna Lavin of CTS Heritage
Air Quality	Terri Bird of Airshed
Health Risk Assessment	Marlene Fourie of Infotox
Climate Change	Sarah Goodbrand of Promethium Carbon
Noise	Morne de Jager of EARES
Visual	Lourens du Plessis of LOGIS
Socio-economic	Eugene de Beer of Urban-Econ Development Economists
Traffic	Iris Wink of JG Afrika
Risk Assessment	Mike Oberholzer of RISCOM

Curricula Vitae (CVs) detailing Savannah Environmental and the specialist team's expertise and relevant experience are provided in **Appendix A**.

CHAPTER 2: STRATEGIC CONTEXT FOR ENERGY PLANNING

2.1 Legal Requirements as per the EIA Regulations for the undertaking of an EIA Report, 2014 (as amended)

This chapter of the draft EIA Report includes the following information required in terms of Appendix 3: Content of the EIA Report:

Requirement	Relevant Section
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context	The policy and legislative context for the development of the Phakwe Richards Bay Gas Power 3 CCPP has been considered throughout this chapter on a national, provincial and local level.

2.2 Energy Policy and Planning

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the DMRE. The legislative context, policy and planning documentation that supports the development of a diversified mix of energy projects, such as gas to power plants are discussed in more detail in the following sections, along with the provincial and local policies and plans that have relevance to the development of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure. The hierarchy of policy and planning documentation that support the development of energy projects such as electricity generation facilities is illustrated in Figure 2.1.

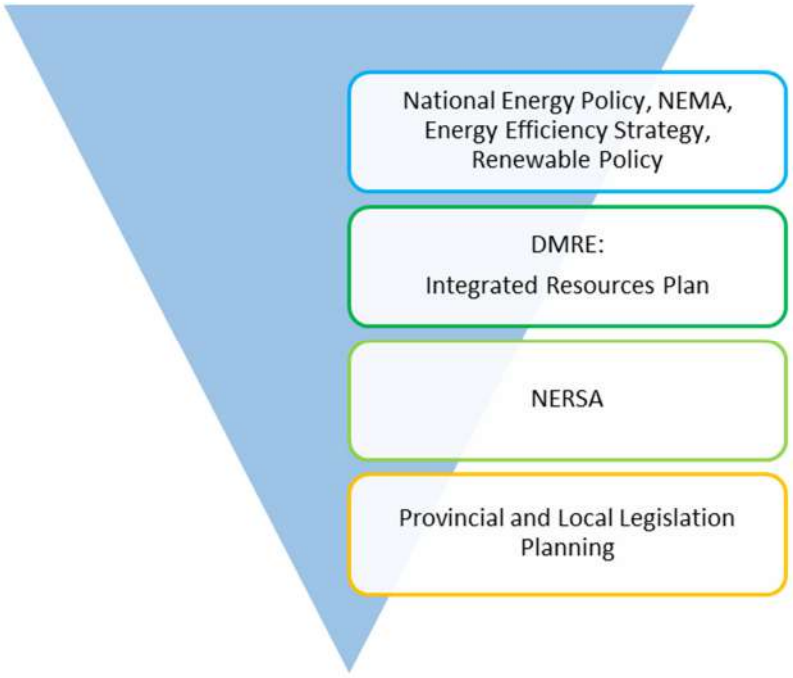

Figure 2.1: Hierarchy of electricity policy and planning documents

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project such as that being considered in this Scoping Report consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As gas to energy developments are multi-sectoral (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a gas to power project and the related statutory environmental assessment process. These policies are discussed in more detail in the following sections, along with the provincial and local policies and plans that have relevance to the proposed development.

At **National Level**, the main regulatory agencies are:

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity and, since merging with the Department of Mineral Resources (DMR), is also responsible for mining applications in terms of the provisions of the Mineral and Petroleum Resource Development Act (No. 28 of 2002) (MPRDA).
- **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity and for the construction and operation of fuel storage facilities linked to these IPP projects.
- **Department of Department of Forestry, Fisheries, and the Environment (DFFE):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GN R326) as amended. DFFE is the competent authority for this project (as per GNR 779 of 01 July 2016), and is charged with granting the EA for the project under consideration. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA).
- **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
- **Department of Water and Sanitation (DWS):** This Department is responsible for effective and efficient water resources management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WUL) and General Authorisation).
- **The Department of Agriculture, Rural Development and Land Reform (DARDLD):** This Department is the custodian of South Africa's agricultural resources and is responsible for the formulation and implementation of policies governing the agriculture sector and the initiation, facilitation, coordination and implementation of integrated rural development programmes.

At **Provincial Level**, the main regulatory agencies are:

- **KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDEAT):** This Department is the commenting authority for the Scoping and EIA process for the project.
- **Ezemvelo KZN Wildlife (EKZN):** is responsible for the management of nature conservation and protected areas in KwaZulu-Natal and issuing of other biodiversity and conservation-related permits.
- **AMAFA (KZN Heritage Authority):** identifies, conserves and manage heritage resources throughout the KwaZulu-Natal Province.

At the **Local Level,** the local and district municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the KwaZulu-Natal Province, both the local and district municipalities play a role. The local municipality includes the **uMhlathuze Local Municipality** which forms part of the **King Cetshwayo District Municipality**. In terms of the Municipal Systems Act (No. 32 of 2000), it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

2.3 National Policy and Planning Context

2.3.1 The National Energy Act (No. 34 of 2008)

The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, while taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply and generation, and for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research.

The Act provides the legal framework which supports the development of power generation facilities, such as the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure.

2.3.2 White Paper on the Energy Policy of South Africa, 1998

The White Paper on the Energy Policy, published by the then Department of Minerals and Energy (DME) in December 1998 was developed so as to clarify government policy regarding the supply and consumption of energy for the next decade. It was intended to address all elements of the energy sector as practically as it could. The main objectives of the White Paper are the following:

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

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

The White Paper on Energy Policy (1998) promotes diversification of generation technologies in the South African energy mix, and recognises natural gas as an attractive option for South Africa. It also provides the basis for the development of the Integrated Energy Plan (IEP).

2.3.3. The Electricity Regulation Act (No. 04 of 2006) (ERA)

The Electricity Regulation Act (No. 04 of 2006) as amended by the Electricity Regulation Act (No. 28 of 2007), replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry.

The ERA establishes a national regulatory framework for the electricity supply industry and made NERSA custodian and enforcer of the National Electricity Regulatory Framework. The ERA also provides for licences and registration as the manner in which the generation, transmission, distribution, reticulation, trading, and import and export of electricity is regulated.

2.3.4. The National Development Plan (NDP) 2030

The National Development Plan (NDP) 2030 offers a long-term plan for the country. It defines desired destinations where inequality and unemployment are reduced and poverty is eliminated so that all South Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living.

While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

» Raising employment through faster economic growth
» Improving the quality of education, skills development and innovation
» Building the capability of the state to play a developmental, transformative role

In terms of the Energy Sector's role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes:

» Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.
» Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households.
» Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

In formulating its vision for the energy sector, the NDP took the IRP 2010 as its point of departure. Therefore, although electricity generation from coal is still seen as part of the energy mix within the NDP, the plan sets out steps that aim to ensure that, by 2030, South Africa's energy system looks very different to the current situation: coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources – especially wind, solar, and imported hydroelectricity – will play a much larger role.

2.3.5. Integrated Energy Plan (IEP), November 2016

The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector.
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels).
- To guide investment in and the development of energy infrastructure in South Africa.
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

A draft version of the IEP was released for comment on 25 November 2016. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The development of the IEP is an ongoing continuous process. It is reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others.

The 8 key objectives of the integrated energy planning process are as follows:

- Objective 1: Ensure security of supply.
- Objective 2: Minimise the cost of energy.
- Objective 3: Promote the creation of jobs and localisation.
- Objective 4: Minimise negative environmental impacts from the energy sector.
- Objective 5: Promote the conservation of water.
- Objective 6: Diversify supply sources and primary sources of energy.
- Objective 7: Promote energy efficiency in the economy.
- Objective 8: Increase access to modern energy.

2.3.6. Integrated Resource Plan (IRP) for Electricity 2010 - 2030

The Integrated Resource Plan (IRP) for Electricity is a subset of the IEP and constitutes South Africa's National electricity plan. The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment. The primary objective of the IRP is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation.

The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.

Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation (Act No. 4) of 2006. The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity.

Since the promulgated IRP 2010–2030, the following capacity developments have taken place:

- A total 6 422 MW under the Renewable Energy Independent Power Producers Programme (REIPPP) has been procured, with 5 250 MW operational and made available to the grid.
- IPPs have commissioned 1 005 MW from two Open Cycle Gas Turbine (OCGT) peaking plants.
- Under the Eskom build programme, the following capacity has been commissioned:
  - 1 324 MW of Ingula pumped storage, 4 600 MW of Medupi, 2 400 MW of Kusile and
  - 100 MW of Sere Wind Farm.
- 18 000MW of new generation capacity has been committed to.

Besides capacity additions, a number of assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore.

These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with INDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline. This trajectory on emissions has been taken into consideration in the development of the IRP, 2019. The IRP specifically calls for a "just transition" of the energy sector to lower carbon emissions. The timing of the transition to a low carbon economy must be socially just and sensitive to the potential impact on jobs and local economies.

Following consideration of all these factors, the following Plan was promulgated.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

Installed Capacity
Committed/Already Contracted Capacity
Capacity Decommissioned
New Additional Capacity
Extension of Koeberg Plant Design Life
Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 2.2: IRP 2019 as promulgated in October 2019[4]

Gas is considered a transition fuel globally and it provides the flexibility necessary to run a system like South Africa has in a cost-effective manner. It is cleaner than other fossil fuels. Therefore, the IRP 2019 provides for the development of 3000MW of new capacity from gas to power projects. The extent of the gas contained in the draft IRP is within the imposed emissions reduction trajectory.

The development of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure provides an opportunity to contribute to "just transition" of the energy mix through the development of a power station which will enable the generation of electricity through the use of a cleaner fuel resource, with less emissions (however not zero emissions, unless fully replaced with green hydrogen as a fuel source – see Chapter 4) than coal-fired power stations, which can also support the uptake of renewable energy as part of the energy mix, while the process of decommissioning of coal-based technology facilities is undertaken.

[4] source: https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html

Risk and mitigation considerations within the IRP as they pertain to gas as detailed in Section 5.3.10 of the IRP:

Area of Risk	Risk	Mitigation
Gas	The availability of gas in the short to medium term is a risk as South Africa does not currently have gas resources. There is also a supply and foreign exchange risk associated with likely increase in gas volumes depending on the energy mix adopted post 2030 when a large number of coal fired power stations are decommissioned.	• For the period up to 2030 gas to power capacity in the IRP has realistically taken into account the infrastructure and logistics required around ports/pipelines, electricity transmission infrastructure. The IRP has therefore adjusted the lead times. • As proposed in the draft IRP update, work to firm up on the gas supply options post 2030 is ongoing. This work will inform in detail the next iteration of the IRP.

2.3.7. New Growth Path (NGP) Framework, 23 November 2010

The purpose of the New Growth Path (NGP) Framework is to provide effective strategies towards accelerated job-creation through the development of an equitable economy and sustained growth. The target of the NGP is to create 5 million jobs by 2020. With economic growth and employment creation as the key indicators identified in the NGP. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. The framework identifies investments in five key areas namely: energy, transport, communication, water and housing. Sustaining high levels of public investment in these areas will create jobs in construction, operation and maintenance of infrastructure. . The framework states that public investment can create 250 000 jobs per annum in energy, transport, water, communications infrastructure and housing. These jobs are said to be in four activities, the construction of new infrastructure; the operation of new facilities; expanded maintenance; and the manufacture of components for the infrastructure programme.

2.3.8. National Climate Change Bill, 2018

On 08 June 2018 the Minister of Environmental Affairs published the National Climate Change Bill ("the Bill") for public comment. The purpose of the Bill is to build an effective climate change response and ensure the long-term, just transition to a climate resilient and lower carbon economy and society. This will be done within the context of sustainable development for South Africa, and will provide for all matters related to climate change.

The National Climate Change Bill addresses issues related institutional and coordination arrangement across the three spheres of government namely national, provincial and local. It further highlights the need the spheres of government and entities, sectors as well business to respond to challenges of climate change. The bill further address the matters relating to, the national adaptation to impacts of climate change, greenhouse gas emissions and removals, and policy alignment and institutional arrangements. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The following objectives are set within the Bill:

a) Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance;

b) Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response;
c) Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.

2.3.9. National Climate Change Response Policy, 2011

South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively.

2.3.10. National Climate Change Adaptation Strategy (South Africa), 2020

South Africa's National Climate Change Adaptation Strategy (NCCAS) supports the country's ability to meeting its obligations in terms of the Paris Agreement on Climate Change. It gives effect to the National Development Plan's vision of creating a low-carbon, climate resilient economy and a just society. The commitment to the Paris Agreement and its implementation is in line with the principles and provisions of the UNFCCC will ensure the balance between adaptation and mitigation, and adequate financial, technological and skills support for South Africa to enhance their efforts against climate change.

2.3.11. Strategic Integrated Projects (SIPs)

The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 36 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development and enabling regional integration. SIP 9 (In terms of Section 8(1)(a) read with Section 7(1) of the Infrastructure Development Act, as amended, 2014 (Act no. 23 of 2014)) of the energy SIPs support the development of the gas proposed power plant:

» SIP 9: Electricity generation to support socio-economic development: The proposed Phakwe Richards Bay Gas Power 3 CCPP is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2019 to meet the needs of the economy and address historical imbalances.

2.3.12. Industrial Policy Action Plan (IPAP), 2018 / 2019 – 2020 / 2021

The Industrial Policy Action Plan (IPAP) 2018/2019 – 2020/2021 represents a significant step forward in scaling up the country's efforts to promote long-term industrialisation and industrial diversification. It is recognised that Southern Africa is fast transforming into an oil and gas jurisdiction due to significant gas discoveries and developments in progress that create the potential for the expansion of imports of natural gas resources from Mozambique in particular, that will build on the volumes already being imported by via the ROMPCO pipeline from the Pande and Temane fields operated by Sasol. From a South African perspective, the scale of the gas reserves in Mozambique is of particular significance. Accordingly, the plan states that a key industrial growth path is gas-based industrialisation (Department of Trade and Industry, 2018).

The expansion of gas supply into the South African market - via the development of domestic resources and the expansion of volumes from Mozambique - should produce affordable gas prices capable of underpinning a significant natural gas-based reindustrialisation of the South African economy. In the longer term (15 years +) the main objective is a vibrant gas industry delivering affordable and secure gas supply to the heavy industry, manufacturing and transport sectors (Department of Trade and Industry, 2018).

2.3.13. Gas Utilisation Master Plan (GUMP)

The Gas Utilisation Master Plan (GUMP) was created to assist in achieving the objectives of the IRP by driving the development of the gas-to-power industry in South Africa. According to the GUMP, the social economic advantages of establishing a large gas-to-power industry include job creation (during construction and operation), industrial development, the potential to use imported liquified natural gas (LNG) instead of diesel, and a source of cheaper energy. South Africa's gas-to-energy development plan spans 30 years, in which gas supply is envisaged to include local indigenous supply as well as imports through pipelines and by ship.

The GUMP identifies challenges facing the development of the gas industry in South Africa. These are: limited domestic supply; no immediate gas demand as yet; lack of gas infrastructure (no LNG import terminal yet); no gas master plan. It is envisaged that by the time construction of the proposed development is complete, more gas infrastructure will be available, such as the LNG import terminal at the Richards Bay port. GUMP identifies that there are potential gas reserves in the Karoo basin, deep offshore, and at the Ibhubesi basin. Through the local pipeline infrastructure, the gas-fired power station in Richards Bay could acquire local gas cheaply if the infrastructure to obtain it is developed. However, as identified, the lack of said infrastructure is currently a constraint. The timing of the development will likely fall in-line with the development of other gas-related infrastructure such as the LNG port in Richards Bay and the extension of gas pipelines from Mozambique. Therefore, the proposed project supports the implementation of GUMP as the facility intends to use natural gas and/or a mixtures of natural gas and hydrogen.

2.3.14. Hydrogen Society Roadmap for South Africa (2021)

Hydrogen is seen as an opportunity to revamp the country's industrial sector and achieve its emissions reduction goals by 2050 while reducing socioeconomic inequality. The country's vision is guided by its Hydrogen Society Roadmap (HSRM) released in February 2021, which sets clear targets to reach by 2050. South Africa aims to deploy 10 gigawatts (GW) of electrolysis capacity in Northern Cape by 2030 and

produce about 500 kilotons of hydrogen annually by 2030. This growth is forecasted to create 20,000 jobs annually by 2030 and 30,000 by 2040.

Key points of the HSRM include[5]:

» South Africa wants to become a major producer and exporter of green hydrogen, capturing a 4 percent global market share by 2050.
» South Africa's hydrogen strategy reflects several priorities: a desire to decarbonize its economy, an effort to create economic growth, an aim for pursuing a just transition away from coal, and a way to fully exploit its critical mineral resources.
» The country has several assets relevant for hydrogen: expertise in the Fischer-Tropsch process, abundant renewable energy resources, and major production capacity of platinum group metals (PGM), a key input for hydrogen applications.
» PGMs, in particular, offer an opportunity to develop a globally relevant industry, capturing local value added from a resource that is now exported as a raw material. A cornerstone of the government's hydrogen strategy is a "Platinum Valley," an industrial cluster to combine various applications into integrated hydrogen ecosystem.

2.4. Provincial Policy and Planning Context

2.4.1. KwaZulu-Natal Provincial Growth and Development Plan (PGDP) (2019)

The KwaZulu-Natal Provincial Growth and Development Plan (PGDP) aims to curb poverty, inequality and achieve shared growth. The PGDP has identified spatial marginalisation as one of the key issues to be addressed through ensuring economic opportunities that will meet the majority of the population's needs. The plan states that alternative sources of energy are a priority and must become a reality. This energy is anticipated through gas and diesel turbines which were anticipated to be on-line in 2016 (Provincial Planning Commission, 2016).

2.4.2. KwaZulu-Natal Provincial Growth and Development Strategy (PGDS) (2016)

The KZN's Provincial Growth and Development Strategy (PGDS) is concisely summarised in **Figure 2.3**. The Provincial Growth and Development Strategy (PGDS) for KZN addresses the triple challenge of poverty, inequality and unemployment. The KZN provincial government's vision is for the province to maximise its position as a gateway to South and Southern Africa, as well as its human and natural resources to create a safe, healthy and sustainable environment by 2035; eliminating poverty, inequality, unemployment and the current disease burden in the province.

[5] https://www.csis.org/analysis/south-africas-hydrogen-strategy#:~:text=The%20country's%20vision%20is%20guided,of%20hydrogen%20annually%20by%202030.

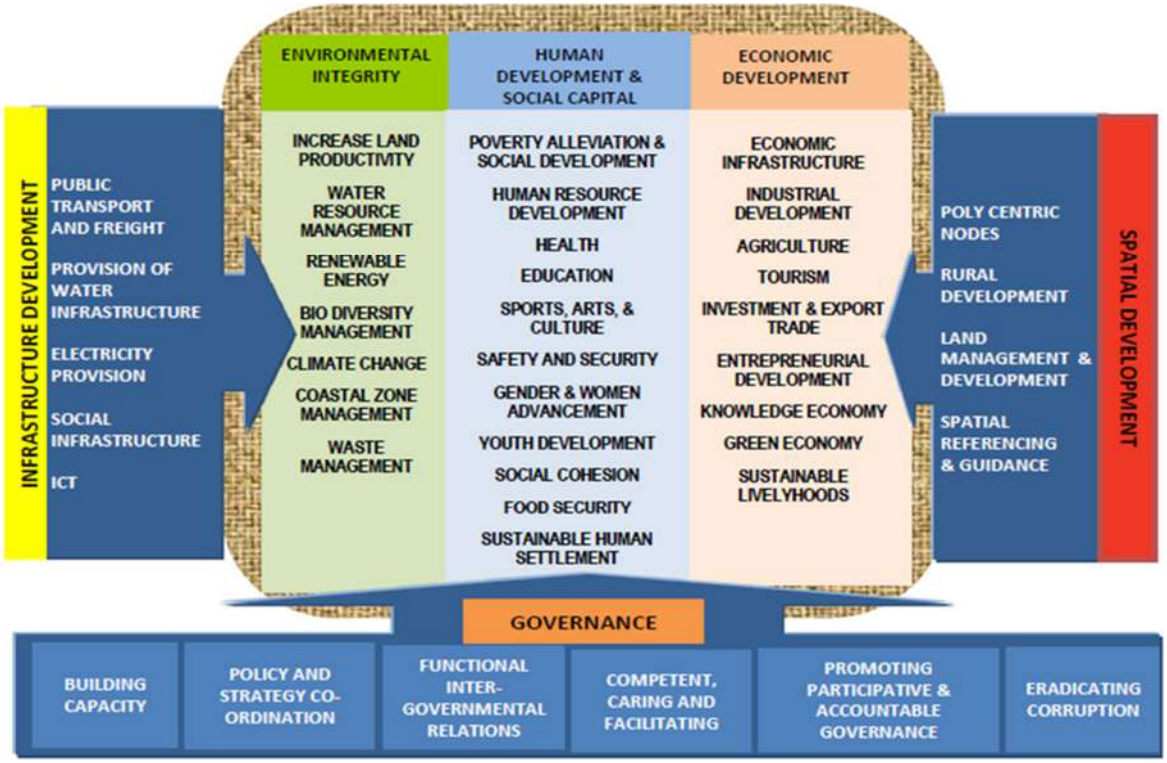

Figure 2.3: KZN Provincial Growth and Development Strategy

Through the seven strategic goals the KZN PGDS aims to achieve its vision by 2035, including:

1) Inclusive economic growth (expanded and sustained economic output is the fundamental driver for job creation)
2) Human resource development (he human resource capacity of KZN is relevant and responsive to the growth and development needs of the province)
3) Human and community development (reduce poverty and inequality in KZN)
4) Strategic infrastructure (strategic infrastructure provides for social and economic growth and development needs of KZN)
5) Environmental sustainability (reduce global greenhouse gas emissions and create social-ecological capacity to adapt to climate change)
6) Governance and policy (effective and efficient government systems)
7) Spatial equity (increased spatial access to goods and services)

Of particular relevance to this project is "Strategic Objective 4.5: Ensure access to affordable, reliable, sustainable and modern energy for all. Sufficient electricity is available for the growth and development needs of KZN". The PGDS states that energy supply in the province, and country, is becoming increasingly expensive for both domestic and business/industrial consumers, and this is exacerbated by the lack of investment in electricity infrastructure (new and maintenance of existing infrastructure). It highlights that the province must prioritise alternative energy projects and/or programmes as a reliable supply of energy. Alternative energy supply or the green economy must become measurable within the Provincial Growth and Development Plan.

The proposed Phakwe Richards Bay Gas Power 3 CCPP will result in the creation of job opportunities, human resource development, and strategic infrastructure for social and economic growth which will contribute

towards reducing poverty and inequality in KZN. This development will therefore assist the province in achieving the aims of the PGDS to some extent.

2.4.3. KwaZulu-Natal Provincial Spatial Economic Development Strategy (2016)

The Provincial Spatial Economic Development Strategy (PSEDS) serves as a framework for the prioritisation of spatial economic development initiatives in the province. It is meant to capitalise on complementarities and facilitate consistent and focused decision making. In addition, the purpose of the strategy is to ensure that investment occurs in the sectors that provide the greatest socio-economic return to investment (Department of Economic Development, 2016).

Figure 2.4 demonstrates that the preferred project site within the Richards Bay area is located in an area demarcated as having economies of scale. Economies of scale are achieved when the number of units produced or the volume of services sold are at such a large scale that it allows for the reduced production costs, ultimately increasing the competitiveness of the product or service. High demand for the product or a service is a prerequisite for economies of scale; this implies that the area where the Phakwe Richards Bay Gas Power 3 CCPP is to be built has a high demand for selected goods and services, including electricity. The area is already highly industrialised and hosts an IDZ nearby, which continuously seeks new investments in ICT, agro-businesses, and metals beneficiation. Therefore, the project is to be located in a potentially high economic growth region.

The development of the Phakwe Richards Bay Gas Power 3 CCPP will drive economic growth, infrastructural transformation and development. The area for development is seen as a favourable area for investment and development.

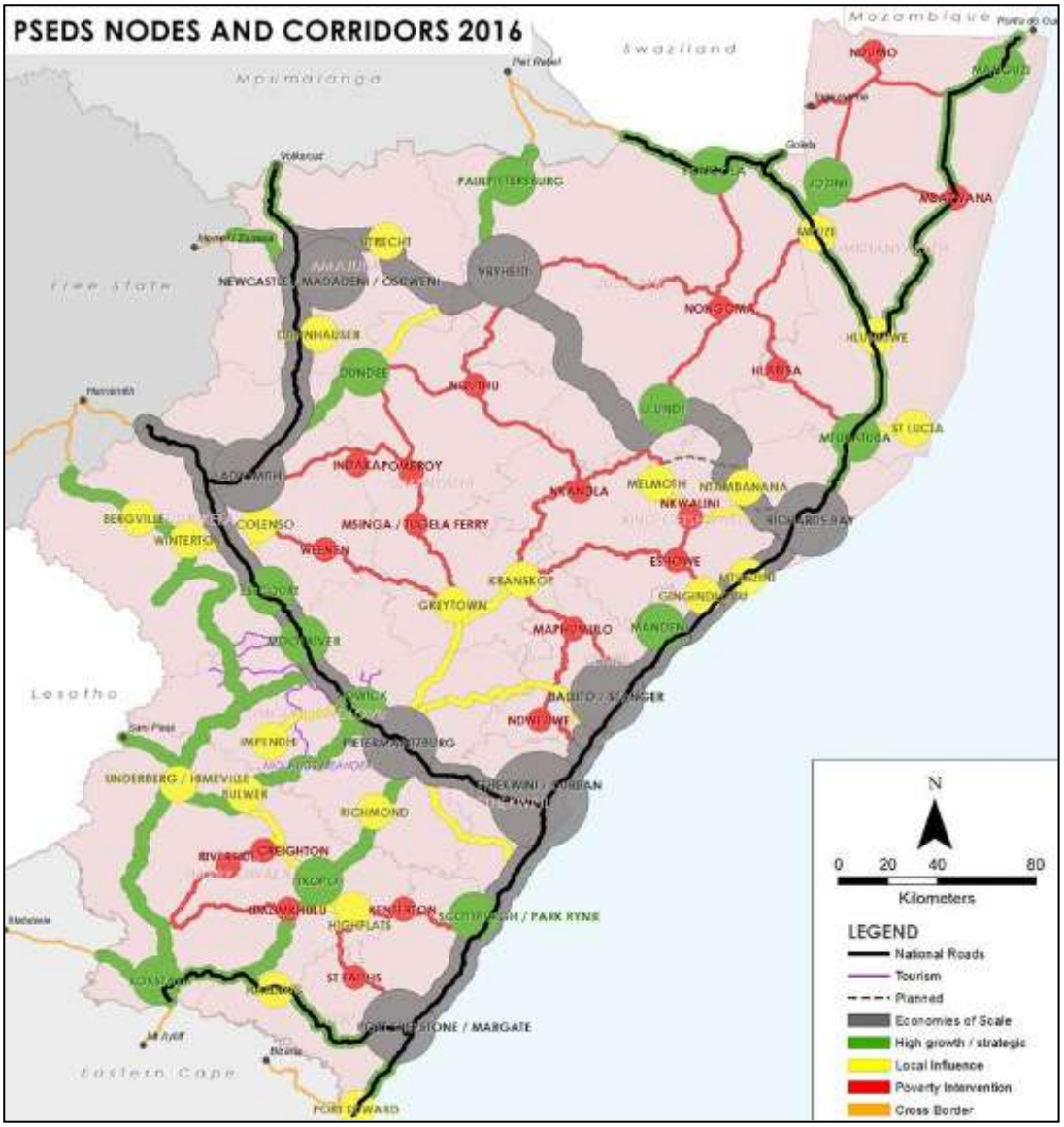

Figure 2.4: KZN Spatial Economic and Development Strategy nodes and corridors

2.4.4. KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs Revised Strategic Plan 2015 - 2020

The strategic focus for the KZN EDTEA during the 2020 planning period will be building a resilient KZN provincial economy that can respond to global factors, stimulating provincial economic development, alignment of functions and purpose of all economic development entities as well as building a vibrant organisation. The vision of the strategic plan is 'leading the attainment of inclusive growth for job creation and economic sustenance.' The mission of the strategic plan is to 1) develop and implement strategies that drive economic growth; 2) be a catalyst for economic transformation and development; 3) provide leadership and facilitate integrated economic planning and development; and 4) create a favourable environment for investment. The main objectives of the strategy that relate to the proposed project are as follows:

» To facilitate the creation of new markets;
» To drive growth of the KZN provincial economy;

- To enhance sector and industrial development through Trade, Investment and Exports Logistics, ICT, Manufacturing, Green economy, agri-business, Tourism, Creative Industries, Maritime, Aerotropolis, Aviation;
- To investigate and develop viable alternative energy generation options.

2.4.5. KwaZulu-Natal Provincial Spatial Development Framework (PSDF)

The KZN Provincial Spatial Development Strategy has been developed in order to achieve the goals and objectives of the PGDS in a targeted and spatial co-ordinated manner. Spatially, it is vital to consider general accessibility as a cross-cutting variable which impacts all three pillars of sustainable development and as a result the four main spatial variables informing the provincial spatial development framework include:

- Environmental Sensitivity;
- Economic Potential;
- Social Needs; and
- Urban Accessibility.

The PSDF spatial variables were considered collectively and a ranking order to key elements used to formulate a composite Provincial Spatial Development Framework which identifies Broad Provincial Spatial Planning Categories such as:

- Conservation Corridors;
- Biodiversity Priority Areas;
- Areas of Economic Value adding;
- Areas of Economic support;
- Areas of Agricultural Development;
- Areas of High Social Need; and
- Mandated Service Delivery Areas.

Areas of Economic Support resemble a region of good economic potential in more than just one of the key provincial economic sectors. Typical interventions in these areas would include economic prioritisation of development, labour force interventions (e.g. skills development), key economic infrastructure investment and area promotion. The development of the Phakwe Richards Bay Gas Power 3 CCPP will contribute towards economic value, economic support and economic growth in the area.

2.4.6. KwaZulu-Natal Climate Change Response and Sustainable Development Plan

In September 2012, the KwaZulu-Natal Provincial Government became the first provincial government to establish a Climate Change and Sustainable Development Council, which boosts multi-stakeholder membership (http://www.theclimategroup.org/who-we-are/our-members/the-province-of-kwazulu-natal). The Council has set up three Working Groups, namely Policy and Regulatory Alignment Working Group; Adaptation and Mitigation Working Group and Renewable Energy Working Group.

The province is in the early stages of developing the Climate Change Response and Sustainable Development Plan which is guided by, among others, the national strategy and the KwaZulu-Natal Growth and Development Strategy which has among its goals environmental sustainability as well as:

- Provision of 100% energy access in KZN Province by 2030, i.e. an additional 600 000 households or some 3 million people.
- Implementation of a number of significant renewable energy and energy efficiency projects.

The development of the Phakwe Richards Bay Gas Power 3 CCPP will promote access to energy through the use of a fuel resource other than coal. The use of natural gas (and eventually Hydrogen) in the development of the project offers reduced emissions when compared to the use of coal or diesel for electricity generation. The implementation of combined cycle technology will also ensure efficiency in terms of the use of natural gas as a fuel resource in the long-term once available.

2.4.7. 2012 KwaZulu-Natal Systematic Conservation Plan

In KwaZulu-Natal (KZN), the Critical Biodiversity Areas (CBA) map has been created as part a strategic planning strategy to ensure biodiversity conservation and persistence in the province. The KZN Provincial Conservation Assessment allows for the development of four defined categories necessary for the development of a Critical Biodiversity Area (CBA) map:

- CBA Mandatory are areas required to meet biodiversity targets for both biodiversity pattern and ecological process features, and no other options are available to meet this target.
- CBA Optimal are areas that are the most optimal to meet the biodiversity conservation targets while avoiding high cost areas as much as possible.
- Ecological Support Areas (ESAs) are areas not essential for directly meeting biodiversity targets but play an important role in supporting and sustaining the ecological functioning of the critical biodiversity areas.
- EGSAs deliver important ecosystem goods and services to the KZN province and the people living therein.

Provincial scale data layers (KZN CBA Irreplaceable version 26012016) identified CBA areas intersecting with the project site. During the Scoping assessment field work, the area was found to be degraded, with existing negative environmental impacts present. The terrestrial biodiversity is therefore not representative of the environmental sensitivities identified during the desktop assessment.

2.5. Local Policy and Planning Context

The strategic policies at the district and local level have similar objectives for the respective areas, namely to accelerate economic growth, create jobs, uplift communities and alleviate poverty. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

2.5.1. King Cetshwayo District Municipality Draft Integrated Development Plan (2020/21 – 2021/22)

The vision for the King Cetshwayo District Municipality Integrated Development Plan IDP 20/21 – 21/22 is to create a 'safe and healthy environment which promotes sustainable, radical, and inclusive economic and social development reinforced by service excellence' (KCDM, 2020: 34). As indicated in the vision, one of the goals is infrastructure development and service delivery. The Richards Bay Industrial Development

Zone (RBIDZ) is identified as a catalytic project (KCDM, 2020: 69). The objective is to promote economic growth in the District and improve the socio-economic conditions of residents.

A catalytic project is defined as a project of significant scale and scope that will make a substantial impact and contribution to the achievement of the vision and goals of the Province. The Richards Bay Industrial Development Zone (IDZ) is defined as a game changer in the context of catalytic projects. The proposed Phakwe Richards Bay Gas Power 3 CCPP will be located within the IDZ on a property zoned for industrial use, thereby contributing to and providing an extension of catalytic projects to the IDZ.

2.5.2. King Cetshwayo District Growth and Development Plan, 2015

The King Cetshwayo District Growth and Development Plan (DGDP) has an integral role in the integration and alignment of the goals of the NDP at national level and PGDP at provincial level. Therefore, the purpose of the DGDP is to translate the Provincial Growth and Development Plan into a detailed implementation plan at a district level (Uthungulu DM, 2015). One strategic intervention identified by the plan is the implementation of the roll-out programme for alternative sources of energy supply in the district where the gas-fixed electricity generation is classified as alternative energy supply. The proposed project will therefore assist with this programme.

2.5.3. King Cetshwayo District Municipality Integrated Development Plan (2019/20 – 2021/22)

The KCDM IDP Vision is "By 2035 King Cetshwayo District Municipality will be cohesive; economically viable district, with sustainable strategic infrastructure; supporting job creation through radical economic transformation rural development and promotion of our heritage".

KCDM's mission is that it will serve its communities to create a prosperous district through:

- Provision of sustainable; quality water and sanitation services;
- Developing the economy through radical economic transformation and job creation;
- Promoting rural development; agrarian reform and food security;
- Co-ordinate planning, spatial equity and environmental sustainability; and,
- Promoting heritage, community participation, nation building and good governance.

The articulated vision of the KCDM is as follows:
By 2035, King Cetshwayo district is renowned for the vastly improved socio-economic status of its residents resulting from 15 years of sustained economic growth. The district is internationally recognized as a world leader in innovative and sustainable manufacturing based on the successful implementation of the RBIDZ initiative. This economic growth, together with the district rural development programme resulted in the creation of decent employment opportunities leading to the fastest growing household and individual income levels in the province and reducing the unemployment rate of the youth in the district by more than 50%. It also resulted in a significant decrease in the economic dependency ratio and improving the overall quality of life in the district. The economic growth is underpinned by a vastly improved information and telecommunication infrastructure network with the entire district having access to a wireless broadband service, all businesses, and more than 50% of households with access to a computer and internet service. By 2035, the district is characterised by a high-quality infrastructure network supporting both household needs and economic growth. All households are provided with access to appropriate water infrastructure, adequate sanitation, and sustainable energy sources. Improved access to health

facilities and quality of health services provided resulted in continually improving health indictors in the district. The quality of the output from the primary and secondary education system has improved dramatically and all learners have access to fully equipped primary and secondary education facilities. Sustainable and coherent spatial development patterns have been successfully implemented through innovative spatial planning frameworks an effective land use management system implemented by highly skilled officials. Improved public sector management and skills levels resulted in sound local governance and financial management.

The KCDM IDP specifically emphasises that the national energy crises has far reaching implication on the supply and maintenance of infrastructure services to the district, notable the cost for stand by generators at pump stations as well as the running costs of such generators. The environmental costs of increased combustion into the atmosphere as a result of generator operations was also highlighted as a risk to be considered.

The proposed CCGPP will contribute to the 2035 vision of the District Municipality through the provision of sustainable and assured supply of electricity for supporting households and economic growth envisioned. Refer to Section 3: Need and Desirability for more details.

2.5.4. uMhlathuze Municipality Integrated Development Plan (IDP), 2019/2020

The City of uMhlathuze has produced the Integrated Development Plan (IDP), in order to further their vision: "The Port City of uMhlathuze offering improved quality of life for all its citizens through sustainable development." The IDP review highlights the Sustainable Development Goals (SDG) offer major improvements on the Millennium Development Goals (MDGs). The SDG framework addresses key systemic barriers to sustainable development such as inequality, unsustainable consumption patterns, weak institutional capacity, and environmental degradation that the MDGs neglected. As such, the City of uMhlathuze have outlined how their interventions will align with the SDGs. The following is of relevance to this proposed project:

Table 2.1: Extracts from the table within the IDP review that highlights the alignment between the SDGs and the City of uMhlathuze's Strategic Framework.

7.	Ensure access to affordable, reliable and modern energy for all.		• Energy Master Plan • Target reduction of 30% of coal powered stations by 2030 • 2000MW Gas to Power • Renewable Energy Efficiency initiatives • Waste to Energy Project • Energy infrastructure upgrade
13.	Take urgent action to combat climate change and its impacts.	Optimal management of natural resources and commitment to sustainable environmental management.	• Climate Change Action Plan • International Partnerships and collaborations (ICELI) • Adaptation and Mitigation Programme • Accelerating low emission development • Responding with adaption initiatives • Urban Air Quality Management • Signed Global Compact of Mayors • Gas to Power Project • Waste Water Reuse

The proposed Phakwe Richards Bay Gas Power 3 CCPP will assist in meeting the gas to power target of 2000MW, which in addition may also lead to a reduced dependence on electricity from the Highveld coal powered stations. LNG is also known to be a cleaner and more environmentally friendly alternative to coal and other fossil fuels. The option to include Hydrogen, once hydrogen is commercially available, in the gas mixture used as fuel will further reduce the carbon emissions of the Phakwe Richards Bay Gas Power 3 CCPP. This will also assist with reducing air quality and knock-on climate change impacts.

2.5.5. City of uMhlathuze Spatial Development Framework 2017/2018 – 2021/2022 (May 2017)

There are a number of existing natural and man-made phenomenon that have shaped and continue to shape the uMhlathuze Municipality spatial landscape. The area to the east of the Municipality is inundated with a system of wetlands and natural water features such as Lakes Cubhu, Mzingazi, Nsezi and Nhlabane. Major rivers include the Mhlathuze and Nsezi. The main access into the municipal area is via the N2 in a north south direction and in an east west direction the R34. Other significant roads in the area include the MR431 (that provides a northerly entry into Richards Bay from the N2) as well as the Old Main Road that straddles the N2 on its inland. Railway lines are prevalent in the municipal area but do not provide a passenger service, only a commercial/ industrial service is provided. The municipality has the benefit of about 45km of coastline of which about 80% is in its natural state. Linked to its coastal locality is the Richards Bay deep-water port that has been instrumental in the spatial development of the area in the past and will impact on the areas the municipal area.

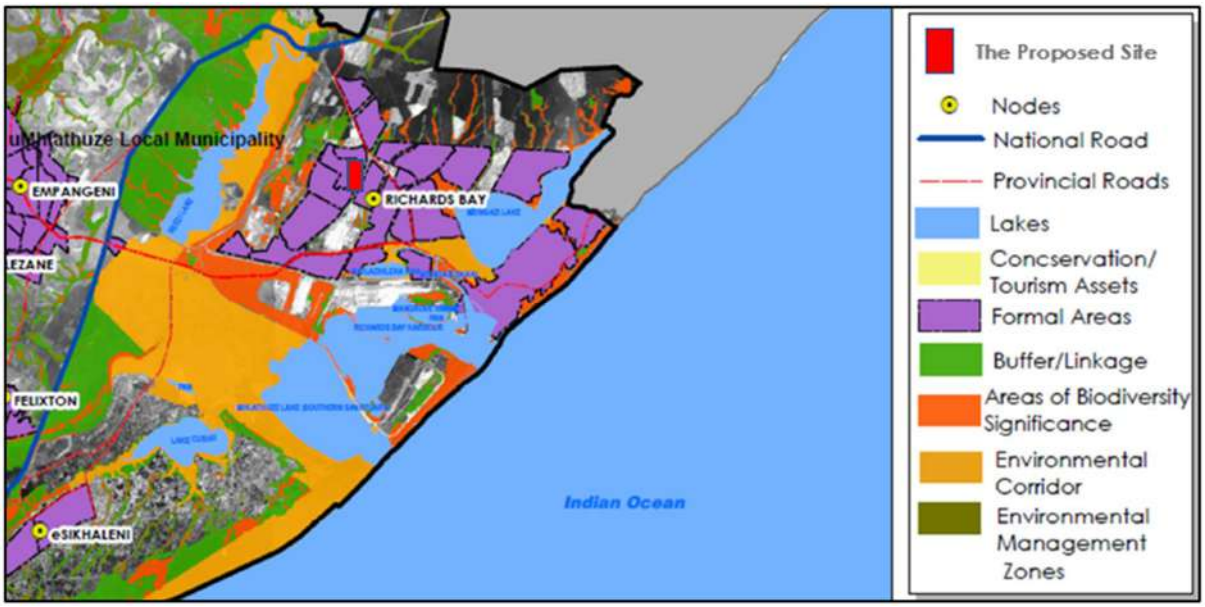

Figure 2.5: Extract from the Environmentally Sensitive Areas map within the uMhlathuze SDF (May 2017), depicting the area to the north-west of the port as "areas of biodiversity significance".

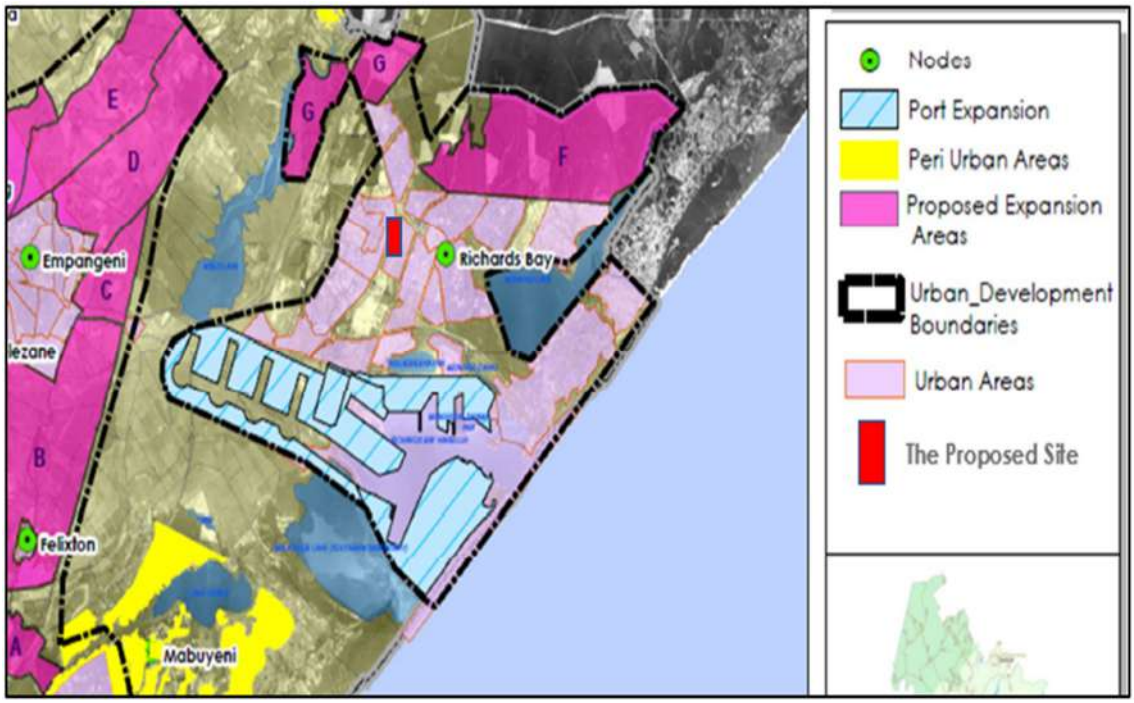

Figure 2.6: Extract from the Urban Development Plan map within the uMhlathuze SDF (May 2027), depicting the study are for this proposed development to be completely within the urban edge.

The SDF confirms that the proposed Phakwe Richards Bay Gas Power 3 CCPP falls within the urban development boundary of Richards Bay. Information retrieved from the City of uMhlathuze land use zoning data layers (http://gis.umhlathuze.gov.za/), indicated that the project site is zoned for noxious industry development (**Figure 2.7**) and falls within Phase 1F of the IDZ.

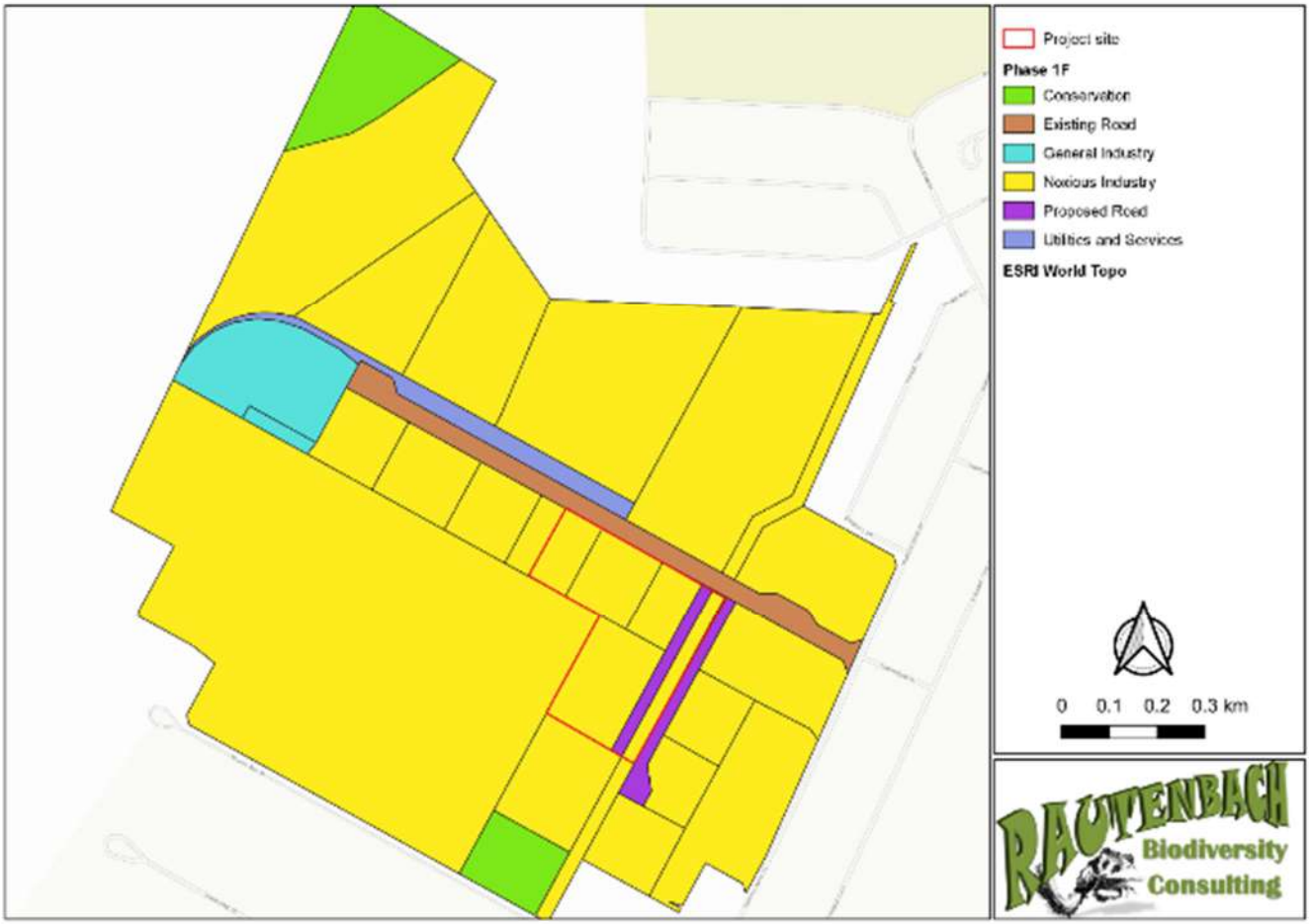

Figure 2.7: Land use zoning on Phase 1F.

2.6. Conclusion

The findings of the review of the relevant policies, programmes and documents pertaining to the energy sector indicate that the Phakwe Richards Bay Gas Power 3 CCPP is supported at a national, provincial, and local level, and that the development will contribute towards the various targets and policy aims.

CHAPTER 3: DESCRIPTION OF GAS TO POWER TECHNOLOGY

This chapter provides an overview of the of gas to power technology (i.e., combined cycle gas power plant), and the varying components associated with the technology.

3.1. Gas to Power Technology

CCPP is one of the most efficient power generating facilities to convert either gas or, as proposed by PRBGP3, potentially a mixture of gas and hydrogen to mechanical power or electricity. CCPP can deliver high power output at efficiencies as high as 50%–60% with low emissions and produce 50% more electricity than a simple-cycle plant consuming the same amount of fuel (Ramireddy, 2012)[6]. A CCPP uses a gas turbine generator to generate electricity. Waste heat from this initial process is used to make steam to generate additional electricity via a steam turbine. In other words, gas or a gas-hydrogen mixture is burnt in a gas turbine producing both electrical power via a coupled generator and hot exhaust gases. The hot exhaust gas passes through a water-cooled heat exchanger to produce steam, which can be turned into electric power with a coupled steam turbine and generator.

The general operation of a CCPP is described below.

1. A gas turbine burns fuel, which will be either natural gas or diesel.
   - » The gas turbine compresses air and mixes it with fuel which is combusted to produce high temperature and high-pressure combustion gases. The combustion gases pass through a gas turbine resulting in the rotation of the turbine blades.
   - » The rotational movement of the turbine blades at a high speed drives a generator which converts a portion of the energy produced by the rotational blades into electricity. The bypass stack associated with the CCPP will also provide operational flexibility that allows the gas turbine to operate in isolation of the rest of the plant.

2. A heat recovery system captures exhaust heat.
   - » The exhaust waste heat generated from the gas turbine enters the Heat Recovery Steam Generator (HRSG).
   - » The HRSG captures exhaust heat from the combustion gases to produce high temperature and high-pressure steam.
   - » The exhaust gases from the HRSG are dispersed via the exhaust stack.
   - » Emissions in the exhaust gas is controlled by means of Selective Catalytic Reduction (SCR). The exhaust gas passes through catalysts located in the HRSG.

3. Delivery of additional electricity through the operation of a steam turbine.
   - » Steam produced from the HRSG is delivered to the steam turbine that sends its energy to the generator drive shaft, where it is converted into additional electricity making the power plant energy efficient.
   - » The spent steam from the steam turbine is sent to the Air Cooled Condensers (ACC) to convert the steam into water. The water is then sent to the HRSG to produce steam. This is a closed system with very little make-up water required, therefore saving water.

[6] https://electrical-engineering-portal.com/an-overview-of-combined-cycle-power-plant

Combined cycle power plants may be either single shaft, wherein both of the gas turbine and steam turbine are connected to the same generator in a tandem arrangement, or multishaft, with each gas turbine and steam turbine driving a separate generator.

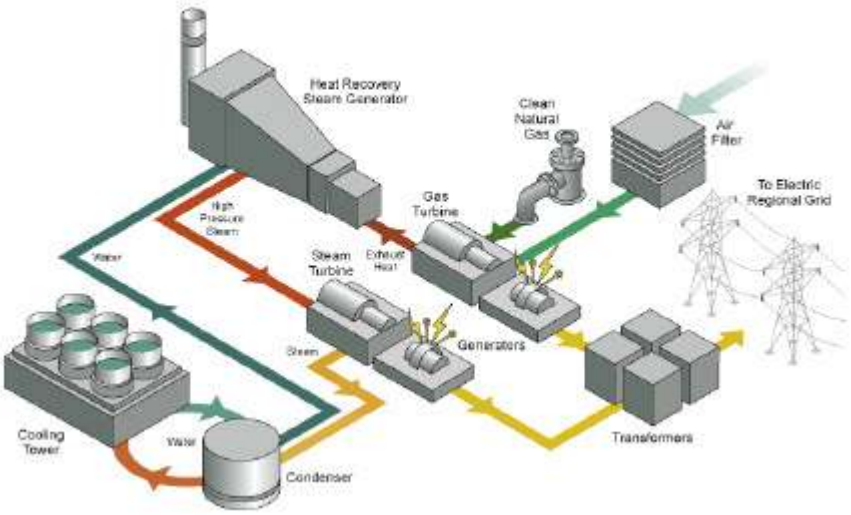

Figure 3.1: Schematic of Combined Cycle Gas-fired Power Generation Process

Table 3.1 details the potential advantages and disadvantages associated with CCPP, as determined by Ramireddy (2012).

Table 3.1: Potential advantages and disadvantages associated with CCPP

Potential Advantages	Potential Disadvantages
Fuel Efficiency	Location of development dependant of the availability and cost effectiveness of fuels.
Low capital costs	
Commercial availability	
Reduced emissions and fuel consumption*	

*Comparable with coal fired power plants

3.2. Fuel Sources

Combined cycle plants are usually powered by natural gas, although fuel oil, synthesis gas (such as Hydrogen) or other fuels can be used.

PRBGP3 proposes the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source. A benefit of using a blend of natural gas and hydrogen gas as a fuel source for turbine operation is the reduction in carbon emissions pre-combustion (if green or similarly sourced hydrogen is used)[7], as well as during combustion. The potential use of hydrogen therefore prevents locking in carbon emissions of gas power plants, which aids in the reduction of carbon emissions[8].

[7] Green hydrogen is hydrogen produced by splitting water by electrolysis. This produces only hydrogen and oxygen. This process to make green hydrogen is powered by renewable energy sources, such as wind or solar.
[8] Hydrogen as a fuel for gas turbines. A pathway to lower CO2. www.ge.com/power/future-of-energy

CHAPTER 4: PROJECT DESCRIPTION AND ALTERNATIVES

This chapter provides an overview of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure. The components and infrastructure presented in this chapter have been refined from that proposed during the Scoping Phase enabling the reader to obtain a comprehensive overview of the proposed project. These will however be confirmed through the final design prior to implementation.

4.1. Legal Requirements as per the EIA Regulations for the undertaking of an EIA Report, 2014 (as amended)

This chapter of the scoping report includes the following information required in terms of Appendix 3: Content of the EIA Report:

Requirement	Relevant Section
(d) a description of the scope of the proposed activity, including – (ii) a description of the associated structures and infrastructure related to the development	A description of the project scope and infrastructure is provided in Section 4.2
(h)(i) details of all the alternatives considered;	The details of all alternatives considered for the development of the Phakwe Richards Bay Gas Power 3 CCPP are included in Section 4.3.
(h)(ix) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such	No project site alternatives are considered for the Phakwe Richards Bay Gas Power 3 CCPP. The motivation behind the exclusion of site alternative have been included in Section 4.4.
h(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report	No project site alternatives are considered for the Phakwe Richards Bay Gas Power 3 CCPP. Technology alternatives considered for the development of the project are considered within Section 4.7. The motivation behind the exclusion of site alternative has been included in Section 4.4.

4.2. Description of the Proposed Project

The Phakwe Richards Bay Gas Power 3 CCPP involves the construction of a gas power station which will provide mid-merit or baseload power supply, estimated at 16 to 24 hours daily operation[9]. The power station will have an installed capacity of up to 2000MW, to be operated on natural gas or a mixture of natural gas and hydrogen. A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and Hydrogen[10]. The pipeline, which will be subject to a separate environmental authorisation process, will be connected to the proposed Transnet

[9] Mid-merit electricity generation capacity refers to the generation of electricity which is adjusted according to the fluctuations in demand in the national grid. Baseload electricity generating capacity refers to the generation of electricity continuously for all hours of the day and night in order to satisfy the minimum demand required in the national grid.
[10] The dedicated pipeline will be authorised through a separate environmental authorisation process.

supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the Richards Bay Harbour[11].

The power plant will operate at mid-merit or baseload duty and will include the following main infrastructure:

- Up to 4 gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- Up to 4 Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- Up to 4 steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
- Water retention pond
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines
- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, waste water
- Fire water (FW) storage and FW system
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal);
  - Warehousing and buildings;
  - Workshop building;
  - Fire water pump building;
  - Administration and Control Building;

[11] Transnet National Ports Authority (TNPA) has confirmed that a request for proposals (RFP) will be issued by July 2022 for the development of an LNG terminal at the Port of Richards Bay, in KwaZulu-Natal (https://www.engineeringnews.co.za/article/transnet-prepares-to-invite-bids-for-richards-bay-lng-terminal-2022-04-21#.YmGBV_JOhtE.linkedin)

- Ablution facilities;
- Storage facilities;
- Guard House;
- Fencing;
- Maintenance and cleaning area;
- Operational and maintenance control centre;

» Electrical facilities including:
- Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
- Generators and auxiliaries;

» Service infrastructure including:
- Stormwater channels;
- Water pipelines
- Temporary work areas during the construction phase (laydown areas)

Table 4.1 provides details of the proposed Phakwe Richards Bay Gas Power 3 CCPP, including the main infrastructure and services. An overview of the indicative areas for the proposed infrastructure is provided in **Figure 4.1**, and a preliminary 3D design of a single unit CCPP is included as **Figure 4.2**. A preliminary detailed design is included in **Appendix P.**

Table 4.1: Details of the Phakwe Richards Bay Gas Power 3 CCPP located near Richards Bay

Component	Description/ Dimensions
Location of the site	Erven 16820, 16819 1/16674 and a subdivision of Erf 17442 within the Richards Bay IDZ Phase 1F, KwaZulu-Natal
Landowner	Richards Bay Industrial Development Zone (IDZ), Phase 1F
Municipal Jurisdiction	King Cetshwayo District Municipality and the City of uMhlathuze Local Municipality
Electricity Generating capacity	2000MW (installed)
Proposed technology	Combined Cycle Gas Turbine Technology with associated Balance of Plant
Extent of preferred project sites	11.8ha
Extent of the 2000MW PRBGP3 CCPP	Up to 11ha
Stack dimensions (Site elevation: 43 - 47 m above mean sea)	» Exhaust and bypass stack height will be a minimum of 45m up to 90m (1 stack per Heat Recovery Steam Generator (HRSG) and one additional bypass for each gas turbine. » Diameter of each stack is expected to be approximately 9m
Fuel Sources	» Natural gas (LNG or similar) – 2 218 407 840 (i.e. 2 218 million) normal m^3. » Mixture of Natural gas and Hydrogen
Site access	The site will be accessed via existing roads within the IDZ Phase 1F (already approved through an EIA undertaken for the Phase 1F infrastructure) and internal access roads (width of up to 6m) which will be constructed.
Grid connection	» Onsite substation (275kV or 400kV) » The Phakwe Richards Bay Gas Power 3 CCPP will be connected to the national grid via a 275kV or 400kV Eskom Switching Station and underground transmission cables that will connect to the

Component	Description/ Dimensions
	selected Eskom grid connection point. A separate EIA process will be undertaken for the switching station and transmission line.
Water requirements	» The construction phase of the PRBGP3 plant will require ~25 000m^3 of water for a period of 36-48 months. The average consumption will be approximately 550-700 m^3/month. Potable water is to be sourced from RB IDZ as part of the lease agreement conditions. » Water volumes of approximately 1 130 000 m^3 per annum are expected to be required for the operation of the plant. This amount to between 2790 and 3100 m^3/day which will be provided by the RB IDZ. Water provided by RB IDZ will be sourced from the uMhlathuze Municipality Water Works. If the potential construction of a Umhlathuze Water treatment plant makes industrial water available in the future, this water could be considered as an alternative source of water during the operation of the plant.
Associated infrastructure	» Temporary laydown areas; » Warehousing and buildings; » Workshop building; » Fire water pump building; » Administration and Control Building; » Ablution facilities; » Storage facilities; » Guard House; » Fencing; » Maintenance and cleaning area; » Operational and maintenance control centre
Services required	The proposed project will be located within the Richards Bay IDZ 1F under a long-term lease. The Zone Operator / Landlord (RBIDZ) is responsible for all services required by Phakwe Richards Bay Gas Power 3 (Pty) Ltd (the tenant) under the long-term lease agreement. The RBIDZ lease agreement states: "*Undeveloped land which is to be serviced by the Landlord to include bulk water, sewer, and electrical connections and a road external to the leased premises but within the RBIDZ. The Landlord will be responsible for the development of the Property as vacant developed land with services in place to the supply points installed by the Landlord near the boundary of the Property*." In this regard, the following engineering services will be provided by the Landlord: » Water; » Sewage; » Roads; » Storm water; » Electricity; and » General waste removal on a weekly basis by the uMhlathuze Municipality.

Component	Description/ Dimensions
	These services are already existing within the IDZ and sufficient water supply for the project from the IDZ has been confirmed by the applicant. Construction waste and hazardous waste during construction and operation will be removed from site by a suitably qualified contractor for disposal at an appropriately licensed waste disposal site or to be recycled (where possible).
Raw/Process-Water Storage Reservoir	Water storage facilities will be located on site. This will include a raw water and fire water tank, demineralisation water tank and a tank for partially treated water.

More details on some of the project components is provided in the sections below.

(a) Combined Cycle Process

In combined-cycle electricity generation, heat exhaust from one or more (natural gas-fuelled) combustion turbines is captured and used to create steam which, in turn, is supplied to a steam turbine. Pairing the different generating technologies together (natural gas and/or mixture of gas and hydrogen, and steam) allows for maximum operating efficiency. The exhaust gasses from combustion are discharged via separate stacks (45m to 90m). The point source (i.e., stack) parameters are indicated in **Table 4.2** below.

Table 4.2: Parameters for point sources of atmospheric pollutant emissions at the project

Source name	Height of Release Above Ground (m)	Height Above Nearby Building (m)	Effective Diameter at Stack Tip / Vent Exit (m)	Actual Gas Exit Temperature (°C)	Actual Gas Volumetric Flow (m³/hr)	Actual Gas Exit Velocity (m/s)
Gas turbine Stack	60	>3[(a)]	9.0	84	3 857 551	16.8
Notes: (a) Assumed parameter. Detail not yet available.						

Maximum Emission Rates (MES) of the point source during Normal Operating Conditions (based on emission factors) are indicated in **Table 4.3** below.

Table 4.3: Atmospheric pollutant emission rates for the project (Emission Factors)

Pollutant Name	Maximum Release Rate				Emissions Hours	Type of Emissions (Continuous / Routine but Intermittent / Emergency Only)
	mg/Nm³	mg/Am³	g/s	Averaging period		
Sulfur dioxide (SO_2)	0.02	0.014	0.0147	Hourly	24 hours per day; 7 days per week	Continuous during operation
Oxides of Nitrogen (NO_X)	50	38.3	41.06	Hourly	24 hours per day; 7 days per week	Continuous during operation
Particulates	10	7.7	8.21	Hourly	24 hours per day; 7 days per week	Continuous during operation
Carbon monoxide (CO)	2.94	2.3	2.411	Hourly	24 hours per day; 7 days per week	Continuous during operation
Total Volatile Organic Compounds (TVOCs)	0.16	0.13	0.135	Hourly	24 hours per day; 7 days per week	Continuous during operation

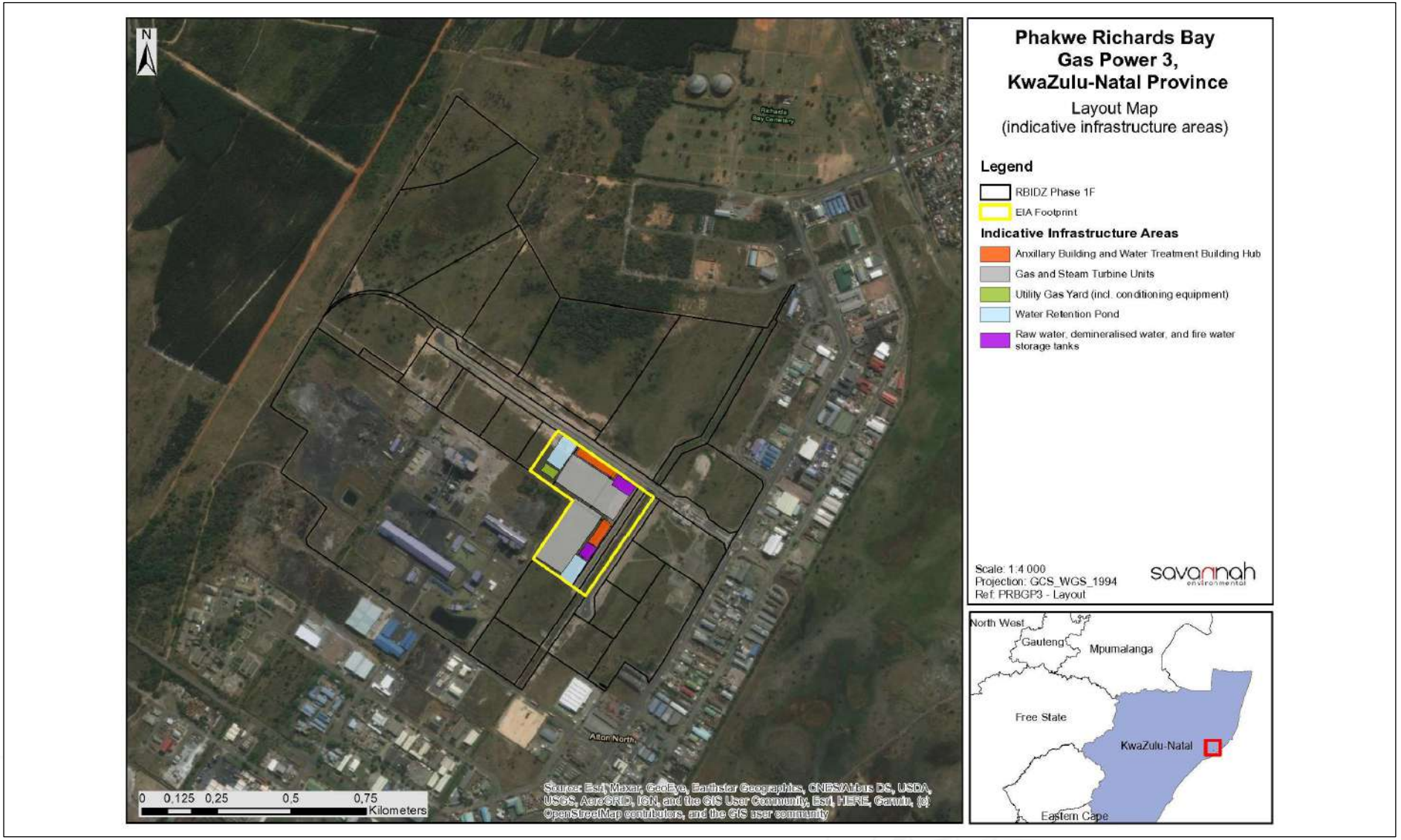

Figure 4.1: Map of indicative areas for infrastructure associated within the Phakwe Richards Bay Gas Power 3 CCPP. A preliminary detailed design is included in **Appendix P**

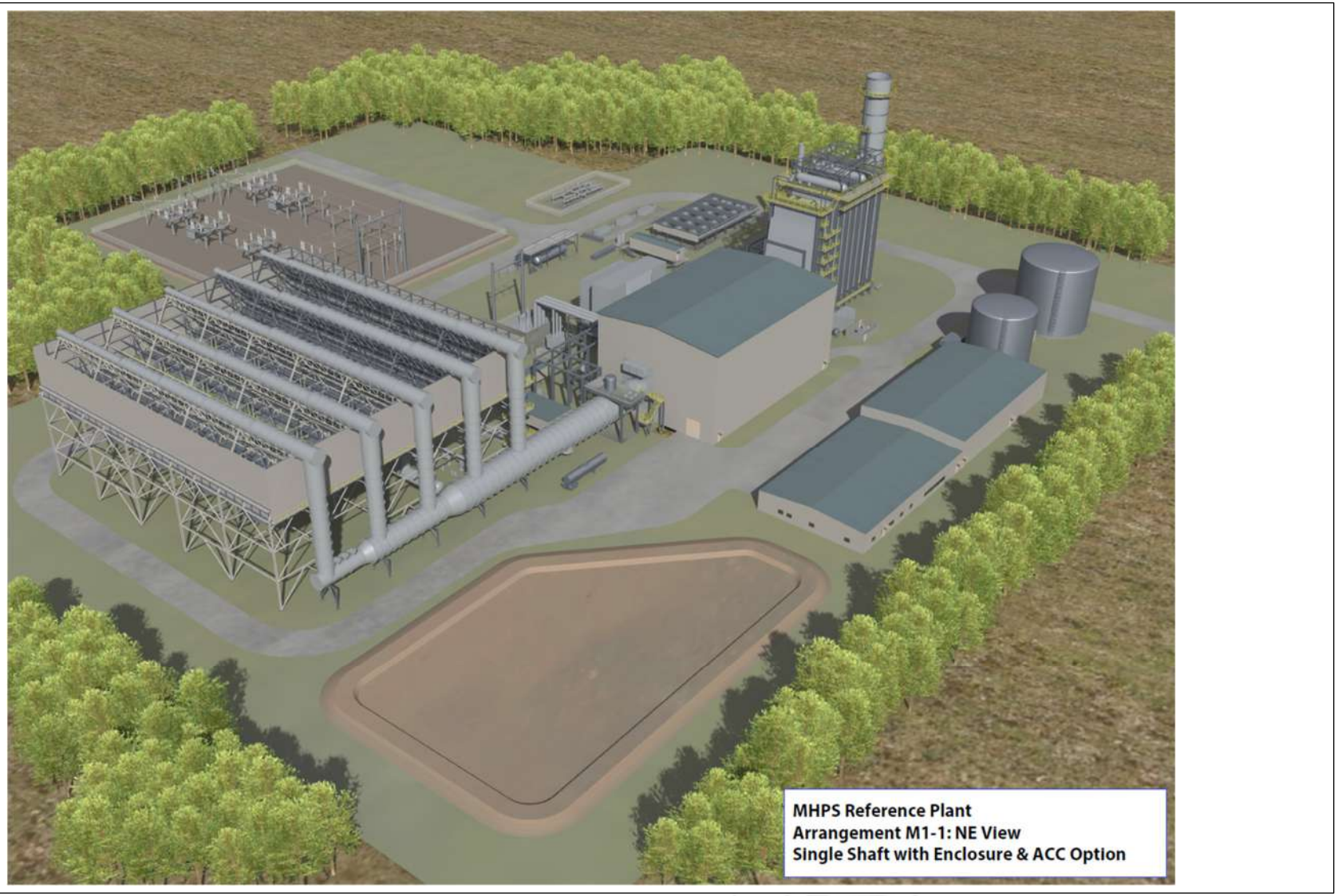

Figure 4.2: Preliminary 3D design of a single unit CCPP similar to that proposed for the Phakwe Richards Bay Gas Power 3 CCPP (source: PhakweGroup)

4.3. Life-cycle Phases of the 2000MW PRBGP3 CCPP

4.3.1. Construction Phase

Construction of the Phakwe Richards Bay Gas Power 3 CCPP is expected to take up to 36 to 48 months to construct depending on the choice of technology and the lead time for equipment. The construction activities involve the following:

- Prior to initiating construction, a number of surveys will be required including, but not limited to, geotechnical survey, site survey and confirmation of the power station footprint and location of exhaust stacks key components.
- Site preparation activities will include clearance of vegetation and excavations for foundations and internal roads. These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.
- Thereafter civil works will take place which involves concrete works for structures such as foundation, the production unit (which houses the engines/turbines, generator, engines and so forth), stacks, cooling towers (if applicable), substation and associated infrastructure.
- Civil works for water storage areas, water demineralisation processing plant and mechanical and electrical work will then follow.
- Ancillary infrastructure such as fuel storage facilities (if required), guard house, admin building, workshops and a warehouse will be established.
- As construction is completed in an area, and as all construction equipment is removed from the site, the site will be rehabilitated where practical and reasonable.

Employment opportunities to local community members will be available during the construction phase of the project. It is estimated that during the construction period the construction staff complement will be ~600 people, with peaks of staff higher, with employment opportunities being provided for the local community as far as possible. The labour required includes 90% low skilled and semi-skilled and a 10% of skilled and highly skilled workforce. Employees will not reside on the project site and will be accommodated in the Richards Bay area.

4.3.2. Operation Phase

Prior to the operation of the power station, testing and trials will need to be undertaken. The proposed facility will create approximately 60 permanent employment positions that will be retained for the 20-year life of the project. The permanent employment positions will include highly skilled, skilled and semi-skilled positions.

The Phakwe Richards Bay Gas Power 3 CCPP is proposed to operate at mid-merit or baseload (estimated 16 to 24 hours daily operation). To operate a power plant of this nature, resources are required (input), and processes and outputs occur from the electricity generation process.

The amount of fuel to be consumed will depend on the degree to which the plant is used (i.e. base load or mid-merit – comparison). The maximum fuel consumption of the power plant will be approximately 116 million GJ per annum at base load and 77 million GJ per annum at mid-merit. The estimated volumes required are: 3 021 000 000m^3 at base load and 2 014 000 000 m^3 at mid-merit. The source of fuel (LNG) is expected to be the Transnet dedicated LNG pipeline, from the Richards Bay harbour. Alternatively, fuel

can be purchased from international suppliers. Where fuel is purchased from a party other than Transnet, it will be supplied to the power plant via a dedicated gas pipeline, also from the Richards Bay harbour.

The gas to power plant may consume water at volumes up to 1 130 000m^3 per annum at base load and 755 000m^3 per annum at mid-merit (note that the volume of water required will be dependent on the final design of the facility as well as on the technology supplier). Every effort is being made to reduce these volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design. The volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Phakwe Richards Bay Gas Power 3 (Pty) Ltd.

Other small consumables include oils for plant lubrication and electrical insulation and selected other chemicals that are typically associated with such plants.

The plant will produce wastewater as an output of the demineralisation plant on site and the washing of turbines, blow down, as well as oily water. The wastewater will be contaminated with heavy metals and must be disposed of by a specialist contractor. The wastewater will be stored in a sump at each unit. Oily water will be collected from drains. The oily water will be sent to an oily water separator (one for the site). Oil that is separated from the water will be removed from the sump periodically by a specialist contractor. The grey water from the separator will be discharged into the RB IDZ's wastewater system which is a dedicated effluent discharge pipeline used by existing industrial users. It must however be noted that prior to any discharge of grey water, the developer must obtain an oil contamination requirement from the RB IDZ to ensure that the oily water separator filter purchased is of the correct specifications. This will ensure that grey water discharged into the RB IDZ's system will not further contaminate the RB IDZ's wastewater system.

It is anticipated that there will be full time security, maintenance and control room staff required at the site.

4.3.3. Decommissioning Phase

The lifespan of the proposed Phakwe Richards Bay Gas Power 3 CCPP will be at least 20 years from date of commissioning. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. Upgrade of the RMPP technology could be possible after the initial 20-year operational life should an extension of operational life be required as the gas engines and turbines are common to have longer operational lives than 20 years. Should the project be decommissioned, the fuel supply infrastructure would similarly need to be decommissioned (natural gas or mixture of natural gas and hydrogen).

It is most likely that decommissioning activities of the infrastructure of the facility discussed in this EIA process would comprise the disassembly and disposal of the infrastructure. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, fuel storage tanks and pipelines, removal of waste from the site and rehabilitation to the desired end-use.

Future use of the site after decommissioning of the Phakwe Richards Bay Gas Power 3 CCPP could possibly form part of another energy generating project of an alternative industry that would be able to utilise some

of the existing infrastructure associated with the plant. This would however be dependent on the development plans of the area at the time.

4.4. Project Alternatives

In accordance with the requirements of Appendix 3 of the 2014 Environmental Impact Assessment (EIA) Regulations (GNR 326), reasonable and feasible alternatives including site and technology alternatives, as well as the "do-nothing" alternative should be considered. Alternatives are required to be assessed in terms of social, biophysical, economic and technical factors.

As per the definition of alternatives as per the Environmental Impact Assessment (EIA) Regulations (GNR 326); "alternatives", in relation to a proposed activity, means different means of meeting the general purpose
and requirements of the activity, which may include alternatives to the:

(a) property on which or location where the activity is proposed to be undertaken;
(b) type of activity to be undertaken;
(c) design or layout of the activity;
(d) technology to be used in the activity; or
(e) operational aspects of the activity;
and includes the option of not implementing the activity;

Most guidelines use terms such as "reasonable", "practicable", "feasible" or "viable" to define the range of alternatives that should be considered. Essentially there are two types of alternatives:

- **Incrementally different** (modifications) alternatives to the project.
- **Fundamentally (totally) different** alternatives to the project.

4.4.1. Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level, and project-specific EIAs are therefore limited in scope and ability to address fundamentally different alternatives. Electricity generating alternatives have been addressed as part of the IRP 2010 – 2030. In this regard, the need for a diversification of the technology mix for power generation has been considered, as detailed in Chapter 2. The fundamental energy generation alternatives were assessed and considered within the development of the IRP and the need for the development of both gas generated energy and highly flexible generation capacity to support the uptake of renewables as part of the energy mix has been defined. As detailed in Chapter 2, gas is considered a transition fuel globally and it provides the flexibility necessary to run a system like South Africa has in a cost-effective manner. It is cleaner than other fossil fuels. Therefore, the IRP 2019 provides for the development of 3000MW of new capacity from gas to power projects. The extent of the gas contained in the draft IRP is within the imposed emissions reduction trajectory committed to by the country.

As detailed in the IRP 2019, the transition of the energy mix must still include the use of non-renewable energy fuel resources in order to allow for the development of the renewable energy sector and the associated infrastructure, as well as enable the establishment of energy developments that can fill the gaps in terms of supply considering the use of renewable energy. Without allowing the transition of energy

technologies and energy fuel resources, the path to a lower carbon economy may be severely constrained (i.e. not socially just and sensitive to the potential impact on jobs and local economies) as the gaps created from the decommissioning of coal-based technology and power facilities, without catering for the required energy supply through the use of better technology during the transition process, might be too large to overcome. Gas is considered to play a vital role in this transition. The impacts of gas on air quality and climate change are acknowledged at policy level and government has recognised the potential for Green Hydrogen generation as an alternative fuel source. As stated previously, PRBGP3 intends on utilising a mix of LNG and Hydrogen (scaling up from 20%) as soon as sources of Hydrogen become available.

As a result of the identified role of gas to energy technologies as part of the just energy transition detailed above, fundamental alternatives to the proposed project, including that of alternative energy development options, were not considered within the EIA report.

4.4.2. Consideration of Incrementally Different Alternatives

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

- The property on which, or location where the activity is proposed to be undertaken.
- The technology to be used in the activity.
- The design or layout of the activity.

In addition, the option of not implementing the activity (i.e. the "do-nothing" alternative) must also be considered.

These alternatives are discussed below.

4.5. Site Alternatives

Richards Bay has been identified by Phakwe Richards Bay Gas Power 3 (Pty) Ltd as the preferred area for the development of the Phakwe Richards Bay Gas Power 3 CCPP due to:

- it being located within an Industrial Development Zone (RBIDZ Phase 1F) on land designated for noxious industry development;
- it being appropriately sized (11.8ha) to accommodate a 2000MW CCPP and associated infrastructure (11ha);
- it being a location with existing large heavy industries and is specifically targeting the attracting of additional heavy industries through the Richards Bay Industrial Development Zone (RBIDZ), which attraction of new industries has been hampered by the unavailability of power to support these planned developments;
- the location of the Port of Richards Bay in close proximity to the industrial areas for the importation of fuel to supply the project, including the future planned LNG import facilities;
- its location in relation to Mozambique, the current exclusive natural gas supplied to South Africa, and the potential to connect Richards Bay to the gas reserves in the north of Mozambique via a new natural gas pipeline which is in accordance with Governments long term energy planning;

» the existence of a large-scale electricity distribution and transmission network connecting to Richards Bay with a capacity of ~3,500MW to facilitate the evacuation of electricity production with the least investment in additional infrastructure.

Following consideration of various technical aspects, the sites for the and related infrastructure was deemed suitable for the project. No alternative sites have been identified.

4.6. Gas to Power Technology Alternatives

The development of a Combined Cycle Power Plant has been identified by Phakwe Richards Bay Gas Power 3 (Pty) Ltd as the most feasible technology alternative for the generation of electricity within the Richards Bay area. The use of this technology has been included in the IRP, 2019, which has been considered as a necessity to be developed within South Africa by 2030 to meet the electricity supply demands and to ensure the significant inclusion of natural gas as an energy resource within the national grid, therefore promoting a diversified energy mix.

As detailed in Chapter 2, the development of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure provides an opportunity to contribute to "just transition" of the energy mix through the development of a power station which will enable the generation of electricity through the use of a cleaner fuel resource, with less emissions (however not zero emissions) than coal fired power stations, which can also support the uptake of renewable energy as part of the energy mix, while the process of decommissioning of coal based technology facilities are undertaken. In addition, by utilising fuel sources such hydrogen (whether 100% hydrogen or a as blend) for the operation of gas power facility, there may be a further reduction in carbon emissions related to power generation if green or similarly sourced hydrogen is used (see Section 4.7 below).

As such, no power generation technology alternatives are being considered for this development within the Richards Bay area.

4.7. Fuel Alternatives

Combined Cycle power technology as proposed for this project is ideally placed, and is able to operate using various fuel sources, depending on availability. The fuel type that is proposed for the proposed gas to power plant is natural gas (LNG, or another form of natural gas), or a mixture of natural gas and Hydrogen. The percentage of H2 in the mix would move up from an initial value of 20% progressively (to eventually 100%) over time depending on the progress of technology for burning higher % of H2 in the Gas turbines of the plant. The use of Hydrogen will be based on the availability of this fuel source at the required volumes and that the H2 price will be competitive for the commercial operation of the plant. As part of the development, it is proposed that the H2 used for the fuel source be produced by renewable energy resources (i.e., green hydrogen), which aids in lower carbon emissions pre-combustion. Furthermore, the inclusion of H2 in the mixture of the fuel source lowers carbon emissions of the power plant during combustion (if green or similarly sourced hydrogen is used), with the potential to reach zero emission when the fuel consists completely of H2, as is envisaged in the future for this facility.

No Diesel, Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO) will be used, due to their high emissions.

No feasible fuel alternatives were identified for the proposed project.

4.8. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Phakwe Richards Bay Gas Power 3 CCPP on the project site within the RBIDZ Phase 1F. The 'do-nothing' alternative has been assessed in Chapter 8 and Chapter 10 of this EIA Report.

CHAPTER 5: PROJECT NEED AND DESIRABILITY

Appendix 3 of the EIA Regulations, 2014 (as amended) requires the inclusion of a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location. This Chapter provides an overview of the anticipated suitability of the Phakwe Richards Bay Gas Power 3 CCPP being developed at the preferred location from a national, regional, and site-specific perspective. It also provides an overview of the need and desirability of the project specifically.

5.1 Legal Requirements as per the EIA Regulations for the undertaking of an EIA Report, 2014 (as amended)

This chapter of the scoping report includes the following information required in terms of Appendix 3: Content of the EIA Report:

Requirement	Relevant Section
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	The need and desirability for the development of the proposed Phakwe Richards Bay Gas Power 3 CCPP is included in Section 5.2.

5.2 Need and Desirability for the Proposed Gas to Power Station

The need and desirability of a development needs to consider whether it is the right time and right place for locating the type of land-use/activity being proposed. Need and desirability is therefore equated to the wise use of land, and should be able to answer the question of what the most sustainable use of land is. This section of the report provides an overview of the need and desirability, and perceived benefits of the Phakwe Richards Bay Gas Power 3 CCPP specifically. Potential impacts associated with the project assessed in **Chapter 8** of this EIA Report and in the attached specialist reports.

5.2.1. Need and Desirability from a National Perspective

The Phakwe Richards Bay Gas Power 3 CCPP is proposed in response to a national government initiative, namely the requirement for the diversification of power generation technology within the IRP 2019 (as detailed within Chapter 2). The overarching objective for the gas to power facility is to be capable of operating across a wide variety of dispatch profiles, from base load to mid-merit and providing ancillary services to aid grid stability. The need and desirability of the project from a national perspective can largely be assimilated from the project's alignment with national government policies, plans and programmes which have relevance to energy planning and production (as discussed in detail in **Chapter 2**).

The promulgated IRP 2010–2030 identifies the preferred generation technologies required to meet expected demand growth up to 2030. It incorporates government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development. In terms of the technology mix, 3000MW is allocated to gas to power technology up until 2030. The need for new gas to power generation has therefore been identified and assessed by government at a national scale considering the national energy requirements as well as international commitments in terms of addressing climate change issues.

The updated IRP 2019 further reconfirmed the allocation of 3000MW of gas to power technology up until 2030 as contained in IRP 2010 - 2030. The Phakwe Richards Bay Gas Power 3 CCPP is being developed in direct response to this new generation capacity requirement. The implementation of the proposed project therefore has the potential to contribute positively towards the identified need at a national level, while simultaneously contributing to job creation and socio-economic development.

The Gas Utilisation Master Plan (GUMP) was created to assist in achieving the objectives of the IRP by driving the development of the gas-to-power industry in South Africa. According to the GUMP, the social economic advantages of establishing a large gas-to-power industry include job creation (during construction and operation), industrial development, the potential to use imported liquified natural gas (LNG) instead of diesel, and a source of cheaper energy. South Africa's gas-to-energy development plan spans 30 years, in which gas supply is envisaged to include local indigenous supply as well as imports through pipelines and by ship. The proposed project supports the implementation of GUMP as the facility intends to use natural gas and/or a mixtures of natural gas and hydrogen.

In addition to the policy considerations detailed above, Government has prioritised post COVID-19 turnaround plans and has compiled an Economic Reconstruction and Recovery Plan which was presented to Parliament in October 2020. According to this plan, the economic recovery will rely on a massive investment in infrastructure, including in energy, telecommunications, ports and rail. The core elements of the Economic Reconstruction and Recovery Plan are as follows:

1. Priority interventions for economic recovery: the plan sets out eight priority interventions that will ignite South Africa's recovery and reconstruction effort. These are the flagship initiatives that all of society will rally around to build a new economy (**Figure 5.1**).

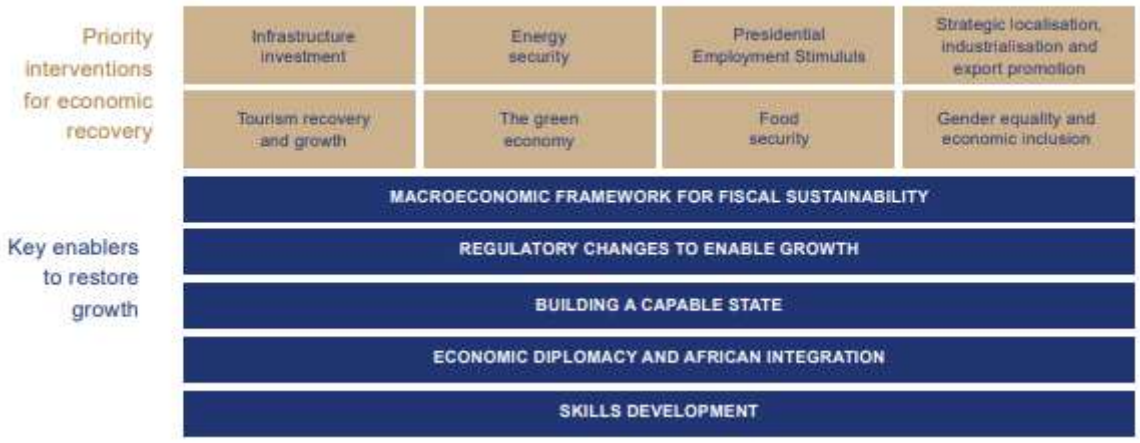

Figure 5.1: Core elements of the Economic Reconstruction and Recovery Plan (source: Building a new economy - Highlights of the Reconstruction and Recovery Plan, Presidency of the Republic of South Africa)

2. Enabling conditions for growth: these are the growth-enhancing reforms and other preconditions for an inclusive, competitive and growing economy.
3. Macroeconomic framework: economic reconstruction and recovery requires careful mobilisation of resources to ensure fiscal sustainability.
4. Institutional arrangements: the plan focuses on execution, and is supported by enhanced institutional arrangements to ensure implementation and accountability.

The plan recognises energy security as the most important prerequisite for the recovery agenda and states that renewed investment in a diversified energy mix can be achieved within a short time horizon, while alleviating a crippling energy crisis and facilitating a necessary transition to a less carbon-intensive economy. One of the key commitments of the plan is therefore to implement the IRP 2019 without delay to provide a substantial increase in the contribution of renewable energy sources by 2030, alongside other sources including battery storage, gas and clean coal. To reach net-zero by 2050, South Africa would need to speed up deployment of renewable energy capacity; at least 4GW of renewables will need to be installed every year – roughly ten times the current pace of new-build. Natural gas as a transition fuel will be critical in this journey – initially growing as an enabler to the integration of wind and solar into the power system at scale, gas will then be gradually replaced by other technologies to reach net-zero emissions[12].

The development of the Phakwe Richards Bay Gas Power 3 CCPP is identified as a mechanism for securing additional power generation capacity as part of the Gas IPP programme. Furthermore, gas-fired and combined cycle power plants may also be regarded as a key technology to improve power production to meet demand, and for decarbonisation, as it reduces the carbon footprint of electricity compared with coal and oil-fired power plants. It may also complement the implementation of renewable energy sources, as it balances power supply from renewable sources and stabilises electricity grids.[13]

Arguments that pause should be placed on any gas-to-power development until at least 2030 are noted, given the analysis that gas supply to balance higher penetration levels of variable renewable electricity will be unnecessary until 2035 (IISD, 2022), and that there is a move away from gas to the use of green hydrogen. As stated previously, it is the intention of the developer to use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source. Recently green hydrogen, produced with renewable sources such as wind and solar energy, is getting a more prominent place in global policy thinking to limit global warming in the context of the Paris agreement. This has been accelerated in the wake of current global political and economic policies not achieving the agreed climate targets. At present, industry is already using large quantities of hydrogen, but this mainly produced from natural gas. Replacement with green hydrogen and expansion to more end-user segments contributes significantly to the (deep) decarbonisation of otherwise hard-to-decarbonise markets.

South Africa is well-positioned to become a major player of green hydrogen in the world. The country has abundant land available and in combination with excellent potential solar and wind resources this could provide a solid base to produce one of the lowest cost green hydrogen in the world. South Africa's world class renewable energy resources also allows a highly competitive production cost of H2 below 1.60 $/kg by 2030, putting South Africa as potentially one of the largest global exporters of green H2 and green fuels.

The Energy Sector Economic Recovery Strategy released by Business for South Africa (2020) has highlighted the need for alignment of the energy sector, with a combined solution for electricity, gas, and liquid fuels. A number of constraints are identified, which if addressed could facilitate the energy sector playing a dual role in driving South Africa's economic recovery, primarily as a catalyst for growth in the economy but also as a driver of direct and indirect jobs.

[12] Just Transition and Climate Pathways Study for South Africa: Decarbonising South Africa's power system. e National Business Initiative (NBI).

[13] Gas key as South Africa transitions to clean energy. https://www.engineeringnews.co.za/article/gas-key-as-south-africa-transitions-to-clean-energy-2021-10-27

The need for new power generation from gas has therefore been identified and assessed by Government at a national scale considering the national energy requirements. The Phakwe Richards Bay Gas Power 3 CCPP is proposed in specific response to these identified needs. As a result, the need and desirability of the project from a national perspective can largely be assimilated from the project's alignment with national. Considering the above, it can be concluded that the implementation of the proposed project has the potential to contribute positively towards the identified need at a national level (as detailed in the various government policies, plans, and programmes which have relevance to energy planning and production, as discussed in Chapter 2), while simultaneously contributing to job creation and socio-economic development.

5.2.2. Need and Desirability of the project from a Regional Perspective

According to the IEP (2016), if South Africa is to make the transition to a low carbon economy, it will become increasingly important to reduce dependence on fossil fuels and diversify energy resources to include other energy forms. The role that natural gas (and eventually Hydrogen) can play in the transition to a low carbon future should also be considered. Diversifying the energy mix is necessary in order to improve security of supply, while at the same time minimising environmental impact and facilitating regional development. The dominance of a single energy system, which is highly reliant on fossil fuels, inevitably places an excessive burden on the environment. This eventually weakens it through environmental fatigue, failure (permanent damage) or even catastrophe if the situation continues for too long. This inevitably poses a health and environmental risk.

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. In 2016, South Africa had a total generation capacity of 237 006GWh. Approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal (predominantly located in Mpumalanga and Limpopo), and only 3,2% (equivalent to 7 584GWh) was generated by natural gas (refer to **Figure 5.2**).

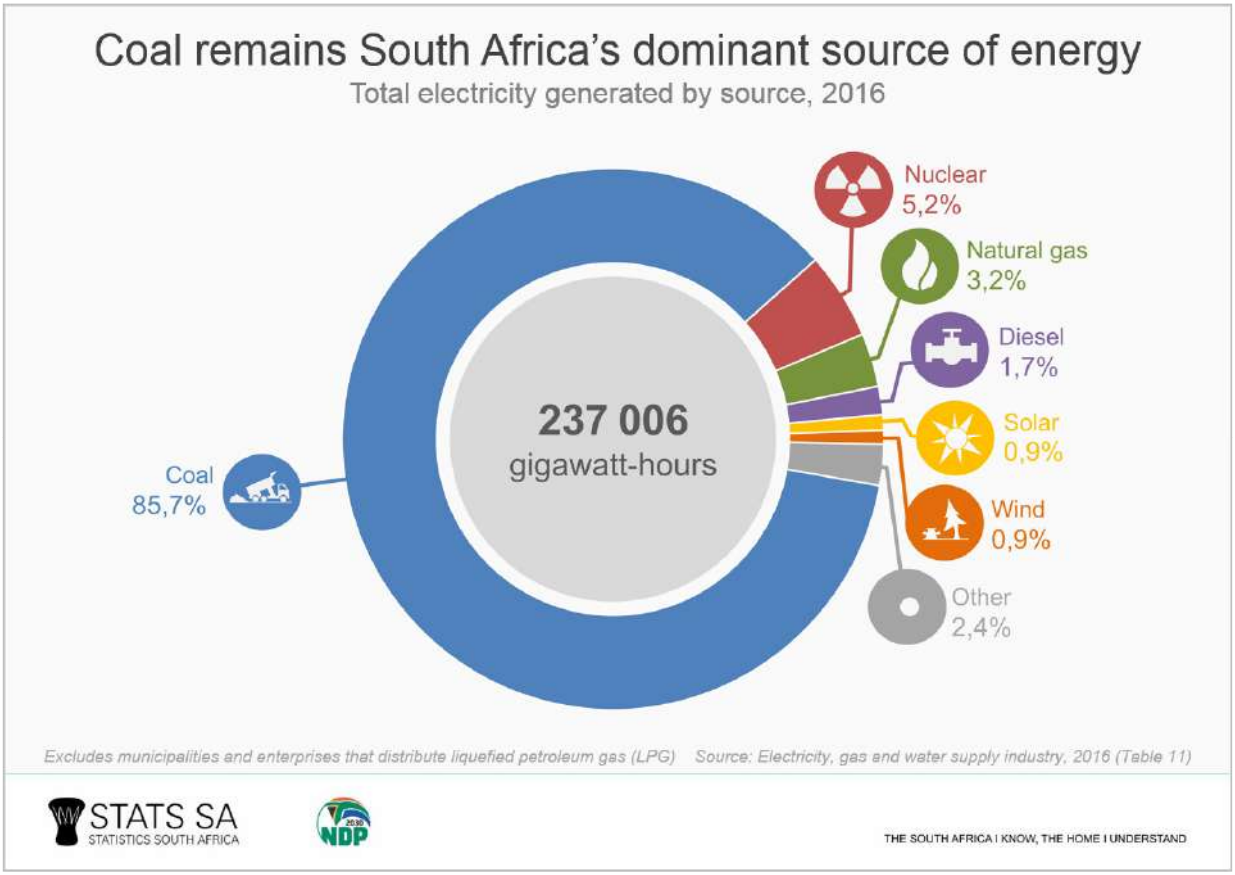

Figure 5.2: Overview of South Africa's electricity generation by source (Source: StatsSA 2016 Electricity, gas and water supply industry).

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province due to the location of coal resources within this province, the KwaZulu-Natal Province has been identified as an area where the development of gas to power facilities is a feasible and suitable option for electricity generation.

The Richards Bay area has been ear-marked as a hub for the development of gas to power projects as it is one of the preferred locations for the for the import of Natural Gas in liquid form. Richards Bay is considered to be 'energy-hungry' due to the nature of the heavy industries in the vicinity. Richards Bay is the only port with the ability to connect imported natural gas into existing gas pipeline transmission networks to enable the supply of regasified LNG to gas users. There is also the ability to supply LNG to non-pipeline connected users utilising the operation of LNG transhipment vessels and land-based LNG distribution solutions.

The Transnet National Ports Authority anticipates the release of a request for proposals for the development of a liquified natural gas (LNG) terminal at the Port of Richards Bay, in KwaZulu-Natal by July 2022.[14] Transnet has highlighted the potential of Richards Bay previously, noting that the cost of gas supply could be reduced by linking it to existing port and pipeline assets, including the Lily pipeline and parts of the Durban-to-Johannesburg pipeline.

[14] Transnet prepares to invite bids for Richards Bay LNG terminal https://www.engineeringnews.co.za/article/transnet-prepares-to-invite-bids-for-richards-bay-lng-terminal-2022-04-21#.YmGBV_JOhtE.linkedin

The Phakwe Richards Bay Gas Power 3 CCPP is aligned with the KwaZulu-Natal's Provincial Growth and Development Strategy (PGDS) to address the triple challenge of poverty, inequality and unemployment by creation of 600 job opportunities during the construction phase and 60 job opportunities during its operational lifespan. The project will contribute to human resource development, and strategic infrastructure for social and economic growth which will contribute towards reducing poverty and inequality in KZN. The development of the Phakwe Richards Bay Gas Power 3 CCPP will also drive economic growth, infrastructural transformation and development and is seen as a favourable area for investment and development in terms of the KwaZulu-Natal Provincial Spatial Economic Development Strategy. The project will also contribute towards economic value, economic support and economic growth in Richards Bay in support of the KwaZulu-Natal Provincial Spatial Development Framework. The project will also support the attraction of industries to the Richards Bay Industrial Development Zone, the development of which has been hampered by the lack of electricity supply to support the establishment of new industrial activities. The use of natural gas or a mixture of natural gas and hydrogen, in the development of the Phakwe Richards Bay Gas Power 3 CCPP will offer reduced emissions when compared to the use of coal or diesel for electricity generation in line with the KwaZulu-Natal Climate Change Response and Sustainable Development Plan.

5.2.3. Receptiveness of the proposed project site to development of the Phakwe Richards Bay Gas Power 3 CCPP

Phakwe Richards Bay Gas Power 3 (Pty) Ltd identified the properties located in the Richards Bay IDZ for the development of the proposed Phakwe Richards Bay Gas Power 3 CCPP, as these properties are industrial zoned undeveloped large land parcels suitable for the development of a power plant. Richards Bay, and specifically the proposed project site, has been identified by Phakwe Richards Bay Gas Power 3 (Pty) Ltd as the preferred area for the development of the Phakwe Richards Bay Gas Power 3 CCPP due to:

- it being located within an Industrial Development Zone (RBIDZ Phase 1F) on land designated for noxious industry development, and specifically for the development of gas to power (refer to **Figure 5.3**);
- it being appropriately sized (11.8ha) to accommodate a 2000MW CCPP and associated infrastructure (11ha);
- it being a location with existing large heavy industries and is specifically targeting the attracting of additional heavy industries through the Richards Bay Industrial Development Zone (RBIDZ), which attraction of new industries has been hampered by the unavailability of power to support these planned developments;
- it being easily accessible via existing roads within the IDZ Phase 1F (already approved through an EIA undertaken for the Phase 1F infrastructure);
- the location of the Port of Richards Bay in close proximity to the industrial areas for the importation of fuel to supply the project, including the future planned LNG import facilities, the Lily pipeline and parts of the Durban-to-Johannesburg pipeline, and the fact that Richards Bay has been noted as a key coastal area which could also benefit from green hydrogen production or facilitate its export;
- its location in relation to Mozambique, the current exclusive natural gas supplied to South Africa, and the potential to connect Richards Bay to the gas reserves in the north of Mozambique via a new natural gas pipeline which is in accordance with Governments long term energy planning;
- the existence of a large-scale electricity distribution and transmission network connecting to Richards Bay with a capacity of ~3 500MW to facilitate the evacuation of electricity production with the least investment in additional infrastructure.

The development on the proposed site was therefore considered as a desirable option.

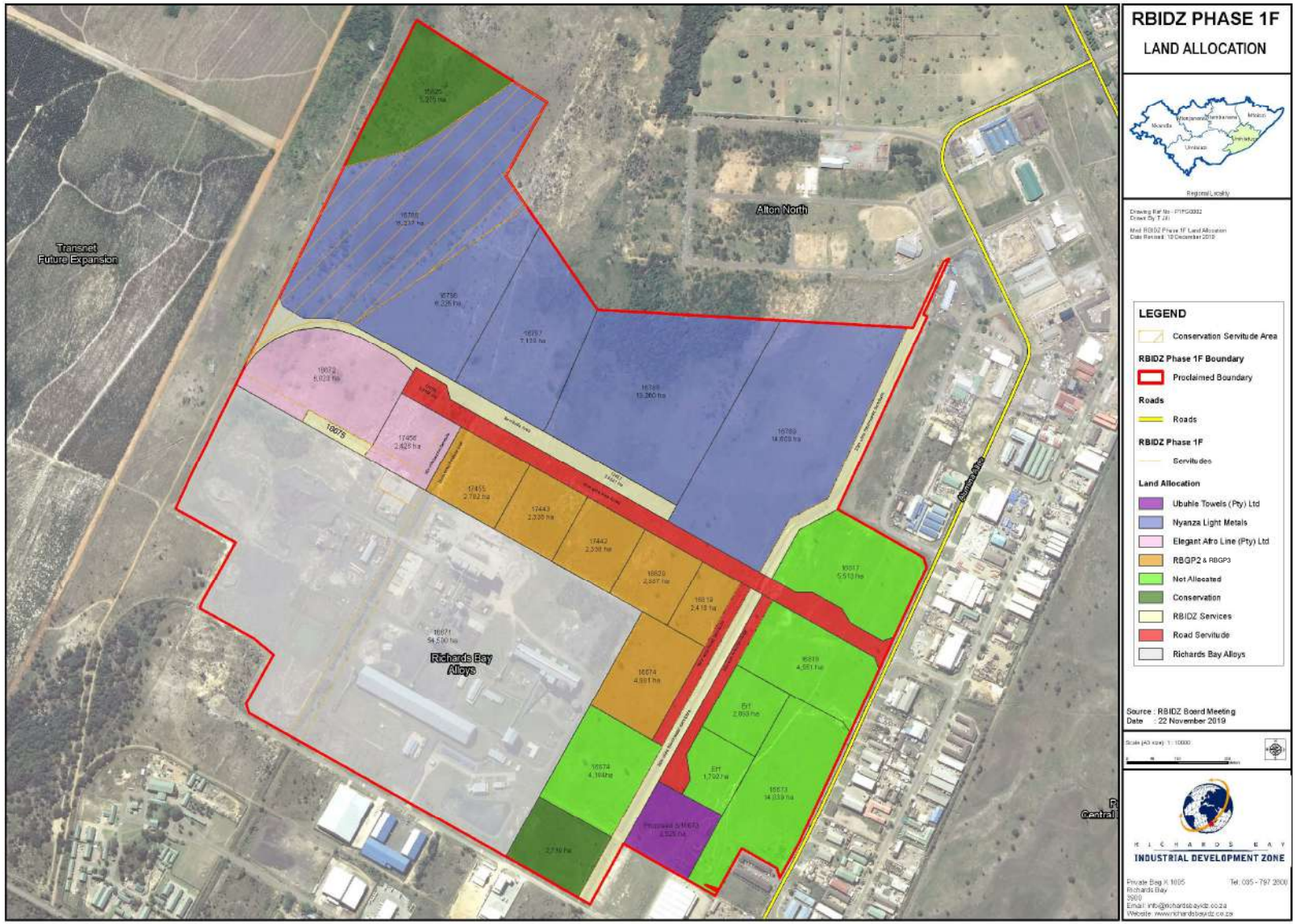

Figure 5.3: Land allocation within the Richards Bay IDZ Phase 1F

CHAPTER 6: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section of the EIA Report provides a description of the environment that may be affected by the Phakwe Richards Bay Gas Power 3 CCPP. This information is provided in order to assist the reader in understanding the receiving environment within which the proposed development is situated. Features of the biophysical, social and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area (refer to Chapter 11 for list of references) and aims to provide the context within which this EIA process is being conducted.

6.1. Legal Requirements as per the EIA Regulations for the undertaking of an EIA Report, 2014 (as amended)

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of the EIA Report:

Requirement	Relevant Section
(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the development of the Phakwe Richards Bay Gas Power 3 CCPP is included as a whole within this chapter. The environmental attributes that are assessed within this chapter includes the following:
	» The regional location of the project site is described in Section 6.2.
	» The climatic conditions of the Richards Bay area is described in Section 6.3.
	» Biophysical characteristics of the project site and the surrounding areas are described in Section 6.4. This includes the topography, hydrology, geology, soils, agricultural potential, and ecology of the project site.
	» Visual considerations are described in Section 6.5
	» The air quality of the area is considered in Section 6.6
	» Ambient noise levels of the area are described in Section 6.7.
	» Heritage resources, including the palaeontology and archaeology of the project site are described in Section 6.8.
	» Social and economic characteristics of the Richards Bay area are described in Section 6.9

6.2. Regional Setting: Location of the Project Site

The KwaZulu-Natal Province is situated in the north-eastern portion of South Africa. The province shares boundaries with the Mpumalanga, Free State and Eastern Cape Provinces. The proposed development falls under the jurisdiction of the City of uMhlathuze Local Municipality and within the greater King Cetshwayo District Municipality in the KwaZulu-Natal Province. The City of uMhlathuze Local Municipality is situated on the coast of the Indian Ocean in KwaZulu-Natal, South Africa. It is one of five local municipalities that form part of the King Cetshwayo District Municipality. In 2002 Richards Bay and Empangeni, as well as the surrounding rural and tribal areas merged to form the "City of uMhlathuze" covering an area of approximately 800 km² and supporting approximately 3 344 459 people.

The proposed development site falls within the Richards Bay IDZ Phase 1F Estate. The Phakwe Richards Bay Gas Power 3 CCPP site is currently vacant and is designated for noxious industry development, and specifically for the development of gas to power. The proposed project is located directly adjacent to the existing Tata Steel facility, with several other existing heavy industrial developments in the surrounding area including, the Hillside and Bayside aluminium smelters, the Mondi paper plant, the Foskor plant and a large number of industrial structures related to coal storage and transportation at the Port of Richards Bay.

There are only two proclaimed terrestrial protected areas within the region, namely the Enseleni Nature Reserve to the north-west and the Richards Bay Game Reserve south of the study area. Other than these protected areas, and potentially along the Indian Ocean seaboard, there are no identified tourist attractions or destinations in closer proximity to the development site. Agricultural activities, mainly relating to plantations are located ~860m west of the project site.

There is a well-established railway network and a large number of electricity distribution and transmission power lines traversing the study area. The site for the proposed Phakwe Richards Bay Gas Power 3 CCPP area is situated south west of the regional road (R619). Access to the Phakwe Richards Bay Gas Power 3 CCPP site is available via an existing 8m wide road constructed by the RBIDZ, for use by tenants within Phase 1F.

6.3. Climatic Conditions

The Richards Bay area is characterised by a subtropical climate. Summers are warm and wet, and winters are mild, moist to dry and do not experience frost conditions. The average annual rainfall of the area is 1128mm, with an average annual temperature of 21.5 °C. Day time temperatures peak from January to March at 29°C. Day time highs in winter from June to August are 23°C, with minimum temperatures of 12°C. Long-term climatic data has been summarised in **Figure 6.1** below.

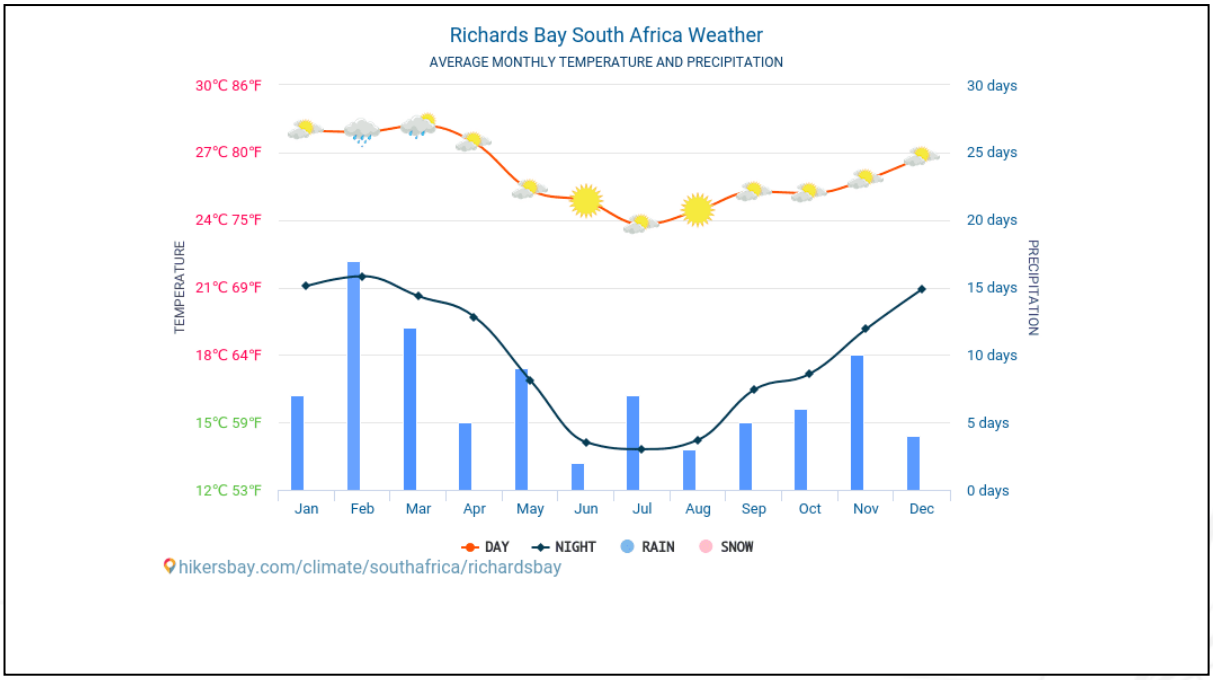

Figure 6.1: Average minimum and maximum temperatures and monthly rainfall for Richards Bay (https://cdn.hikb.at/charts/meteo-average-weather/richardsbay-meteo-average-weather.png).

The current and future changes in climate for the Phakwe Richards Bay Gas Power 3 CCPP Project, are summarised in the below table.

Table 6.1: Current and future climate projections for the Project within the uMhlathuze Local Municipality.

Climate change impact	Current	Shared Socio-economic Pathway (SSP) 2*	Shared Socio-economic Pathway (SSP) 5**
		The projected change for the period 2021 to 2050, relative to the baseline period (1961 to 1990).	
Temperature	Average annual temperature between 19-21 ˚C.	Average annual temperature increases by between 1.61°C to 1.79°C	Average annual temperature increases by between 1.97°C to 2.15°C
Very Hot Days (>35°C)[15,16]	It is seen that the region will increase between 5 to 12 very hot days.	Potential increase of 0.30 days to 12.04 days	The average increase in the number of very hot days could increase between 0.60 days to 18.26 days
Rainfall	Average of 1300mm to 1500 mm in most regions, however the South is seen to experience 1600 to 1800mm	Average annual rainfall may decrease by 50.30 mm to 17.25 mm	Average annual rainfall may increase between 66.78 mm to 61.73 mm.
Extreme Rainfall Days[17]	*Information is not available for the baseline*	The region could experience a change of 2.44 days fewer extreme rainfall days or up to 0.34 days more.	The region could experience a change of 0.02 to 1.38 days more of extreme rainfall days.
Flood Risk[18]	North and West regions are seen to have a medium to high flood risk, while the East and South have a low to medium risk.	*Information is not available for the SSP 2 scenario*	Central region there is a medium risk, while most parts of Richards Bay show a low risk.
Drought Risk[19]	Drought tendencies are increasing in most regions of the municipality, with the South have no information reported.	*Information is not available for the SSP 2 scenario*	Most parts of Richards Bay and central part of the municipality shows a high risk
Fire Risk	Likely risk in the central region of the municipality,	*Information is not available for the SSP 2 scenario*	High in central regions and South part of Richards Bay,

[15] Very hot days: the number of days (per 8 x 8 km grid point) where the maximum temperature exceeds 35°C.
[16] Heat wave days: where temperature exceeds maximum temperature of the warmest month of the year by 5°C for a period of 3 or more consecutive days.
[17] 20mm of rain occurring within 24 hours over the 8 x 8 km grid point
[18] Flood, drought and fire risk data were modelled for the RCP 8.5 scenario only (see greenbook.co.za), therefore no RCP 4.5 data could be included in this analysis. Floods, drought and fires are the most destructive and have the greatest environmental and social impact. RCP 8.5 scenario was selected to give a good indication of how climate change would precipitate as a function of the current conditions under these three aspects. Providing a current and worst-case scenario will help to provide a more conservative approach upon which actions can be based.
[19] Number of cases exceeding near-normal per decade for the period 1995-2024 relative to 1986-2005 baseline period, under the low mitigation scenario.

Climate change impact	Current	Shared Socio-economic Pathway (SSP) 2*	Shared Socio-economic Pathway (SSP) 5**
		The projected change for the period 2021 to 2050, relative to the baseline period (1961 to 1990).	
	with Richards Bay specifically having a rare risk.		while the East of Richards Bay shows a low risk.

* This is the "Middle of the Road" or medium pathway, which extrapolates the past and current global development into the future. In this scenario, there is a certain cooperation between states, but it is barely expanded. Global population growth is moderate, levelling off in the second half of the century. Environmental systems are facing a certain degradation. This scenario is equivalent to RCP 4.5 in the IPCC's Fifth Assessment Report (AR5).

** This is the "Fossil-fuelled Development" scenario. In the scenario, global markets are increasingly integrated, leading to innovations and technological progress. The social and economic development is based on an intensified exploitation of fossil fuel resources with a high percentage of coal and an energy-intensive lifestyle worldwide. The world economy is growing and local environmental problems such as air pollution are being tackled successfully. . This scenario is equivalent to RCP 8.5 in the IPCC's Fifth Assessment Report (AR5).

6.4. Biophysical Characteristics of the Study Area

6.4.1 Topography

The topography of the study area is described as plains of the eastern coastal foreland. The region has an even slope with elevation ranging from sea level at the Indian Ocean to approximately 130m above sea level to the north-west. The flat topography is dominated by wetlands and water bodies (e.g. the Nsezi and Mzingazi lakes, the harbour bay and its numerous channels) while the Mhlatuze River meanders to the south of the study area. The project site is considered to be relatively flat with maximum and minimum elevations of between 32 and 46m above sea level across the north-western portions of the site.

6.4.2 Geology, Soils and Agricultural Potential

The larger study area is underlain by unconsolidated, Quaternary-age sediments. These redistributed cover sands are underlain by recent clays and sands of the upper Port Durnford Formation of the Maputaland Group. The Port Durnford Formation rests unconformably on either Cretaceous sediments or partially calcified / lithified sediments of the Uloa or Umkwelane Formations. It comprises a succession of carbonaceous muds and sands, with basal sandstones, black muds and lignite in evidence. Nearer the surface however, white and orange mottled clayey sands are overlain by younger dune sands, which cover much of the coastal plain.

According to the land type database (Land Type Survey Staff, 1972-2006) the project area is located within the Hb69 land type. The land type is described in the table below (**Table 6.2**).

Table 6.2 The expected soil features for the land type present

Land Type	Expected Soil Features
Hb69	Grey Regic Sands; Regic sands and other soils

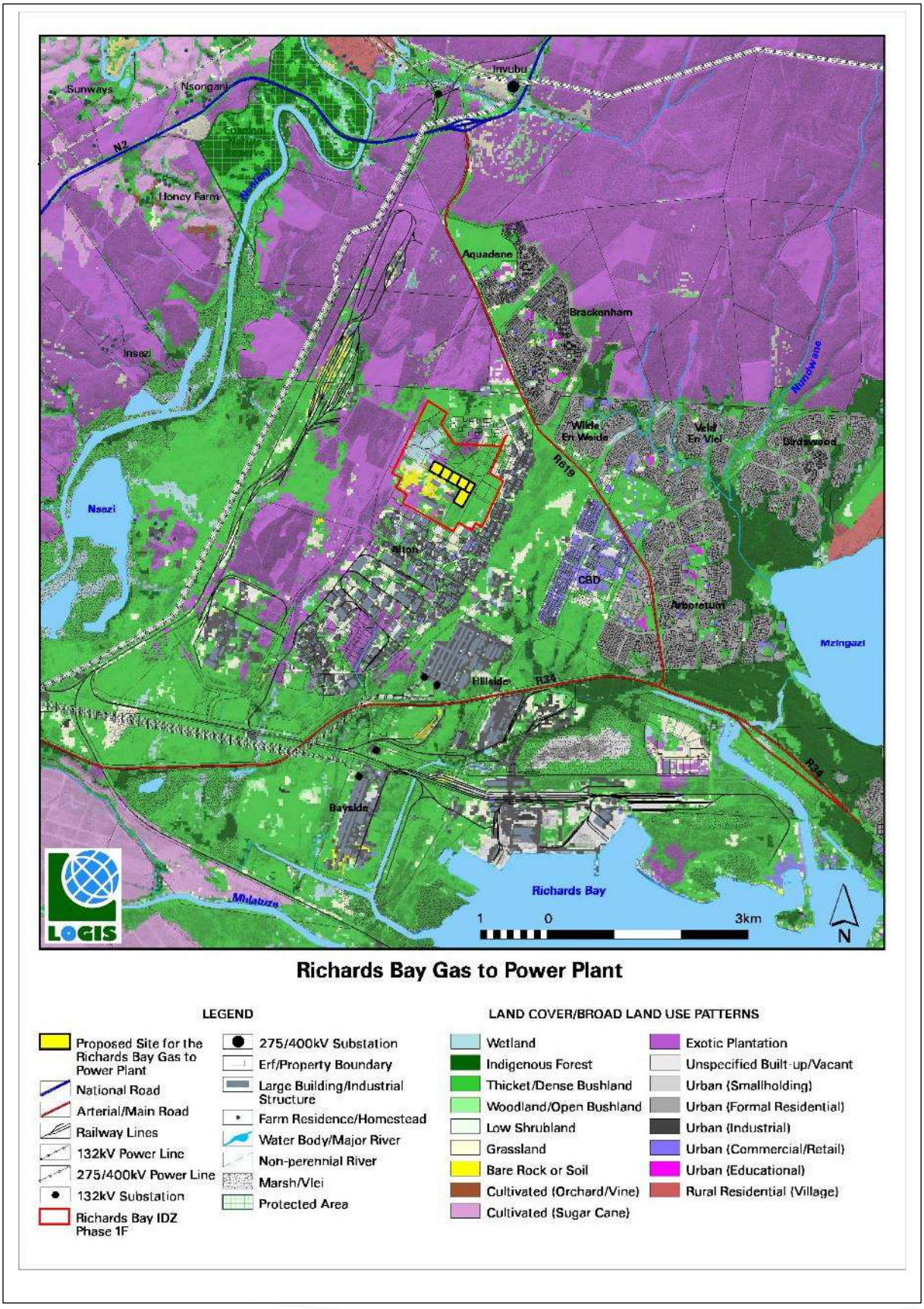

Figure 6.2: Context of the Phakwe Richards Bay Gas Power 3 CCPP project site in the Richards Bay IDZ zones and surrounding areas

6.4.3 Freshwater Features

The project site is located within the Pongola - Mtamvuna Water Management Area (WMA 4) and predominantly falls within the W12F quaternary catchment (**Figure 6.3**). Two Sub Quaternary Reaches (SQRs) are associated with the Phase 1F boundary, namely the classified Nseleni River SQR W12H-3459 SQR and an unnamed SQR which serves as the Mhlatuze estuarine catchment which includes the Richards Bay Harbour. Several wetland areas are located within and around the development footprint area. The Nseleni River is a major tributary of the Mhlatuze River and contributes to the ecological functioning of the Mhlatuze lagoon and Richards Bay Harbour. The desktop ecological status and composition of the classified SQRs is shown in **Table** (DWS, 2021).

Table 6.3 Desktop data pertaining to the ecological condition of the associated SQRs (DWS, 2021)

SQR	Nseleni W12H-3459	Nundwane W12J-3450
Present Ecological Status	Largely Modified (class D)	Moderately Modified (class C)
Ecological Importance	High	High
Ecological Sensitivity	Very High	Very High
Contributing Factors	Enseleni Nature Reserve, extensive cultivation (dryland sugarcane), Lake Nsezi - artificially raised, water supply to Richards Bay, back flooding entire reach, estuary in lower reach	Extensive forestry, swamp forest in Riparian Zone, Alien Invasive Plants, roads, urban in lower reach (Richard Bay), lower reach in Lake Mzingazi
Default Ecological Category	Natural (class A)	Natural (class A)

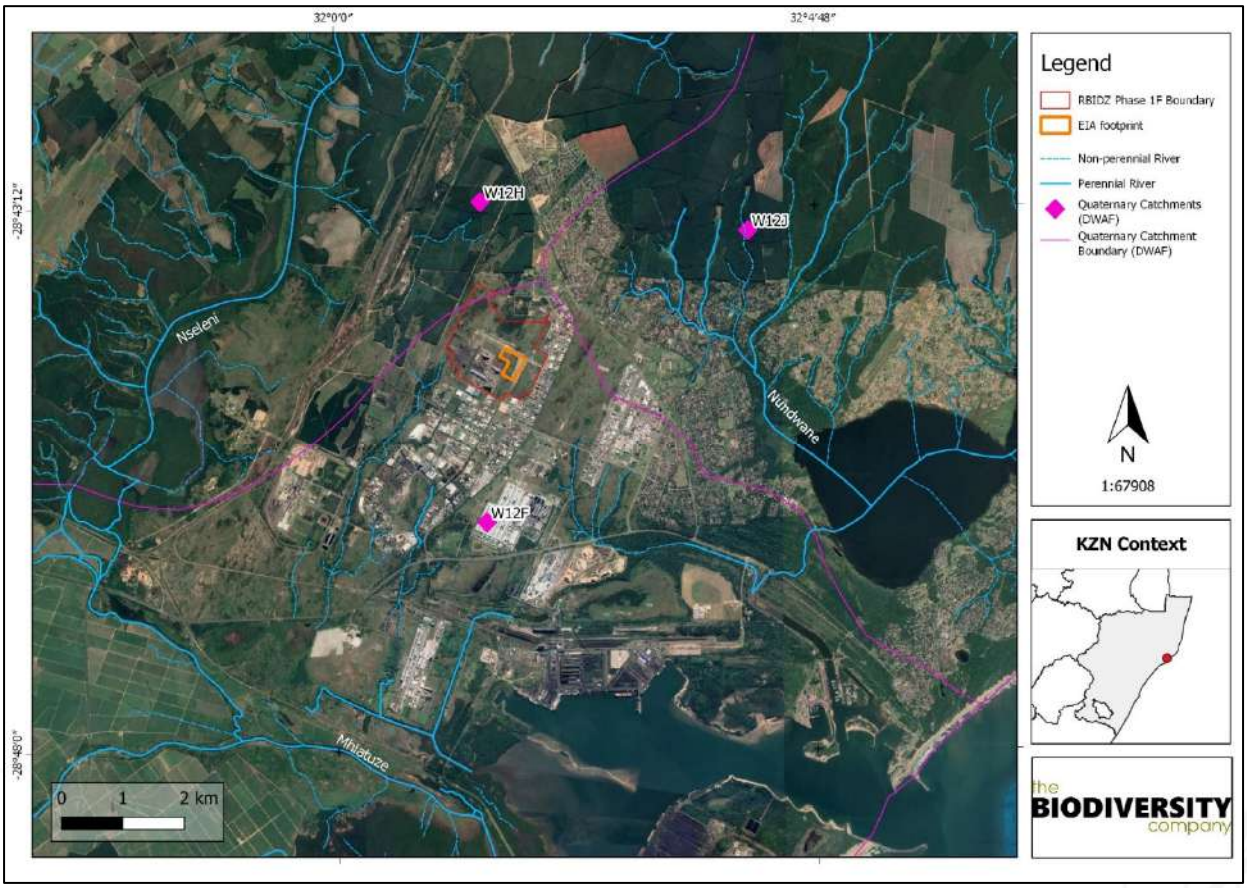

Figure 6.3 The project site in relation to the sub quaternary reach catchments

The National Wetland Map 5 (NWM 5) spatial data was published in October 2019 (Deventer *et al*. 2019) in collaboration with SANBI with the specific aim of spatially representing the location, type and extent of wetlands in South Africa. The data represents a synthesis of a wide number of official watercourse data including rivers, inland wetlands and estuaries. This database recognises the presence of depression wetlands within the project area belonging to Indian Ocean Coastal Belt Group 1 (**Figure 6.4**). A wetland assessment as part of the RBIDZ feasibility (SIVEST, 2010) noted that the loss of the wetland areas must be looked at holistically in the context of the conservation needs of all the IDZ sites assessed. In response to this, two sites were of distinctly higher quality, namely, IDZ 1C and the western portion of IDZ 1D as they have very high conservation significance and it was felt that these areas should be excluded from any development planning for the area and development should rather be focused on IDZ 1A, 1B, 1F and the eastern portion of 1D. The IDZ 1C and 1D are referred to as potential offset areas.

Richards Bay Industrial Development Zone SoC Ltd received Environmental Authorisation (EA) for the IDZ Phase 1F in September 2016 (DFFE Ref No.: 14/12/16/3/3/3/665). This EA included the infilling of some of the wetlands on site to release the land for development.

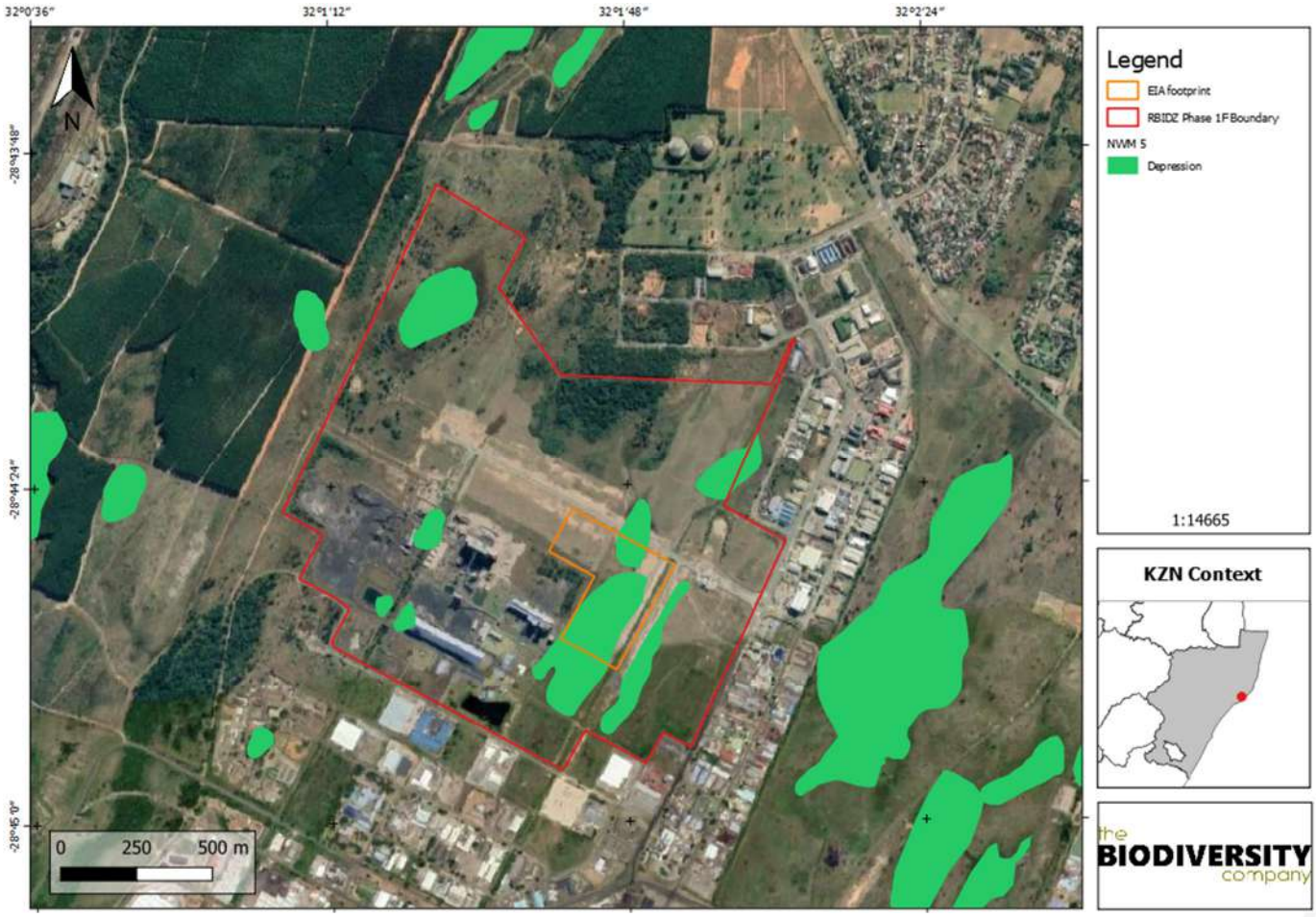

Figure 6.4 National wetland areas located within the development footprint

The following existing impacts were observed in the Phase 1F project area:

» The existing development within the area has altered the surface flow dynamics through construction of the plant and ancillary infrastructure, creating directional surface run-off across the project area and

artificial pooling in some localities (**Figure 6.5**). Water typically exits a wetland flat through evapotranspiration and infiltration (Ollis *et al.* 2013), which has been inhibited due to the changes in topography and slope for the catchment area (**Figure 6.6**).

» The removal of vegetation due to historical clearing in sections of the project area, and current development for service infrastructure. Large areas of disturbance and associated erosion scarring is present.

» Historical disturbances and current land uses have likely resulted in the onset and establishment of alien vegetation across the project and offset areas

» Industrial activities in the upper reaches of the Eastern unnamed tributary have resulted in the modification of the aquatic environment (class D). Cumulative impacts in the form of a large impoundment have further altered the natural hydrology of the system.

Figure 6.5: Photograph of the EIA footprint area and associated existing impacts

Figure 6.6: Satellite imagery of Phase 1F development area and associated existing impacts A) 7/2016 and B) 7/2020 (Google Earth)

6.4.4 Ecological Profile

The larger study area is situated within the Freshwater Wetlands and Maputaland Wooded Grassland vegetation biomes and vegetation types. The Subtropical Freshwater Wetlands ordinarily occur in low lying

areas and are expected to be dominated by reeds, sedges, rushes and water-logged meadows dominated by grasses. The dominant vegetation type is the Maputaland Wooded Grassland. This vegetation type is typically supported coastal sandy grasslands rich in geoxylic suffritices, dwarf shrubs, small trees and very rich herbaceous flora.

i) Protected and other conservation areas

Protected areas considered include National Parks, Provincial Nature Reserves, Local Authority Nature reserves, Wildlife Management Areas, Private Nature Reserves, Important Bird Areas (IBA) Areas, Game Farms, Game Reserves, Nationally Protected Forest Patches and NPAES focus areas. The following protected areas are located within a 30 km radius of the project site (refer to **Figure 6.7**):

» Richards Bay Nature Reserve and IBA located 6 km to the south
» Enseleni Nature Reserve located 4 km to the northwest
» NPAES priority focus area located 22.9 km to the west

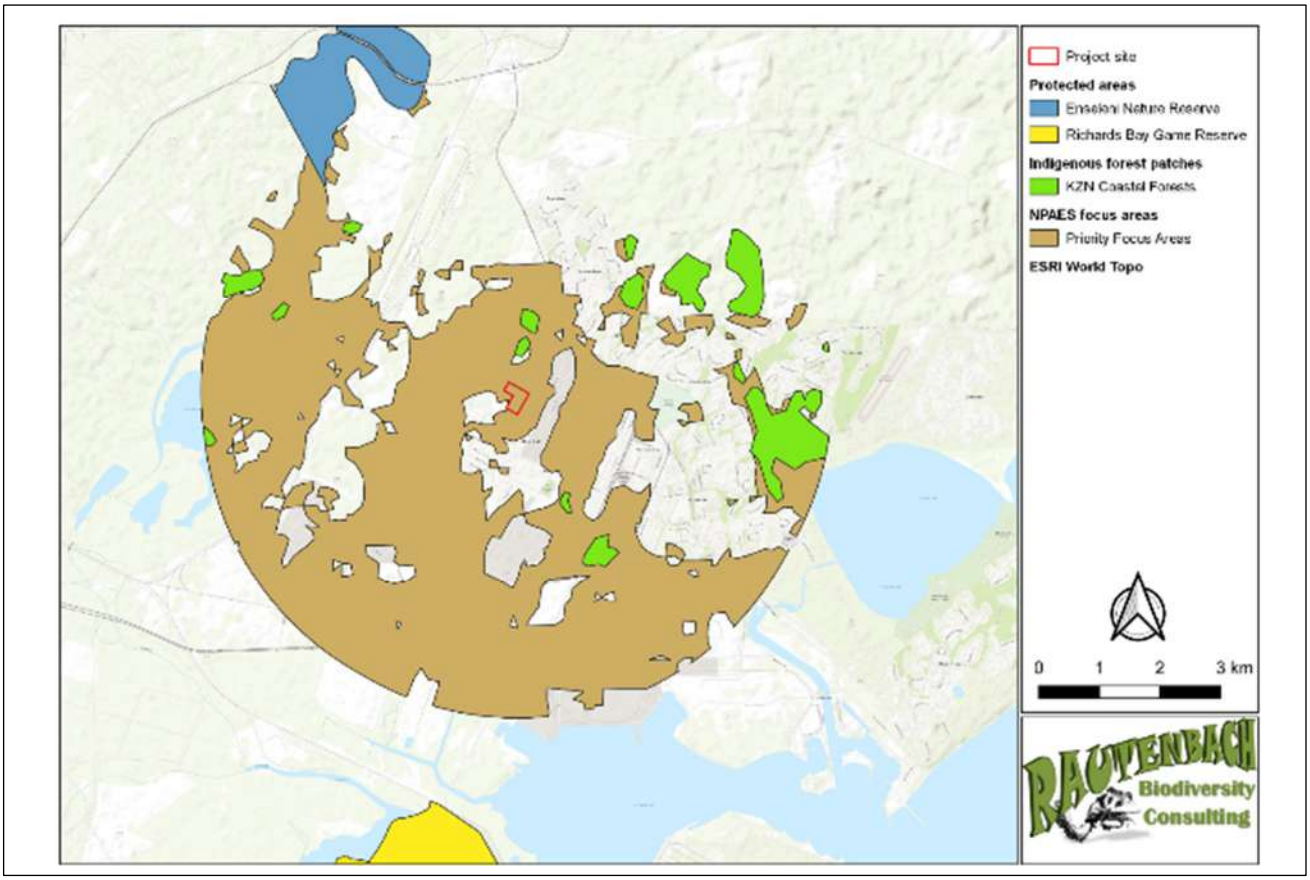

Figure 6.7: Protected and other conservation areas in relation to the project site

ii) Threatened Ecosystems

The project site falls entirely with the 'Critically Endangered' Kwambonambi Hygrophilous Grassland terrestrial ecosystem, identified at national level.

At regional level, according to the Ecosystem Threat Status of the National Biodiversity Assessment (NBA, SANBI 2018) and EKZNW (2011) the Maputaland Wooded Grassland is classified as Endangered. Provincial

vegetation delineation demarcated two vegetation types intersecting with the project site, the "Endangered" Maputaland Wooded Grassland, and "Vulnerable" Subtropical freshwater wetlands (**Figure 6.8**).

Figure 6.8: Provincial vegetation classification

iii) Critical Biodiversity Areas

According to EKZNW (2016), the planning units (PU) identified in the CBAs represent the localities for one or more biodiversity features for which conservation targets can be achieved. The distribution of the biodiversity features is not always applicable to the entire extent of the PU but is more often confined to a specific niche habitat, e.g. a forest or wetland reflected as a portion of the PU. Generally, CBAs are terrestrial (land) and aquatic (water) features (e.g. vleis, rivers and estuaries) in the landscape and/or indicates the potential for the occurrence of protected species that are critical for conserving biodiversity and maintaining ecosystem functioning in the long-term.

Provincial scale data layers (KZN CBA Irreplaceable version 26012016) identified CBA areas intersecting with the project site (**Figure 6.9**). Important biodiversity features contained within the CBA areas include the presence of NPAES focus areas and the Critically Endangered Kwambonambi Hygrophilous Grassland ecosystem. No national or provincial ESA designated areas intersect with the project site.

The ecologist has indicated however that the site may have been incorrectly classified as CBA due to an error in the land cover map, or alternatively a disturbance to the site has occurred subsequent to the development of the CBA Map.

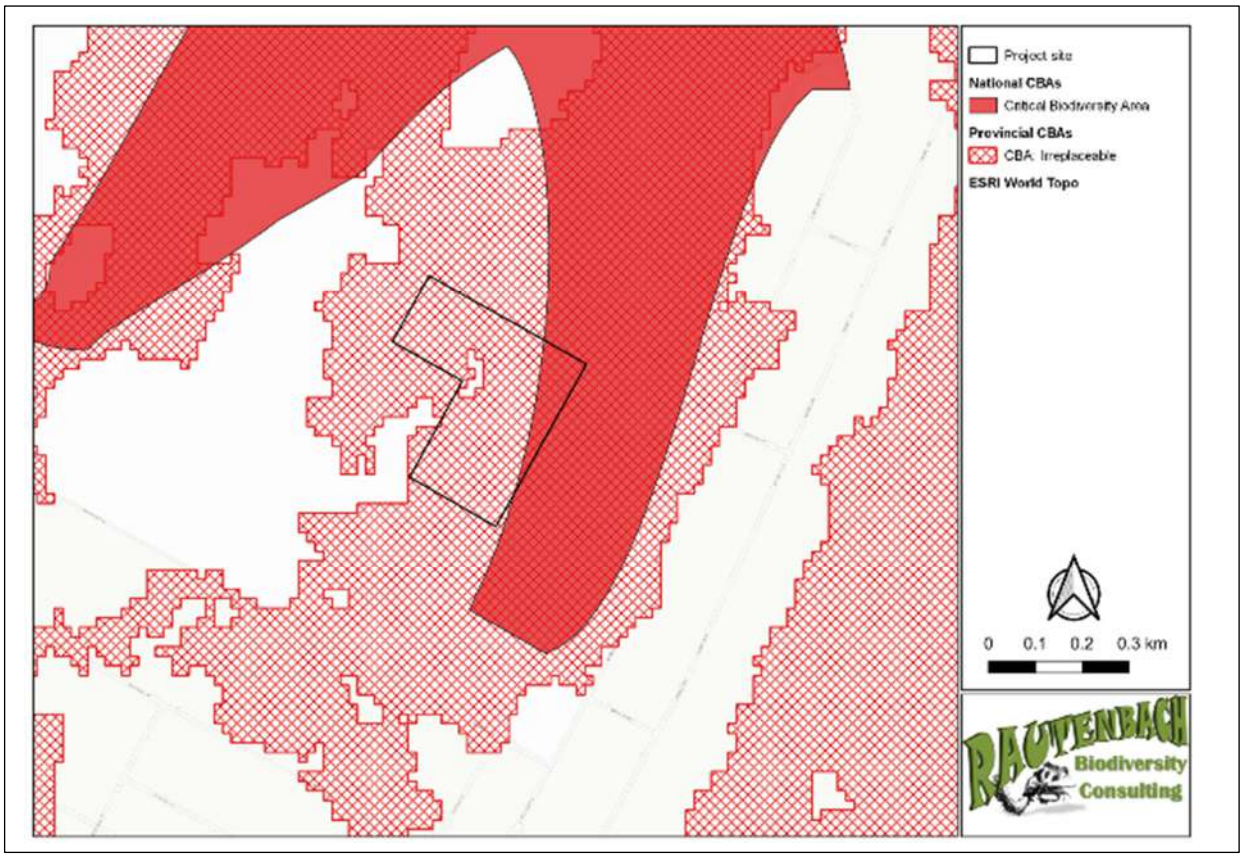

Figure 6.9: Critical Biodiversity Areas present in the study area

The EKZNW also identified a series of altitudinal and biogeographic corridors which created a linked landscape for the conservation of species in a fragmented environment and which facilitate evolutionary, ecological and climate change processes. The project site does not intersect with any landscape or locally recognised important ecological corridors.

The project site is bordered by industrial and residential developments and natural grassland. Areas directly adjacent to the project site categorised as natural grassland are degraded (based on onsite observation). The project site is thus not connected to untransformed habitats, but migrations may still be possible across some of the surrounding transformed/degraded habitats, specifically the more mobile species such as birds.

iv) Vegetation of the Project Site

The project site was found to be located within degraded coastal grasslands and hygrophilous sedge wetlands, with visible surface water present on the southern portion. Most of the site was recently mowed, thus the site had a homogenous appearance (refer to **Figure 6.10**).

Unvegetated areas, particularly along the north-eastern and south-eastern boundaries were noted, and numerous vehicle tracks crossed the entire site. Surprisingly, few invasive plant species were present although species such as *Psidium guajava* and *Cuscuta campestris* were observed, albeit at low densities.

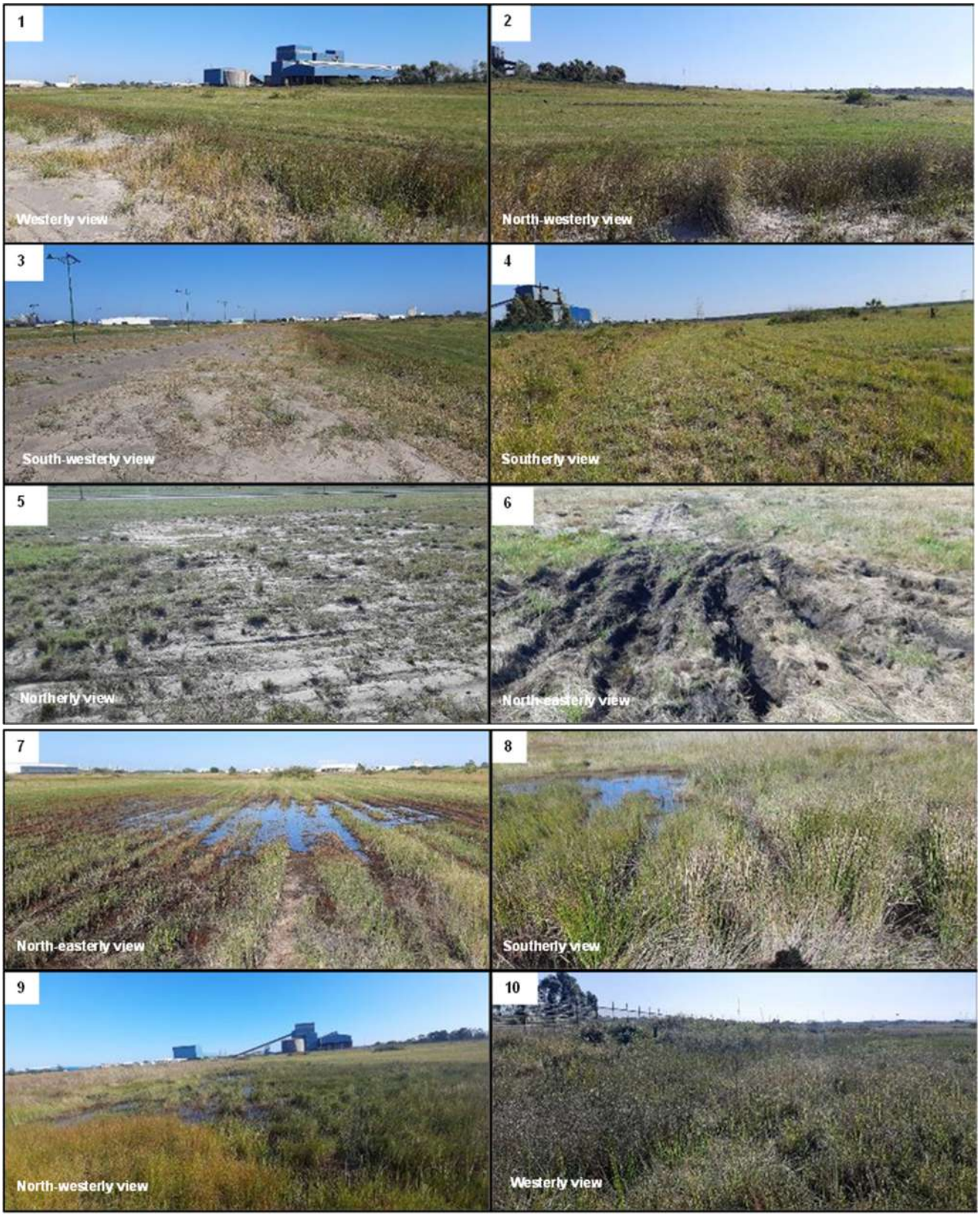

Figure 6.10: Photographs of the vegetation on the project site

Flora & Fauna species of Conservation Concern

Database searches identified 94 Red Listed fauna and flora species known/expected to be present in KwaZulu-Natal. Of these, **25** species may potentially be present on the project site (**Figure 6.11** and **Table 6.4** and **Table 6.5**). Due to the degraded nature of the project site, most of these species have a Low probability of occurrence.

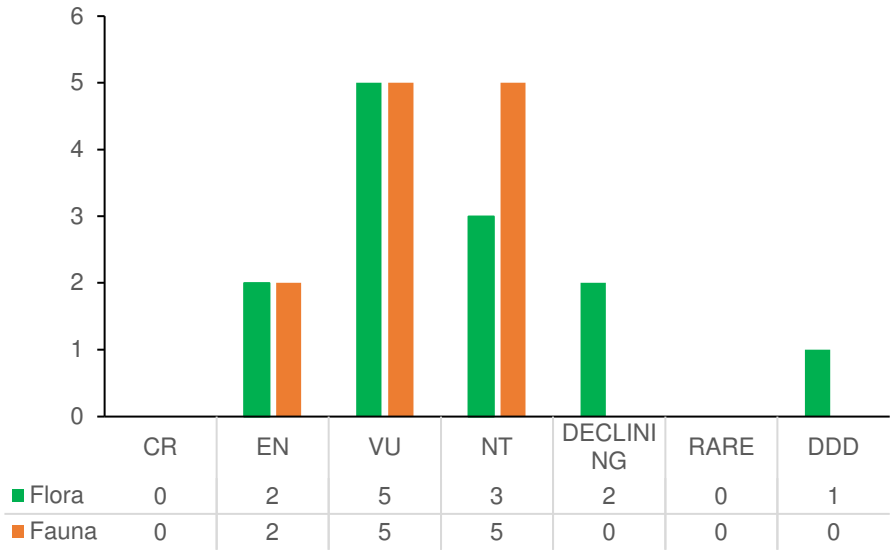

Figure 6.11: Number of Red Listed fauna and flora species potentially present on the project site.

Table 6.4: List of Red Listed flora species potentially present on the project site.

TAXONOMIC INFORMATION		CONSERVATION STATUS			
Family	**Scientific Name**	**SA Red List Status**	**NEMBA (2015)**	**Provincial**	**SA Endemism**
Apocynaceae	*Raphionacme lucens*	NT	-	Sched 8	-
	Sisyranthus franksiae	DDD	-	Sched 8	Endemic
	Pachycarpus concolor subsp. *arenicola*	VU			
Araceae	*Wolffiella denticulata*	VU			SA endemic
Asphodelaceae	** *Aloe cooperi*	DECLINING	-	Sched 8	
	Kniphofia littoralis	NT	-	Sched 8	Endemic
Asteraceae	*Nidorella tongensis*	EN	-	-	Endemic
Cyperaceae	*Cyperus sensilis*	NT	-	Sched 8	SA endemic
Fabaceae	*Aspalathus gerrardii*	VU	-	Sched 7	SA endemic
Hypoxidaceae	*Hypoxis hemerocallidea*	LC (DECREASING)		Sched 8	-
Iridaceae	*Freesia laxa* subsp. *azurea*	VU	-	Sched 12/Sched 7	-
Polygonaceae	*Oxygonum dregeanum* subsp. *streyi*	EN			
Santalaceae	*Thesium polygaloides*	VU	-	Sched 7	Endemic

Table 6.5: List of Red Listed flora species potentially present on the project site

Taxonomic Information			Conservation Status				
Family	**Scientific Name**	**Common Name**	**SA Red Listing**	**NEMBA 2015**	**Provincial**	**Cites**	**SA Endemism**
		MAMMALS					
Muridae	*Dasymys incomtus*	African Marsh Rat	NT	-	Sched 3	-	No
Soricidae	*Crocidura maquassiensis*	Maquassie Musk Shrew	VU	-	Sched 3	-	No
	Crocidura mariquensis	Swamp Musk Shrew	NT	-	-	-	No
Vespertilionidae	*Scotoecus albofuscus*	Thomas' House Bat	NT	-	Sched 3	-	End of range
		Reptiles					
Pelomedusidae	*Pelusios rhodesianus*	Variable hinged terrapin	VU	-	Sched 3	-	No
		Frogs					
Hemisotidae	*Hemisus guttatus*	Spotted Shovel-nosed Frog	VU	-	Sched 3	-	Endemic
Hyperoliidae	*Afrixalus spinifrons*	Natal Leaf-folding Frog	VU	-	Sched 3	-	No
	Hyperolius pickersgilli	Pickersgill's reed frog	EN	-	Sched 3	-	No
		Birds					
Accipitridae	*Circus ranivorus*	Marsh-harrier, African	EN	-	Sched 3	II	No
Coraciidae	*Coracias garrulus*	Roller, European	NT	-	-	-	No
Motacillidae	*Anthus brachyurus*	Pipit Short-tailed	VU	-	Sched 3	-	No
Rostratulidae	*Rostratula benghalensis*	Painted-snipe Greater	NT	-	Sched 3		

6.5 Visual Considerations

The industrial activities, the Richards Bay IDZ and the transportation infrastructure related to the Richards Bay port are the primary land use activities within the study area. This and the intensive forestry and sugar cane production to the north (and south) account for the largest economical drivers within the region. There is a well-established railway network and a large number of electricity distribution and transmission power lines traversing the study area.

The N2 national road, the R34 arterial road (John Ross Parkway) and the R619 main road provide motorised access to the region. The John Ross Parkway traverses south of the Alton industrial area and the R619 north-east of the proposed development site.

The majority of residential areas within Richards Bay are located north of the city and east of the R619 main road. Residential neighbourhoods include Aquadene, Brackenham, Arboretum, Birdswood, Veld-en-Vlei and Wilde-en-Weide. The Brackenham and Wilde-en-Weide residential areas are located at distances of respectively 1.2km and 1.4km (at the closest) from the proposed development site.

The power plant may have a fairly large area of potential visual exposure (**Figure 6.12**), not considering the built structures and vegetation. The visual impacts will not be in isolation, but rather determined in the context of the existing structures and buildings present at this location and within the region.

Figure 6.12: Map indicating the potential (preliminary) visual exposure of the proposed power plant

6.6 Air Quality

Meteorological mechanisms direct the dispersion, transformation and eventual removal of pollutants from the atmosphere. The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the earth's boundary layer. This dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the surface-mixing layer define the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is similarly a function of wind speed, in combination with surface roughness. The wind direction, and variability in wind direction, determines the general path pollutants will follow, and the extent of crosswind spreading. The pollution concentration levels therefore fluctuate in response to changes in atmospheric stability, to concurrent variations in the mixing depth, and to shifts in the wind field.

i) Sources of air pollution in the region

The identification of existing sources of emission in the region and the characterisation of existing ambient pollutant concentrations is fundamental to understand the current air quality of the area. Source types present in the area and the pollutants associated with such source types are noted with the aim of identifying pollutants, which may be of importance in terms of cumulative impact potentials. The source types include:

- Stack, vent and fugitive emissions from industrial operations;
- Fugitive emissions from industrial, mining, commercial and miscellaneous operations;
- Vehicle tailpipe emissions;
- Biomass burning (veld fires, forest fires and sugar cane burning);
- Waste treatment facilities (i.e. water treatment plants, landfills, incinerators etc.); and
- Various miscellaneous fugitive dust sources (agricultural activities, wind erosion of open areas, vehicle-entrainment of dust along paved and unpaved roads).

Figure 6.13 provides the location of the main industries and mines within the Local Municipality as identified from existing information available at the time of compiling this report.

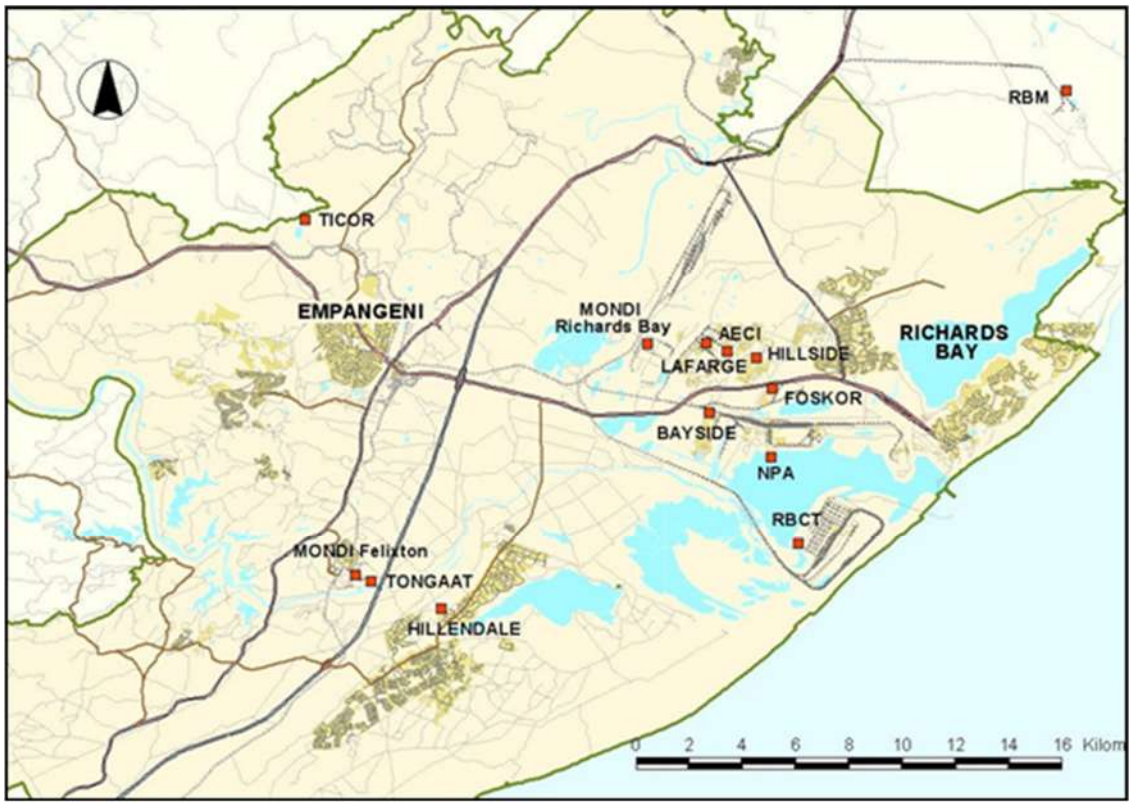

Figure 6.13: Location of all the main industries and mines within the City of uMhlathuze Local Municipality

Industrial Sources

Most of industrial sources within the region are located within Richards Bay. These industrial operations have a substantial influence on ambient concentrations in Richards Bay.

Mining sources

Mining operations within the Richards Bay area almost exclusively include mineral sand mining activities. Only two mines are operational within the municipal boundaries namely Tronox Hillendale, and Hlanganani Sandwork Operations. There might be other smaller sandwork operations within the municipality. The Tronox Hillendale Mine is nearing the end of its life, and the Fairbreeze Mine to the south of Hillendale, will provide the mineral concentrate for the smelter once the Hillendale operations have ceased. The Zulti South Mining Lease Area is a proposed mineral sand mine to be located northeast of Mtunzini, covering an area of 20 km in length by a maximum of 2 km in width. The operations will include opencast dry mining of dune sand and processing to produce heavy mineral concentrate (HMC).

Mining operations represent potentially significant sources of fugitive dust emissions, where the particulate emissions are the main pollutant of concern. Fugitive dust sources associated with sand mining activities include materials handling activities, vehicle-entrainment by haul trucks and wind-blown dust from tailings impoundments and stockpiles.

Transport related emissions

Vehicles, railroad, shipping and the airport are included in this category. The main source of concern in the area is vehicle tailpipe emissions. The main national and provincial highways and roads include the N2 from Durban in the south to north of Empangeni. Various main and secondary roads link the rural and urban areas within the municipality.

Biomass burning

Crop-residue burning and general wildfires (veld fires) represent significant sources of combustion-related emissions associated with agricultural areas and forestry. Major pollutants from veld fires are particulates, CO and VOCs. The extent of NO_X emissions depend on combustion temperatures, with minor quantities of sulfur oxides released. Emissions are greater from sugar cane burning than for savannas due to sugar cane areas being associated with a greater availability of existing material to be burned.

Miscellaneous sources

Various miscellaneous fugitive dust sources, including agricultural activities, wind erosion of open areas, vehicle-entrainment of dust along paved and unpaved roads are found in the area.

ii) Air Quality Sensitive Receptors

The nearest large residential areas to the project site are Wild-en-Weide (1.9 km east-north-east); Richards Bay CBD (1.9 km south-east); Brackenham (2.1 km north-east); Aquadene (3.5 km north) and Arboretum (4km east-south-east). There are several schools, hospitals and clinics located within 5 km of the proposed location (**Figure 6.14**). The location of the various air quality monitoring station (AQMS) is shown in **Figure 6.15**. Industrial areas (Alton and the Richards Bay CBD) are located within 5 km of the proposed project.

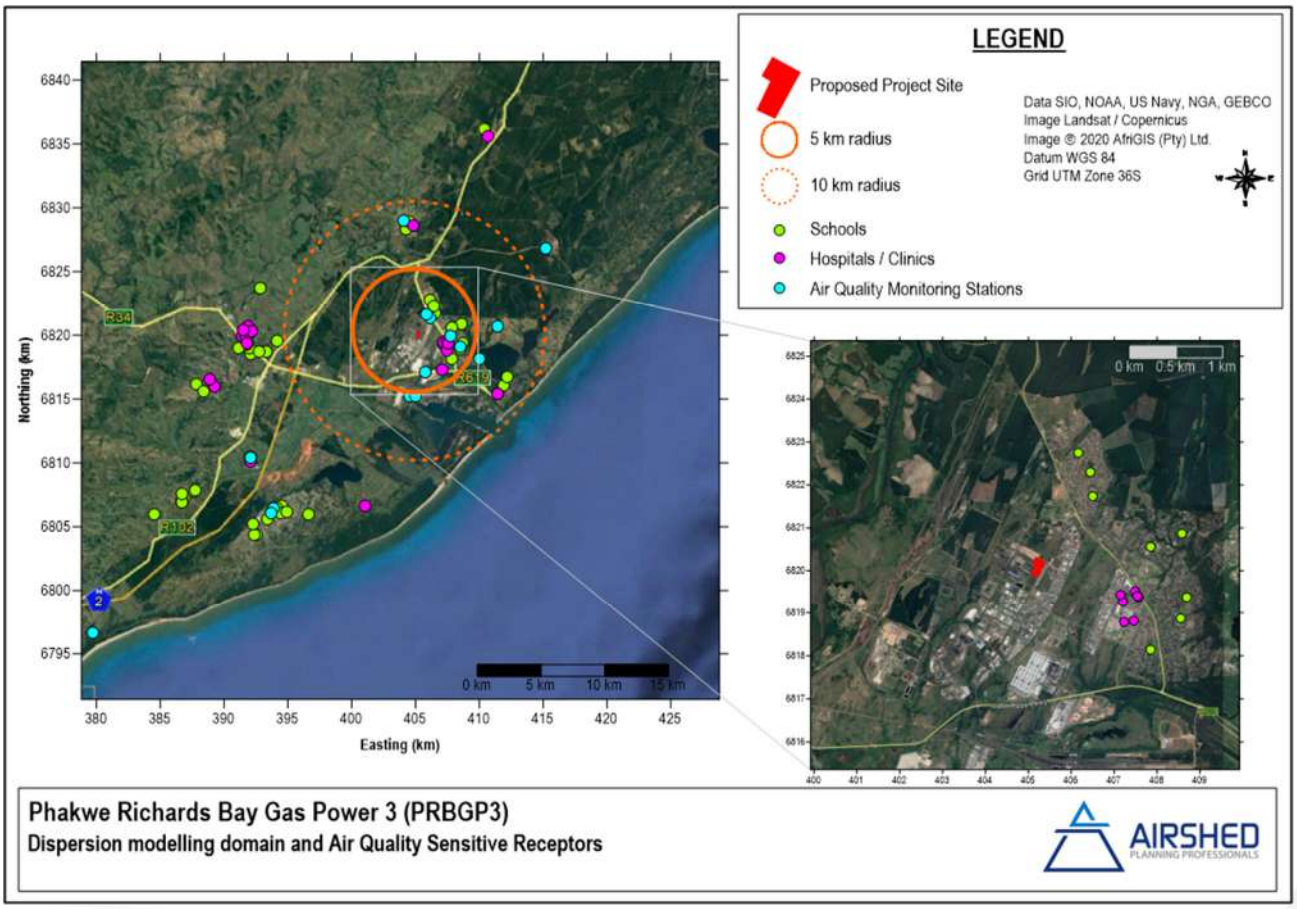

Figure 6.14: Location of the Proposed Project in relation to the Air Quality Sensitive Receptors

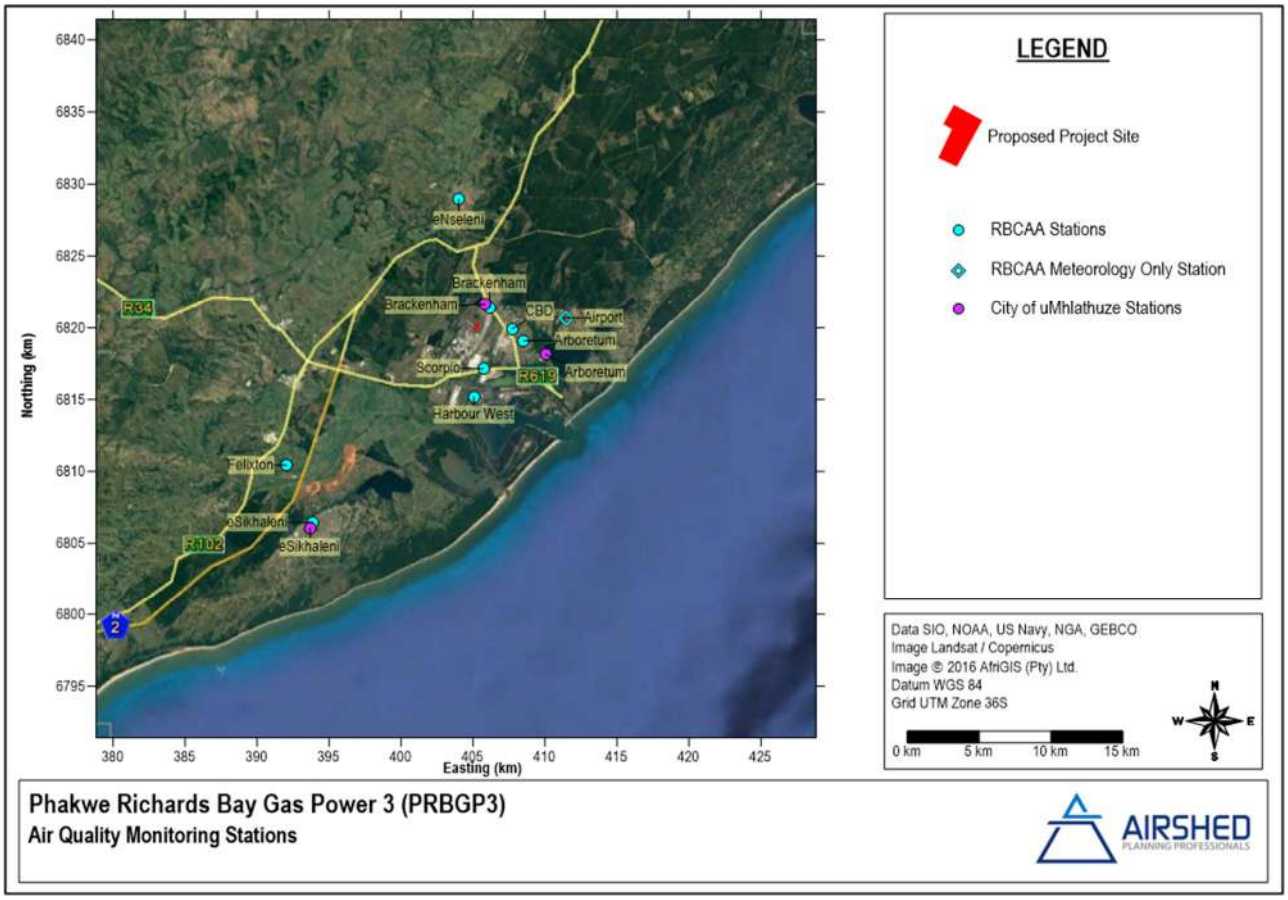

Figure 6.15: Location of the Proposed Project in relation to the AQMSs

ii) Measured Baseline Ambient Air Quality

Air quality monitoring stations operated by the Richards Bay Air Quality Association (7) and the City of uMhlattuze (3), measuring meteorological parameters and ambient SO_2, TRS and PM_{10} concentrations are located within the study area. Hourly data from all stations was provided by the RBCAA for the period 2016 to 2020. In general, the ambient air quality in Richards Bay is in compliance with NAAQS, with the exception of Harbour West for daily SO_2, Brackenham for daily PM10, and eSikhaleni for $PM_{2.5}$ and PM_{10}.

PM_{10} & $PM_{2.5}$ Ambient Concentrations

The daily PM_{10} concentrations – for the data period provided (2016 to 2020) – indicate non-compliance with the daily PM_{10} NAAQS at Brackenham station during 2018, where daily average concentrations measured exceeded 75 µg/m³ on more than four occasions during the year. There were exceedances of the 24-hour NAAQS for both PM2.5 and PM10 in 2019 and 2020 at the uMhlathuze eSikhaleni station. The annual NAAQS was also exceeded for $PM_{2.5}$ in 2019. Annual average PM_{10} concentrations were compliant with the NAAQS at all stations and similarity between years at each station is noted.

SO_2 Ambient Concentrations

Hourly SO_2 concentrations recorded at seven RBCAA stations complied with the hourly NAAQS for all years in the data set. Harbour West AQMS had the largest number of hourly exceedances, 22 hours in 2018 and 1 hour in 2020. The NAAQS allows for 88 hours exceeding the limit concentration per year (350 µg/m³). The Scorpio AQMS recorded 12 hours in 2018 and 2 hours in 2016. The CBD AQMS recorded 1 hour (in 2016) exceeding the hourly limit concentration. No hourly exceedances were measured at the other stations

during the January 2016 to December 2019 period. The Harbour West AQMS recorded non-compliance with the daily SO2 NAAQS (125 µg/m³) in 2018 due to 5 days recording averages in excess of the limit concentration (4 days are allowed). Although the daily average SO_2 concentrations exceeded the limit concentration at Scorpio for one day during 2018 no further daily exceedances at the Scorpio (or other AQMS) have been recorded. Annual average SO_2 at all stations was compliant with the NAAQS with a slight trend towards improvement at all stations.

6.7. Noise

Potential noise sensitive receptors which could be affected by the development of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure have been identified from aerial images. Potential noise-sensitive developments identified are highlighted in **Figure 6.16**. This include the residential suburb of "Wild en Weide" where ambient sound levels is ideal for residential use.

The current environmental sound character was determined through a methodology used to measure ambient sound levels as defined by the South African National Standard SANS 10103:2008. A number of single measurements were collected to gauge the ambient sound character and levels around the project site while being able to hear and possibly identify noise sources.

Long-term measurements were collected over a period of two (2) nights at three location in the "Wild en Weide" residential suburb. This data was augmented with 4 short-term (10-minutes) sound level measurements collected within the Alton Industrial area over the same 2-night period. Considering the results of the measurement data, the following was concluded:

- Ambient sound levels in the closest residential area are typical of a sub-urban to urban noise district and within the noise limits recommended for residential use by the WHO and IFC;
- Ambient noise levels in the Alton Industrial area are elevated and typical of a busy urban to central business noise district. It should be noted that SANS 10103 highlights that ambient sound levels in an industrial noise district (appropriately zoned) up to 70 dBA is expected and typical.

Figure 6.16: Aerial image indicating potentially noise-sensitive receptors close to the proposed project focus area

6.8. Heritage features of the region

6.8.1. Heritage and archaeology

In general, the study area has been subjected to a lot of industrial activity. The surrounding area is under sugarcane agriculture with electrical, rail, gas pipeline, and vehicle servitudes. While the large number of known sites within the vicinity of the proposed development (**Figure 6.17**) is indicative of some archaeological sensitivity, the specific area proposed for development has been extensively previously disturbed and is located within an area that has been extensively previously developed. As such, it is very unlikely that significant archaeological heritage will be impacted by the proposed development.

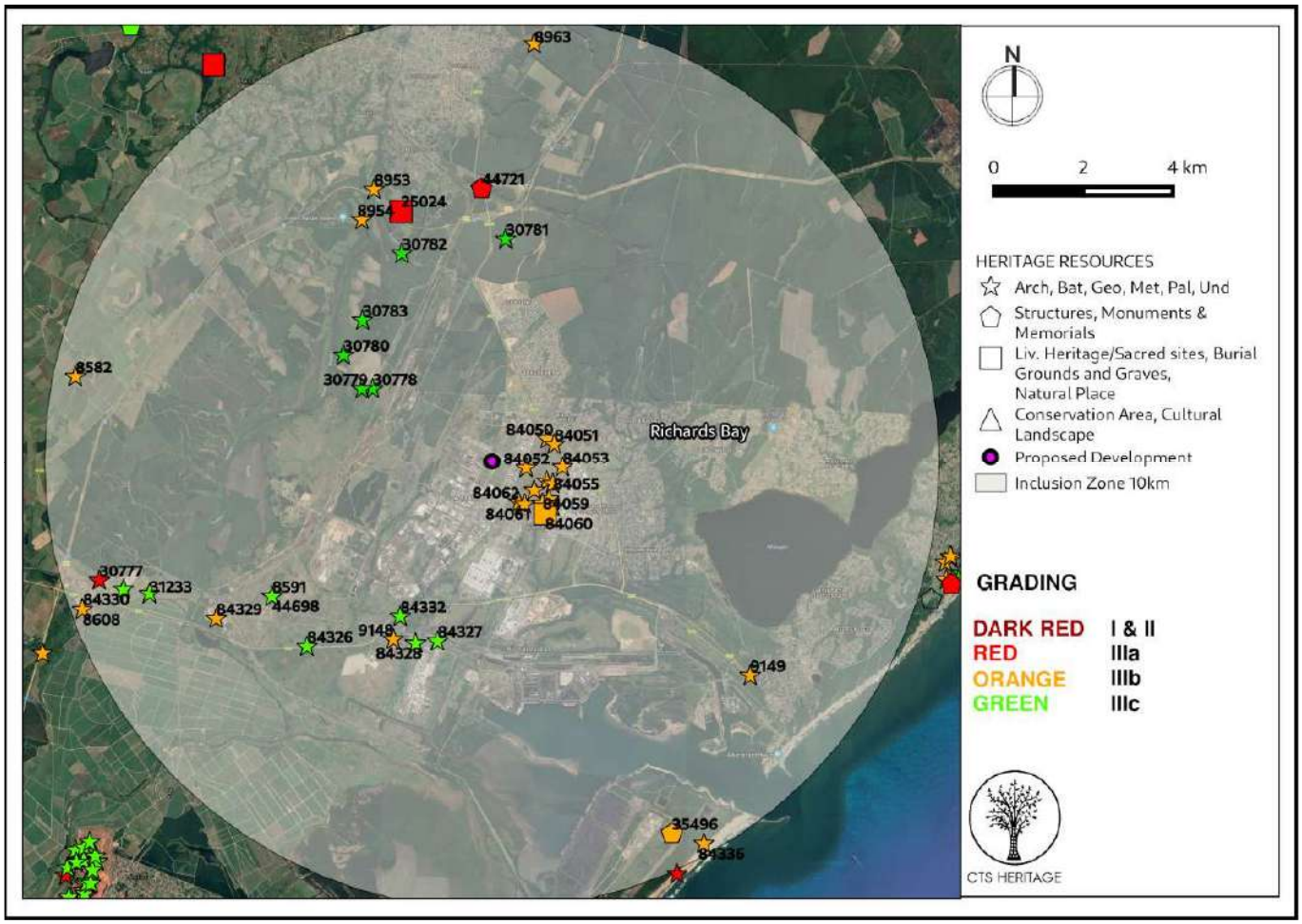

Figure 6.17: Map of heritage resources identified within the area.

6.8.2. Palaeontology (Fossils)

According to the SAHRIS Palaeosensitivity Map (**Figure 6.18**), the area proposed for development is underlain by sediments of low palaeontological sensitivity consisting of redistributed yellow quaternary sands. As such, it is very unlikely that the proposed development will negatively impact on significant palaeontological heritage.

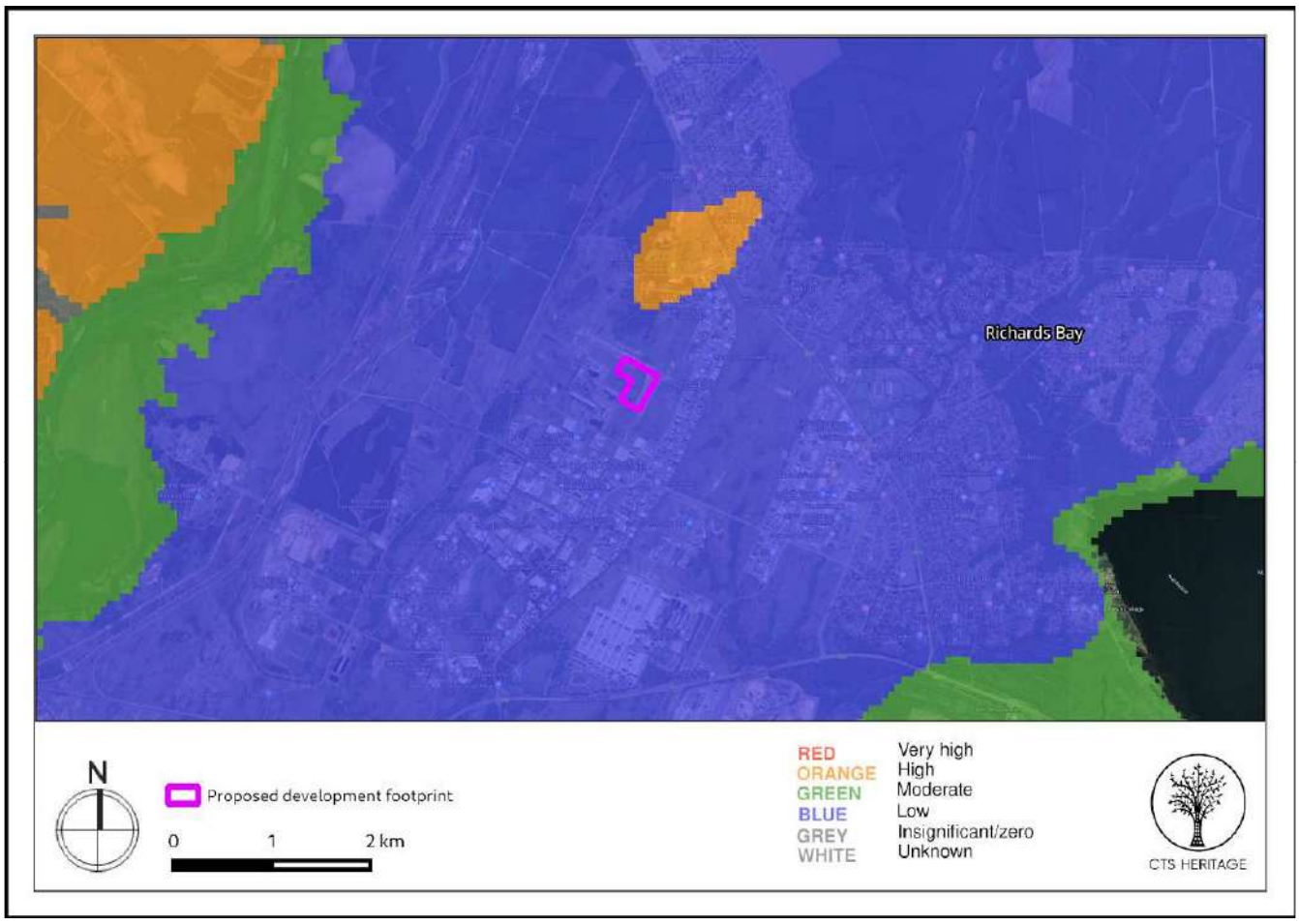

Figure 6.18: Palaeosensitivity Map. Indicating fossil sensitivity underlying the study area

6.9. Current Social and Economic Characteristics of the Project Site and Surrounding Areas

Between 2001 and 2011 the City of uMhlathuze Local Municipality (LM) experienced an annual population increase of 1.5%, with the population in 2011 reported to be 362 778 people. According to the 2016, Community Survey 2016 population within the uMhlathuze LM reported to be 410 465 persons, indicating a growth rate of 2.81% annually between 2011 and 2016, significantly higher than previously experienced.

For the period 1996 to 2016, the percentage of the total population within the City of uMhlathuze Local Municipality classified as 'potentially economically active' (ages of 15 and 64) has been consistently higher than the percentage of the population within this age group in the District Municipality and KZN province. Access to education within uMhlathuze Local Municipality improved between 2001 and 2011, with the percentage of the population over the age of 20 reported to have never received formal education dropping from 18% to 8%. While the same trend was experienced within the DM (a drop of 32% to 16% reporting no access) and province (a drop of 22% to 11% reporting no access), access was better within the LM.

Despite improvements between 2001 and 2016, unemployment within the uMhlathuze Local Municipality remains high at 30% however, this is below the level of unemployment reported for the King Cetshwayo DM 34% and KwaZulu-Natal 33.

The Gross Value Added (GVA) of City of uMhlathuze LM was valued to be R36 122 million in 2019 current prices as shown in the table below. This is equal to a GDP per capita of R102 152 which is significantly higher than the national and provincial economies with a GDP-R per capita of R75 205 and R61 174 respectively.

The figure below illustrates the economic profile of the City of uMhlathuze LM in terms of GVA per sector.

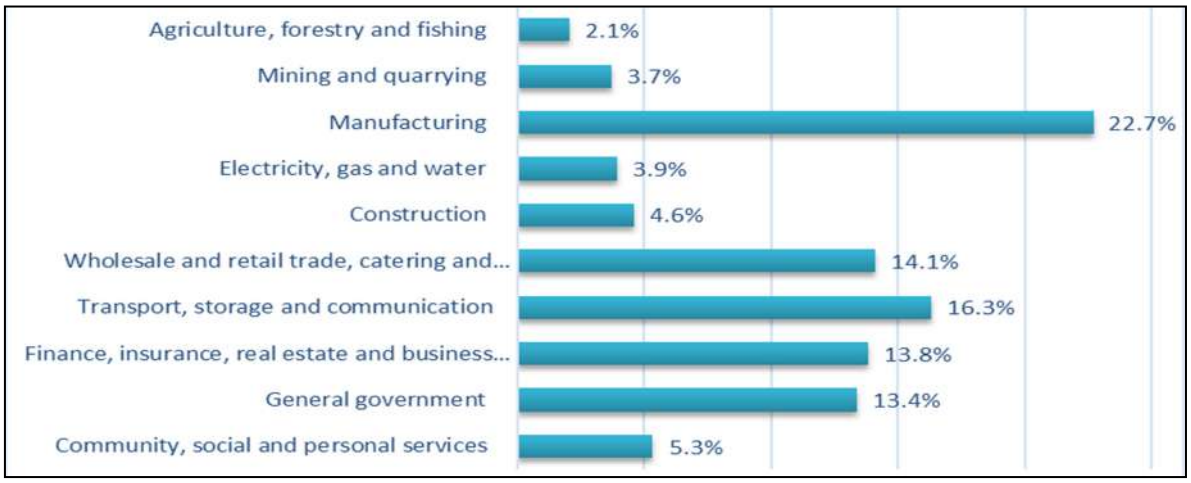

Figure 6.19: City of uMhlathuze Local Municipality GVA Contribution by Sector, 2018 (Source: Quantec Research, Urban-Econ Calculations, 2020)

As illustrated, the economy of the City of uMhlathuze LM is dominated by manufacturing, which accounts for about a fifth of the economy (22%). This is indicative of the high concentration of industrial activity in Richards Bay, with the Port of Richards Bay, the RBIDZ and associated industries playing a significant economic role.

Transport storage and communication is the next highest contributor (16%), followed by wholesale and retail trade sector contributing 14%. Finance, insurance and business services and General government sectors each contribute about 13%. These sectors are typically associated with the provision of services to industry. General government contributes 13%, which is to be expected given that Richards Bay is home to both the DM and LM governments, as well as several satellite provincial departments which service the north of KwaZulu-Natal (KZN). The remaining 20% is made of the agriculture, mining, construction, and social and personal services sectors.

The sectoral employment pattern of City of uMhlathuze LM show that the largest sector is the Wholesale and retail trade sector with about 22% of total employment. This is followed by the Finance insurance real estate and business services and the Community and social services sectors.

Access to electricity for lighting (the most basic level of access) within the uMhlathuze LM is better than access on a district and provincial level. Access to piped water improved significantly within the uMhlathuze LM between 2001 and 2016, with 94% of all households reported to have access to piped water either within their household or within their yard.

CHAPTER 7: APPROACH TO UNDERTAKING THE EIA PROCESS

In terms of the EIA Regulations of December 2014 (as amended) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of Phakwe Richards Bay Gas Power 3 CCPP is a listed activity requiring Environmental Authorisation (EA). The application for EA is required to be supported by an Environmental Impact Assessment (EIA) process.

An EIA process involves the identification and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project or activity. The EIA process comprises two main phases: i.e., **Scoping** and **EIA Phase**, and is illustrated in **Figure 7.1**. Public participation forms an important component of the process and is undertaken throughout both phases.

Figure 7.1: The Phases of an Environmental Impact Assessment (EIA) Process

7.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Impact Assessment Report

This chapter includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment Report:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for and (ii) a description of the activities to be undertaken, including associated structures and infrastructure.	All listed activities triggered and applied for are included in **Section 7.2**.
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	The public participation process followed throughout the EIA process for the Phakwe Richards Bay Gas Power 3 CCPP is included in **Section 7.5.2** and copies of the supporting documents and inputs are included in **Appendix C**.
3(h)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which	All comments received from the commencement of the EIA Process, are included in the Comments and Responses

Requirement	Relevant Section
the issues were incorporated, or the reasons for not including them.	Report in **Appendix C9**. Notes of meetings held are included in **Appendix C8**. All comments raised during the 30-day review and comment period of the EIA Report and through on-going consultation with I&APs will be included and responded to as part of the C&RR (**Appendix C9**) to be submitted as part of the final EIA Report to the DFFE for decision-making.
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks is included in **Section 7.5.3**.
3(p) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the EIA process being undertaken for the Phakwe Richards Bay Gas Power 3 CCPP are included in **Section 7.6**.

7.2. Relevant legislative permitting requirements

The legislative permitting requirements applicable to Phakwe Richards Bay Gas Power 3 CCPP, as identified at this stage in the process and considered within this EIA process, are described in more detail under the respective sub-headings.

7.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA)

The NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of the NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed, and reported on to the Competent Authority (the decision-maker) charged by NEMA with granting of the relevant Environmental Authorisation (EA). Since the Phakwe Richards Bay Gas Power 3 CCPP is a power generation project and therefore relates to the IRP for Electricity 2010 – 2030, the National Department of Forestry, Fisheries, and the Environment (DFFE) has been determined as the Competent Authority (CA) in terms of GNR 779 of 01 July 2016. The KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development (EDTEA) is the Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under NEMA ensures that developers are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the Competent Authority with sufficient information in order for an informed decision to be taken regarding the Application for EA.

The EIA process being conducted for the Phakwe Richards Bay Gas Power 3 CCPP is undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for EA, and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental

effect on the environment, and which may not commence without an EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

A) Relevant Listed Activities

The proposed Phakwe Richards Bay Gas Power 3 CCPP is located within the Richards Bay IDZ Phase 1F. Richards Bay Industrial Development Zone SoC Ltd received Environmental Authorisation (EA) for the IDZ Phase 1F in September 2016 (DFFE Ref No.: 14/12/16/3/3/3/665) (refer to **Appendix T**). In terms of the EIA Regulations, 2010, of GN 544, 545, and 546, the following listed activities **have been authorised** as part of the EA for the IDZ Phase 1F:

Table 7.1: Listed activities authorised for the Richards Bay Phase 1F (DFFE Ref No.: 14/12/16/3/3/3/665)

Listed Activity	Activity Description
GN R. 544 Item 9: The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water- (i) with an internal diameter of 0,36 metres or more; or a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	The proposed development includes the development of 2.7km of water pipelines with diameters of 150mm, 200mm, 250mm, 300mm, 350mm, 400mm & 450mm. The throughput of the proposed pipeline is 94.3 litres per second for domestic water and100 litres per second for firewater (6000 litres per minute). Approximately 2.3km of storm water pipelines of 450mm, 525mm, 675mm, 750mm, 900mm, 1050m, 1350mm, 1500 mm, 1650mm and 1800mm diameters will also be developed.
GN R. 544 Item 11: The construction of. (ii) bridges; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The proposed development will be constructed within 32m from the edge of the watercourse. There are a number of wetlands on the proposed site
GN R. 544 Item 18: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from (i) a watercourse.	Wetlands will be infilled as part of this development. In Alternative B all three wetlands on site are infilled whereas in Alternative 2, Wetland A and part of Wetland B will be conserved. The total volume for the road crossing fills and the site platform is 348 407 m^3.
GN R. 545 Item 15: Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or	Approximately 102 hectares of land will be developed for industrial use. The site is currently undeveloped/vacant although is already zoned for industrial use.

Listed Activity	Activity Description
(ii) agriculture or afforestation where activity 16 in this Schedule will apply.	
GN R. 546 Item 13: The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: (1) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008(Act No. 59 of 2008), in which case the activity is regarded to be excluded from this list. (2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010.	A portion of the site is located within a Level 3 Critical Biodiversity Area (CBA) according to the Ezemvelo KZN Wildlife Systematic Conservation Plan. Approximately 102 hectares will be developed as part of RBIDZ 1F.

Given that the EA for the Richards Bay Phase 1F is still valid, and the site on which the proposed PRBGP3 project is proposed has been prepared for development, the activities listed above will not be applied for as part of the EA application for the proposed Phakwe Richards Bay Gas Power 3 CCPP.

In terms of the EIA Regulations, 2014, of GN R324, GN R325 and GN R327, the following 'listed activities' are triggered by the proposed facility and **have been applied** for within the Application for Authorisation:

Table 7.2: Listed activities triggered by the Phakwe Richards Bay Gas Power 3 CCPP

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended (GNR327)	Describe the portion of the proposed project to which the applicable listed activity relates.
14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	Chemicals of up to 80m^3 will be utilized during construction and operation of the facility, stored in bunded tanks on site. This storage infrastructure will supply the proposed development with the fuel required for black start, heating as well as operation.
16	The development and related operation of facilities for the desalination of water with a design capacity to produce more than 100 cubic metres of treated water per day.	A demineralisation water treatment plant producing more than 100m^3 per day of process water to be used in the energy production system will be developed as part of this project
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation,	The development requires the clearance of up to a maximum of 11.8 ha of indigenous vegetation.
28(ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:	The development occurs within an industrial complex (RB IDZ Phase 1F) which is regarded as being outside an urban area, and will have a footprint of up to 11.8ha. This area was most likely utilised for

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended (GNR327)	Describe the portion of the proposed project to which the applicable listed activity relates.
	(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	agriculture between the years of 1998 and 2004.

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 3 of the EIA Regulations, 2014 as amended (GNR324)	Describe the portion of the proposed project to which the applicable listed activity relates.
2(d)(viii)	The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres. d. KwaZulu-Natal viii. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The development includes storage tanks for process water of capacity greater than 250 cubic metres. The project site is located within a Critical Biodiversity Area (CBA) as per the KwaZulu-Natal Biodiversity Sector Plan, 2016 (updated).
4(d)(viii)	The development of a road wider than 4 metres with a reserve less than 13,5 metres. d. KwaZulu-Natal viii. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The development will require the development of access or internal roads of 6m maximum width. The project site is located within a Critical Biodiversity Area (CBA) as per the KwaZulu-Natal Biodiversity Sector Plan, 2016 (updated)
10(d) (ix)	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. d. KwaZulu-Natal ix. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	Chemicals of up to 80m^3 will be utilized during construction and operation of the facility, stored in bunded tanks on site. This storage infrastructure will supply the proposed development with the fuel required for black start, heating as well as operation. The project site is located within a Critical Biodiversity Area (CBA) as per the KwaZulu-Natal Biodiversity Sector Plan, 2016 (updated).
12(d)(v)	The clearance of an area of 300 square metres or more of indigenous vegetation d. KwaZulu-Natal v. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The development requires the clearance of up to a maximum of 11.8ha of indigenous vegetation. The project site is located within a Critical Biodiversity Area (CBA) as per the KwaZulu-Natal Biodiversity Sector Plan, 2016 (updated).
15	The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010.	The development site is located within the RB IDZ phase 1F, for which rezoning efforts are ongoing. The site may have been zoned open space, conservation or equivalent since 2010 and therefore this activity will represent commercial and industrial development in such a zone.

Activity No(s):	Provide the relevant Scoping and EIR Activity(ies) as set out in Listing Notice 2 of the EIA Regulations, 2014 as amended (GNR325)	Describe the portion of the proposed project to which the applicable listed activity relates.
2	The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more.	Phakwe Richards Bay Gas Power 3 CCPP will have a generating capacity of up to 2000MW and will use natural gas (in various forms) as a fuel resource, which is a non-renewable resource.
6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent	An Air Emissions Licence is required to be obtained for the development in terms of the NEM: Air Quality Act

On the basis of the above listed activities, a Scoping and an EIA process is required to be undertaken for the development in support of an Application for Authorisation. This process is to be undertaken in two phases as follows:

1. The Scoping Phase includes the identification and description of potential impacts associated with the proposed project through a desktop study and consultation with affected parties and key stakeholders. This phase considers the broader site in order to identify and delineate any environmental fatal flaws, no-go or sensitive areas, as well as project alternatives in order to determine which should be assessed in more detail in the EIA Phase. Following the public review period of the Scoping report, this phase culminates in the submission of a final Scoping Report and Plan of Study for EIA to the competent authority for acceptance and approval to continue with the EIA phase of the process. Acceptance of the Scoping Report and the Plan of Study for EIA for the project was received from the DFFE on 24 February 2022.
2. The EIA Phase involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations (including field surveys), consideration of feasible alternatives and public consultation. Recommendations of practical and achievable mitigation and management measures are included in an Environmental Management Programme (EMPr) considering all phases of the project. Following the public review of the EIA report and EMPr, this phase culminates in the submission of a Final EIA Report and EMPr to the competent authority for review and decision-making.

7.2.2 National Water Act (No. 36 of 1998) (NWA)

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e., the Regional Department of Water and Sanitation (DWS) or the relevant Catchment Management Agency (CMA)). Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

The proposed Phakwe Richards Bay Gas Power 3 CCPP is located within the Richards Bay IDZ Phase 1F. Richards Bay Industrial Development Zone SoC Ltd has received a Water Use Authorisation for the activities proposed within this area.

7.2.3 National Heritage Resources Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources, and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

Section 38: Heritage Resources Management

1). Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –

a. the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

b. the construction of a bridge or similar structure exceeding 50m in length;

c. any development or other activity which will change the character of a site –

i). exceeding 5 000m² in extent; or

ii). involving three or more existing erven or subdivisions thereof; or

iii). involving three or more erven or divisions thereof which have been consolidated within the past five years; or

iv). the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority.

Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. As detailed in the Scoping Report, significant archaeology is unlikely to be negatively impacted by the proposed development as the area has been extensively previously disturbed. In addition, significant palaeontological heritage is unlikely to be negatively impacted by the proposed development as the palaeontological sensitivity of the area is Low. However, should heritage resources of significance be affected by the proposed development, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the South African Heritage Resources Agency (SAHRA) Permit Regulations (GNR 668).

7.3. Overview of the Scoping Phase

The final Scoping Report submitted to the DFFE on 13 January 2022 and subsequently accepted on 24 February 2022 documented the evaluation of potential environmental impacts of the Phakwe Richards Bay Gas Power 3 CCPP. The Scoping Phase was conducted in accordance with the requirements of the 2014 EIA Regulations (GNR 326), as amended, and therefore aimed to:

- Identify, describe and evaluate potential environmental (biophysical and social) impacts and benefits of all phases of the proposed facility (including design, construction, operation and decommissioning) within the identified site through a desk-top review of existing baseline data and desk-top specialist studies.
- Identify potentially sensitive environmental features and areas within the broader site in order to inform the preliminary design process of the facility.
- Define the scope of studies to be undertaken within the EIA process.
- Provide the authorities with sufficient information in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required to be undertaken as part of the EIA Phase of the process.

Within this context, the objectives of this Scoping Phase are to, through a consultative process:

- Identify the policies and legislation relevant to the project.
- Motivate the need and desirability of the proposed project, including the need and desirability of the activity in the context of the preferred location.
- Identify and confirm the preferred project and technology alternative.
- Identify and confirm the preferred site.
- Identify the key issues to be addressed in the EIA phase.
- Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the project will impose on the preferred site through the life of the project, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site.
- Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Key tasks undertaken within the Scoping Phase included:

- Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
- Submission of the completed application for authorisation to the competent authority (i.e. the National DEFF) in terms of Regulations 5 and 16 of the EIA Regulations 2016, as amended (GNR326).
- Undertaking a public participation process throughout the Scoping phase in accordance with Chapter 6 of GNR326 and the Department of Environmental Affairs (2017) Public Participation guidelines in terms of NEMA EIA Regulations (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
- Undertaking of independent specialist studies in accordance with Appendix 6 of GNR326 as amended, and the requirements of the Specialist Protocols published in Regulation GNR 320, issued 20 March 2020 and GNR 1150 of 30 October 2020, where relevant, as well as other relevant guidelines.
- Preparation of a Scoping Report and Plan of Study for EIA in accordance with the requirements of Appendix 2 of GN R326.
- Provision of a 30-day public and authority review period for the Scoping Report.
- Preparation of a Comments and Responses Report detailing key issues raised by I&APs as part of the Scoping phase.

» Submission of a Final Scoping Report, including a Plan of Study for the EIA, to the DFFE for review, acceptance on 13 January 2022.

Table 7.3 provides a summary of the public participation process undertaken during the Scoping Phase.

Table 7.3: Summary of Public Participation Process during the Scoping Phase

Activity	Date
The EIA process was advertised in: » The Zululand Observer.	12 November 2021
Placement of site notices, on-site and in public places.	10 November 2021
Distribution of process notification letters and background information documents to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and stakeholder groups.	12 November 2021
The availability of the scoping report was advertised in: » The Zululand Observer	12 November 2021
Review period for the Scoping Report for public comment.	12 November – 13 December 2021
Preliminary list of Focus Group Meetings to be held: » City of Mhlathuze Local Municipality » KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs » Richards Bay Clean Air Association » Adjacent Landowners & other I&APs	25 November 2021 25 November 2021 8 December 2021 9 December 2021

Acceptance of the Scoping Report and approval of the Plan of Study for the EIA Phase was received on 24 February 2022, marking the start of the EIA Phase (refer to **Appendix B**).

7.4. Overview of the EIA Phase

As per the EIA Regulations (GNR 326), the objectives of the EIA Phase are to, through a consultative process:

» Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context.
» Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Scoping Report.
» Identify the location of the development footprint within the approved site as contemplated in the accepted Scoping Report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment.
» Determine the:
    * Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    * Degree to which these impacts:
        - Can be reversed;
        - May cause irreplaceable loss of resources; and
        - Can be avoided, managed or mitigated.

- Identify the most ideal development footprint for the activity within the development area as contemplated in the accepted Scoping Report based on the lowest level of environmental sensitivity identified during the assessment.
- Identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted Scoping Report through the life of the activity.
- Identify suitable measures to avoid, manage or mitigate identified impacts.
- Identify residual risks that need to be managed and monitored.

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

The following subsections outline the activities within the EIA process that have been undertaken to date.

7.4.1 Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

Consultation with authorities has been undertaken during the Scoping Phase and will continue throughout the EIA process. The following consultation forms part of this EIA phase of the process:

- Request for extension of the BA timeframe from DFFE in terms of Regulation 3(7) of the EIA Regulations of 2014 (as amended) in order to ensure all potential impacts are comprehensively assessed and adequate time is allowed for public consultation on the draft EIA Report.
- Make the EIA Report available for a 45-day public and authority review period.
- Notification and consultation with stakeholders, I&APs and Organs of State that may have jurisdiction over the project, including provincial and local government departments, and State-Owned Enterprises.
- Incorporating comments received during the 45-day public review period to prepare a Final EIA Report.
- Submission of the Final EIA Report to DFFE for decision making.
- Provide an opportunity for DFFE and EDTEA representatives to visit and inspect the proposed site and project area.

The submissions, as listed above, were undertaken electronically, as required by the DFFE. A record of all authority correspondence undertaken prior to and within the EIA Phase is included in **Appendix B** and **Appendix C5**.

7.4.2 Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326), as amended. The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326, as amended, and is being followed for this proposed project.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the EIA process from the outset. The public participation process is

designed to provide sufficient and accessible information to I&APs in an objective manner. The public participation process affords I&APs opportunities to provide input into and receive information regarding the EIA process in the following ways:

During the **Scoping Phase**:
» Identify issues of concern and suggestions for enhanced benefits.
» Verify that their issues have been recorded.
» Assist in identifying reasonable alternatives.
» Contribute relevant local information and knowledge to the environmental assessment.

During the **EIA Phase**:
» Contribute relevant local information and knowledge to the environmental assessment.
» Verify that issues have been considered in the environmental investigations as far as possible as identified within the Scoping Phase.
» Comment on the findings of the environmental assessments.

During the **decision-making phase**:
» To advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The following sections detail the tasks undertaken as part of the public participation process within the EIA Phase.

i. Advertisements and Notifications

The availability of the EIA Report for review and comment was announced to the Organs of State, potentially affected and adjacent landowners, tenants and occupiers, and general public via the following:

» Notification letter distributed to all registered parties advising them of the availability of the EIA Report for review on comment on **06 June 2022.**
» An advertisement announcing the availability of and inviting comment on the EIA Report in the Zululand Observer (English and Zulu advertisements) on **06 May 2022**. A copy of the newspaper adverts as sent to the newspaper and the advert tear sheet are included in **Appendix C3** of the EIA Report.
» The EIA Report was made available for review by I&APs for a 45-day review and comment period from **06 June 2022 to 22 July 2022**. The EIA Report has been made available on the Savannah Environmental website (https://savannahsa.com/public-documents/energy-generation/prbgp3-2000mw-ccpp/) and all registered I&APs have been notified of the availability on **06 June 2022**. I&APs have been encouraged to view the EIA Report and submit written comment. The EIA Report has been circulated to Organs of State via electronic transfer (Dropbox, WeTransfer, etc), or CD and/or hardcopy as per individual request. Evidence of distribution of this EIA Report will be included in the final EIA Report.

ii. Public Involvement and Consultation

In order to accommodate the varying needs of stakeholders and I&APs within the surrounding area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities are being provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

- Opportunity to review the EIA Report for a 45-day review and comment period from **06 June 2022** to **122 July 2022**.
- Comments received during this review period will be captured within a Comments and Responses Report (**Appendix C9**), which will be included within the final EIA Report.
- Focus group meetings: Virtual focus group meetings will be held with key government departments, stakeholders and landowners during the 45-day review and comment period of the EIA Report. The purpose of these focus group meetings is to provide an overview of the findings of the EIA studies in order to facilitate comments on the EIA process and EIA Report, as well as to record any issues or concerns raised by stakeholders regarding the project. The minutes of these meetings will be included in the final EIA Report as **Appendix C8**.
- An information session and public meeting will be held at Pelican Hall, Buscom Centre, Zululand Chamber of Business Forum Community Park, Guldengracht, Alton, Richards Bay on Thursday, 23 June 2022 at 15h00. The Information Session will start with a poster display at 15h00 after which those that are interested in attending the presentation can attend the public meeting which will start at 17h00.
- Telephonic consultation sessions.
- Written, faxed or e-mail correspondence.

Table 7.5: Public involvement during EIA Phase

Activity	Date
Advertising of the availability of the EIA Report for a 30-day review and comment period in the Zululand Observer (English and Zulu advertisements).	06 June 2022
Distribution of notification letters announcing the availability of the EIA Report for a 45-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	06 June 2022
45-day review and comment period of the EIA Report.	06 June 2022 to 22 July 2022
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group: » Landowners » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations). » Where an I&AP does not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video call) will be set-up and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions. Direct in-person consultation will only take place in limited numbers and where sanitary conditions can be maintained at all times.	» Focus group meetings will be held with key stakeholders during the 30-day review and comment period of the EIA Report via a virtual platform, where relevant. » An information session and public meeting will be held at Pelican Hall, Buscom Centre, Zululand Chamber of Business Forum Community Park, Guldengracht, Alton, Richards Bay on Thursday, 23 June 2022 at 15h00. The Information Session will start with a poster display at 15h00 after which those that are interested in attending the presentation can attend the public meeting which will start at 17h00
On-going consultation (i.e., telephone liaison; e-mail communication) with all I&APs.	Throughout the EIA process

iii. Registered I&APs entitled to Comment on the EIA Report

43.(1) A registered I&AP is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

(2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.

44.(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.

(2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –

(a) A lack of skills to read or write;
(b) Disability; or
(c) Any other disadvantage;

Reasonable alternative methods of recording comments must be provided for.

I&APs registered on the database have been notified by means of a notification letter of the release of the EIA Report for a 45-day review and comment period, invited to provide comment on the EIA Report, and informed of the manner in which, and timeframe within which such comment must be made. The report has been made available in soft copies to I&APs. Hard copies of the report can be made available on requested, on condition that sanitary conditions can be maintained.

The EIA Report has been made available on the Savannah Environmental website (i.e., online stakeholder engagement platform) (https://savannahsa.com/public-documents/energy-generation/prbgp3-2000mw-ccpp/). A notification letter to all registered parties was distributed prior to commencement of the 45-day review and comment period, on **06 June 2022**. Where I&APs are not able to provide written comments (including SMS and WhatsApp), other means of consultation, such as telephonic discussions and discussions at the information session to be held in the project area will be used.

All comments raised as part of the discussions and written comments submitted during the 45-day review and comment period will be recorded and included in **Appendix C** of the Final EIA Report.

iv. Identification and Recording of Comments

Comments raised by I&APs to date have been included into a Comments and Responses (C&R) Report, which is included in **Appendix C9** of this EIA Report. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised. The C&R Report will be updated with all comments received during the 45-day review and comment period of the EIA Report and will be included as **Appendix C9** in the Final EIA Report submitted to the DFFE for decision-making.

Notes of all the telephonic discussions, virtual meetings, and the information session to be conducted during the 30-day review and comment period of the EIA Report will be included in **Appendix C8** of the Final EIA Report.

7.5. Outcomes of the DFFE Web-Based Screening Tool

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulation 19 and 21 of the 2014 EIA Regulations.

The requirement for the submission of a Screening Report (**Appendix Q** for the proposed development is applicable as it triggers Regulation 19 of the 2014 EIA Regulations (as amended). **Table 7.4** provides a summary of the specialist assessment requirements identified for the project site in terms of the screening tool and responses to each assessment requirement based on the nature and extent of the project.

Table 7.4: Sensitivity ratings from the DEFF's web-based online Screening Tool associated with the development of Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Landscape/Visual Assessment	Not specified within screening tool	A Visual Impact Assessment has been undertaken for the proposed project (refer to Appendix J).
Archaeological and Cultural Heritage Impact Assessment	Low Sensitivity	A Heritage Screening Assessment was undertaken for the proposed project. It was concluded that no significant impacts are expected to be associated with the project and therefore no detailed assessment was required to be undertaken.
Palaeontology Impact Assessment	Low Sensitivity	A Heritage Screening Assessment was undertaken for the proposed project. It was concluded that no significant impacts are expected to be associated with the project and therefore no detailed assessment was required to be undertaken.
Terrestrial Biodiversity Impact Assessment	Very High Sensitivity	A Terrestrial Biodiversity Impact Assessment has been undertaken for the proposed project (refer to Appendix D).
Aquatic Biodiversity Impact Assessment	Very High Sensitivity	An Aquatic Biodiversity Impact Assessment has been undertaken for the proposed project (refer to Appendix E).
Socio- Economic Assessment	Not specified within screening tool	A Socio- Economic Impact Assessment has been undertaken for the proposed project (refer to Appendix L).
Plant Species Assessment	Medium Sensitivity	A plant species assessment has been included within the Terrestrial Biodiversity Assessment (refer to Appendix D).
Animal Species Assessment	High Sensitivity	An animal species assessment has been included within the Terrestrial Biodiversity Assessment (refer to Appendix D).
Soil and Agricultural Assessment	Very High Sensitivity	A Soil and Agricultural Potential Assessment has been undertaken for the proposed project (refer to Appendix F).

7.6. Assessment of Issues Identified through the EIA Process

Based on the results of the screening, and from experience on similar projects and in the study area, the EIA project team has identified the following issues as requiring investigation.

Table 7.5: Specialist consultants appointed to evaluate the potential impacts associated with the Phakwe Richards Bay Gas Power 3 CCPP

Issue	Specialist	Refer Appendix
Terrestrial Ecology	Anita Rautenbach of Rautenbach Biodiversity Consulting	Appendix D
Wetlands	Dale Kindler and Andrew Husted of The Biodiversity Company	Appendix E
Soils	Ivan Baker of The Biodiversity Company	Appendix F
Air Quality	Terri Bird of Airshed	Appendix G
Health Impact Assessment	Infotox	Appendix H
Climate Change	Promethium Carbon	Appendix I
Visual	Lourens du Plessis of LOGIS	Appendix J
Noise	Morne de Jager of EARES	Appendix K
Socio-economic	Eugene de Beer of Urban-Econ Development Economists	Appendix L
Traffic	Iris Wink of JG Afrika	Appendix M
Quantitative Risk Assessment	Mike Oberholzer of Riscom	Appendix N

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the facility. Identified impacts are assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
  - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
  - Medium-term (5–15 years) – assigned a score of 3
  - Long term (> 15 years) - assigned a score of 4
  - Permanent - assigned a score of 5
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment
  - 2 is minor and will not result in an impact on processes
  - 4 is low and will cause a slight impact on processes
  - 6 is moderate and will result in processes continuing but in a modified way
  - 8 is high (processes are altered to the extent that they temporarily cease)
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
  - Assigned a score of 2 is improbable (some possibility, but low likelihood)
  - Assigned a score of 3 is probable (distinct possibility)

    - Assigned a score of 4 is highly probable (most likely)
    - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
- The **status**, which is described as either positive, negative or neutral
- The degree to which the impact can be reversed
- The degree to which the impact may cause irreplaceable loss of resources
- The degree to which the impact can be mitigated

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

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

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

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

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

Specialist studies also considered cumulative impacts associated with similar developments within a 30km radius of the proposed project. The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e., whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

A conclusion regarding whether the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area is included in the respective specialist reports.

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the requirements of NEMA and the 2014 EIA Regulations (GNR 326)), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr)

that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix O** to this EIA Report.

7.7. Assumptions and Limitations of the EIA Process

The following assumptions and limitations are applicable to the EIA process for the Phakwe Richards Bay Gas Power 3 CCPP:

- All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
- The development area identified by the developer represents a technically suitable site for the establishment of the Phakwe Richards Bay Gas Power 3 CCPP, which is based on the design undertaken by technical consultants for the project.
- The development footprint (the area that will be affected during the operation phase) will include the footprint for the CCPP and associated infrastructure.
- Conclusions of the specialist studies undertaken, and this overall impact assessment assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset in accordance with the relevant recommendations made.
- This report and its investigations are project specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies contained in **Appendices D - M** for limitations specific to the independent specialist studies.

7.8. Legislation and Guidelines that have informed the preparation of this Scoping Report

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

- National Environmental Management Act (Act No. 107 of 1998);
- EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended);
- Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations;
- Department of Environmental Affairs (2017), Integrated Environmental Management Guideline: Guideline on Need and Desirability;
- Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation; and
- International guidelines – the Equator Principles, the IFC Performance Standards, the Sustainable Development Goals, World Bank Environmental and Social Framework, and the and World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the scoping report and are to be addressed in the EIA. A listing of relevant legislation is provided in **Table 7.6**.

Table 7.6: Review of the relevant environmental policies, legislation, guidelines and standards applicable to the Phakwe Richards Bay Gas Power 3 CCPP

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* ∗ *Prevent pollution and ecological degradation,* ∗ *Promote conservation, and* ∗ *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right implies a long-term responsibility to ensure sustainable development and environmental protection for future generations. The Environmental right clause provides that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. A Scoping and EIA Process is required to be undertaken for the proposed project.	DFFE – Competent Authority KwaZulu-Natal EDTEA – Commenting Authority	The listed activities requiring authorisation triggered by the proposed project have been identified and are being assessed as part of the EIA process for the Phakwe Richards Bay Gas Power 3 CCPP. The EIA process will culminate in the submission of a final EIA Report to the Competent Authority in support of the Application for Environmental Authorisation.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management Act (No 107 of 1998) (NEMA)	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	DFFE KwaZulu-Natal EDTEA	While no permitting or licensing requirements arise directly by virtue of the Phakwe Richards Bay Gas Power 3 CCPP in terms of this section, this general duty of care finds application through the consideration of potential cumulative, direct and indirect impacts.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).	DFFE KwaZulu-Natal EDTEA uMhlatuze Local Municipality	Noise impacts are expected to be associated with the construction and operational phase of the project. Considering the location of the Phakwe Richards Bay Gas Power 3 CCPP in relation to residential areas and provided that appropriate mitigation measures are implemented, construction and operational noise is unlikely to present a significant intrusion to the local community (refer to specialist noise impact assessment in Appendix K).
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible	Regional Department of Water and Sanitation	The proposed Phakwe Richards Bay Gas Power 3 CCPP is located within the Richards Bay IDZ Phase 1F. Richards Bay Industrial Development

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	under a GA, or if a responsible authority waives the need for a licence. Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. Consumptive water uses may include taking water from a water resource (Section 21(a)), and storing water (Section 21(b)). Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)), and disposal of waste water (section 21 e-h).		Zone SoC Ltd has received a Water Use Authorisation for the activities proposed within this area.
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit. Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA.	Department of Mineral Resources	No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA is not required to be obtained in this regard.
	Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner unless on any land		In terms of Section 53 of the MPRDA, approval may be required from the Minister of Mineral Resources to ensure that the proposed project does not sterilise a mineral resource that might occur on the site.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	which lies within an approved town planning scheme which has applied for an obtained approval.		
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The List of Activities Which Result in Atmospheric Emissions Which Have or May Have A Significant Detrimental Effect on The Environment, Including Health, Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage (GN 893) published under Section 21(1)b of the NEM: AQA prescribe the emissions standards for a number of listed activities deemed detrimental to the environment. In accordance with the Regulations (GN 893) any person who conducts any activity in such a way as to give rise to emissions in quantities and concentrations that may exceed the minimum emissions standards set out must, apply for an Air Emissions License (AEL).	DEFF KwaZulu-Natal EDTEA / King Cetshwayo District Municipality	The project is a new facility and does not yet have an AEL. As a gas-fired power station with capacity greater than 50 MW, the project will require an AEL to operate. Emissions from the power station will be required to comply with the new plant Minimum Emission Standards (MES). The applicable listed activities categories will include: Subcategory 1.4 (Gas Combustion Installations). Listed activities defined in Section 21 of the NEM:AQA (as amended) require Environmental Authorisation – therefore triggering the Environmental Impact Assessment process - prior to the issuance of an AEL granting license to operate a facility that may impact ambient air quality.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority. Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources	South African Heritage Resources Agency AMAFA	A Heritage Screening Assessment was undertaken for the proposed project. It was concluded that no significant impacts are expected to be associated with the project and therefore no detailed assessment was required to be undertaken.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	authority and furnish it with details regarding the location, nature, and extent of the proposed development. Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.		
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).	DFFE KwaZulu-Natal EDTEA	Under NEM:BA, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. No protected species were found within the project site (refer to Terrestrial Biodiversity Assessment included in **Appendix D**). Due to the potential for protected plants to occur in the broader area, a further walk through will be undertaken prior to construction.
National Environmental Management:	Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted	DFFE	Alien plant species listed in terms of Chapter 5 of NEM: BA were identified within the project as per

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Biodiversity Act (No. 10 of 2004) (NEM:BA)	activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out. Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864). Restricted activities and the respective requirements applicable to persons in control of different categories of listed invasive species are contained within the Alien and Invasive Species Regulations (GNR 598) published under NEM:BA, together with the requirements of the Risk Assessment to be undertaken.	KwaZulu-Natal EDTEA	the findings of the Terrestrial Assessment (**Appendix D** of the EIA report). These must be managed in accordance with the relevant legislative requirements.
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GNR 1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GNR 1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	Department of Agriculture, Land Reform and Rural Development (DALRD)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of DALRD will be required if the project requires the draining of vleis, marshes or water sponges on land outside urban areas. However, this is not applicable to the project. In terms of Regulation 15E (GNR 1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods: » Uprooting, felling, cutting or burning.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			» Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer. » Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation (4). » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734. The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister".	DFFE	A licence is required for the removal of protected trees listed under the National Forests Act of 1998 (No 84 of 1998). No species protected in terms of the NFA were observed on the proposed development site (refer to **Appendix D**).
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire	DFFE	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it. Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.		operation of the project, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes.
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH). Hazardous substances (e,g, LPG) will be stored within the project site

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and	DFFE – hazardous waste KwaZulu-Natal EDTEA – general waste	No waste listed activities are triggered by the project and therefore no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard, if more than 100m^3 of general waste or 80m^3 for hazardous waste is to be generated by the project and stored on site at any one time. Third party registered waste contractors will be responsible for the handling and disposal of the waste.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Pollution of the environment and harm to health are prevented.		
National Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	South African National Roads Agency (SANRAL) – national roads KwaZulu-Natal Department of Transport (DoT)	An abnormal vehicle permit may be required by transporters to transport various components of the transmission infrastructure to site for construction. These may include road clearances for vehicles carrying abnormally dimensioned loads (transport vehicles exceeding the dimensional limitations (length) of 22m). Hazardous waste transporters will have to comply with the National Road Traffic Act requirements.
Provincial Policies / Legislation			
KwaZulu-Natal Systematic Conservation Plan (KZNSCP, 2012)	The process of conservation planning involves extensive mapping of vegetation types, transformation, species data, ecological processes and threats.	KwaZulu-Natal EDTEA EKZN Wildlife	Provincial scale data layers (KZN CBA Irreplaceable version 26012016) identified CBA areas intersecting with the project site. Important biodiversity features contained within the CBA areas include the presence of NPAES focus areas and the Critically Endangered Kwambonambi Hygrophilous Grassland ecosystem. No national

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			or provincial ESA designated areas intersect with the project site. The ecologist has indicated however that the site may have been incorrectly classified as CBA due to an error in the land cover map, or alternatively a disturbance to the site has occurred subsequent to the development of the CBA Map (refer to **Appendix D**).
KwaZulu -Natal Nature Conservation Ordinance (No. 15 of 1974)	This Ordinance provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Oridinance; provides for the appointment of nature conservators to implement the provisions of the Ordinance; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; The Ordinance provides lists of protected species for the Province.	KwaZulu Natal EDTEA	A collection/destruction permit must be obtained from KZN EDTEA for the removal of any protected plant or animal species found on site. One plant species listed as Declining and provincial protected, i.e., *Crinum* cf. *stuhlmanniii* was observed on site. All species from the Family AMARYLLIDACEAE are protected by the Provincial Conservation Ordinance and may not be damaged, destroyed or relocated without permit authorization from Ezemvelo KwaZulu-Natal Wildlife.

7.8.1 International Guidelines

i) <u>The Equator Principles IV (July, 2013)</u>

The Equator Principles (EPs) IV constitute a financial industry benchmark used for determining, assessing, and managing projects environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects and apply globally to all industry sectors.

The EPs comprise the following principles:

Principle 1: Review and Categorisation
Principle 2: Environmental and Social Assessment.
Principle 3: Applicable Environmental and Social Standards.
Principle 4: Environmental and Social Management System and Equator Principles Action Plan
Principle 5: Stakeholder Engagement
Principle 6: Grievance Mechanism
Principle 7: Independent Review
Principle 8: Covenants
Principle 9: Independent Monitoring and Reporting
Principle 10: Reporting and Transparency.

When a project is proposed for financing, the Equator Principle Financial Institution (EPFI) will categorise it based on the magnitude of its potential environmental and social risks and impacts.

Projects can be categorized as follows:

Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented.
Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.
Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.

Category A and Category B projects require that an assessment process be conducted to address the relevant environmental and social impacts and risks associated with the project.

The Phakwe Richards Bay Gas Power 3 CCPP is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GNR 326), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed. The National EIA process aligns and fulfils the requirements of the Equator Principles.

ii) International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (January 2012)

The International Finance Corporation (IFC), a division of the World Bank Group that lends to private investors.

The IFC Performance Standards (PS) on Environmental and Social Sustainability were developed by the IFC, to provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations.

The PS comprise of the following:

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

Performance Standard 1 establishes the importance of:

i). Integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects.
ii). Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them.
iii). The management of social and environmental performance throughout the life of a project through an effective Environmental and Social Management System (ESMS).

PS 1 requires that a process of environmental and social assessment be conducted, and an ESMS appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts be established and maintained. PS 1 is the overarching standard to which all the other standards relate. PS 2 through 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, PS 2 through 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its Environmental and Social Management System (ESMS) consistent with PS 1.

This EIA has taken into consideration the requirements and guidelines set out in the IFC PS's and incorporated specific assessments where relevant.

CHAPTER 8: ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of the Phakwe Richards Bay Gas Power 3 CCPP. This assessment has considered the construction of a gas to power facility with a contracted capacity of up to 2000MW within a development footprint of approximately 11ha in extent on various erven within the Richards Bay IDZ Phase 1F, Richards Bay. The power plant will operate at mid-merit to baseload duty and will include the following main infrastructure:

- Up to 4 gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- Up to 4 Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- Up to 4 steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
- Water retention pond
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines
- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, waste water
- Fire water (FW) storage and FW system
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal);
  - Warehousing and buildings;
  - Workshop building;
  - Fire water pump building;
  - Administration and Control Building;

- Ablution facilities;
- Storage facilities;
- Guard House;
- Fencing;
- Maintenance and cleaning area;
- Operational and maintenance control centre;

» Electrical facilities including:
- Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
- Generators and auxiliaries;

» Service infrastructure including:
- Stormwater channels;
- Water pipelines
- Temporary work areas during the construction phase (laydown areas)

A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and Hydrogen. The pipeline will be connected to the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the Richards Bay Harbour. A separate EIA process will be undertaken for the dedicated fuel-supply pipeline.

The grid connection infrastructure will include an Eskom portion of the 275kV or 400kV GIS interface Substation, Underground 275kV or 400kV power cabling connecting the Power Plant GIS substation and Eskom GIS Interface substation and an overhead 275kV or 400kV power line connecting the Eskom interface substation to the selected Eskom grid connection point. A separate EIA process will be undertaken for the grid connection infrastructure.

The full extent of the project site was considered through the EIA process by the independent specialists and the EAP. Environmental sensitivities were identified through the review of existing information, desktop evaluations and field surveys. A development footprint for the facility within the project site was proposed by the developer for consideration in the EIA process (refer to **Figure 8.1**).

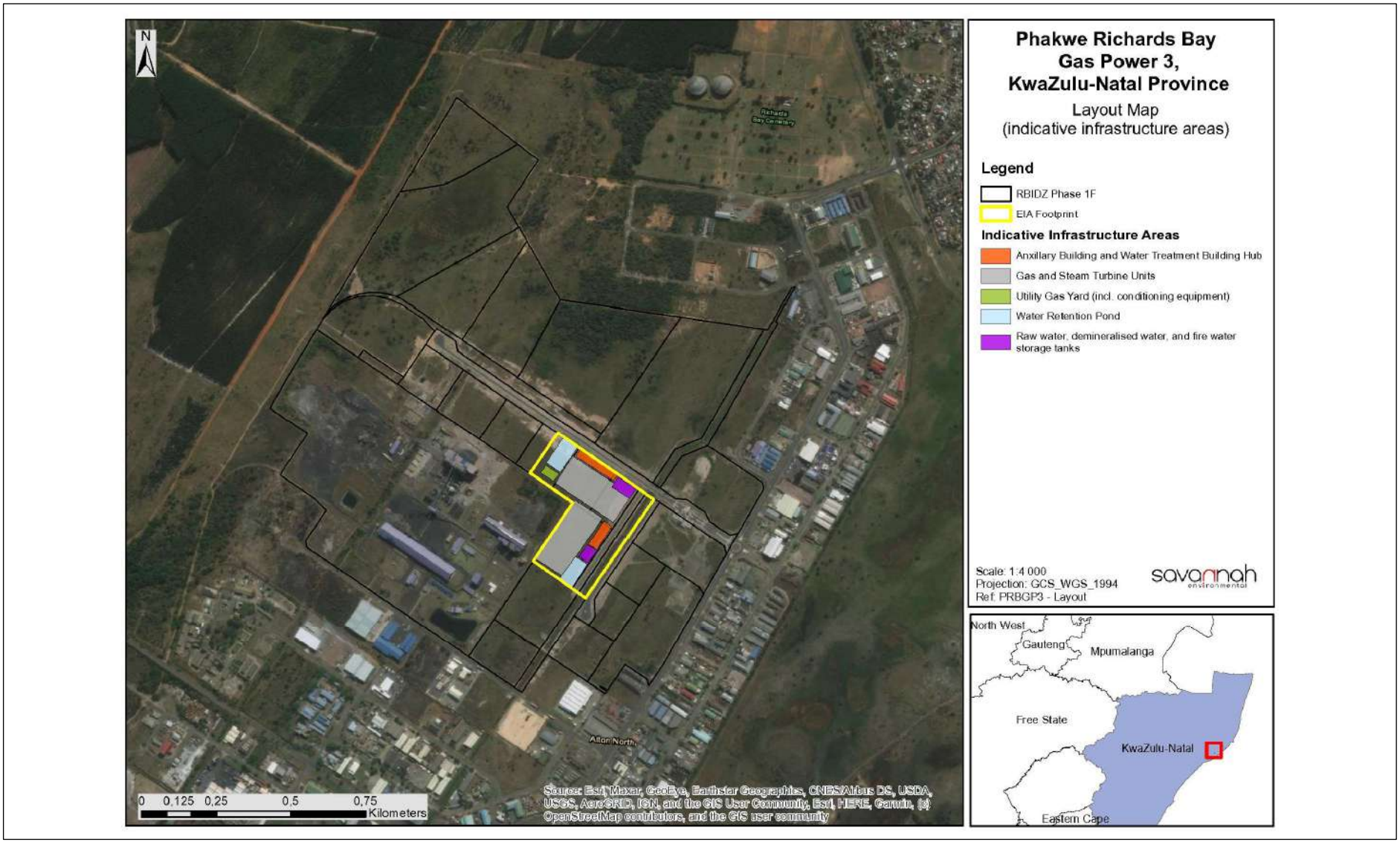

Figure 8.1: Map of indicative areas for infrastructure associated within the Phakwe Richards Bay Gas Power 3 CCPP. A preliminary detailed design is included in **Appendix P.**

The development of Phakwe Richards Bay Gas Power 3 CCPP will comprise the following phases:

- *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads, laydown areas, and facility infrastructure; construction of foundations involving excavations; the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for the project is estimated to take up to 36 to 48 months to construct depending on the choice of technology and the lead time for equipment.
- *Operation* – will include the operation of the Phakwe Richards Bay Gas Power 3 CCPP and the generation of electricity. This will be fed into the national grid at the selected Eskom grid connection point (to be determined in consultation with Eskom). The operation phase of project is expected to be approximately 20 years (with maintenance). Depending on the economic viability of the facility, the length of the operation phase may be extended beyond a 20-year period.
- *Decommissioning* –At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the thermal energy facility, clearance of the relevant infrastructure at the site and appropriate disposal thereof, and rehabilitation. Impacts associated with decommissioning are expected to be similar to those associated with construction activities. Therefore, these impacts are not considered separately within this chapter.

8.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Impact Assessment Report

This chapter of the EIA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 3: : Scope of Assessment and Content of Environmental Impact Assessment Report:

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated.	The impacts and risks associated with the development of the project, including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources are included in this chapter and the specialist studies included in Appendix D-N.
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The positive and negative impacts associated with the development of the project are included in this chapter and the specialist studies included in Appendix D-N.
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with the project are included in the impact tables presented this chapter and the specialist studies included in Appendix D-N.
3(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the	A description of all environmental impacts identified for the project during the EIA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are included in in this chapter and the specialist studies included in Appendix D-N.

Requirement	Relevant Section
extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures,.	
3(j) an assessment of each identified potentially significant impact and risk, including (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources and, (vii) the degree to which the impact and risk can be avoided, managed or mitigated.	An assessment of each impact associated with the development of the project, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in this chapter and the specialist studies included in Appendix D-N.
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in the impact tables presented in this chapter and the specialist studies included in Appendix D-N.

8.2. Potential impacts identified during the Scoping Study

Impacts/ issues identified through the Scoping process requiring assessment in the EIA Phase include the following:

- Impacts on terrestrial biodiversity
- Impacts on wetlands and aquatic ecology
- Impacts on soils and agricultural potential
- Impacts on air quality
- Health risk assessment
- Impacts on climate change
- Visual impacts
- Socio-economic impacts
- Traffic impacts
- Impacts on ambient Noise Levels
- Quantitative Risk Assessment (Impact due to unplanned events)

These issues have been assessed during the EIA Phase, and where applicable potential sensitivities have been mapped accordingly based on the detailed specialist studies and site investigations undertaken. Cumulative impacts have been assessed in Chapter 9 of this report.

8.3. Impacts on Terrestrial Biodiversity

The majority of the ecological impacts associated with the development would occur during the construction phase as a result of the disturbance associated with site clearance, excavations, the operation of heavy machinery at the site and the presence of construction personnel. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

8.3.1. Results of Terrestrial Ecology Impact Assessment

The vegetation of the project site was found to be impacted by longstanding and significant anthropogenic disturbance and not representative of the environmental sensitivities identified during the desktop assessment. Based on floristic composition, vegetation structure and level of degradation, four vegetation communities were identified, described, and mapped and included *Digitaria natalensis – Parinari capensis* Grassland, *Ischaemum fasciculatum* Hygrophilous Grassland, Degraded areas, and *Typha capensis – Phragmites australis* drainage canal.

Most of the flora species present are widespread and abundant in South Africa, with no extinction risk. Noteworthy observations included one species listed as Declining (Red List of SA Plants) and provincial protected (i.e., *Crinum* cf. *stuhlmanniii*), present in the *D. natalensis - P. capensis* Grassland, and four South African endemics of which three species (*Raphionacme palustris, Helichrysum ruderale, Selago tarachodes*) were present in the *D. natalensis - P. capensis* Grassland, and one in the *I. fasciculatum* Hygrophilous Grassland (Roella glomerata). All the endemics are listed as of Least Concern on the Red List of SA Plants (SANBI).

The undeveloped habitats directly adjacent to the project site and alongside the boundaries of Phase 1F on the northwest is degraded by longstanding anthropogenic disturbance. The vegetation on the project site and on the rest of Phase 1F is thus not connected to undisturbed natural vegetation.

The Site Ecological Importance (SEI) for the *D. natalensis - P. capensis* Grassland vegetation community was regarded as of Medium sensitivity owing to the presence of one species listed as Declining (*C. cf. stuhlmanniii*) and three South African endemics. For the fauna species, SEI ranged from Low to Medium. The overall SEI for the project site was therefore regarded as of Medium sensitivity. The SEI for the site is shown in Figure 8.1.

8.3.2. Description of Terrestrial Biodiversity Impacts

Direct, indirect, residual and cumulative impacts were considered for the construction and operational phases of the proposed project. No information was available on the anticipated lifespan of the proposed facility.

- Direct impacts occur as a direct result of an action at the same time and location as the action.
- Indirect impacts are reasonably foreseeable and occur as a result of an action but occur later in time or are removed from the action location.
- Residual impacts are defined as those impacts that remain following the implementation of mitigation measures.
- Cumulative impacts result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

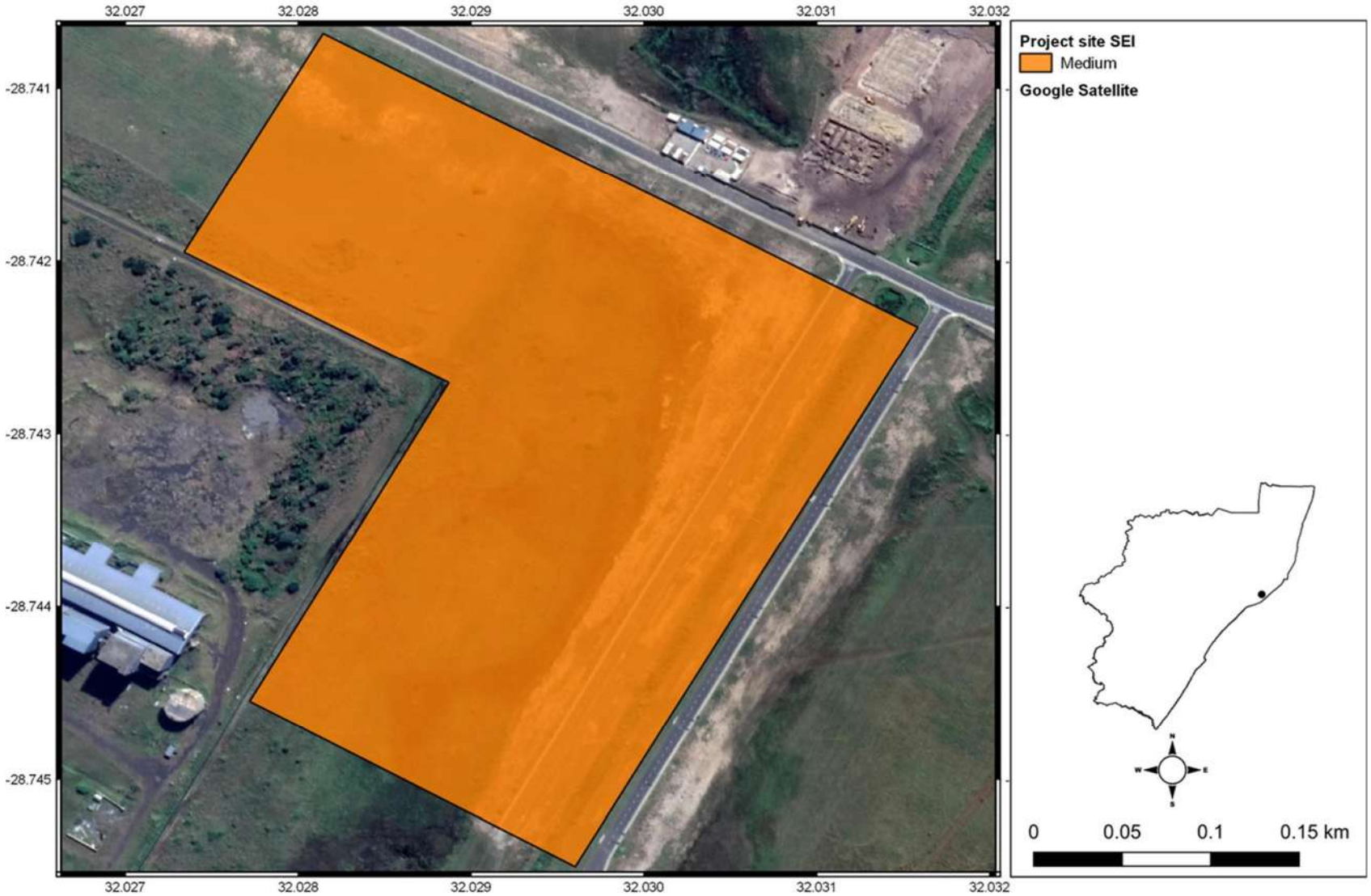

Figure 8.1: Final Site Ecological Importance (SEI)

Negative impacts were addressed through the implementation of the mitigation hierarchy which is a framework designed to limit environmental impacts through the following sequential steps:

» Avoidance: This preventive step is intended to avoid impacts on the most sensitive features for example, through site selection, project design and/or scheduling. Avoidance is often the easiest and most cost-effective way of reducing potential negative impacts but requires that biodiversity be considered in the early stages of a project.
» Minimisation: A preventative step with the aim of reducing negative impacts that cannot be avoided through physical, operational or abatement controls. Minimisation can reduce negative impacts such as noise and pollution, invasive species etc. The construction phase tends to be the key phase for minimization measures.
» Rehabilitation/restoration: Measures taken to repair degradation or damage to biodiversity features following project impacts that cannot be completely avoided and/or minimized. It is the most important remediative component of the mitigation hierarchy. Restoration tries to return an area to the original ecosystem that was present before impacts, whereas rehabilitation only aims to restore basic ecological functions and/or ecosystem services – such as through planting trees to stabilise bare soil.
» Offset: Offsets are designed to compensate for significant residual impacts that remain after the application of the appropriate, comprehensive, and targeted avoidance, minimization and restoration measures were applied.

Construction Phase Impacts

The expected duration of the construction phase will be approximately 36 – 48 months. To accommodate the proposed infrastructure the following construction activities likely to be undertaken may include (but may not be necessarily limited to) the following:

» Vegetation clearance
» Topsoil stripping
» Access roads and tracks
» Fence construction
» Establishment of contractor's camp, yard, and workshops
» Bulk earthworks
» Concrete batch plant
» Building and plant construction
» Stormwater drainage and effluent management
» Labour force
» Construction traffic

The main impacts these activities may have on the terrestrial biodiversity of the area may include the following:
» Permanent loss of habitat in sensitive environmental areas.
» Loss of SCC flora.
» Loss of SCC fauna.
» Loss/disturbance of local fauna populations.
» Spread of invasive plant species and weeds.
» Noise and artificial light disturbance.
» Soil erosion and sedimentation.

» Pollution of soils and habitat.

Construction Phase Impacts

Ecological impacts likely to be associated with the operational phase may include the following:
» Invasion and spread of IAPs and weeds
» Disturbance of local fauna communities and accidental fauna mortalities
» Artificial noise and light disturbance
» Pollution of soils and habitat

8.3.3. Assessment of Potential Impacts

Construction Phase Impacts

Nature of Impact: Permanent loss of habitat in sensitive environmental areas
During the desktop assessment, it was determined that the project site falls within the following sensitive environmental areas:

- Kwambonambi Hygrophilous Grassland ecosystem listed as **Critically Endangered**.
- Maputaland Wooded Grassland vegetation type listed as **Endangered**.
- Subtropical Freshwater Wetlands listed as **Vulnerable**.
- NPAES focus area
- National, Provincial and District scale **CBA areas**

Phase 1F is zoned for the development of noxious industries. It is still largely undeveloped but has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services (i.e., water, sewer, stormwater, electricity, roads, artificial drainage canals, Figures 18-22), and the more recent infilling of the wetlands presented in Figure 13. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO^2 Pilot plant which covers approximately a third of Phase 1F. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds.

None of the sensitive environmental features associated with the CR ecosystem (i.e., *Hyperolius pickersgilli, Centrobolus fulgidus*, *Doratogonus zuluensis*, *Centrobolus richardi, C. rugulosus, Kniphofia leucocephala;* Table 11) was present since the project site does not offer suitable habitat. *H. pickersgilli* requires perennial wetlands with very dense reed beds; the millipede species are all forest specialists, and *K. leucocephala* is so rare it is only known from one locality south of Richards Bay.

Following the infilling of the wetlands, the vegetation composition of the area changed and resulted in a mosaic of terrestrial vegetation interspersed within hygrophilous grassland vegetation. Of the 131 species recorded during the field surveys, 23% (Maputaland Wooded Grassland), and 19% (Subtropical Freshwater Wetlands) are regarded as important floristic elements of these vegetation types by Mucina & Rutherford (2006). The project site is not representative its CBA status and none of the important biodiversity features associated with this CBA area were observed (Table 13).

During the construction phase, all the vegetation will be cleared from the project site to accommodate infrastructure, resulting in a permanent loss of habitat and species from the development footprint. Given the degraded/secondary/transformed nature of the vegetation on the project site, and the absence of important biodiversity features associated with this ecosystem/CBA areas, the area is regarded as of low ecological sensitivity and is unlikely to contribute significantly to ecosystem conservation targets. The area south of the project site, outside of the development footprint is still largely undeveloped although degraded, but still provide habitat to several local

fauna species. Therefore, care should be taken to prevent construction personnel and machinery from operating outside of the development footprint to prevent disturbance of local flora populations and destruction of their habitat.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	All the vegetation will be removed to accommodate infrastructure and replaced with impermeable surfaces.	**Low Negative (33)**
Extent	Local (2)	The vegetation on the project site and on the rest of Phase 1F is degraded by past anthropogenic disturbance and not connected to undisturbed natural vegetation.	
Magnitude	Low (4)	Vegetation on the project site connected to degraded vegetation on undeveloped areas adjacent to the project site.	
Probability	Probable (3)	Surrounding natural areas within Phase 1F is degraded. Areas outside the boundaries of Phase 1F is transformed by urban expansion and plantations.	

Mitigation/Enhancement Measures

Mitigation:

The probability, magnitude and extent of the impact cannot be practically mitigated since all the vegetation will be removed to accommodate the proposed infrastructure. However, the magnitude and extent of the disturbance can be minimised on adjacent habitats to limit disturbance of local fauna species and their habitat through the implementation of the following mitigation measures:

General

- Undeveloped areas beyond the development footprint should be regarded as no-go areas and be expressly off limits to construction personnel and construction vehicles and this should be communicated to them and monitored.
- Limit site camps and lay-down areas to the disturbed areas within the boundaries of the project site as identified during the assessment.
- No vegetation clearance, construction camps, access roads, firewood collecting, hunting, disturbance of fauna/flora must be allowed in the no-go areas.
- No stockpiling of topsoil on the no-go areas must be allowed.
- No open fires must be allowed on the construction site, or any of the no-go areas.
- Keep the camp and all its storage and laydown areas secure and neat at all times
- No vegetative matter may be removed from the no-go areas.
- No fires or open flames should be permitted close to the no-go areas, especially in the dry season.
- Do not locate any site toilet, sanitary convenience, septic tank or French drain within a horizontal distance of 100m of the drainage line.
- Do not locate any reservoir, dam or depot for any substance which causes or is likely to cause pollution within a horizontal distance of 100 m of the drainage line.
- Do not dump waste of any nature, or any foreign material into the drainage line.
- Do not allow the use of the water in the drainage line for the cleaning of clothing, tools, or equipment.
- Prevent the discharge of water containing pollutants or visible suspended materials directly into the drainage line.
- Do not discharge any turbid water pumped from excavations into the drainage line.

Roads and Access

- Make use of existing roads and tracks where feasible, rather than creating new routes.
- Ensure that adequate vehicle turning areas are allowed for.
- Always enforce speed limits, both on public roads and on-site roads.
- Ensure that only authorised roads and access routes are used.
- Vehicles may not leave the designated roads and tracks and turnaround points must be limited to specific sites.
- Maintain all access routes and roads to minimise erosion and undue surface damage. Repair rutting and potholing immediately and maintain stormwater control mechanisms.
- Runoff from roads must be managed to avoid erosion and pollution problems.

- Clear up any gravel or cement spillage on roads.
- No offroad driving is to be permitted.

Topsoil Conservation and Stockpiling of Topsoil

- Topsoil should be stockpiled separately from overburden (subsoil and rocky material).
- In the absence of a recognizable topsoil layer, strip the upper most 300 mm of soil.
- Co-ordinate works to limit unnecessarily prolonged exposure of stripped areas and stockpiles. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area.
- Strip and stockpile herbaceous vegetation, overlying grass, and other fine organic matter along with the topsoil.
- Do not strip topsoil when it is wet.
- Store stripped topsoil in an approved location and in an approved manner for later reuse in the rehabilitation process.
- Stockpile topsoil stripped from different sites separately, as reapplication during rehabilitation must be site specific. If necessary, keep a stockpile register.
- Do not mix topsoil obtained from different areas.
- Topsoil is to be handled twice only – once to strip and stockpile, and once to replace and level.
- Position topsoil stockpiles on demarcated areas only.
- Ensure that all topsoil is stored in such a way and in such a place that it will not cause erosion gullies or wash away.
- Do not stockpile topsoil in heaps exceeding 2 m in height.
- Protect topsoil stockpiles from erosion.
- Remove exotic / invasive plants and broad leaf weeds that emerge on topsoil stockpiles.
- If topsoil is to be stockpiled for extended periods, especially during the wet season, one of the following measures need to be implemented:
    - The re-vegetation of the stockpiles with indigenous grasses.
    - The covering of the stockpiles with a protective material such as hessian mats.
- Ensure that topsoil is at no time buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation.

Fire Control

- Take adequate precautions to ensure that fires are not started because of works on the site.
- Do not permit any fires or open flames in the vicinity of no-go areas, especially during the dry season.
- Take immediate steps to extinguish any fire which may break out on the construction site.
- No open fires are permitted anywhere on site.
- Restrict contained fires for heating and cooking (i.e., in a fire drum) to designated areas on site. Prevent employees from creating fires randomly outside designated areas.
- Do not store gas and liquid fuel in the same storage area.
- Do not permit any smoking within 3 m of any fuel or chemical storage area, or refuelling area.

Rehabilitation Phase

The rehabilitation phase refers to the period of the project after the completion of the construction works, the onset signalled by site cleanup, site rehabilitation, the withdrawal of the contractor from site, and coinciding with the maintenance period.

Removal of structures and infrastructure

- Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, fixtures, and any other temporary works.
- Materials that will not be used again must be sold if possible or rehabilitated to blend in with the surrounding landscape.
- Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and / or a state no worse than prior to construction.

Inert waste and rubble

» Clear the site of all inert waste and rubble, including surplus rock.
» Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal facility.

Hazardous waste and pollution control

» Remove from site all temporary fuel stores, hazardous substance stores, hazardous waste stores and pollution control sumps. Dispose of hazardous waste in the appropriate manner.
» Remove from site all pollution containment structures. Dispose of materials that will not be used again as hazardous waste.
» Remove from site all temporary sanitary infrastructure and wastewater disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the appropriate manner.

Final shaping

» Shape all disturbed areas to blend in with the surrounding landscape.
» Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfilling is smoothed over to blend in with the surrounding landscape.

Topsoil replacement and soil amelioration

» The principle of Progressive Reinstatement must be followed wherever possible. This includes the reinstatement of disturbed areas on an ongoing basis, immediately after the specified construction activities for that area are concluded.
» Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
» Execute topsoil placement concurrently with construction where possible, or as soon as construction in an area has ceased.
» Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas on the construction site, including temporary access routes and roads. Replace topsoil to the original depth (i.e., as much as was removed prior to construction).
» Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
» The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
» Do not use topsoil suspected to be contaminated with the seed of alien vegetation.
» Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner to blend in with the local surrounding area.
» After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.

Ripping and scarifying

» Rip and / or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers if necessary.
» Rip and / or scarify all disturbed areas on the construction site, including temporary access routes and roads, compacted during the execution of the works.
» Rip and / or scarify along the contour to prevent the creation of down-slope channels.
» Rip and / or scarify all areas at 300 mm intervals (but not more than 400 mm intervals), ensuring that the lines overlap.
» Do not rip and / or scarify areas under wet conditions, as the soil will not break up.

Revegetation

» Should revegetation be required, only indigenous species must be used. **NO exotic species** must be used during landscaping.			
Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	All vegetation will be permanent removed from the project site to accommodate infrastructure.	**Minor Negative (16)**
Extent	Site (1)	Disturbance will be limited to the development footprint.	
Magnitude	Minor (2)	Impacts will be limited to the development footprint.	
Probability	Improbable (2)	Adjacent habitats are degraded and not connected to undisturbed natural vegetation.	
Residual Risks: Expected to be minor for the proposed project. The permanent removal of vegetation will however result in a permanent residual impact.			

Nature of Impact: Loss of SCC flora

SCC flora identified on the project site included three RSA Endemics, all listed as of LC with widespread distributions, and one species listed as Declining and provincial protected (*Crinum* cf. *stuhlmanniii*).

The RSA Endemics is not restricted to the project site and has widespread distributions in South African, with stable populations. These species were also not particularly common on the project site and it is highly unlikely that vegetation removal will impact local and regional populations.

C. cf. *stuhlmanniii* has a widespread distribution in South Africa but is heavily exploited by the medicinal plant trade. This species is however a suitable candidate for translocation and must be removed from the development footprint prior to construction site establishment and vegetation clearance to a suitable habitat, but may not be removed/translocated without permit authorisation from Ezemvelo KZN Wildlife.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	All the vegetation will be removed to accommodate infrastructure and replaced with impermeable surfaces.	**Moderate Negative (55)**
Extent	Local (2)	Development footprint and adjacent undeveloped areas.	
Magnitude	Low (4)	Decline of SCC flora populations. Low abundance on the project site.	
Probability	Definite (5)	The vegetation on the project site will be entirely removed.	

Mitigation/Enhancement Measures

Mitigation:

The magnitude and extent of the disturbance can be minimized through the implementation of the following mitigation measures:

» The presence of the Declining species *C.* cf. *stuhlmanniii* was confirmed during the field assessment. Geographic localities are provided in Section 4.2.3 and displayed in Figure 31 of the specialist report (Appendix D). In addition to the above, the following SCC flora was confirmed to be present on Phase 1F during previous assessments. The probability exist that these species could have been overlooked on the project site during the February 2022 field assessment.
  - *Ledebouria ovatifolia* (Provincial protected)
  - *Hypoxis hemerocallidea* (Declining)
  - *Boophone disticha* (Declining)
  - *Eulophia speciosa* (Declining)

» Prior to vegetation clearance, the development footprint and the 200 m of adjoining areas must be scanned for the presence of the above listed species by a suitably qualified Botanist/Ecologist. Any protected plants close to

the site that will remain in place must be clearly marked and may not be defaced, disturbed, destroyed, or removed. The plants must be cordoned off with construction tape or similar barriers and marked as no-go areas.

» This scan should be conducted at a favourable time of the year when the probability of recognising these species is high (Aug – Oct).
» Any Red Listed or protected species that falls within the development footprint must be removed and translocated prior to vegetation clearance.
» The above species are all geophytes and thus suitable candidates for translocations.
» No Red Listed or provincial protected species may be removed/translocated without permit authorization from Ezemvelo KZN Wildlife.
» Since most of Phase 1F will be developed, receiver sites within Phase 1F are limited to the small conservation areas north and south of the project site. The suitability of these areas as receiver sites must be investigated prior to the removal of any affected species.

TRANSLOCATION PROTOCOL

Basic principles for the translocation of the affected species into suitable habitats are described below:

Principles of Plant Translocations

» *In situ* conservation is preferable to *ex situ* conservation. Removing a population from its natural habitat and placing it under artificial conditions results in the erosion of the inherent genetic diversity and characteristics of that species.
» To ensure the persistence of a population, it is imperative that the ecological processes maintaining that population persist.
» Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed from.
» Re-planting into the wild must cause as little disturbance and harm as possible to existing natural ecosystems.
» Rescue must be limited to only those areas where plants will be destroyed by the development. No plants should be removed from areas that will otherwise not be disturbed.
» Rescue should not be undertaken from any site where there is a significant risk that well-established invasive alien plants or other pests will be spread by the relocated plants.
» Translocation of Red Data species is an unacceptable conservation measure since the translocated species may have undesirable ecological effects. For example, alterations to habitat by translocated species may be harmful to other species and translocations may lead to transmission of pathogens or parasites (Hodder & Bullock, 1997). Translocation may result in rapid changes in the species itself (Conant, 1988). Translocations are expensive and rarely successful (Griffith *et al*., 1989). Success entails not only survival of the translocated individuals but also establishment of a self-sustaining, viable population able to reproduce and adapt to changing environmental conditions (Milton *et al.*, 1999).
» Suitable habitat adjacent to known populations of Red List plant species has a high probability of being colonized.

Plant Rescue Plan

Below are details on the actions that are required to rescue Red Listed/Protected plant species from the path of development and what steps are to be taken to house them temporarily before placing it into suitable habitats.

Prior to vegetation clearance, the following actions must be taken:

Action	Responsible Person
• A walk-through survey to identify and mark the locations of *C.* cf. *stuhlmanniii* and a scan of the entire project site for the potential presence of the SCC flora identified during previous studies (listed above) on Phase 1F. • Identification of suitable receiver sites.	Botanist / Ecologist / ECO
Search and rescue operation of all protected species within the development footprint:	Botanist / Ecologist / ECO

• For each individual plant that is rescued, the plant must be photographed before removal, tagged with a unique number or code and a latitude longitude position recorded using a hand-held GPS device. • The plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into a suitable/natural habitat. • If planted into suitable/natural habitat, the position must be marked to aid in future monitoring of that plant.	
• Rescued plants housed in a temporary nursery may be used in one of two ways: ▪ transplanted into suitable natural habitats near to where they were rescued, or ▪ used for replanting in rehabilitation areas. • Receiver sites must be matched as closely as possible with the origin of the plants and, where possible, be placed as near as possible to where they originated.	Botanist / Ecologist / ECO
• Any listed plants close to the development servitude that will remain in place must be marked clearly and may not be defaced, disturbed, destroyed, or removed. • They should be cordoned off with construction tape or similar barrier and marked as no-go areas.	ECO
ECO to give permission to clear vegetation only once all search and rescue operations have been completed.	ECO
The ECO should monitor construction activities in sensitive habitats to ensure that impacts within these areas are kept to a minimum.	ECO
The collecting of plants by unauthorized persons should be prevented and signs stating so should be placed at the entrance to the site.	Client / ECO

Monitoring requirements

The following monitoring activities are recommended as part of the plant rescue plan:

» The submission of a report that provides an indication of the number of individuals of each listed species that are likely to be impacted by the proposed development.
» Post-relocation monitoring of plants relocated during search and rescue to evaluate whether the intervention was successful or not.
» This should be undertaken on a three-monthly basis for two years after transplanting to evaluate the success thereof. Provision of detailed records, including photographs, indicating the success of the plant rescue operation.

ADDITIONAL MITIGATION MEASURES

» Undeveloped areas beyond the development footprint should be regarded as no-go areas and be expressly off limits to construction personnel and construction vehicles and this should be communicated to them.
» During construction, the ECO must monitor vegetation clearing at the site. Any deviations from the approved plans which will result in the removal of vegetation from additional areas should first be checked for Red Listed/protected species by the ECO. Any Red List/protected species present which can survive translocation should be translocated to a safe site provided that the required permits are in place.
» No plant species are permitted to be collected or removed by the contractor without prior approval from the ECO.
» The timing between clearing of an area and subsequent development must be minimised.
» No harvesting of plants for firewood, medicinal or any other purposes must be permitted.

Post Mitigation/Enhancement Measures			
Duration	Short duration (1)	Potential impacts during the search and rescue and translocation phase.	**Minor Negative (4)**
Extent	Site (1)	Provincial protected and Declining flora will be translocated.	
Magnitude	Small (0)	SCC will be removed and translocated.	

Probability	Improbable (2)	Slight possibility that some specimens may be overlooked.	
Residual Risks: Expected to be minor on the project site provided that the mitigation measures are implemented.			

Nature of Impact: Loss of SCC fauna

No threatened fauna was observed during the February 2022 field assessment and previous assessments done in the past on Phase 1F (Ecopulse 2016; Nemai 2016). Nevertheless, based on current site conditions, one mammal (*Poecilogale albinucha*), one frog (*Hemisus guttatus*), both listed as Near Threatened, and one bird species (*Falco biarmicus*) listed as Vulnerable may potentially be present.

Scats, tracks, and runways from the small mammal species *Otomys* cf. *angoniensis* was abundant on the project site and is indicative of a healthy population. The project site therefore offers sufficient prey items to the specialist small mammal predator *Poecologale albinucha* as well as for the raptor *Falco biarmicus* which feeds predominantly on birds and small mammals. Removal of vegetation will result in a direct impact on the prey species by causing a decline of the local population and may indirectly affect the abundance and distribution of *P. albinucha* and *F. biarmicus* in the area.

The infilling of the wetland resulted in the destruction of habitat suitable for the frog species *Hemisus guttatus*. This area was however partially restored through natural processes and currently provide habitat for this species. Unassisted recolonisation of the site was therefore likely but would have depended on the abundance of this species on adjoining areas. This species is known to be present in the Richards Bay area but due to its cryptic and fossorial nature it is rarely encountered. The mechanical removal of topsoil and excavations may unearth *H. guttatus* and individuals are likely to get killed during this process.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	The loss of Red Listed fauna is permanent.	**Low Negative (39)**
Extent	National (4)	Potential impacts on population abundance and national threat status.	
Magnitude	Low (4)	All species have a Low probability of occurrence on the project site and are not particularly abundant in the larger geographic area.	
Probability	Probable (3)	All species are known to be present in the Richards Bay area although the probability of the affected species being on the project site is regarded as low.	

Mitigation/Enhancement Measures

Mitigation:

The probability, magnitude and extent of the impact cannot be practically mitigated since all the vegetation will be removed to accommodate the proposed infrastructure and destroy the habitat of the small mammal prey species.

Measures to reduce the inadvertent killing of *H. guttatus* include the following:

- During vegetation clearance, methods should be employed to minimise potential harm to this species. Clearing must take place in a phased and slow manner, commencing from the interior of the project area progressing outwards towards the boundary.
- Should a specimen be unearthed, all construction work on the area should be immediately stopped and the unearthed specimen should be carefully captured and relocated outside of the project area by an Ecologist/Zoologist in a suitable habitat.

Post Mitigation/Enhancement Measures

Duration	Permanent (5)	The loss of Red Listed fauna is permanent.	**Low Negative (33)**
Extent	National (4)	May impact on national threat status.	
Magnitude	Minor (2)	The species have a low probability of occurrence on the project site.	
Probability	Probable (3)	All species are known to be present in the Richards Bay area although the probability of the affected species being on the project site is regarded as low.	
Residual Risks: Expected to be low but may cumulatively contribute to the loss of species on national and provincial scales.			

Nature of Impact: Loss/disturbance of local fauna populations

The project site provide habitat to several fauna species. Although it is assumed that the majority of fauna species will move to different areas as a result of disturbance, many fauna species have very specific habitat requirements. For example, frogs are reliant on aquatic habitats for breeding. Although the wetland on the project site was already infilled, partial but natural recovery of vegetation on the infill areas were observed during the site visits in February 2022 and provided habitat to local frog populations.

The smaller non-volant mammals such as rodents, mongooses and duikers are tolerant to disturbance and would simply move away to more suitable habitats during the construction phase, if provided the opportunity. However, the clearing of vegetation to accommodate infrastructure will reduce available habitat for fauna species on Phase 1F. Local fauna species such as Duikers are already prevented from natural dispersal by the boundary fence of Phase 1F and may contribute to ever-reducing population sizes in future. The duikers will also be vulnerable to poaching for food.

Slower moving species such as reptiles and the more terrestrial frog species would either seek shelter or not be able to move away from construction machinery and would be killed by vehicles and earth-moving machinery. These slower moving species would also be vulnerable to poaching for food, trade, or fatality.

Construction phase activities are likely to cause disturbance and displacement of local bird populations, especially shy and/or ground nesting species such as pipits and night jars. The construction phase of a project can be highly disturbing to birds breeding in the vicinity of the construction activities. Many birds are highly susceptible to disturbance, and should this disturbance take place during a critical time in the breeding cycle, for example, when the eggs have not hatched or just prior to the chick fledging, it could lead to temporary or permanent abandonment of the nest or premature fledging. In both instances, the consequences are almost invariably fatal for the eggs or the fledgling. Such a sequence of events can have far reaching implications for certain large, rare species that only breed once a year or once every two years.

Adverse environmental impacts of the project on fauna populations can however be minimised through several mitigation measures.

	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Permanent (5)	Disturbance events will be limited to the duration of the construction phase, but local loss of habitat will be permanent.	**Moderate Negative (55)**
Extent	Local (2)	The impact will be limited to Phase 1F. Noise, disturbance will disturb species on adjacent habitats.	
Magnitude	Low (4)	Many of the species will be able to move to different areas.	

Probability	Definite (5)	Local fauna populations will be disturbed by construction activities. Fauna habitat will be destroyed to accommodate infrastructure.	

Mitigation/Enhancement Measures

Mitigation

This is a difficult impact to mitigate due to the nature of the work. The magnitude of the impact can however be reduced by implementing the following avoidance and minimization measures to reduce impacts on local fauna populations.

- Vegetation clearance should, ideally, start during the non-breeding season of fauna populations (i.e., winter).
- Where possible, work should be restricted to one area at a time. This will give the smaller birds, mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.
- During vegetation clearance, methods should be employed to minimise potential harm to fauna species. Clearing must take place in a phased and slow manner, commencing from the interior of the project site progressing outwards towards the boundary to maximise potential for mobile species to move to adjacent areas.
- Prior and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery.
- Fauna species such as frogs and reptiles that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by an Ecologist/Zoologist trained in the handling and relocation of animals.
- Areas beyond the development footprint should be expressly off limits to construction personnel and construction vehicles and this should be communicated to them.
- It is recommended that, while trenches are open during the construction phase, an appropriately sloping section of the sidewall is made available for the escape of any trapped animals.
- All stormwater structures should be designed to block amphibian and reptile access to the road surface.
- All contractors and subcontractor personnel working on the project must participate in an environmental awareness program. The program must include appropriate wildlife avoidance methodologies, such as impact minimisation procedures and methods for protecting nesting birds. Information about the importance and purpose of protecting wildlife must be described in the program.
- No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted in the project site or surrounding areas.

Mitigation measures for mammals and herpetofauna

- Prior to construction and vegetation clearance a suitably qualified Zoologist should closely examine the project site for the presence of local fauna species and relocate any affected non-Red Listed/Protected animals to appropriate habitat away from the project site.

Post Mitigation/Enhancement Measures

Duration	Permanent (5)	Disturbance events will be limited to the duration of the construction phase, but local loss of habitat will be permanent.	**Moderate Negative (50)**
Extent	Local (2)	Impacts will be limited to Phase 1F. Noise, movement will disturb species in adjacent habitats.	
Magnitude	Minor (2)	Many of the species will be able to move away from disturbance.	
Probability	Definite (5)	Local fauna populations will be affected by construction activities regardless of any mitigation measures.	

Residual Risks:

Expected to be Moderate.

Nature of Impact: Noise and artificial light disturbance

Fauna generally respond to disturbances caused by human activities according to the magnitude, timing, and duration of the particular disturbance. Human activities can affect an animal's ability to feed, rest, and breed if it is unable to habituate to the disturbance caused. Disturbance created by general visual and noise pollution associated with workers and construction activities can therefore affect wildlife utilising nearby habitats.

Noise from human activities (in particular from infrastructure and construction sites) has a strong impact on the physiology and behavior of birds. This impact concerns the masking of signals used (1) for communication and mating and (2) for hunting. As a result of this masking, there is a decrease in bird density with an increase in noise level. Furthermore, if alternative silent habitats do not exist, the noise impact could negatively affect wild bird conservation (Bottalico *et al.,* 2015).

Unfortunately it is very difficult to mitigate this impact. This impact is, however, likely to be short-lived during the construction phase and will probably mainly affect local bird species that can easily migrate to other areas.

The ecologic effects of artificial light have been well documented. Light pollution has been shown to affect both flora and fauna. For instance, prolonged exposure to artificial light prevents many trees from adjusting to seasonal variations. This, in turn, has implications for the wildlife that depend on trees for their natural habitat. Research on insects, turtles, birds, fish, reptiles, and other wildlife species shows that light pollution can alter behaviors, foraging areas, and breeding cycles, and not just in urban centers but in rural areas as well.

For example, bright electric lights can disrupt the behavior of birds especially during inclement weather with low cloud cover, they routinely are confused during passage by brightly lit buildings, communication towers, and other structures, increasing the risk of collission with these man-made structures. Frogs have been found to inhibit their mating calls when they are exposed to excessive light at night, reducing their reproductive capacity, and the feeding behavior of bats is altered by artificial light (Chepesiuk, 2009).

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Short-term (2)	Duration of the construction phase.	**Low Negative (30)**
Extent	Local (2)	It may impact on local fauna populations.	
Magnitude	Moderate (6)	Can alter foraging, breeding cycles, communication, and mating.	
Probability	Probable (3)	Several fauna species are present on Phase 1F. Consequently, the probability exist the species could be affected.	

Mitigation/Enhancement Measures

Mitigation

Measures to minimise the impacts of noise and artificial lighting is listed below.

- All outside lighting should be directed into the proposed development as opposed to away from the development, and also not in the direction of sensitive areas, including sensitive areas on neighbouring properties.
- Fluorescent and mercury vapour lighting should be avoided, and sodium vapour (yellow) lights should be used wherever possible.
- To reduce low intensity noise levels, work areas need to be effectively screened to reduce or deflect noise. Engineering controls such as modifications to equipment or work areas to make it quieter, the acquisition of equipment designed to emit low noise and vibration, creation of noise barriers, proper maintenance of tools and equipment must be considered.
- Noise from vehicles and powered machinery and equipment on-site should not exceed the manufacturer's specifications, based on the installation of a silencer.
- Equipment should be regularly serviced.
- Attention should also be given to muffler maintenance and enclosure of noisy equipment.

Post Mitigation/Enhancement Measures

Duration	Short-term (2)	Duration of the construction phase.	**Low Negative (21)**
Extent	Local (2)	Likely to be limited to Phase 1F	
Magnitude	Low (4)	A difficult impact to mitigate but may be reduced with the implementation of the mitigation measures.	
Probability	Probable (3)	Local fauna likely to be impacted regardless of any mitigation measures.	
Residual Risks: Expected to be low negative but of short duration.			

Nature of Impact: Spread of invasive plant species and weeds

During the construction phase, large areas of vegetation will be cleared to accommodate infrastructure. This will create ideal opportunities and optimal conditions for weeds and alien & invasive plant species to invade disturbed areas and become established. IAPs and indigenous weeds can out-compete and replace indigenous flora, which will in turn impact on natural biodiversity. However, the alien invasive plant issue is one that can be successfully mitigated by means of ongoing alien invasive plant management on and around the proposed development.

	Rating	Motivation	Significance
		Prior to Mitigation	
Duration	Long-term (4)	Initiated during the construction phase but will result in a longstanding impact should no control be implemented.	**Moderate Negative (48)**
Extent	Local (2)	Phase 1F	
Magnitude	Moderate (6)	Spread of IAPs to adjacent undeveloped areas. Replacement of indigenous flora. Adjacent habitats already degraded.	
Probability	Highly Probable (4)	Vegetation clearance will create optimal opportunities for the establishment of invasive species.	
		Mitigation/Enhancement Measures	

Mitigation:

Implementation of an ongoing Alien & Invasive plant species eradication and control programme. Guidelines are provided below:

INVASIVE PLANT SPECIES MANAGEMENT AND MONITORING PLAN

These guidelines provide an outline of the overall approach that should be adopted on the site to minimize the probability of invasive alien plants becoming established and ensuring that any outbreaks are managed quickly to ensure that they do not become a long-term problem. The establishment of any dense infestations will be expensive to eradicate and will require more complex control measures than would be necessary for low density invasions.

Prevention

A prevention strategy should be considered and established, that must include regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural habitats. Prevention could also include measures such as washing the working parts and wheels of earth-moving equipment prior to it being brought onto site, visual walk-through surveys every three months.

Early identification and eradication

Monitoring plans should be developed which are designed to contain Invasive Alien Plant Species shortly after they arrive on the project site. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When new Invasive Alien Plant Species are spotted an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also ensure that natural systems are impacted to the smallest degree possible.

CONTROL METHODS

Control methods for the removal of IAPs is provided below:

Chemical control – the use of herbicides

- Chemical control should only be used as a last resort since it is hazardous for natural vegetation. It should not be necessary if regular monitoring is undertaken, which should be effective for controlling invasive alien plants and weeds.
- Chemical control involves the use of registered herbicides to kill the target weed. Managers and herbicide operators must understand how herbicides function. The use of inappropriate herbicides is wasteful and expensive and often do more harm than good, especially when working close to aquatic habitat. Some herbicides can quickly contaminate fresh water and/or be transported downstream where they may remain active in the ecosystem.
- Herbicides are either classified as selective or non-selective. Selective herbicides are usually specific to a group of plants, e.g., those specified for use on broad leaf plants, but should not kill narrow-leaf plants such as grasses. **Non-selective herbicides can kill any plant that they come into contact with and are therefore not suitable for use in areas where indigenous vegetation is present.**
- Chemical application techniques include foliar (leaf) application, stem applications (basal stem, total frill, stem injections) and stump applications (cut stump, total stump, scrape, and paint).

Herbicide use tips and precautions

- Only use herbicides that are registered for use on the specific species to be treated.
- Spray plants during the active growing period. When leaf colour starts to turn for winter, it is too late to apply herbicides.
- Spray plants before the seeds are produced, namely, between flowering and fruit set. Avoid using herbicides on drought-stressed or diseased plants or in extremely hot or cold conditions.
- Do not spray plants that are over 1 m in height.
- Herbicides should not be applied during wet conditions, before or after rain. If it rains after application, it is important to monitor the effect as one may need to re-apply.
- Herbicides should always be applied immediately after the selected mechanical control method (e.g., after frilling, ringbarking, cut stumping or strip- barking). Once the stem has dried it will not absorb the herbicide. However, if for some reason this is not done, and one needs to apply the herbicide a few days or a week or two later, it is imperative to remove any callous tissue that has formed. Once the living cells are exposed, the herbicide should be applied.
- **Chemical control of alien plants is not recommended in aquatic systems due to the risk of pollution.**
- Remember to keep herbicide in the shade while at the work site to keep it cool.
- To avoid spills, keep herbicide containers on a waterproof tarpaulin, or inside a big plastic bucket. When mixing herbicides, ensure that you use a funnel to avoid spilling. Should you spill the herbicide, it can be poured back into the container from the plastic bucket.
- Containers containing mixed herbicide should be clearly marked (e.g., 'glyphosate mix'). Likewise, containers filled with water to be used for mixing herbicide should also be clearly marked to ensure that people do not drink from them.
- Always use a measuring jug to measure the correct quantity required.

- To mix herbicides, half fill the appropriate size container with water, and then add the herbicide using the measuring jug. Secondly, close the container and shake, and then fill the rest of the container with water.
- Keep the herbicide away from food.
- Carefully read and understand the instructions on the label prior to initiating chemical control. Most selective herbicides will lose selectivity at a high enough dose, highlighting the importance of adhering to instructions on the label.
- Always store herbicides in the original container and in secure storage areas.
- All persons must wear the required personal protective equipment when working with herbicides. These include overalls, rubber gloves and a face mask.
- Avoid skin contact with herbicides and avoid breathing in the vapour.

Manual methods

- Always start at the highest point and work downwards, i.e., downhill when using manual control methods.
- Start towards the edge of the infestation and work towards the centre.

Hand pulling

- Hand pulling is most effective with small (30 cm), immature or shallow rooted plants.
- Shake the excess sandy material from the plant, this makes the plant easier to stockpile and lighter to transport.
-

Chopping/cutting/slashing

- These menthods entails damaging or removing the plant by physical action. This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/trunks. This control option is feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. For species that coppice after cutting, chemical treatment of the cut stumps will be required.
  - Cut/slash the stem of the plant as near as possible to ground level.
  - Paint resprouting plants (i.e., black wattle, lantana) with an appropriate herbicide immediately after they have been cut.
  - Stockpile removed material into piles as prescribed.

Basal bark

For plants with thin bark or stems up to 25 cm in diameter.

- Application of suitable herbicide in water can be carried out to the bottom 250 mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.
- If the plant is multi stemmed, then individual stems need to be treated.

Ring barking

This method is not used for stands but for large individual trees.

- Remove the bark and cambium around the trunk of the tree in a continuous band around the tree at least 25 cm wide, starting as low as possible.
- Where clean de-barking is not possible due to crevices in the stem or where roots are exposed, a combination of bark removal and basal stem treatments should be carried out.
- For aggressively coppicing species pull off the bark below the cut to ground level (bark stripping), to avoid the use of herbicide.

Bark stripping

- All the bark should be stripped from the trunk between the ground level and 1 m above ground level.
- Application of suitable herbicide can also be used with this method.
- Herbicide applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

Frilling

- Using an axe or bush knife, make a series of overlapping cuts around the trunk of the tree, through the bark into the softwood (approximately 500 mm from ground level). The thickness of the blade should force the bark open slightly, ensuring access to the cambium layer.
- Ensure to affect the cuts around the entire stem.
- Apply a suitable herbicide immediately to the cuts by spraying into the frill. The frill needs to be deep enough to retain the herbicide.

Mechanical methods

Felling
- De-branch cut trees and where possible remove all material.
- Where possible large trees are to be felled so that they fall uphill.
- Cut the plant down as low as possible to the ground.
- Apply a suitable herbicide immediately (no later than 30 minutes) to the cambium layer.
- Ensure all the cuts in the cambium layer are treated.

Injection
- Drill or punch downward slanting holes into the tree around the entire circumference of the stem.
- Inject the chemical directly into the plant.

Foliar spray
- Use a solid cone nozzle that ensures an even coverage on all leaves and stems to the point of runoff.
- Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls.
- Avoid spraying in windy weather as the spray may come into contact with non-target plants.
- Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.
-

Cut stump application

This is a highly effective and appropriate control method for larger woody vegetation that has already been cut off close to the ground.
- The appropriate herbicide should be applied to the stump using a paintbrush within 30 minutes of being cut.
- Stems should be cut as low as possible. Herbicides are applied in water as recommended for the herbicide.

Construction phase activities

The following management actions are required to minimize soil and vegetation disturbance during the construction phase, to reduce the probability of invasive alien plants becoming established:

ACTION	FREQUENCY
The Environmental Control Officer (ECO) is to provide permission before any natural vegetation is to be cleared for development.	Daily/when required
Clearing of vegetation must be undertaken as the work front progresses. Mass clearing is not to be permitted.	Weekly/when required
On areas where revegetation is required but cannot be done immediately after clearance, the cleared area must be protected with packed brush or appropriately battered with fascine work (fixing horizontal branches along the ground using vertical pegs to create resistance to down-slope flow of water/materials). Alternatively, jute (Soil Saver) may be pegged over the soil to stabilize it.	Weekly
Organic matter used to encourage regrowth of vegetation on cleared areas should not be brought onto site from foreign areas. Brush from cleared areas (except for invasive plants) should be used as much as possible. The use of manure or other soil amendments should not be used as this would encourage invasion.	Weekly
Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving	Weekly

equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	
ECO to survey site once a month to detect aliens and have them removed.	Monthly
Alien vegetation regrowth must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best practice for the species concerned. Such information can be obtained from the Working for Water website as well as herbicide guidelines.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into adjacent no-go areas. No-go areas should be clearly demarcated prior to construction.	Daily

Disposal of removed plant material

» When removing material, take care to remove all debris, including shoots and seeds.
» Disposal of the cut IAP material needs to be carefully considered, for example, **the burning of some species of IAPs stimulates seed release or rapid seed germination.**

Post-removal follow-up and rehabilitation

» Re-establishment of indigenous vegetation needs to be undertaken where required to reduce the probability of re-emergence of invasive alien plants and to reduce the risk of soil erosion where the soil surface is poorly vegetated. Rehabilitation should follow these steps:
  - All areas of exposed soil should be immediately protected by placing packed brush or creating erosion control barriers using branches, sticks or logs. On slopes, these should be placed horizontally across the slope at 1 m intervals (the steeper the slope the closer the barriers should be placed to one another). If topsoil has been lost, rehabilitation of indigenous vegetation will be a difficult and expensive process.
  - Monitor these areas on a regular basis (monthly during construction and three-monthly during operation) for emergent seedlings of invasive alien species and remove these (hand pulling or chemical control).

Construction phase monitoring

To monitor the impact of clearing activities and rehabilitation efforts (where required), monitoring must be undertaken. This section provides a description of a monitoring programme to assess of the magnitude of IAPs on site and of the management actions.

In general, the following principles apply to monitoring:

» Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
» Simple records must be kept of daily operations, e.g., area/location cleared, labour units and, if ever used, the amount of herbicide used.
» It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action

The following monitoring is required during the construction phase of the projects:

MONITORING ACTION	INDICATOR	TIMEFRAME
Document alien species present on site	Alien species list	Pre-construction and monthly thereafter
Alien plant distribution	Distribution maps, GPS coordinates	Monthly
Document and record alien control measures implemented	Record of clearing activities	6-monthly
Review alien control success rate	Decline in abundance of alien plant species over time	Annually

Post Mitigation/Enhancement Measures			
Duration	Short-term (1)	Monthly monitoring and then the immediate removal of IAPs.	**Minor Negative (2)**
Extent	Site (1)	Suitable control and eradication methods will prevent the spread.	
Magnitude	Small (0)	Suitable control methods will ensure that IAPs are immediately removed.	
Probability	Improbable (1)	Unlikely to spread to adjacent areas provided that a management and monitoring programme are implemented.	
Residual Risks: Expected to be minor and localized provided that the mitigation measures are implemented.			

Nature of Impact: Soil erosion and sedimentation

Construction activities will temporarily expose the soils to the erosive elements. This could be exacerbated by water flowing down trenches and access roads, as well as from trench de-watering activities. Soil erosion can result in the loss of valuable topsoil and formation of erosion gullies. This can cause localised habitat loss / alteration due to increased sediment deposition or erosion of areas. Rapid and effective rehabilitation of these areas will be important in reducing erosion risk.

Although impacts would be localised, erosion is likely to persist or worsen over time if not addressed. If managed properly, the probability and extent of this impact can be reduced quite significantly.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	A gradual process with permanent effects.	**Moderate Negative (52)**
Extent	Local (2)	Project site and adjacent habitats.	
Magnitude	Moderate (6)	Soil degradation on adjacent habitats.	
Probability	Highly Probable (4)	High erosion potential of soils on the project site.	

Mitigation/Enhancement Measures

Mitigation:

Mitigation measures to minimize soil erosion is outlined below:

EROSION CONTROL

Surface water control

- Monitor water consumption and ensure that all possible use is accounted for, and areas of waste are identified (i.e., water used for surface wetting, for batching, for potable supply etc.).
- Repair identified leaks and address issues of water wastage as soon as these are identified.
- Avoid over-wetting, saturation, and unnecessary runoff during dust control activities.
- Do not allow surface water or storm water to be concentrated, or to flow without erosion protection measures being in place.
- Ensure that overland discharge occurs over areas that have a minimum cover of 90% grass cover at a minimum height of 150 mm.

Erosion protection

- Program construction activities so that the area of exposed soil is minimised during times of the year when the potential for erosion is high, for example during summer when intense rainstorms are common.
- Site-specific plans for site erosion and sediment control should be developed and implemented. This should include a determination of site erosion potential and the identification of water bodies at risk.

- » Site drainage such as those generated by the dewatering of excavated trenches must be diverted away from cleared, graded, or excavated areas.
- » Sediment barriers or sediment traps such as silt fences, sandbags, and hay bales for example must be established to curb erosion and sedimentation where necessary.
- » Sediment barriers should be regularly maintained and cleaned to ensure effective drainage.
- » These temporary barriers may only be removed once construction has been completed and there is no further risk of sedimentation.
- » Stockpiles are not to be used as stormwater control features.
- » Erosion, sediment control measures such as silt fences, concrete blocks and/or sandbags must be placed around stockpiles (i.e., soil and materials) to limit runoff.
- » Stockpiling of any materials on slopes is to be avoided unless appropriate erosion control and management measures are implemented.
- » Protect all areas from erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas.
- » Retain natural shrubbery and grass species wherever possible.
- » Do not permit vehicular or pedestrian access into undeveloped areas beyond the demarcated boundary of the work areas.

Post Mitigation/Enhancement Measures			
Duration	Short-term (1)	Erosion protection measures will be in place.	**Minor Negative (2)**
Extent	Site (1)	Limited to the site	
Magnitude	Small (0)	Erosion protection measures will be in place.	
Probability	Improbable (1)	Unlikely to happen if mitigation measures are implemented.	

Residual Risks:
Minor: Expected to be minor and localized provided that the mitigation measures are implemented.

Nature of Impact: Pollution of soils and habitat

Waste products and pollutants generated during the construction phase may include fuels and oils from construction vehicles as well as solid waste in the form of building material and litter from labourers. These can potentially enter undeveloped areas adjacent to the project site either directly through disposal/mismanagement of waste products, or indirectly through surface water runoff during periods of rainfall.

Chemicals can enter the air, water, and soil when they are produced, used, or disposed. Their impact on the environment is determined by the amount of the chemical that is released, the type and concentration of the chemical, and where it is found. Some chemicals can be harmful if released to the environment even when there is not an immediate, visible impact. Some chemicals are of concern as they can work their way into the food chain and accumulate and/or persist in the environment for many years. Harmful effects of such chemical and biological agents as toxicants from pollutants, insecticides, pesticides, and fertilizers can affect an organism and its community by reducing its species diversity and abundance. Such changes in population dynamics affect the ecosystem by reducing its productivity and stability.

	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Permanent (5)	Many chemicals can persist in the environment for many years and permanently alter biological processes.	**Moderate negative (56)**
Extent	Regional (3)	Chemicals can enter air and water causing a regional impact. Windblown litter can enter adjacent habitats and the drainage canal. Pollution of downstream habitats.	
Magnitude	Moderate (6)	Reduction of species diversity and abundance. Contamination of ecosystems.	

Probability	Highly probable (4)	Hazardous chemicals will be used during the construction phase. Solid, liquid, and hazardous waste will be generated during the construction phase.	

Mitigation/Enhancement Measures

Mitigation:

SOLID WASTE

» Collect all domestic waste in adequate numbers of litter bins located as required on the work sites and within the Contractors camp.
» Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out.
» Ensure that personnel make use of the litter bins provided. Keep all work sites and the Contractors camp tidy and litter free at all times.
» Empty litter bins weekly (or as required before they reach capacity).
» Where necessary, dedicate a storage area on site for the collection of construction waste.
» Ensure that solid waste is transported properly, avoiding waste spills en-route.
» No solid waste may be burned on site.

LIQUID WASTE

» Ensure that adequate numbers of conveniently located site toilets are available on all work sites at all times in quantities related to the number of users (1 toilet per 30 users is the norm).
» Maintain and clean site toilets regularly as is required to keep them in good, functional working order and in an acceptable state of hygiene.
» Combine drinking water facilities with hand washing facilities near site toilets.

HAZARDOUS WASTE

» Ensure compliance with all national, regional, and local legislation with regards to the storage and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
» Collect any hazardous waste in receptacles located on a drip tray on site pending disposal.
» Regularly dispose of all hazardous waste not earmarked for reuse, recycling, or resale (such as oil contaminated with chlorinated hydrocarbons, electrical cleaning solvent, certain chemicals) at a registered hazardous waste disposal site.
» Contain chemical spills, and arrange for cleanup / control by the supplier, or by professional pollution control personnel.

POLLUTION CONTROL

» Do not dump waste of any nature, or any foreign material into the drainage canal.
» Do not allow the use of the water in the drainage canal for the cleaning of clothing, tools, or equipment.
» Deflect any unpolluted water / runoff away from any dirty area (including plants, maintenance areas, and contractors' yard).
» Otherwise, clean, but silt laden water may be discharged overland, provided no erosion is resultant from this discharge.
» Take special care during rainy periods to prevent the contents of sumps and drip trays from overflowing.
» Do not hose oil or fuel spills into the surrounding natural environment.
» Clean small oil or fuel spills with an approved absorbent material, such as 'Drizit' or 'Spill-sorb'.
» Contain oil or fuel spills in water using an approved oil absorbent fibre.
» Treat soil contaminated by oil or fuel using one of the following methods:
  - Remove the soil to the depth of the contamination and dispose of at a registered Hazardous Waste Disposal Site.
  - Remove the soil to the depth of the contamination, and regenerate using approved bio-remediation methods.
» Report major oil or fuel spills to the provincial Department of Water Affairs and Forestry, as well as to the relevant Local Authority.
» Carefully control all on-site operations that involve the use of cement and concrete.

- » Limit cement and concrete mixing to single sites where possible.
- » Use plastic trays or liners when mixing cement and concrete: Do not mix cement and concrete directly on the ground.
- » Dispose of all visible remains of excess cement and concrete after the completion of tasks. Dispose of in the approved manner (solid waste concrete may be treated as inert construction rubble, but wet cement and liquid slurry, as well as cement powder must be treated as hazardous waste).
- » Contain water and slurry from cement and concrete mixing operations. Direct such wastewater into a settlement pond or for later disposal as hazardous waste.
- » Do not allow the washing of trucks delivering concrete anywhere but within designated wash bays equipped with runoff containment. Direct such wastewater into a settlement pond for later disposal.
- » Minimise fuels and chemicals stored on site.
- » Install bunds on storage areas and take other precautions to reduce the risk of spills.
- » Implement a contingency plan to handle spills, so that environmental damage is avoided.
- » No refuelling, servicing of plant/equipment or chemical substance storage allowed outside of designated areas.
- » Drip trays should be used during al fuel/chemical dispensing.
- » Drip trays to be placed beneath standing machinery/plant.
- » In the case of petrochemical spillages, the spill should be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).

Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	Duration of the construction phase.	**Minor Negative (10)**
Extent	Site (1)	Limited to the site.	
Magnitude	Minor (2)	Minor and will probably not happen provided that the mitigation measures are implemented.	
Probability	Improbable (2)	Due to the nature of the operations, some possibility exist that the impact will occur, but with a low likelihood provided that the mitigation measures are implemented.	
Residual Risks: Expected to be minor and localized provided that the mitigation measures are implemented.			

Operation Phase Impacts

Nature of Impact: Invasion and spread of IAPs and weeds

The clearance of vegetation and disturbance initiated during the construction phase may create edge habitat immediately adjacent to the facility. This creates ideal opportunities and optimal conditions for weeds and alien & invasive plant species to invade these edge habitats. IAPs and indigenous weeds can out-compete and replace the remaining indigenous flora in the general area surrounding the facility, which will in turn impact on natural biodiversity.

The alien invasive plant issue is one that can be successfully mitigated, by means of ongoing alien invasive plant management on and around the proposed development.

	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (39)**
Extent	Local (2)	Areas directly adjacent to the facility may be affected as well as remaining natural habitat within Phase 1F.	
Magnitude	Moderate (6)	Invasive species may replace indigenous species over time. The vegetation of Phase	

		1F is disturbed by past anthropogenic activities.	
Probability	Probable (3)	Invasive species are already present on the project site and on adjacent habitats. Spread of invasives thus likely (i.e., wind-dispersed seeds; birds as seed dispersers)	

Mitigation/Enhancement Measures

Mitigation:

Implementation of an ongoing Alien & Invasive plant species eradication and control programme. Guidelines are provided under the mitigation measures for the construction phase impact descriptions.

The following management actions are aimed at maintaining non-invaded areas clear of invasive alien species as well as reducing the abundance of any aliens during the operational phase:

ACTION	FREQUENCY
Surveys for alien species should be conducted regularly. All aliens identified should be cleared immediately following detection. Refer to	Every 3 months for 2 years and biannually thereafter.
Re-vegetation with indigenous, locally occurring species should take place in areas where natural vegetation is slow to recover or where repeated invasion has taken place where applicable.	Biannually, but re-vegetation should take place at the beginning of the rainy season.
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected.	When necessary
No alien species should be cultivated on site. If vegetation is required for aesthetic or other purposes, then non-invasive locally occurring indigenous species should be used.	When necessary

The following monitoring is required during the operational phase of the project:

MONITORING ACTION	INDICATOR	TIMEFRAME
Document alien species distribution and abundance on site	Alien species distribution maps	Every 3 months
Document alien plant control measures implemented, and success rate achieved	Records of control measures and their success rate	Every 3 months
Document rehabilitation measures implemented, and success achieved in problem areas	Decline in vulnerable bare areas over time	Every 3 months

Post Mitigation/Enhancement Measures

Duration	Short-term (1)	Regular surveys will be conducted to identify and remove invasives.	**Minor Negative (2)**
Extent	Site (1)	Monitoring will prevent the spread to adjacent undeveloped areas.	
Magnitude	Small (0)	Invasives will be immediately removed	
Probability	Very Improbable (1)	With regular maintenance and monitoring it is unlikely that invasives will spread to adjacent undeveloped areas.	

Residual Risks:

Expected to be Minor and localized if mitigation measures are implemented.

Nature of Impact: Disturbance/loss of local fauna species and accidental fauna mortalities

Except for a few generalist bird species such as House Sparrows and Crows, it is unlikely that local fauna populations will utilise the project site. The facility will be fenced which will prevent larger animals such as Duikers and Mongooses from entering the area. However, smaller reptile species such as such as *Agama aculeata distanti*, *Lygodactylus capensis capensis, Acanthocercus atricollis atricollis,* and in particular *Chamaeleo dilepis* are prone to electrocution on electric fencing.

Phase 1F provides habitat to several fauna species. The construction of the proposed facility will reduce the available habitat for these species, and result in increased fragmentation of available habitat within Phase 1F, increase the risk of poaching and may result in accidental mortalities because of increased traffic in the area. Local fauna species such as Duikers are already prevented from natural dispersal by the boundary fence of Phase 1F which may contribute to ever-reducing population sizes in future. The duikers will also be vulnerable to poaching for food and increased human presence and traffic from staff accessing the facility will increase the risk of wildlife mortalities on the roads.

The above impacts described will be an ongoing threat during the entire operational phase of the project.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Moderate Negative (52)**
Extent	Local (2)	Local fauna population on Phase 1F	
Magnitude	Moderate (6)	Reduced availability of habitat on Phase 1F. Increased presence of people and vehicles on Phase 1F.	
Probability	Highly probably (4)	Local fauna populations will be affected.	

Mitigation/Enhancement Measures

Mitigation:

Minimisation methods to reduce electrocutions on electric fencing:

- Should the facility be fenced with electrified fencing, then no electrified strands should be placed within 30 cm of the ground.
- Keep foliage trimmed well away from the electric fence.
- Regularly patrol the perimeter of the fence line to remove any overgrowing vegetation.

General minimization measures:

- Access to undeveloped areas should be restricted and controlled. This should be clearly communicated to all employees.
- No hunting, snaring, killing, or disturbing any fauna species to be allowed on Phase 1F.
- No collecting or flora species must be permitted anywhere on Phase 1F.
- The handling and removal of any venomous fauna species such as snakes must be prohibited. Should any such species be encountered, a qualified and experienced professional with experience in snake handling and removal must be contacted immediately.
- The vehicle operating speed of employees entering Phase 1F should be reduced to avoid collisions with local fauna species.

Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (33)**
Extent	Local (2)	Phase 1F	

Magnitude	Low (4)	No habitat on the facility. Only generalist bird species may utilise the area occasionally. Electrocution of reptiles cannot be entirely prevented.	
Probability	Probable (3)	It is likely that impacts will occur regardless of mitigation measures.	
Residual Risks: Residual impacts are expected with regards to a loss of local habitat, habitat connectivity and loss of local fauna species.			

Nature of Impact: Noise and artificial light disturbance

Potential negative ecological consequences of noise and artificial light disturbance have been discussed under the Construction phase impacts. Since those impacts are also applicable during the Operational phase, it will not be discussed further.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (33)**
Extent	Local (2)	Phase 1F	
Magnitude	Low (4)	Likely to affect local fauna populations.	
Probability	Probable (3)	Likely to affect local fauna populations.	
Mitigation/Enhancement Measures			
Mitigation: » Outside lighting should be designed to minimise impacts on fauna. » All outside lighting should be directed into the facility as opposed to away from the facility, and not in the direction of undeveloped areas, including undeveloped areas adjacent to the proposed development. » Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible. » To reduce low intensity noise levels, work areas need to be effectively screened to reduce or deflect noise. Engineering controls such as modifications to equipment or work areas to make it quieter, the acquisition of equipment designed to emit low noise and vibration, creation of noise barriers, proper maintenance of tools and equipment must be considered. » Noise from vehicles and powered machinery and equipment used during operations should not exceed the manufacturer's specifications, based on the installation of a silencer. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.			
Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (24)**
Extent	Local (2)	Phase 1F	
Magnitude	Minor (2)	Likely to affect local fauna communities	
Probability	Probable (3)	Likely to affect local fauna communities	
Residual Risks: Low negative but with a cumulative contribution towards light pollution of the larger geographic area.			

Nature of Impact: Pollution of soils and habitat

Improper waste management practices and the improper storage of hazardous chemical substances could result in significant environmental damage on the project site and adjacent properties. Hazardous substances may enter the soil as water trickles from contaminated sites leaching chemicals, resulting in soil and groundwater contamination.

Contaminated soil can damage flora and fauna directly and indirectly by releasing toxic components into the food chain. Ingesting, inhaling, or touching contaminated soil may have a serious adverse impact on humans and fauna. The project site also falls within an area with a shallow water table which increases the potential for groundwater contamination significantly.

Improper waste management practices may result in soil contamination and loss of biodiversity on undeveloped areas adjacent to the project site (i.e., windblown litter).

Understanding the legal responsibilities with respect to waste management can be a daunting task. Compliance requirements pertaining to waste is contained in a wide array of legislation, across all tiers of government and administered by numerous government departments. Poor waste management practises can lead to high clean-up and rehabilitation costs in terms of Section 28 of the National Environmental Management Act (Act 73 of 1998) and Section 19 of the National Water Act (Act 36 of 1998).

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	Groundwater contamination is permanent and irreversible.	**Moderate Negative (48)**
Extent	Region (3)	Contaminated groundwater can spread over large areas.	
Magnitude	High (8)	Can result in significant environmental damage and health impacts.	
Probability	Probable (3)	Due to the size of the operation, it is expected that large volumes of hazardous chemicals will be stored on the premises.	

Mitigation/Enhancement Measures

Mitigation:

To comply with the chemical regulations in South Africa, it is required that a comprehensive Hazardous Materials Management Plan and Emergency Spill Response Procedures be developed by taking into consideration all the relevant National, Provincial and Municipal laws and regulations, as well as the relevant SANS/SABS codes Specific attention should be paid to the following:

- Record keeping – Detailed, up to date records of all chemicals stored on site, including the volumes of the chemicals and the areas where the chemicals are stored
- Safety data sheets for all chemical
- Correct labelling of chemicals
- Criteria for temperature control should it be required
- Health and environmental hazard identification
- Precautions for safe handing
- Conditions for safe storage, including any incompatibilities
- Exposure controls/personal protection
- Ecological information
- Disposal considerations
- Relevant South African regulations and statutory provisions

Detailed spill response procedures must as a minimum include the following:

- Materials inventory
- Facilities map
- Spill kit inventory and labelling
- Spill log
- Responsibilities
- Emergency contact numbers
- Emergency evacuation procedures

» Spill response and clean-up for small, medium, and large spills
» Detailed clean-up procedures
» Reporting of spills

It is recommended that an Integrated Waste Management Plan for general and hazardous waste, structured around the steps in the waste management hierarchy (avoid, reduce, recycle, eliminate), the National Waste Management Strategy 2020, the NEMA: Waste Act, 2004, and all the applicable environmental laws, regulations, and best practice standards be developed.

Integrated Waste Management (IWM) is a comprehensive waste prevention, recycling, composting, and disposal program. An effective IWM system considers how to prevent, recycle, and manage solid and hazardous waste in ways that most effectively protect human health and the environment. IWM involves evaluating organisational needs and conditions, and then selecting and combining the most appropriate waste management activities for those conditions. The major IWM activities are waste prevention, recycling and composting, and combustion and disposal in properly designed, constructed, and managed landfills. Each of these activities requires careful planning, financing, collection, and transport.

An integrated waste management plan is a practical document that can help guide the Plant's waste management efforts. It can help to:
» Define and understand current waste management practices and the system in place.
» Identify problems and deficiencies with the current system.
» Identify opportunities for improvement in the current system.
» Set priorities for action to address problems and affect improvement.
» Measure progress toward implementing actions.
» Identify the resources needed and develop budgets and schedules.
» Revisit and modify priorities as the plan develop.

Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Minor Negative (16)**
Extent	Site (1)	Limited to site operations.	
Magnitude	Minor (2)	Expected to be minor provided that the mitigation measures are implemented.	
Probability	Improbable (2)	Unlikely to occur but cannot be entirely eliminated. With the implementation of the mitigation measures, accidental spillages can be contained and prevented from entering into the environment.	
Residual Risks: Expected to be minor and localized provided that the mitigation measures are implemented.			

8.3.4. Implications for Project Implementation

The project under consideration is located within areas recognised as of national, provincial, district or municipal conservation significance (Valued Ecosystem Components (VECs)[20]) considered important in terms of habitats, species, ecosystems, and ecosystem services conservation that are required to meet national, provincial, district and municipal conservation targets. Despite the presence of VECs within Phase 1F, this area was incorporated into the Industrial Development Zone and received authorisation for industrial development in 2016.

[20] VECs are defined as elements of the environment that have scientific, ecological, economic, social, or cultural significance.

Phase 1F of the IDZ is still largely undeveloped but has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services infrastructure (i.e., water, sewer, stormwater, electricity, roads, artificial drainage canals), and the more recent infilling of the wetlands as authorised for the development of the IDZ. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO_2 Pilot plant which covers approximately a third of Phase 1F. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds.

The project site on Phase 1F has experienced past environmental disturbances that were judged to have had a negative influence on its biodiversity and ecology and included the following:

» Land clearance on the project site resulted in the direct loss of indigenous vegetation.
» The wetlands on the proposed development site were fragmented by the construction of a drainage line and roads.
» The wetlands on the project site were infilled to prepare the area for future development.

The site has been determined to have a moderate Ecological Importance. In this context, development activities of medium impact are considered acceptable followed by appropriate restoration activities. Many of the anticipated project-specific impacts during the construction and operational phases can be successfully mitigated to moderate, low, and minor levels of significance, and are thus considered acceptable.

8.4. Potential Impacts on Aquatic Biodiversity

Potential impacts on wetlands associated with the project were identified and assessed through a specialist investigation (refer to **Appendix E** for more details).

8.4.1. Results of Aquatic Ecology Impact Assessment

Three hydrogeomorphic (HGM) units were identified within the 500 m regulated area, including two unchannelled valley bottoms and a hillslope seep wetland (refer to **Figure 8.2**). Environmental authorisation has already been granted (DFFE Ref No.: 14/12/16/3/3/3/665) for the proposed development inside HGM units 1 and 2. According to this EA, the Richards Bay Industrial Development Zone has the authorisation to conduct the following activities associated with the proposed projects within the wetlands:

» Buildings exceeding 50 square metres in size;
» Infrastructure covering 50 square metres or more where the construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line;
» The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from (i) a watercourse;
» Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more, except where such physical alteration takes place for: (linear development activities; or agriculture or afforestation where activity 16 in this Schedule will apply; and

» The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for:
  * The undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from the list.
  * The undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010.

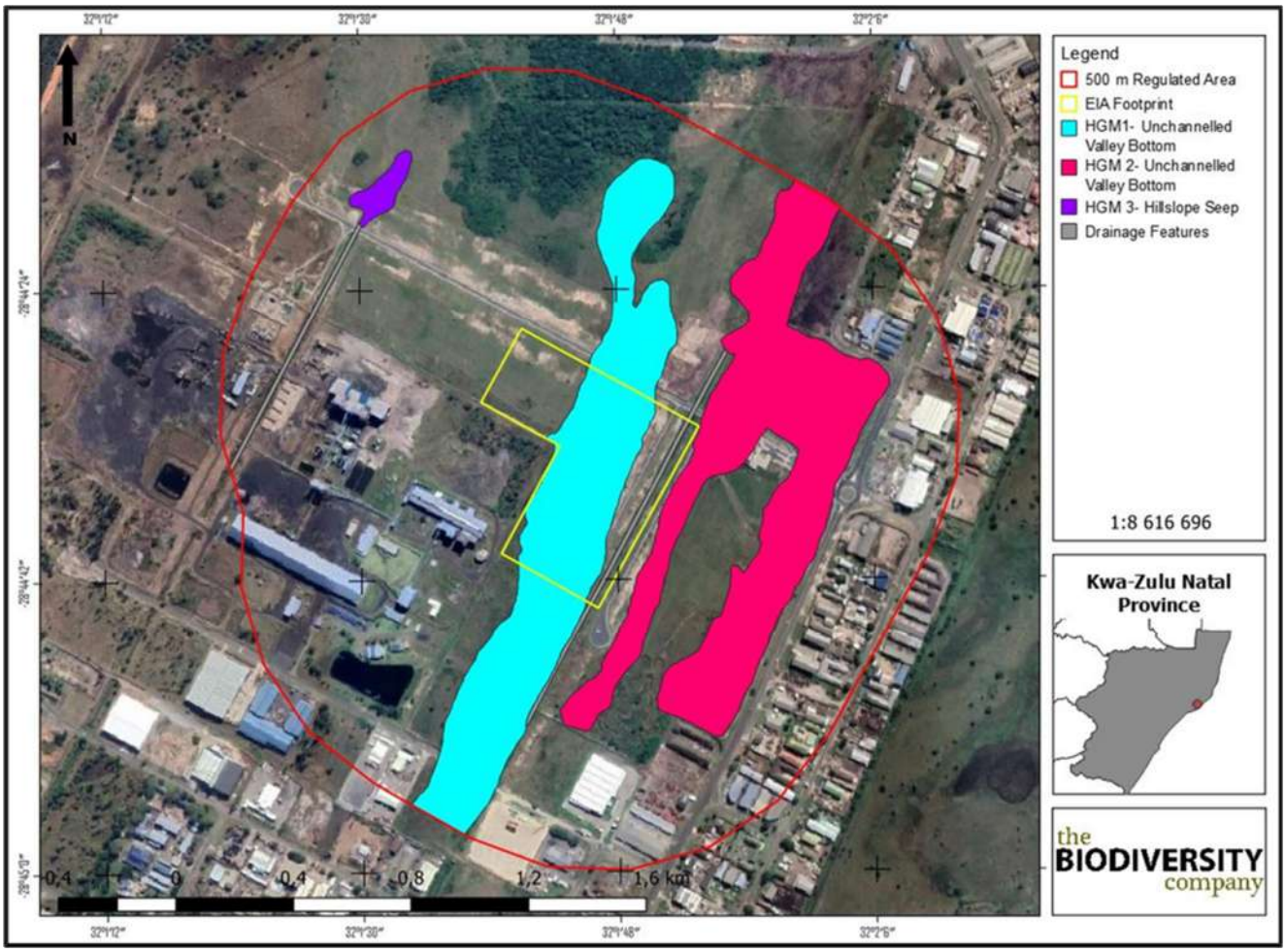

Figure 8.2: Delineation of all the wetlands HGM units located throughout the 500 m regulated area

HGM 3 is located to the northwest of the proposed development, but the wetland is located within a sub-basin that cannot be impacted through ground water movement (see **Figure 8.3**). According to the topography, HGM 3 can thus also not be impacted through surface flows or surface runoff from the proposed development area. Based on this, no impacts to the system are expected.

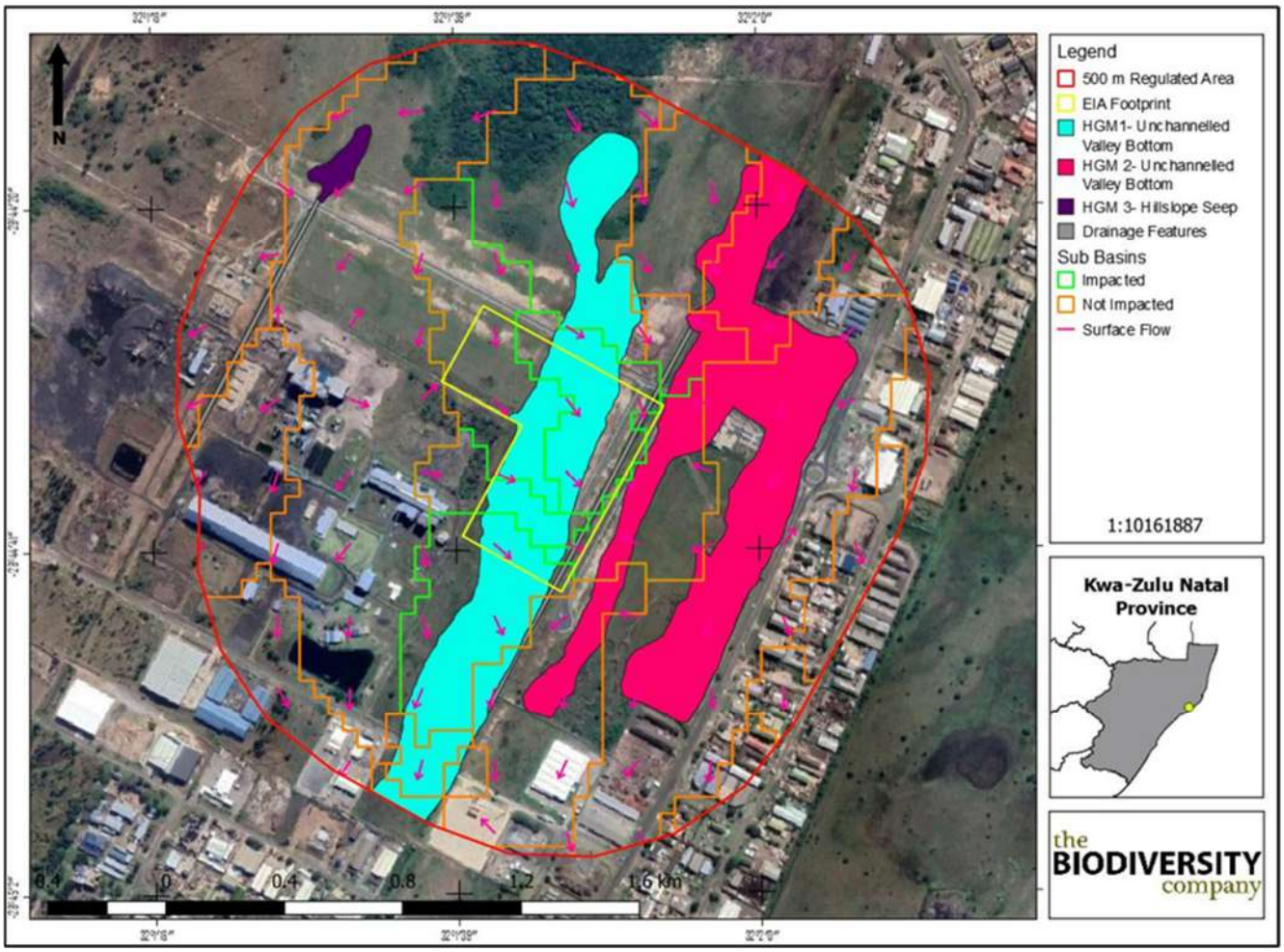

Figure 8.3: Sub-Basin and surface water flow inside the 500 m regulated area

8.4.2. Implications for Project Implementation

Three HGM units were identified within the 500 m regulated area, of which two have been classified as unchanneled valley bottom wetlands and one classified as a hillslope seep. The HGM units consist of one dominant soil form was identified within the identified wetland, namely the Manguzi soil form.

The Richards Bay Industrial Development Zone received environmental authorisation, which includes the development of two of the wetland areas. The remaining third wetland is not in a position in the landscape to be affected by the development. Therefore no additional authorisation or WUL is required for the proposed PRBGP3 project.

It is recommended that the conceptual wetland plan developed for the industrial zone (Royal Haskoning DHV, 2015) be implemented for the project.

8.5. Assessment of Impacts on Soils and Agricultural Potential

Potential impacts on soils associated with the project were identified and assessed through a specialist investigation (refer to **Appendix F** for more details). Impact are expected

8.5.1. Results of Soils and Agricultural Potential Impact Assessment

According to DAFF (2017), two classes of land capability sensitivity are located within the project area, namely a class comprising of land capability 9 to 10 (moderately high sensitivity) and land capability 11 to 15 (high to very high sensitivity) (refer to **Figure 8.4**). The baseline conditions observed within the 50 m regulated area concur with the DAFF (2017) findings in respect to the sensitivities identified. The DAFF (2017) information however neglects to identify hydromorphic properties and disturbed area which is characterised by lower sensitivities.

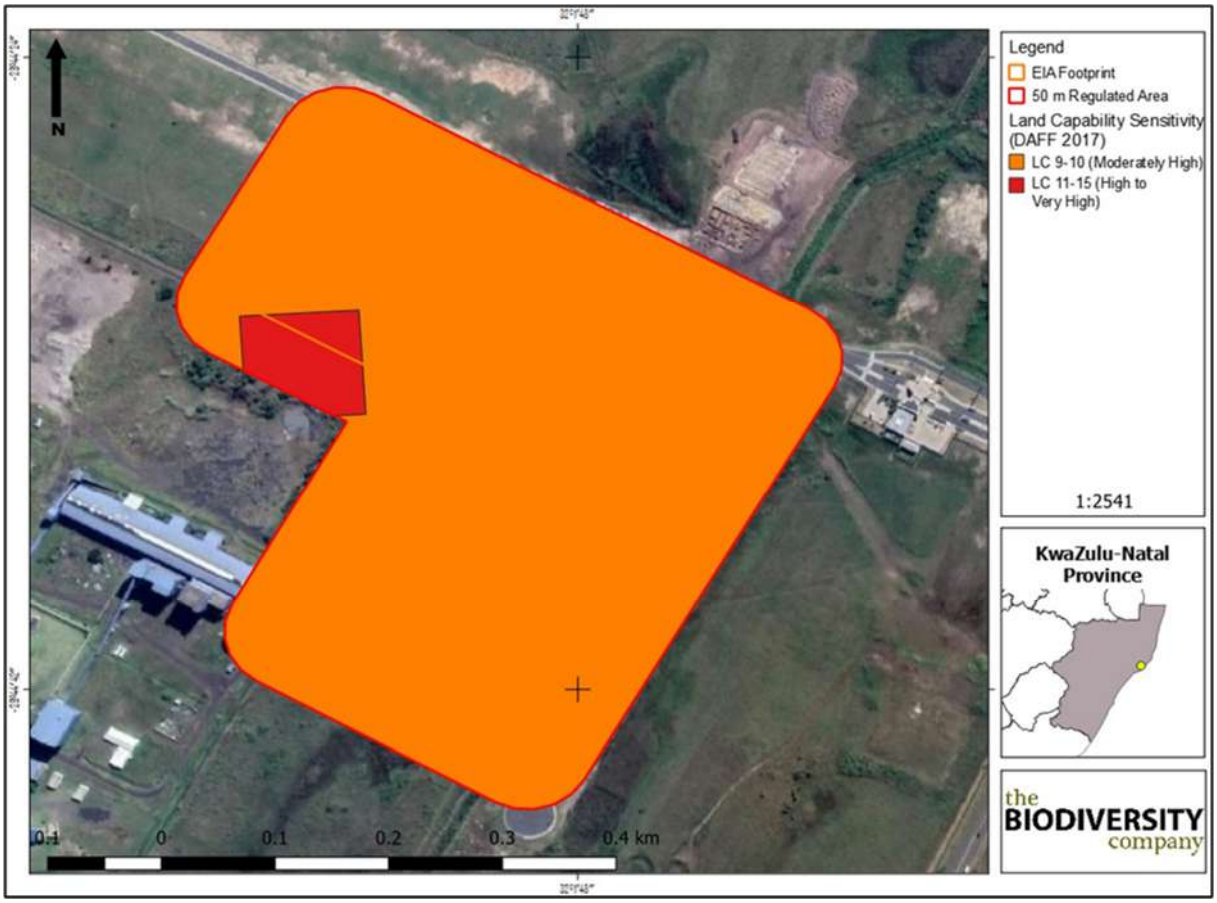

Figure 8.4: Land capability sensitivity of the project area (DAFF, 2017)

Various soil forms have been identified which have been divided into four main land capability classes according to depth, texture, hydromorphic properties etc. (namely land capability class II, III, IV and V). From these four classes as well as the ideal climatic capability of "C1", three land potential levels were calculated, namely land potential 1, 2 and "vlei". Therefore, the overall land potential ranges from "Low" (for the wetland areas characterised by non-arable conditions) to "Very High". Development on the site could therefore result in potential loss of highly valued land. High potential arable land is only useful to agricultural land use, with limited significance outside of such a land use. It is worth considering the locality of the proposed project area being on the outskirts of the Richards Bay CBD. Therefore, regardless of whether or not the proposed activities proceed, the soil will not be used for agriculture due to the zoning of the area.

8.5.2. Description of Impacts on Soil and Agricultural Potential

During the construction phase, high intensity construction activities will be carried out. This includes soil stripping, digging foundations, compacting soil, removing vegetation and the use of heavy machinery. During the operational phase, those impacts associated with the construction phase are expected to be prolonged, specifically in regard to compaction of the soil and the continues alteration of land use.

8.5.3. Assessment of Potential Impacts

Construction phase

Nature: Loss of land capability		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: » Investigate the possibility of avoiding large concrete areas » Demarcate all access routes » Vegetate all stockpiles after stripping/removing soils » Storage of potential contaminants in bunded areas » All contractors must have spill kits available and be trained in the correct use thereof. » All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping". » No cleaning or servicing of vehicles, machines and equipment in water resources. » Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems. » Continuously monitor erosion on site		
Residual Impacts: Significant residual impacts are foreseen considering the fact that the residual land use will be characterised by "developed" or "disturbed" areas as opposed to high potential arable soil		

Operational phase

Nature: Loss of land capability		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long Term (4)	Long Term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low

Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: » Continuously monitor erosion on site » Monitor compaction on site		
Residual Impacts: Significant residual impacts are foreseen considering the fact that the residual land use will be characterised by "developed" or "disturbed" areas as opposed to high potential arable soil		

8.5.4. Implications for Project Implementation

Various soil forms have been identified which have been divided into four main land capability classes according to depth, texture, hydromorphic properties etc. (namely land capability class II, III, IV and V). From these four classes as well as the ideal climatic capability of "C1", three land potential levels were calculated, namely land potential 1, 2 and "vlei". Therefore, the overall land potential ranges from "Low" (for the wetland areas characterised by non-arable conditions) to "Very High".

The 50 m regulated area comprises of land potential resources characterised by "Very High" arable potential under natural conditions, owing to the ideal climatic conditions of the region as well as the physical properties of the classified soil forms. The high sensitivity of these soils emphasises the potential loss of highly valued land. It is worth noting that the agricultural land use in the surrounding area needs to be considered holistically.

High potential arable land is only useful to agricultural land use, with limited significance outside of such a land use. It is worth considering the locality of the proposed project area being on the outskirts of the Richards Bay CBD. Therefore, regardless of whether or not the proposed activities proceed, the soil will not be used for agriculture due to the zoning of the area. Therefore, it is the specialist's opinion that even though significant impacts towards soil resources are expected, no impacts towards agricultural land use are foreseen. The soil resources will ultimately never be of value to farming practices reliant on high potential arable land. Therefore, the proposed activities should proceed as have been planned.

8.6. Air Quality Impacts

Impacts on air quality associated with the development are expected to occur during the construction and operational phases. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G** for more details).

8.6.1. Results of the Air Quality Impact Assessment

The proposed project site is located less than 2km west of the Richards Bay Central Business District (CBD), is located within Zone 1F of the Richards Bay Industrial Development Zone (IDZ) and is located immediately to the north of Richards Bay Alloys. The nearest large residential areas to the project site are Wild-en-Weide (1.9 km east-north-east); Richards Bay CBD (1.9 km south-east); Brackenham (2.1 km north-east); Aquadene (3.5 km north) and Arboretum (4 km east-south-east). There are several schools, hospitals and clinics located within 5 km of the proposed project site (**Figure 8.5** and **Table 8.1**). Industrial areas (Alton and the Richards Bay CBD) are located within 5 km of the proposed project site.

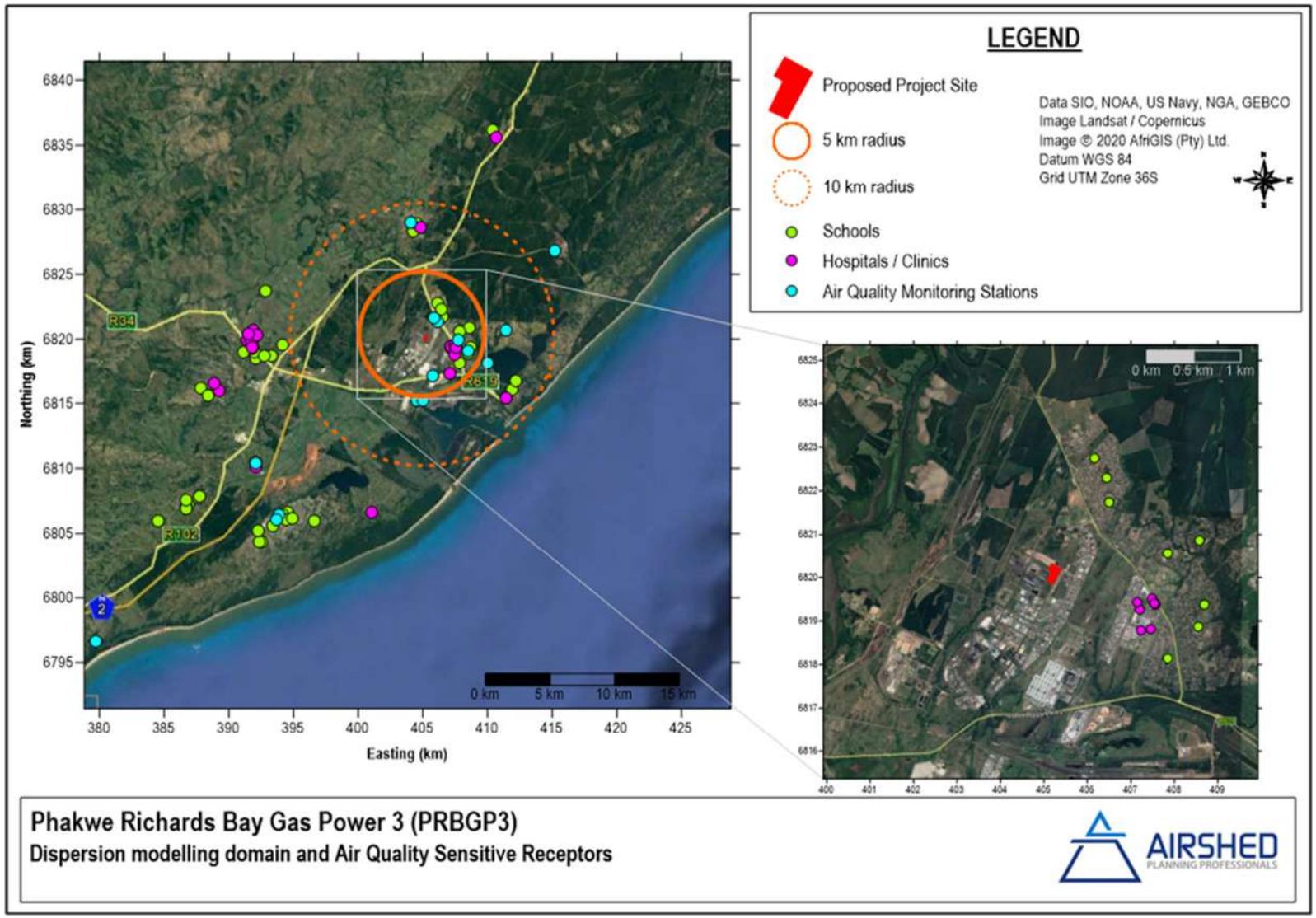

Figure 8.5: Location of the Proposed Project in relation to the identified ir Quality Sensitive Receptors

Table 8.1: Distance to the air quality monitoring stations and the 20 closest air quality sensitive receptors

Air Quality Monitoring Station Name	Distance from proposed site (km)	Direction from proposed site
Brackenham (uMhlathuze)	1.5	NNE
Brackenham (RBCAA)	1.5	NE
CBD (RBCAA)	2.5	E
Scorpio (RBCAA)	3.1	S
Arboretum (RBCAA)	3.5	ESE
Bayside (RBCAA)	5.1	S
Harbour West (RBCAA)	5.0	S
Arboretum (uMhlathuze)	5.3	ESE
Airport (RBCAA)	6.3	E
eNseleni (RBCAA)	8.8	N
RBM (RBCAA)	12.0	ENE
Felixton (RBCAA)	16.4	SW
Esikhawini (RBCAA)	17.9	SW
eSikhaleni (uMhlathuze)	18.3	SW
Mtunzini (RBCAA)	34.8	SW
St Lucia (RBCAA)	55.7	NE
Receptor name / details	**Distance from proposed site (km)**	**Direction from proposed site**
Wild En Weide	1.9	ENE
Richards Bay Central	1.9	SE
Richards Bay Secondary School	2.0	NE
Better2Know Private STD Health Centre Richards Bay	2.1	ESE
Mens Clinic International - Richards Bay	2.2	ESE
Mandlazini Clinic	2.4	ESE
Brackenham Primary School	2.4	NNE
Richards Bay Medical Institute	2.4	ESE
Richards Bay Municipal Clinic	2.5	SE
The Bay Hospital	2.5	ESE
Umhlathuze Dental	2.6	ESE
Veldenvlei Primary School	2.7	E
Bay Primary School	2.7	NNE
John Ross College	3.4	SE
Richards Bay Christian School	3.4	E
Aquadene	3.5	N
Richardsbaai Hoerskool	3.6	ESE
Arboretum Primary School	3.6	ESE
Arboretum	4.0	ESE
Birdswood	5.0	E

8.6.2. Description of Potential Air Quality Impacts

The CALPUFF/CALMET model suite was selected for use in the current investigation to predict maximum short-term (1 and 24-hour) and annual average ground-level concentrations at various receptor locations within the computational domain. This model was selected as the most appropriate tool based on a number of considerations as detailed in the specialist report (**Appendix G**). An understanding of the atmospheric dispersion potential of the area is essential to an air quality impact assessment. In the absence of on-site surface and upper air (sounding) meteorological data required for atmospheric dispersion modelling use was made of WRF data for the period January 2017 to December 2019.

The quantification of sources of emission during the operational phase was restricted to the gas turbines. Dispersion simulations were undertaken to determine second-highest hourly, first-highest daily average and first-highest annual average ground level concentrations and dustfall rates for each of the pollutants considered in the study as well as the frequency at which short term criteria are exceeded. Averaging periods were selected to facilitate the comparison of simulated pollutant concentrations to relevant ambient air quality criteria and dustfall regulations. The model results were analysed against the NAAQS and national dust control regulations (NDCR) and relevant international criteria.

The following key issues have been identified and assessed during the air quality impact assessment:

Construction phase:
» Particulate matter impacts

Operational phase:
» SO_2, NO_2, PM, CO, and VOC impacts

For the purposes of assessment of impact, it was assumed that the decommissioning phase would have similar impacts to the construction phase, since activities are similar.

8.6.3. Assessment of Potential Impacts

Nature: Impacts on Air Quality during Construction and Decommissioning				
Construction (and decommissioning) activities are likely to result in emissions of particulate and gaseous pollutants due to civil and building work and from vehicle traffic. The nature of emissions from construction activities is highly variable in terms of temporal and spatial distribution and is also transient. Increased ambient concentrations of fine particulates and gaseous pollutants may result in negative human health impacts. Increased nuisance dustfall is likely as a result of wind-blown dust emissions from the working areas. Increased nuisance dustfall rates will likely result in negative impact on dustfall at nearby residences and on potentially on plants. Unmitigated particulate emissions were conservatively found to results in slightly elevated concentrations but not resulting in exceedances of the NAAQS or NDCR off-site. The impact of gaseous pollutants is likely to minor.				
	Rating before mitigation		**Motivation**	**Significance**
Duration	Short-term	2	Construction duration provided as 36 months	**24**
Extent	Low	2	No off-site exceedances of NAAQS or NDCR	**Low**
Magnitude	Low	4	No off-site exceedances of NAAQS or NDCR	
Probability	Probable	3	Emissions estimation is conservative and assumes major earthworks for the full duration over the full area. This is unlikely in practice.	
Proposed mitigation measures:				
» Wet suppression at key handling points or cleared areas, and on unpaved roads. » Haul trucks to be restricted to specified haul roads and using the most direct route. » Reduce unnecessary traffic. » Strict on-site speed control (i.e. 40km/hr for haul trucks). » Reduction of extent of open areas to minimised the time between clearing and infrastructure construction, and/or use of wind breaks and water suppression to reduce emissions from open areas. » Restriction of disturbance to periods of low wind speeds (less than 5 m/s). » Stabilisation of disturbed soil (for example, chemical, rock cladding, or vegetation). » Re-vegetation of cleared areas as soon as practically feasible.				
Post Mitigation / Enhancement Measures				

	Rating after mitigation		Motivation	Significance
Duration	Short-term	2	Construction duration provided as 36 months	**15**
Extent	On-site	1	No off-site exceedances of NAAQS or NDCR	**Low**
Magnitude	Low	2	No off-site exceedances of NAAQS or NDCR. Lower PM_{10} and Dustfall rates associated with the construction / demolition phase of the project	
Probability	Probable	3	Emissions estimation is conservative and assumes major earthworks for the full duration over the full area. This is unlikely in practice.	
Residual Impacts Expected to be low if mitigation measures are properly implemented.				

Nature: Incremental impact of the project on ambient SO_2, CO, VOCs, and particulate matter concentrations

The normal operation of the proposed combined cycle power station will result in emission of gaseous and particulate pollutants including: SO_2, CO, VOCs, and to a lesser extent PM. Increased ambient concentrations of these pollutants may result in negative human health impacts, and nuisance dustfall.

Unmitigated emissions of these pollutants were found to comply with the assessment criteria and off-site impacts are unlikely. Residential receptors, schools, and medical facilities are unlikely to be affected. Areas to the north and south-southwest of the project site are more likely to be affected in the long-term, due to the predominant winds.

	Rating Without mitigation		Motivation	Significance
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**21**
Extent	Low	1	No off-site exceedances of NAAQS, Inhalation guidelines, or NDCR	**Low**
Magnitude	Minor	2	No off-site exceedances of NAAQS, Inhalation guidelines, or NDCR	
Probability	Probable	3	Impact estimated using MES, emission factors, current design specifications and dispersion modelling. As far as possible reducible uncertainty - from (1) uncertainties in the input values of the known conditions (i.e., emission characteristics and meteorological data); (2) errors in the measured concentrations which are used to compute the concentration residuals; and (3) inadequate model physics and formulation - have been minimized through better (more accurate and more representative) measurements and better model physics. Inherent uncertainty is associated with the stochastic (turbulent) nature of the atmosphere and its representation (approximation) by numerical models. Models predict concentrations that represent an ensemble average of numerous repetitions for the same nominal event. An individual observed value can deviate significantly from the ensemble value. This uncertainty may be responsible for a ± 50% deviation from the measured value.	

Proposed mitigation measures:

» Turbine maintenance as per manufacturers recommendations

» A move to hydrogen fuel as soon as practically possible, will reduce most pollutant emissions.

Post Mitigation / Enhancement Measures

	Rating Without mitigation		Motivation	Significance
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**20**

Extent	Low	1	No off-site exceedances of NAAQS, Inhalation guidelines, or NDCR	**Low**
Magnitude	Small	0	No off-site exceedances of NAAQS, Inhalation guidelines, or NDCR especially after the introduction as hydrogen in the fuel mixture	
Probability	Probable	3	The introduction of hydrogen into the fuel mix will have positive benefits, however, the technology is not yet at commercial scale implementation in South Africa. Therefore, the probability is marked as probable.	
Residual Impacts Expected to be low if mitigation measures are properly implemented.				

Nature: Incremental impact of the project on ambient NO_2 concentrations

The normal operation of the proposed combined cycle power station will result in emission of gaseous and particulate pollutants including: NO_2. Increased ambient concentrations of these pollutants may result in negative human health impacts.

Emissions of NO_2 at the MES were found to result in off-site exceedances with the 1-hour NAAQS, however the frequency of exceedance was within the 88 hours allowed per year. Annual average NO_2 concentrations were below the NAAQS and the critical levels for vegetation. Residential receptors, schools, and medical facilities may be affected, especially during start-up events. Areas to the north and south-southwest of the project site are more likely to be affected in the long-term, due to the predominant winds.

	Rating Without mitigation		**Motivation**	**Significance**
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**33**
Extent	Moderate	3	Off-site exceedances of the 1-hour NO_2 NAAQS, especially during start-up.	**Medium**
Magnitude	Low	4	Off-site exceedances of the 1-hour NO_2 NAAQS, especially during start-up. Annual NO_2 concentrations were below the NAAQS and the critical levels for vegetation.	
Probability	Probable	3	Impact estimated using MES, current design specifications, assumptions regarding start-up emissions and dispersion modelling. As far as possible reducible uncertainty - from (1) uncertainties in the input values of the known conditions (i.e., emission characteristics and meteorological data); (2) errors in the measured concentrations which are used to compute the concentration residuals; and (3) inadequate model physics and formulation - have been minimized through better (more accurate and more representative) measurements and better model physics. Inherent uncertainty is associated with the stochastic (turbulent) nature of the atmosphere and its representation (approximation) by numerical models. Models predict concentrations that represent an ensemble average of numerous repetitions for the same nominal event. An individual observed value can deviate significantly from the ensemble value. This uncertainty may be responsible for a ± 50% deviation from the measured value.	

Proposed mitigation measures:

» Water injection for NOx emission controls to meet MES (already planned).

» Minimise start-up events or the duration thereof. Restrict cold start-ups (from the backup diesel generator) as far as is practical.
» Turbine maintenance as per manufacturers recommendations
» A move to pure hydrogen fuel with appropriate combustion zone temperature control, as soon as practically possible, will reduce emissions of NO_X.

Post Mitigation / Enhancement Measures

	Rating Without mitigation		Motivation	Significance
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**21**
Extent	Low	1	No off-site exceedances of NAAQS	**Low**
Magnitude	Low	2	No off-site exceedances of NAAQS especially after the introduction as hydrogen in the fuel mixture	
Probability	Probable	3	Compliance with emission standards during start up may not be possible. Minimisation of the number of start-ups will be dependent on the day-to-day demand of the power purchaser. Additionally, the introduction of hydrogen into the fuel mix could have positive benefits, however, the technology is not yet at commercial scale implementation in South Africa. Therefore, the probability is marked as improbable (with a larger negative impact on the significance).	

Residual Impacts
Since observed NO_2 concentrations (where measured in the domain) are low, residual impacts are likely to be limited to locations near site.

8.6.4. Implications for Project Implementation

The main findings of the simulated incremental assessment were:

8. The construction phase of the project could result in off-site exceedances of inhalable particulate matter of less than 10 µm in diameter - PM_{10} daily and annual National Ambient Air Quality Standards (NAAQS) over the 36-month construction phase.
    b. It is likely that the construction (and decommissioning) phase(s) may have a "low" impact on the ambient air quality before and after effective mitigation measures are implemented.
9. Compliance with hourly, daily and annual NAAQS under normal operations for hourly, daily and annual average pollutant concentrations as applicable to sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$ – inhalable and respirable particulate matter of less than 10 µm and 2.5 µm in diameter, respectively), carbon monoxide (CO) and total volatile organic compounds (TVOCs). Exceedances of the nitrogen dioxide (NO_2) NAAQ Limit Concentration could result from the normal operation of the facility using natural gas, but the frequency of exceedance is likely to be within that allowed by the NAAQS.
    c. The operational phase of the project will have a low impact significance (based on design mitigation measures) on ambient SO_2, PM, CO, and VOC concentrations, with no additional mitigation required.
    d. The operational phase is likely to have a "medium" impact significance for NO_2; however, if additional mitigation measures are implemented, the significance could be reduced to "low".
10. Due to the inherently low sulfur content of natural gas, SO_2 emissions from the turbines will not reach the emission standard and therefore the facility's impact on SO_2 was also assessed using mass balance calculations for combined cycle turbines using the default sulfur content of the emission factor (4600 g/IE+06 Nm^3).

b. Compliance the NAAQS was simulated for hourly, daily, and annual average SO2 for the operational scenario based on emission factor calculations.

11. The impact of start-up on ambient nitrogen dioxide (NO_2) concentrations was estimated, and exceedances of the NAAQS could result at residential receptors, schools and medical facilities. The impacts can be reduced if the turbines reach Minimum Emission Standards in less than 30 minutes, and if the frequency of start-up events is reduced.
12. Annual SO_2 and NO_2 concentrations are unlikely to affect vegetation productivity or animal health off-site.
13. The impact of the facility was simulated to be below the National Dust Control Regulations (NDCR) acceptable dustfall rates for all project phases.
14. While hydrogen (or natural gas – hydrogen mixture) could significantly reduce emissions of SO2, CO, PM and VOCs from the facility, emissions of oxides of nitrogen (NOX) could potentially be similar to those from natural gas combustion.

From an air quality perspective, it is the opinion of the specialist that the Phakwe Richards Bay Gas Power 3 Combined Cycle Gas to Power Plant be authorised, on condition that:

» Emissions be monitored as per standard practice for the appropriate listed activity.
» Emissions are maintained at or lower than the Minimum Emission Standards appropriate for the listed activity.
» Conformance with the other environmental management programme requirements for air quality are met.

8.7. Rapid Appraisal Health Impact Assessment

A rapid appraisal health impact assessment (RAHIA) was undertaken for the proposed project, supported by a Baseline Health Assessment Report and a Human Health Risk Assessment (refer to **Appendix H**). According to the Good Practice guidance of the IFC, a RAHIA is suitable for the project, because an influx of people settling in the area, due to the construction and operation of the facility, is not foreseen.

8.7.1. Results of the Rapid Appraisal Health Impact Assessment

the geographical study area considered as impacted includes those areas and communities where the proposed developments may have an impact on the environmental quality, particularly through airborne emissions from the project site. The impact of such emissions on air quality has been determined by air dispersion modelling specialists of Airshed Planning Professionals (Pty) Ltd ("Airshed"), as detailed in Section 8.5 above and Appendix G.

The ambient air contaminants of concern in the construction phase, identified by Bird and Von Gruenewaldt (2022) are dust falls, modelled as PM10 concentrations due to construction phase emissions. Detailed PM2.5 concentrations for the construction phase were not modelled by Airshed and were thus not assessed in the INFOTOX human health risk assessment (HHRA).

However, the air modelling specialists have concluded that the construction phase particulate matter impact area would be limited to the near-site area and mostly to within the Richards Bay Industrial Development Zone (RBIDZ). Furthermore, comparison of the isopleth maps in the AQI report shows that the impact at the closest receptors during the construction phase is similar to the impact in the operational phase. Thus, it can be concluded that the health impact due to particulate matter exposure in the construction phase will also be similar to that in the operational phase.

The ambient air contaminants of concern in the operational phase of the plant are four criteria pollutants, namely, the $PM_{2.5}$ fraction of airborne inorganic particulate matter, sulfur dioxide (SO_2), nitrogen oxides as NO_2, carbon monoxide (CO), and VOCs (as an unspecified group of substances).

According to the AQI, for the purposes of assessment of impact, it is assumed that the decommissioning phase would have similar impacts to the construction phase, since activities would be similar.

8.7.2. Assessment of Potential Impacts

Construction Phase

Impact rating for $PM_{2.5}$ in the construction and decommissioning phases				
Construction and decommissioning activities are likely to result in emissions of particulates due to earthmoving by heavy duty vehicles and other activities during the construction phase, and due to demolition activities during the decommissioning phase. $PM_{2.5}$ is the most important particulate fraction with regard to health effects and community exposure to $PM_{2.5}$ is the basis for the assessment of the health impact of airborne particulates. The air dispersion modelling specialists reported in the AQI that increased air concentrations of particulates are mostly limited to the RBIDZ. The health specialist (INFOTOX) concluded from the modelling results that the concentrations of $PM_{2.5}$ to which community receptors would be exposed in the construction and decommissioning phases are similar to those of the operational phase. Therefore, the health impact of particulates during the construction and decommissioning phases is assessed as being similar to the operational phase. Based on the assessment of the baseline health of the receptor community there are no grounds to assume a significantly increased vulnerability to the effects of exposure to the air pollutants of interest in the 1-to-14-years population in the receptor area, as compared to the KwaZulu-Natal population. A slightly to moderately increased vulnerability is possible in the age group 65 years and older. These vulnerabilities are considered in the rating of the significance of health impacts.				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Short-term	2	Construction duration provided as 36 months	**3**
Extent	Low	1	Only the closest community receptors are likely to be impacted	**Low**
Magnitude	Small	0	The AQI indicates that mitigation measures should be implemented, but are not expected to have a significant effect on the off-site (community) air quality impact. The assessed health risks are in the negligible range and do not indicate any reason for concern with regard to human health effects as a consequence of the foreseen construction and decommissioning activities at the Phakwe power plant. This is valid even for the sensitive age groups	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to particulates is indicated as negligible (unlikely)	
Proposed mitigation measures:				
» Dust suppression as described in the Air Quality Impact Assessment.				
Post Mitigation / Enhancement Measures				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Short-term	2	Construction duration provided as 36 months	**3**
Extent	Low	1	Only the closest community receptors are likely to be impacted	**Low**

Magnitude	Small	0	The AQI indicates that mitigation measures should be implemented, but are not expected to have a significant effect on the off-site (community) air quality impact. The assessed health risks are in the negligible range and do not indicate any reason for concern with regard to human health effects as a consequence of the foreseen construction and decommissioning activities at the Phakwe power plant. This is valid even for the sensitive age groups	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to particulates is indicated as negligible (unlikely)	
Residual Impacts Expected to be insignificant if mitigation measures are properly implemented.				

Impact rating for VOCs in the construction and decommissioning phases				
Construction and decommissioning activities are likely to result in emissions of VOCs due to earthmoving by heavy duty vehicles and other vehicular traffic during the construction phase, and due to demolition activities during the decommissioning phase (Bird and Von Gruenwaldt 2022). The air dispersion specialists have determined that the air quality impact of gaseous pollutants, assessed as VOCs in the HHRA, is likely to be minor. INFOTOX interprets this as not exceeding the impact during the operational phase, and assesses the health impacts during the construction and decommissioning phases based on this understanding. There are no residences within the relevant AQI area. However, even if there had been residential exposure in the impact area, the concentrations (assessed as equal to those modelled for the operational phase) would not be in the range associated with an impact on community health. As explained above, there are no grounds to assume a significantly increased vulnerability to the effects of exposure to the air pollutants of interest in the 1-to-14-years population in the receptor area. A slightly to moderately increased vulnerability is possible in the age group 65 years and older and these vulnerabilities are considered in the rating of the significance of health impacts				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Short-term	2	Construction duration provided as 36 months	**3**
Extent	Low	1	Only the closest community receptors are likely to be impacted	**Low**
Magnitude	Small	0	The AQI indicates that mitigation measures should be implemented, but are not expected to have a significant effect on the off-site (community) air quality impact. There are no residences within the relevant AQI area. Even if there had been residential exposure, the concentrations are not in the range associated with an impact on community health.	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to VOCs, assessed as benzene, is indicated as negligible (unlikely)	
Proposed mitigation measures:				
» Adherence to a regular vehicle maintenance programme, in order to limit VOC emissions.				
Post Mitigation / Enhancement Measures				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Short-term	2	Construction duration provided as 36 months	**3**
Extent	Low	1	Only the closest community receptors are likely to be impacted	**Low**

Magnitude	Small	0	The exposure concentrations are highly unlikely to be in the range associated with an impact on community health, even in the sensitive age groups.	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to VOCs is indicated as negligible (unlikely)	
Residual Impacts Expected to be insignificant if mitigation measures are properly implemented.				

Operation Phase

Impact rating for $PM_{2.5}$, SO_2 and CO in the operational phase				
Air concentrations of $PM_{2.5}$ and SO_2 were modelled in detail at all 95 identified community receptors by the air dispersion specialists and the health risks assessed accordingly by INFOTOX. Regarding CO, it was determined that there are no residences within the impact area delineated by the results of air dispersion modelling. The impacted area is mostly within Zone 1F of the RBIDZ, within agricultural fields and covering only a small are within the light industrial area just to the north of the RBIDZ boundary. It is INFOTOX's considered opinion that, although daily concentrations were not calculated, the 99th percentile of the daily concentrations at even the closest receptor or residential area is likely to not be higher than background concentrations, or that the difference from background concentrations would be so slight as to be of no practical significance as far as risks to health are concerned.				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**4**
Extent	Low	1	Only local community receptors are impacted	**Low**
Magnitude	Small	0	The AQI indicates that mitigation measures should be implemented, but are not expected to have a significant effect on the off-site (community) air quality impact. The assessed health risks are in the negligible range and do not indicate any reason for concern with regard to human health effects as a consequence of the foreseen operational activities at the Phakwe power plant. This is valid even for the sensitive age groups.	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to $PM_{2.5}$, SO_2 and CO is indicated as negligible (unlikely).	
Proposed mitigation measures:				
» Implement mitigation as described in the Air Quality Impact Assessment » Turbine maintenance as per manufacturers recommendations. » A move to hydrogen fuel as soon as practically possible.				
Post Mitigation / Enhancement Measures				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Short-term	4	Indicative power purchase agreement is for 20+ years	**4**
Extent	Low	1	Only local community receptors are impacted	**Low**
Magnitude	Small	0	The assessed health risks are in the negligible range and do not indicate any reason for concern with regard to human health effects as a consequence of the foreseen operational activities at the Phakwe power plant. This is valid even for the sensitive age groups.	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to $PM_{2.5}$, SO_2 and CO is indicated as negligible (unlikely).	
Residual Impacts Expected to be insignificant if mitigation measures are properly implemented.				

Impact rating for NO_2 in the operational phase				
NO_2 air concentrations at all 95 identified community receptors were reported in detail by the air dispersion specialists (Appendix G) and the health risks assessed accordingly by INFOTOX (Appendix H),				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**14**
Extent	Low	1	Only local community receptors are impacted	**Low**
Magnitude	Minor	2	The AQI indicates that mitigation measures should be implemented, but are not expected to have a significant effect on the off-site (community) air quality impact. The HHRA indicates health risks in the range viewed as very low to negligible and cannot be interpreted as indicating a significant or serious risk to health. This is valid even for the sensitive age groups.	
Probability	Improbable	2	The risk of health effects is indicated as very low to negligible.	
Proposed mitigation measures:				
» Implement mitigation as described in the Air Quality Impact Assessment » Turbine maintenance as per manufacturers recommendations. » A move to hydrogen fuel as soon as practically possible.				
Post Mitigation / Enhancement Measures				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**14**
Extent	Low	1	Only local community receptors are impacted	**Low**
Magnitude	Minor	2	The HHRA indicates health risks in the range viewed as very low to negligible. This is valid even for the sensitive age groups	
Probability	Improbable	2	The risk of health effects is indicated as very low to negligible.	
Residual Impacts Expected to be insignificant if mitigation measures are properly implemented.				

Impact rating for VOCs in the operational phase				
VOCs are associated with the gas turbine operations (Bird and Von Gruenewaldt 2022). The air dispersion specialists have determined that there are no residences within the relevant AQI area. However, even if there had been residential exposure in the impact area, the concentrations are not in the range associated with an impact on community health, even when the health vulnerabilities of the receptor communities are considered.				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**5**
Extent	Low	1	Only the closest community receptors are likely to be impacted	**Low**
Magnitude	Small	0	The AQI indicates that mitigation measures should be implemented, but are not expected to have a significant effect on the off-site (community) air quality impact. There are no residences within the relevant AQI area. Even if there had been residential exposure, the concentrations are not in the range associated with an impact on community health.	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to VOCs, assessed as benzene, is indicated as negligible (unlikely).	
Proposed mitigation measures:				

» Implement mitigation as described in the Air Quality Impact Assessment » Turbine maintenance as per manufacturers recommendations. » A move to hydrogen fuel as soon as practically possible.				
Post Mitigation / Enhancement Measures				
	Rating Without mitigation		**Motivation**	**Significance**
Duration	Long-term	4	Indicative power purchase agreement is for 20+ years	**5**
Extent	Low	1	Only the closest community receptors are likely to be impacted	**Low**
Magnitude	Small	0	The exposure concentrations are highly unlikely to be in the range associated with an impact on community health, even in the sensitive age groups.	
Probability	Very improbable	1	The risk of health effects occurring due to exposure to VOCs is indicated as negligible (unlikely)	
Residual Impacts Expected to be insignificant if mitigation measures are properly implemented.				

8.7.3. Implications for Project Implementation

» The assessment has been conducted with consideration of the health vulnerabilities of certain age groups in the receptor population, as indicated in the community baseline health report.
» Impacts on health associated with PM2.5, SO2, NO2, CO and VOC emissions from the proposed Phakwe power plant project during the construction, operational and decommissioning phases are assessed as of low significance, with a neutral status.
» Implementation of the proposed power plant is associated with low impact on health, even in sensitive receptor communities.

8.8. Assessment of Impacts on Climate Change

Impacts on climate change associated with the development are expected to occur mainly as a result of the operational phase. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix I** for more details).

8.8.1. Results of the Climate Change Impact Assessment

A Greenhouse Gas (GHG) inventory was calculated for the proposed Phakwe Richards Bay Gas Power 3 CCPP to quantify the effects of the project on climate change. The direct, upstream, and downstream emissions for both the construction and operational phases of the proposed Phakwe Richards Bay Gas Power 3 CCPP were considered. The direct emissions relate to onsite emissions during construction and operation (such as combustion of natural gas for the generation of electricity). The upstream emissions relate to the sourcing of materials consumed during construction and operation (such as emissions arising from manufacture of construction materials and transport-related emissions of material/fuels used onsite). The downstream emissions relate to the end of life of materials and products used (such as waste management activities).

The impact of the project on climate change was assessed in the context of both GHG emissions from the project, as well as the potential positive impact the project can have through the avoidance of emissions. The results are compared to South Africa's carbon budget for the NDC Low Emission Scenario, which was calculated as 7 760 million tons CO_2e.

The project will emit 82 $ktCO_2e$ during the construction phase, 7 870 $ktCO_2e$/year during the operational phase and 236 000 $ktCO_2e$ over its lifetime when operating on LNG (i.e. worst-case scenario). The portion of these emissions emitted inside the borders of South Africa represents 1.9% of the low emission nationally determined contribution (NDC) carbon budget calculated, for the lifetime of the project.

When considering the potential positive impact of the proposed project, the expected GHG emissions from the project will avoid emissions through the displacement of coal. In addition to this, the project will enable an increased level of intermittent renewable energy capacity to be placed onto the South African grid. The total avoided emissions are 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this, there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget.

Climate projections for the KwaZulu Natal province indicate an annual average ambient temperature increase, with overall variability in precipitation with an increasing drought risk. More specifically, Richards Bay is likely to become drier in the future with an increased risk of drought. Parts of the municipality are also predicted to experience floods due to rainfall variability, as well as tropical cyclones due to the municipality's location along the east coast of South Africa. There will be an increase in the number of extreme hot days with an average annual temperature increase of at least 1.6°C to 1.8°C from the baseline period (1961-1990).

8.8.2. Description of Climate Change Impacts

Potential impacts identified to be associated with the project include:

- The proposed Phakwe Richards Bay Gas Power 3 CCPP will result in GHG emissions from the combustion of fuel for electricity generation during operation, as well as GHG emissions related to construction activities. The decommissioning of the proposed Phakwe Richards Bay Gas Power 3 CCPP will have negligible amounts of GHG emissions. This is due to most of the material that would be landfilled (concrete and steel) not releasing any GHG emissions when landfilled.
- The impacts of climate change are likely to result in increased climate-related vulnerabilities for the proposed Phakwe Richards Bay Gas Power 3 CCPP's core operations, value chain, and social and natural environments.

8.8.3. Assessment of Impacts

Nature: The proposed Phakwe Richards Bay Gas Power 3 CCPP is a gas-to-power facility. It will combust the natural gas in a gas turbine or gas engine to generate electricity. The combustion of the natural gas will lead to direct GHG emissions from the project.

The manufacture and transport of fuels (such as the natural gas) and materials consumed (such as the steel in the turbines/engines) will also lead to the release of GHG emissions. These emissions are indirect emissions.

The emissions taken into consideration within the context of this impact assessment are all those that occur within the boundary of South Africa. This includes the direct emissions from the combustion of the natural gas and the indirect emissions relating to the manufacture of some materials consumed and some of the fugitive emissions. Phakwe Richards Bay Gas Power 3 CCPP direct and indirect GHG emissions total 4 980 $ktCO_2e$/year.

Extent (E)	5 (International)
Duration (D)	5 (Permanent)
Magnitude (M)	7 (High)
Probability (P)	5 (Definite)
Significance (S)	**85 (High)**
Mitigation: » Making use of natural gas as the fuel source for the generation of electricity is already a mitigation measure relative to the current standard of using coal as the dominant fuel source for grid electricity. » Further mitigation could be achieved by using renewable fuels, such as biomethane and green hydrogen. The extent of reduction in emissions would be directly proportional to the reduction in natural gas used.	
Residual risks: There is a low residual risk associated with the proposed Phakwe Richards Bay Gas Power 3 CCPP due to fossil fuel GHG emissions lock from the combustion of natural gas.	

Project Vulnerability to Climate Change

Vulnerability is defined as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes[21]. **Figure 8.6** indicates fire, drought and floods risks as well as extreme hot days[22] for the uMhlathuze Local Municipality, within which the Phakwe Richards Bay Gas Power 3 CCPP is located. The trends displayed in the map indicate that the uMhlathuze Local Municipality is prone to extreme hot days which are widespread throughout the municipality. These trends also support a study undertaken by Buthelezi *et al*., (2020)[23] which revealed that the uMhlathuze Local Municipality experiences variations in rainfall and temperature and these variations have resulted in drought conditions within the area.

The Phakwe Richards Bay Gas Power 3 CCPP will consume up to 1 130 000 m^3 of water per annum at base load and 755 000 m^3 per annum at mid-merit[24]. The volume of water required will be dependent on the final design of the facility as well as on the technology. The volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allocation from the uMhlathuze Municipality Water Works.

The King Cetshwayo District Municipality's (which the uMhlathuze Local Municipality falls under) Climate Change Response Plan[25] as also reported that the uMhlathuze Local Municipality is prone to climate-related hazards, with fire hazards being one of the risks that the area is highly vulnerable to.

Rainfall variability is expected within the uMhlathuze Local Municipality. Due to this variability the municipality will potentially be exposed to both flooding events but also droughts. The risks mentioned above must therefore be considered within the context of the project and within the context of the vulnerability of the local municipality.

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21 IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

22 Extreme hot days are defined as summertime temperatures that are much hotter and/or humid than average (https://www.cdc.gov/disasters/extremeheat/heat_guide.html)

23 Buthelezi, N.N., Rawlins, B.K., Ilesanmi, K.D., and Oladejo, A.O., 2020: Economic Impacts of Drought on Water Users of uMhlathuze Municipality of South Africa, Journal of Human Ecology, 69(1-3):127-133.

24 Savannah Environmental, 2022: Phakwe Richards Bay Gas Power 3 Combined Cycle Power Plant (CCPP), Richards Bay, KwaZulu-Natal Province Final Scoping Report, DFFE Ref: 14/12/16/3/3/2/2117

25 Available at: https://letsrespondtoolkit.org/municipalities/kwazulu-natal/king-cetshwayo/

Climate change projections have also indicated that the east coast of South Africa may experience tropical cyclones. Severe tropical cyclones made landfall on the east coast of South Africa in the past. Under projected climate change conditions, these hazards along the east coast are likely to become more vulnerable to tropical cyclones in the future.[26]

According to the information provided by the Greenbook and uMhlathuze Local Municipality disaster risk management plan, the map presented below summarises the risks associated with uMhlathuze Local Municipality within which the Phakwe Richards Bay Gas Power 3 CCPP is located.

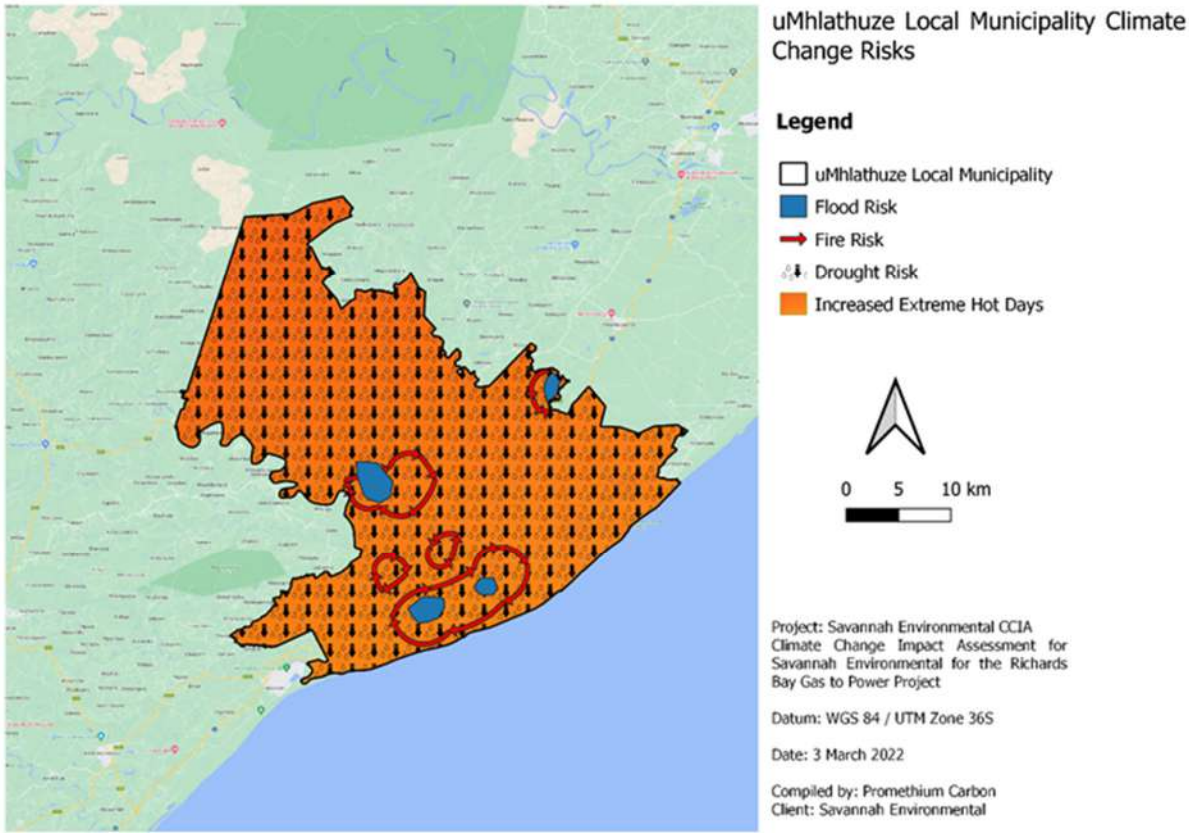

Figure 8.6: uMhlathuze Local Municipality fire, drought, extreme hot days, and flood risks

8.8.4. Project Mitigation and Adaptation Measures

Mitigation and adaptation measures will need to be addressed in terms of both the measures the proposed Phakwe Richards Bay Gas Power 3 CCPP must take to reduce its *impact on climate change*, as well as the measures needed improve the *resilience of the project to climate change*. These are discussed further below.

[26] Green, A.N., Cooper, J,A,G, Louriero, C., Hahn, A., and Zabel, M., 2021: Stormier mid-Holocene southwest Indian ocean due to poleward trending tropical cyclones, Natural Geoscience, 15, 60-66.

i) Measures to reduce the impact of the Project on Climate Change

The Phakwe Richards Bay Gas Power 3 CCPP would need to reduce it GHG emissions over its lifetime to reduce its impacts on climate change. There is little the project can feasibly do to achieve this. This is due to the inherent nature of the project requiring the combusting of natural gas to produce electricity.
The option to switch to renewable gaseous fuels to supplement/replace the use of natural gas is a viable GHG mitigation option. Such fuels include green hydrogen, biogas, biomethane and other fuels that are generated from renewable resources. For example, the International Renewable Energy Agency predicts that green hydrogen will become competitive with the use of fossil fuels in the near- to medium-term future[27]. According to the International Energy Association, South Africa has access to enough solar and wind resources to produce hydrogen at less than 2.5USD/kg H_2 throughout most of South Africa[28].

GHG emissions from the combustion of renewable fuels are accounted for as zero due to the short-cycle nature of these emissions. Thus, increasing the fraction of energy sourced from renewable fuels has a linear decrease on the amount of emissions from the proposed Phakwe Richards Bay Gas Power 3 CCPP. This is illustrated in **Figure 8.7** below.

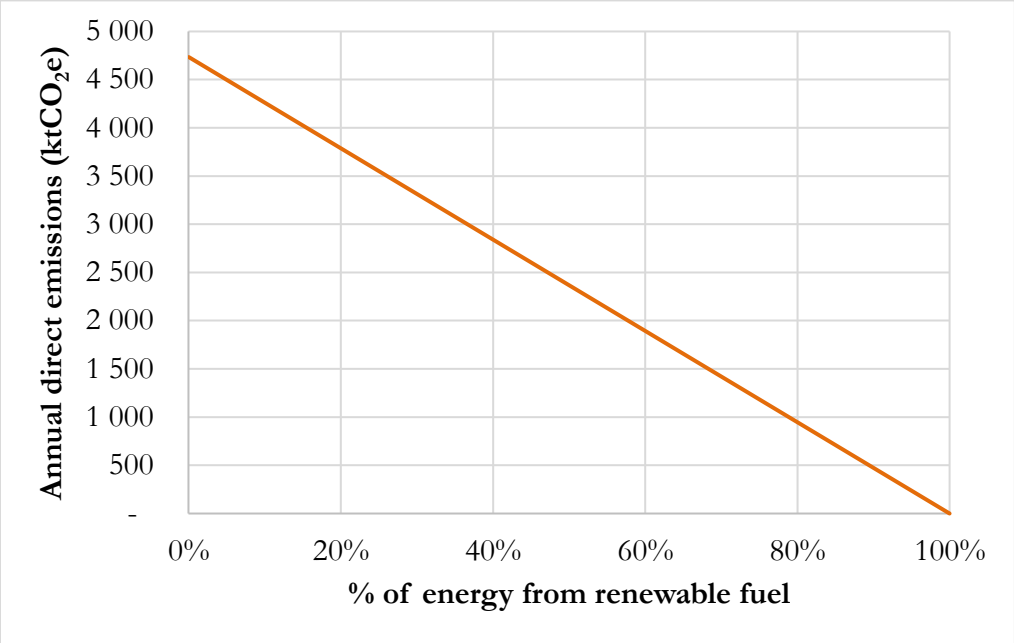

Figure 8.7: Change in emissions due to uptake of renewable fuels

ii) Adaptation Measures to Increase the Project's Resilience to Climate Change

As described in Section 8.8.3 of this report (and in Appendix I), climate change impacts are likely to influence the proposed Phakwe Richards Bay Gas Power 3 CCPP, as well as the surrounding communities and broader natural environment.

The most notable mitigation measure is to ensure that the design and layout of the plant takes into consideration the increased likelihood of severe rainfall events, as these could lead to more frequent and

[27] IRENA (2019) *Hydrogen: A Renewable Energy Perspective*. International Renewable Energy Agency, Abu Dhabi.

[28] IEA (2019) *The Future of Hydrogen: Seizing today's opportunities*. International Energy Agency.

severe localised flooding onsite. However, the details around the mitigation of this impact needs to be provided by a relevant water specialist.

The hydrological study should also consider the need for climate change impacts on surface stormwater management in the area. Stormwater infrastructure design should accommodate the likelihood for severe rainfall and extreme events. The inclusion of floodproof stormwater infrastructure should be considered where possible.

8.8.5. Implications for Project Implementation

The assessment of the climate change impact of this project has considered the impact of the project on climate change, the resilience of the project to climate change, as well as the options for mitigation of the impacts.

The impact of the project on climate change was assessed in the context of both GHG emissions from the project, as well as the potential positive impact the project can have through the avoidance of emissions. This was assuming natural gas is the only fuel used. The results are compared to South Africa's carbon budget for the NDC Low Emission Scenario, which was calculated as 7 760 million tons CO_2e.

The project will emit 82 $ktCO_2e$ during the construction phase, 7 870 $ktCO_2e$/year during the operational phase and 236 000 $ktCO_2e$ over its lifetime. The portion of these emissions emitted inside the borders of South Africa represents 1.9% of the low emission NDC carbon budget calculated, for the lifetime of the project.

When considering the potential positive impact of the proposed project, the expected GHG emissions from the project will avoid emissions through the displacement of coal. In addition to this, the project will enable an increased level of intermittent renewable energy capacity to be placed onto the South African grid. In the long-term, hydrogen can be a potential fuel source used to offset the projects carbon emissions. The total avoided emissions is 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget

The positive impact of the project on climate change with respect the avoided emissions from the coal baseline, and the potential avoided emissions through the increase of the grid to accept intermittent renewable energy far outweighs the contribution of the project to national inventory.
With respect to the resilience of the project to climate change, we found that there are no significant risk factors that should be considered in the environmental authorisation.

There are limited mitigation measures available to this proposed project, and as a result this project will be exposed to a low residual risk of lock in emissions, due to the combustion of natural gas.

In accordance with the findings of this CCIA, the specialist has concluded that the proposed Phakwe Richards Bay Gas Power 3 CCPP should not be refused environmental authorisation on climate change related issues.

8.9. Assessment of Visual Impacts

Visual impacts associated with the development are expected to occur during the construction and operational phases. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix J** for more details).

8.9.1. Results of the Visual Impact Assessment

A viewshed analysis for the proposed project was undertaken from the project components (four CCPP units), and included the following heights (offsets) above ground level:

- 10m – gas turbine power plants
- 45m – smoke stacks (minimum height)
- 90m – smoke stacks (maximum height)

This was done to determine the visual exposure (visibility) of the area under investigation, simulating the maximum height of the proposed structures and activities associated with the power plant. The results of this were combined with consideration of viewer incidence/perception and visual distance of the proposed project to formulate the visual impact index (refer to **Figure 8.8**). Here the weighted impact and the likely areas of impact have been indicated as a visual impact index.

An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a potentially negative perception (i.e. a sensitive visual receptor) would therefore have a **higher** value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential **magnitude** of the visual impact.

The index indicates that **potentially sensitive visual receptors** within a 1km radius of the power plant may experience a **very high** visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; **high** within a 1– 3km radius (where/if sensitive receptors are present) and **moderate** within a 3 – 6km radius (where/if sensitive receptors are present). Receptors beyond 6km are expected to have a **low** potential visual impact.

Likely areas of potential visual impact and potential sensitive visual receptors located within the study area are displayed on **Figure 8.8** and discussed below.

Magnitude of the potential visual impact

0 - 1km

There are no residences or public roads within a 1km radius of the proposed power plant. The VIA assumes that observers within the Alton industrial area are not opposed to the power plant. This assumption is based on the nature of the activities and structures already present within the industrial area. There were no objections lodged in response to the visual study submitted in the scoping phase in respect of the PRBGP3CCPP project.

Based on the rating methodology for the calculation of the visual impact index, there will not likely be any visual impact of a **very high** magnitude within a 1km radius of the proposed project infrastructure.

1 - 3km

The proposed project infrastructure may have a visual impact of **high** magnitude on the following observers:

Observers travelling along the following roads:

» A section of the R619 main road north-east of the proposed project site (indicated as Receptor 1 on Figure 8.8)
» A section of the East Central Arterial Road (Receptor 3) to the south-east
» A short section of the R34 arterial road to the south-east (Receptor 4)

Residents of/visitors to:

» Aquadene
» Brackenham
» Wilde-en-Weide

The visual impact is likely to be contained to the open spaces or green belts located in between the above residential areas. These are indicated as Receptor Sites 2.

3 – 6km

The proposed project infrastructure may have a visual impact of **moderate** magnitude on the following observers located within a 3 – 6km radius:

» The Insezi homestead (Whistling Woods cottages) (Receptor 5)
» The Nseleni Nature Reserve (Receptor 6)

> 6km

Potential sensitive visual receptors located beyond a 6km radius of the proposed project site is expected to have visual impacts of **low** magnitude.

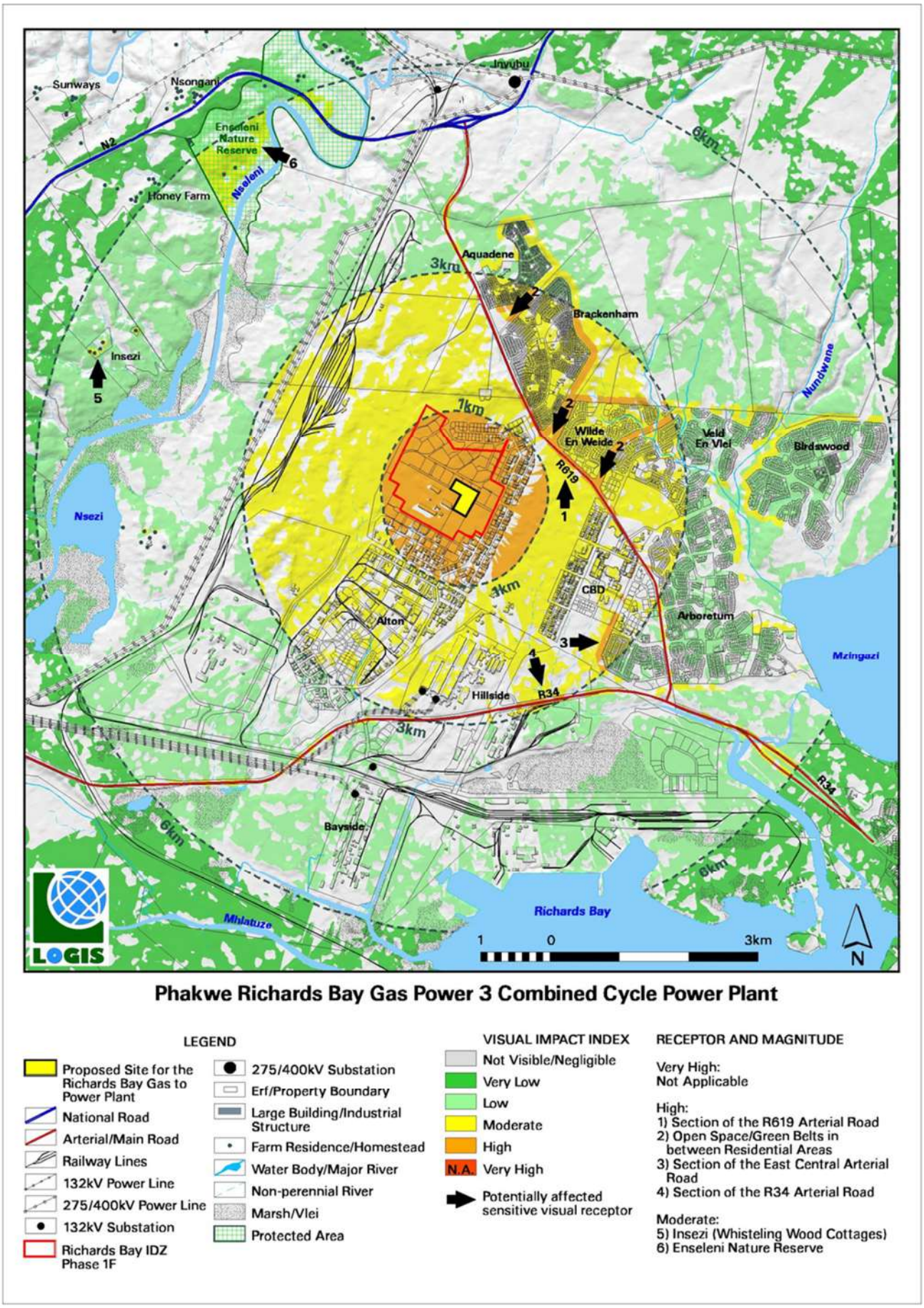

Figure 8.8: Visual impact index and potentially affected sensitive visual receptors

8.9.2. Description of Visual Impacts

Anticipated issues related to the potential visual impact of the proposed power plant and ancillary infrastructure as identified in the Scoping Phase and assessed within the EIA includes the following:

- The visibility of the facility from, and potential visual impact on observers travelling along the R619 and R34 arterial/main roads
- The visibility of the facility from, and potential visual impact on observers residing within a 3km radius of the plant (e.g. residents of Aquadene, Brachenham, Wilde-en-Weide and Arboretum).
- The visibility of the facility to, and potential visual impact on residents of farm residences located within close proximity of the site (if present).
- Potential cumulative visual impacts (or alternatively, consolidation of visual impacts) with specific reference to the location of the proposed power plant within an existing industrial area.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity to the facility.
- The visual absorption capacity of existing structures, buildings and natural or planted vegetation (if applicable) within the study area.
- The potential to mitigate visual impacts.

It is envisaged that the issues listed above may constitute a visual impact at a local and/or regional scale.

8.9.3. Assessment of Impacts

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed power plant.

During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and employees in the area. The project is expected to take between 36 and 48 months to complete.

	Without mitigation	**With mitigation**
Extent	Very Short Distance **(4)**	Very Short Distance **(4)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	**Moderate (56)**	**Moderate (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

- Retain and maintain natural vegetation immediately adjacent to the development footprint.

Construction:

- Ensure that vegetation is not unnecessarily removed during the construction phase.
- Retain and maintain natural features (e.g. rivers, wetlands, rock outcrops, etc.) and vegetation in all areas outside of the activity footprint and along the property perimeter.
- Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.

» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
» Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
» Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
» Rehabilitate all disturbed areas immediately after the completion of construction works.

Residual impacts:
None, provided rehabilitation works are carried out as specified.

Nature of Impact: Visual impact on observers within a 1km radius of the power plant

There are no residences or public roads within a 1km radius of the proposed project site

	Without mitigation	**With mitigation**
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	**Moderate (32)**	**Low (28)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.
» Consult adjacent landowners (if present) to inform them of the development and to identify any (valid) visual impact concerns.

Operations:

» Retain / re-establish and maintain large trees, natural features and noteworthy natural vegetation in all areas outside of the activity footprint.
» Retain natural pockets (wetland, river and other sensitive vegetation zones) as buffers within the property and along the perimeter.
» Introducing landscaping measures such as vegetating berms if required.
» Maintain the general appearance of the site as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.

Residual impacts:
Potential permanent scarring of the landscape if no rehabilitation is undertaken.

Nature of Impact: Potential visual impact on sensitive visual receptors within a 1 – 3km radius

The operation of the Phakwe Richards Bay Gas Power 3 CCPP is expected to have a **moderate** visual impact (significance rating = 45) on the following observers located within a 1 – 3km radius:

» A section of the R619 main road
» A section of the R34 arterial road (John Ross Parkway)
» A section of the East Central Arterial Road

» The open space/green belt areas in between Aquadene, Brackenham and Wilde-en-Weide

This impact relates mainly to the smoke stack structures that may be 45 – 90m tall, and may be visible from the above receptor sites.

	Without mitigation	**With mitigation**
Extent	Short distance **(3)**	Short distance **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Moderate (45)**	**Moderate (45)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practice management measures can be implemented.	

Generic best practise mitigation/management measures:

Planning:

» Retain and maintain natural vegetation immediately adjacent to the development footprint.

Construction:

» Ensure that vegetation is not unnecessarily removed during the construction phase.
» Retain and maintain natural features (e.g. rivers, wetlands, rock outcrops, etc.) and vegetation in all areas outside of the activity footprint and along the property perimeter.
» Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
» Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
» Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
» Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
» Rehabilitate all disturbed areas immediately after the completion of construction works.

Residual impacts:

None, provided rehabilitation works are carried out as specified.

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the power plant

	Without mitigation	**With mitigation**
Extent	Medium to longer distance **(2)**	Medium to longer distance **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	**Low (24)**	**Low (24)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, however best practice measures are recommended.	

Generic best practise mitigation/management measures:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.

Operations:

- » Retain / re-establish and maintain large trees, natural features and noteworthy natural vegetation in all areas outside of the activity footprint.
- » Retain natural pockets (wetland, river and other sensitive vegetation zones) as buffers within the property and along the perimeter.
- » Introducing landscaping measures such as vegetating berms.
- » Avoid the use of highly reflective material.
- » Metal surfaces, where they occur, should be painted in natural soft colours that would blend in with the environment.
- » Maintain the general appearance of the site as a whole.

Decommissioning:

- » Remove infrastructure not required for the post-decommissioning use.
- » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
- » Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.

Residual impacts:
Potential permanent scarring of the landscape if no rehabilitation is undertaken.

Nature of Impact: Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed power plant.

Lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions and which are visible over long distances.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow.

Mitigation of direct lighting impacts and sky glow entails the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the power plant and the ancillary infrastructure (e.g. workshop and storage facilities) will go far to contain rather than spread the light.

	Without mitigation	**With mitigation**
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	**Moderate (48)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

- » Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).
- » Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights.
- » Make use of minimum lumen or wattage in fixtures.
- » Make use of down-lighters, or shielded fixtures.
- » Make use of Low Pressure Sodium lighting or other types of low impact lighting.
- » Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
- » Lighting should be kept to a minimum wherever possible.

- » Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the activity – this is especially relevant where the edge of the activity is exposed to residential properties.
- » Wherever possible, lights should be directed downwards to avoid illuminating the sky.
- » Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on movement.

Residual impacts:
The visual impact of lighting will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Visual impact of the ancillary infrastructure during the operational phase on observers in close proximity to the structures.

On-site ancillary infrastructure associated with the power plant includes internal access roads, a workshop, office buildings, etc.

No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the power plant operations. The anticipated visual impact resulting from this infrastructure is likely to be of **low** significance both before and after mitigation.

	Without mitigation	**With mitigation**
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	**Low (24)**	**Low (24)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Generic best practise mitigation/management measures:

Planning:

- » Retain/re-establish and maintain natural vegetation immediately adjacent to the power plant.

Operations:

- » Maintain the general appearance of the infrastructure.

Decommissioning:

- » Remove infrastructure not required for the post-decommissioning use.
- » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual impacts:
The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: The potential impact on the sense of place of the region.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a mixed rural and developed character, with limited natural land remaining due to forestry, sugar cane cultivation and industrial developments. The areas considered to have a higher visual quality within the region are predominantly associated with the Indian Ocean seaboard. These are not expected to be influenced by the power plant development.

The anticipated visual impact of the proposed power plant on the overall regional visual quality, and by implication, on the sense of place, is generally expected to be of **low** significance. This is due to the transformed nature and industrial developments already present at and surrounding the proposed development site.

	Without mitigation	**With mitigation**
Extent	Long Distance **(1)**	Long Distance **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	**Low (18)**	**Low (18)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Generic best practise mitigation/management measures:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the power plant.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual impacts:

Potential permanent scarring of the landscape if no rehabilitation is undertaken.

The potential to mitigate visual impacts

The primary visual impact, namely the appearance of the power plant (gas turbines, heat recovery steam generators, steam turbines, smoke stacks, etc.) is not possible to mitigate. The functional design of these project components cannot be changed to reduce visual impacts.

The following mitigation measures are however possible and are recommended during the construction, operational and decommissioning phases:

» It is recommended that vegetation cover (i.e. either natural or cultivated) immediately adjacent to the development footprint be maintained, both during construction and operation of the proposed facility. This will minimise the visual impact of cleared areas and areas denuded of vegetation.
» Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. The construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.
» In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible.
» Mitigation of lighting impacts includes the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the proposed power

plant and ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include the following:
  - » Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
  - » Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
  - » Making use of minimum lumen or wattage in fixtures;
  - » Making use of down-lighters, or shielded fixtures;
  - » Making use of Low Pressure Sodium lighting or other types of low impact lighting.
  - » Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
- » Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:
  - » Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
  - » Reduce the construction period through careful logistical planning and productive implementation of resources.
  - » Plan the placement of laydown areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
  - » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
  - » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
  - » Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
  - » Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
  - » Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
- » During operation, the maintenance of the power plant and ancillary structures and infrastructure will ensure that the power plant does not degrade, therefore avoiding aggravating the visual impact.
- » Roads (if not paved) must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as and when required.
- » Once the power plant has exhausted its life span, all infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.
- » All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.
- » Secondary impacts anticipated as a result of the proposed power plant (i.e. visual character and sense of place) are not possible to mitigate.
- » Where sensitive visual receptors (if present), are likely to be affected it is recommended that the developer enter into negotiations with the property owners regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.
- »

Good practice requires that the mitigation of both primary and secondary visual impacts, as listed above, be implemented and maintained on an ongoing basis.

8.9.4. Implications for Project Implementation

The development and operation of the proposed Phakwe Richards Bay Gas Power 3 CCPP and its associated infrastructure is not expected to have a significant visual impact within the larger study area. The location of the proposed power plant within an established industrial area is in line with the principle of consolidating industrial infrastructure within allocated areas. It is also not expected to significantly increase the potential cumulative visual impacts of industrial developments within the region, given the existing industrial nature of the port of Richards Bay, the Alton industrial area and the RB IDZ Phase 1F developments, and the planned port expansion endeavours.

Overall, the significance of the visual impacts (should any occur) is expected to range from **moderate** to **low** as there are no known potential sensitive visual receptors within close proximity of the proposed development. There are no residences located within a 1km radius of the proposed development and no tourist attractions or tourist routes that would be significantly impacted.

A number of mitigation measures have been proposed. Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should be implemented and maintained throughout the construction, operational and decommissioning phases of the proposed power plant.

If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the development of the Phakwe Richards Bay Gas Power 3 CCPP would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

8.10. Noise Impacts

Impacts on ambient noise levels associated with the development could potentially occur during the construction and operational phases. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix K** for more details).

8.10.1. Results of Noise Impact Assessment

An assessment of the site was done using available aerial images (GoogleEarth®) to identify potential dwellings that could be considered to be noise-sensitive developments (NSD). The site was visited in July 2020 to confirm the status of these NSD, with the identified NSD indicated on **Figure 8.9**.

Also indicated on this figure are generalised 500, 1000 and 2 000m buffer zones. Generally, normally, noises from such industrial activities:

- are limited to a distance of less than 500m from active access roads, though this would normally be less than 200m with low traffic volumes and speeds associated with such roads (night-time impacts). This can be increased to a distance of 1,000m, normally associated with very busy roads (such as a busy national road where average speeds exceed 100km/h);
- are significant and clearly audible within 500m, with receptors staying within 500m from activities being able to detect the change in ambient sound levels with potential complaints about the noise levels;
- are generally clearly audible, but the noise impact is limited to a distance of approximately 1,000m from the active industrial activities. Ambient sound levels are increased due to noises from the industrial

activities, with the potential noise impact measurable and audible. Noise levels from such industrial activities are generally less than 45 dBA further than 1 000m from these activities;
» are generally audible up to a distance of 2 000m at night and may be audible up to 4 000m during very quiet periods at night with certain meteorological conditions; and
» are normally of a low concern at distanced greater than 2 000m from activities at night (though it may be audible up to 4 000m during very quiet periods).

8.10.2. Description of Noise Impacts

Construction Phase:
It is estimated that construction will take approximately 36 - 48 months, with mobile equipment and activities generating the maximum noises only 50% of the time. Construction activities will take place at various locations, at different times, with equipment operating under different loads (generating different noise levels).

Operation Phase:
The major noise sources for a typical most combine-cycle gas turbine (CCGT) power plants are the air-cooled condenser (ACC), the steam turbine generator (STG), the inlet filter house (IFH), the exhaust stack as well as the heat recovery steam generator (HRSG) (Significant temporary noises are also created during start-up due to high-pressure steam flowing through the piping, though this will not be the subject of this assessment).

The combustion turbine and generator (CTG) are typically housed in weather enclosures (typical also incorporating acoustical treatment) which significantly decrease noise emissions. This is not to suggest that other balance-of-plant (BOP) equipment does not generate noise, as the cumulative effect of fuel gas compressors, air compressor skids, boiler feedwater pumps, lube oil coolers, and other equipment can also have a profound effect on far-field noise levels. Significant noise source that generally contribute more than 80% of the noise include:
» The ACC (or Cooling Tower) - a major noise source, primarily due to the cumulative effect of a bank of fans located between 4 to 10 meters above ground level. For mitigation, options include fan selection (larger, slower-turning fans), fan deck acoustic barrier walls and air inlet acoustic baffles;
» The Exhaust Stack and HRSG – often the primary noise source, with noise generated by turbulent exhaust gases exiting the stack, the vibrating casing and various BOP equipment associated with the HRSG. Vertical silencers in the stack, horizontal silencers within the HRSG are typically used to mitigate noise caused by the exhaust stream itself with acoustical lagging and thicker casing material used to reduce this noise source;
» The STG – consisting of the steam turbine, the steam generator, condenser and condensate pumps. This equipment is normally protected from the elements inside an enclosure, typically treated acoustically to reduce noise levels.

Traffic
A potential significant source of noise during both the construction and operational phases are additional traffic to and from the site, as well as traffic on the site. Being an industrial area close to busy main roads with significant traffic, these potential noise sources will not be investigated. Due to a relative short impact associated with shift changes, the potential impact from increased traffic will not be considered

Figure 8.9: Aerial image indicating potentially noise-sensitive receptors close to the proposed project focus area

8.10.3. Assessment of Impacts

Construction Phase

Nature of Impact: Noise Impact Assessment: Potential day-time construction activities

Precautious approach, with daytime ambient sound level measurements indicating noise levels typical of a suburban noise district, though it should be noted that measurements were collected further from the R619 road. Ambient sound levels closer to the R619 will be higher. Considering the developmental character, a rating level typical of an urban noise district will be assumed (55 dBA). The projected noise levels, the potential change in ambient sound level as well as the potential significance are expected to be low for the daytime period for all the NSDs identified.

Impact description: Increase in ambient sound levels in the noise-sensitive residential areas north-east of the project site.

Prior to Mitigation			
	Rating	**Motivation**	**Significance**
Magnitude	Minor (2)	Construction noises will not change the ambient sound levels during the day.	**Low (6)**
Duration	Short-term (2)	The noise impact relating to construction phase will last 1 – 5 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1 000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	

Mitigation / Management Measures

Mitigation:
Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.

Post Mitigation			
	Rating	**Motivation**	**Significance**
Magnitude	Minor (2)	Construction noises will not change the ambient sound levels during the day.	**Low (6)**
Duration	Short-term (2)	The noise impact relating to construction phase will last 1 – 5 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1,000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	

Residual Risks:
Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.

Nature of Impact: Noise Impact Assessment: Potential night-time construction activities

Precautious approach, with night-time ambient sound level measurements indicating noise levels typical of an urban noise district, though it should be noted that measurements were collected further from the R619 road. Ambient sound levels closer to the R619 will be higher. Considering the developmental character, a rating level typical of an urban noise district will be assumed (45 dBA). The projected noise levels, the potential change in

ambient sound level as well as the potential significance are expected to be low for the night-time period for all the NSDs identified.

Impact description: Increase in ambient sound levels in the noise-sensitive residential areas north-east of the project site.

Prior to Mitigation			
	Rating	**Motivation**	**Significance**
Magnitude	Minor (2)	Construction noises will not change night-time ambient sound levels.	**Low (6)**
Duration	Short-term (2)	The noise impact relating to construction phase will last 1 – 5 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1,000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	

Mitigation / Management Measures

Mitigation:
Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.

Post Mitigation			
	Rating	Motivation	Significance
Magnitude	Minor (2)	Construction noises will not change night-time ambient sound levels.	**Low (6)**
Duration	Short-term (2)	The noise impact relating to construction phase will last 1 – 5 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1,000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	

Residual Risks:
Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.

Operation Phase:

Nature of Impact: Noise Impact Assessment: Potential daytime operational activities

Precautious approach, with daytime ambient sound level measurements indicating noise levels typical of a suburban noise district, though it should be noted that measurements were collected further from the R619 road. Ambient sound levels closer to the R619 will be higher. Considering the developmental character, a rating level typical of an urban noise district will be assumed (55 dBA). The projected noise levels, the potential change in ambient sound level as well as the potential significance are expected to be low for the daytime period for all the NSDs identified.

Impact description: Increase in ambient sound levels in the noise-sensitive residential areas north-east of the project site.

Prior to Mitigation			
	Rating	**Motivation**	**Significance**
Magnitude	Minor (2)	Operational noises (power generation activities) will not change the ambient sound levels during the day.	**Low (8)**

Duration	Long-term (4)	The noise impact relating to the operational phase can last up to 25 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1 000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	
Mitigation / Management Measures			
Mitigation: Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.			
Post Mitigation			
	Rating	**Motivation**	**Significance**
Magnitude	Minor (2)	Operational noises (power generation activities) will not change the ambient sound levels during the day.	**Low (8)**
Duration	Long-term (4)	The noise impact relating to the operational phase can last up to 25 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1 000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	
Residual Risks: Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.			

Nature of Impact: Noise Impact Assessment: Potential night-time operational activities Precautious approach, with night-time ambient sound level measurements indicating noise levels typical of an urban noise district, though it should be noted that measurements were collected further from the R619 road. Ambient sound levels closer to the R619 will be higher. Considering the developmental character, a rating level typical of an urban noise district will be assumed (45 dBA). The projected noise levels, the potential change in ambient sound level as well as the potential significance are expected to be low for the night-time period for all the NSDs identified.			
Impact description: Increase in ambient sound levels in the noise-sensitive residential areas north-east of the project site.			
Prior to Mitigation			
	Rating	**Motivation**	**Significance**
Magnitude	Minor (2)	Operational noises (power generation activities) will not change night-time ambient sound levels.	**Low (8)**
Duration	Short-term (2)	The noise impact relating to the operational phase can last up to 25 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1,000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	
Mitigation / Management Measures			

Mitigation: Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.			
Post Mitigation			
	Rating	**Motivation**	**Significance**
Magnitude	Minor (2)	Operational noises (power generation activities) will not change night-time ambient sound levels.	**Low (8)**
Duration	Short-term (2)	The noise impact relating to the operational phase can last up to 25 years.	
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local (2)	The noise impact would extent from the site, potentially as far as 1 000m.	
Probability	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSD.	
Residual Risks: Significance of the construction noise impact is **low** for the scenario as conceptualized and additional mitigation measures are not required.			

8.10.4. Implications of Project Implementation

Potential scenarios were conceptualized for the future proposed construction and operational phases, with the output of the modelling exercise indicating a potential noise impact of low significance for both the day- and night-time periods for all the project phases. No mitigation or management measures are required or recommended to reduce noise levels (when considering Environmental Noise). The power generation facility still has to comply with the relevant Health and Safety Regulations and Guidelines that my stipulate periodic noise monitoring (Noise-Induced Hearing Loss Regulations [GNR 307 of 2020] as well as the Occupational Health and Safety Act, 1993 [Act 85 of 1993]).

Similarly, no additional acoustic studies are recommended for this development, and it will not be required to develop or implement an environmental noise monitoring programme considering:

» the developmental character of the area;
» the results from the night-time ambient sound level measurements;
» the projected low significance of the noise impacts

It is therefore recommended that the proposed 2 000MW Phakwe Gas to Power Project be authorized from an acoustic perspective.

8.11. Assessment of Socio-economic Impacts

Impacts on the socio-economic environment associated with the development are expected to occur during both the construction and operation phases of the project. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix L** for more details).

8.11.1. Results of the Socio-economic Impact Assessment

The construction activities in establishing the Phakwe Richards Bay Gas Power 3 CCPP will generate positive social and economic impacts. The construction activities will trigger several direct, indirect, and induced

activity in the economy through the new demands that are generated for goods and services that did not exist before.

The operation of the Phakwe Richards Bay Gas Power 3 CCPP will have a positive economic impact on not only the local economy of the City of uMhlathuze LM but also on the national economy (South Africa). The technology proposed has the twofold benefit of providing quick to market electricity desperately needed to meet the power demands in the RSA and secondly, in assisting with the stabilisation of the national grid to allow for some industry to reopen and grow.

The electricity generated from the Phakwe Richards Bay Gas Power 3 CCPP will feed into the national power supply electric grid which would help stabilise power supply and increase capacity. This would significantly reduce demand pressure on ESKOM thus alleviating load shedding. Further, with the improved power supply and energy efficiency, this may bring the cost of electricity down allowing some new industries to open or to reopen.

8.11.2. Description of Socio-economic Impacts

Potential social impacts are expected to occur during both construction and operation and are expected to include:

- Community impacts, including impacts on sense of place, air quality and traffic
- Demographic and gender impacts
- Crime impacts
- Health, mental health and psychological impacts
- Impacts on social and human capital
- Infrastructural impacts
- Natural resources and other community environmental factors
- Political impacts (human rights, governance, democratisation etc)
- Impacts on poverty levels (through creation of employment opportunities)
- Land use impact

Economic Impacts
The economic impacts of the PRBGP3 are derived through the application of the National Input-Output (IO) model based on both the capital outlay for the development of the PRBGP3 and the operational expenditure costs associated with the PRBGP3 as reported in the cost breakdown provided.

It is important to note that this socio-economic impact assessment only addresses the SA component that is expenditure taking place in SA. The expenditure associated with other capital equipment that will be imported are not accounted for in this assessment. The economic benefits of the imported plant and equipment will accrue to those countries from which they are imported or manufactured and are excluded in this assessment.

The plant's CAPEX and OPEX figures respectively are classified into the respective expenditure SIC Code[29] classifications and are entered into the I-O Model which generated the direct and indirect impacts of the expenditure taking into account the relevant multipliers for each individual expenditure item.

[29] SIC is the Standardized Industrial Classification Codes published by StasSA

The economic impact assessment isolates Phakwe Richards Bay Gas Power 3 CCPP's impact on:

» Increases in Production generated in the economy
» Contribution to Gross Value Add (GVA)
» Contribution to Employment Creation
» Contribution to Business Income levels retained in the economy

8.11.3. Assessment of Impacts

i) Social Impacts

Nature: **[Community Impacts]**			
Impact description: Community impacts relate to impacts which affect a community's sense of place which is developed over time. The sense of place is created through the interaction of a number of different factors such as the areas visual resources, its air quality, climate, noise levels, culture and heritage as well as the lifestyle of individuals that live in and visit the area.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period will last for a period three years.	**Low Negative (10)**
Extent	Local (1)	There will likely be negative community impacts on areas surrounding the proposed development.	
Magnitude	Low (4)	The increase in level of air pollution, noise pollution and negative visuals from the establishment are not expected to be major since the site is located in a well-developed industrial area.	
Probability	Probable (3)	The possibility of the negative impact on pollution and visual affects is likely to take place.	
Mitigation/Enhancement Measures			
Mitigation: The community impacts have to be mitigated to reduce any negatives on the community as a result of the proposed development. Landscaping and trees could be planted around the development to reduce negative visual effects from the development and to encourage sustainable environment friendly operations.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	Pressure will only be added on the local municipality as the plant will be operational in the uMhlathuze Local Municipality area.	**Low Negative (6)**
Extent	Local (1)	The negative visual effect and the pollution levels can be mitigated by planting trees around the plant establishment.	
Magnitude	Low (1)	The possibility of the air, visual and noise impacts on the surrounding land uses is very low since the site is located in an IDZ.	

Probability	Improbable (1)	A reduced amount of pressure will be added on the local municipality to enforce measures to fight pollution.	

Nature: **[Population Levels]**			
Impact description: With anticipated employment opportunities being created from the proposed development, there is a possibility of there being an influx of job seekers relocating to residential areas near the site in search if job opportunities. This might add pressure and increase the need for basic service delivery.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period will last for a period three years.	**Low Negative (10)**
Extent	Local (1)	There will likely be an increase in population numbers on residential areas surrounding the proposed development.	
Magnitude	Low (4)	The increase in population numbers should not be extensive as workers will primarily be sourced from the local communities.	
Probability	Probable (3)	The possibility of the impact on the population numbers is very low	
Mitigation/Enhancement Measures			
Mitigation: The increase population numbers have to be mitigated to avoid a situation where there is added pressure on limited resource.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	The construction of the plant will take place over three years.	**Low Negative (7)**
Extent	Local (1)	The extent of the impact will be at a local municipal level as any changes in the population size of the will affect the demographics of uMhlathuze.	
Magnitude	Minor (2)	To reduce the magnitude of the population levels increase, mitigation measures such as prioritising local workers for employment should be applied	
Probability	Improbable (2)	Focusing on local employees will be reduce the probability of there being a increase in the population levels of the area.	

Nature: **[Crime Levels]**
Impact description: With an increase in the number of job seekers moving close to the proposed development site, there is a possibility of there being an increase in the crime levels in the area as some individuals will not be able to find employment and might find themselves engaging in illegal activities to earn a living.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Short-term (2)	The construction period will last for three years	**Low Negative (10)**
Extent	Local (1)	Crime levels might rise in the areas surrounding the site as more people move closer to the plant in search of job opportunities	
Magnitude	Low (4)	The magnitude of this impact is expected to be low since the immediate surrounding land uses are industrial property	
Probability	Probable (3)	The probability of this impact taking place is low	
Mitigation/Enhancement Measures			
Mitigation: The impact of potential rising crime levels must be mitigated so as to ensure that crime does not overshadow the positive impacts of this development, and hence deter investment to the region.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	The duration of the construction will be three years	**Low Negative (7)**
Extent	Local (1)	The extent of the impact is expected to be local	
Magnitude	Minor (2)	The magnitude of potential crime levels can be reduced by ensuring that there is good security measure on the premises of the plant.	
Probability	Improbable (2)	The probability of crime increased crime levels in the area is low	

	Rating	Motivation	Significance
Nature: **[Standard of Living]**			
Impact description: With increase pressure on basic services as well as increased crime levels, the standard of living in the residential areas close to the proposed development would like fall and some households might move away from these residential areas.			
Prior to Mitigation			
Duration	Long-term (4)	The operational phase of the plant is expected to last for 20 years	**Low Negative (12)**
Extent	Local (1)	Pressure will only be added on the local municipality since the plant's workforce and operations will be focused on the local municipal level.	
Magnitude	Low (4)	The magnitude of this impact is expected to be low	
Probability	Probable (3)	The probability of this impact taking place will not be substantial	
Mitigation/Enhancement Measures			
Mitigation: Any negative impacts on the standard of living in the area as a result of this proposed project need to be mitigated			

Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	The plant is expected to operate for 20 years before decommissioning.	**Low Negative (9)**
Extent	Local (1)	The extent of this impact is expected to be local since the plant's operations are expected to be focused in uMhlathuze Local Municipality.	
Magnitude	Minor (2)	To mitigate the magnitude of the impact occurring, proper employment procedures have to be followed with workers being part of a relevant labour union to ensure that their concerns are addressed. This would assist in ensuring that there standard of living of the workers does not deteriorate over the 20-year lifecycle of the plant	
Probability	Improbable (2)	Given the nature of the plant and the important role it will play at a national level, the probability of standards of living deteriorating when proper employment measures are followed is low.	

ii) Economic Impacts

Nature: **[Employment Creation]**			
Impact description: The construction of the PRBGP3 will result in the creation of short-term opportunities in the local community			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period will last for a period of 3 years	**Low Positive (11)**
Extent	Local (1)	Pressure will only be added on the local municipality as a total 600 jobs are expected to be created directly from the construction of the plant.	
Magnitude	Low (4)	The increase in demand for employees will not result in noticeable employment changes in the local economy since South Africa is still experiencing high levels of unemployment.	
Probability	Highly Probable (4)	The possibility of the impact on employment creation in the region is highly probable as the plant infrastructure will have to be build before the plant can begin its operations.	
Mitigation/Enhancement Measures			
Mitigation: Given the positive nature of the above discussed impact, there is no need to implement any measures to reduce this impact. The construction of the plant will create much needed employment opportunities. This impact can be enhance through the creation of youth internship opportunities to train and transfer skills to unemployed youth. This would improve			

the chances of these youth to be absorbed in the mainstream economy as they would have been trained in a particular skill.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	The construction period will last for a period of 3 years	**Low Positive (12)**
Extent	Local (2)	A substantial portion of the workers employed during the construction of the plant will be those from the local municipality	
Magnitude	Low (4)	The magnitude of this impact can be enhanced through the creation of youth internship opportunities to train and transfer skills to unemployed youth	
Probability	Highly Probable (4)	The possibility of the impact on employment creation in the region is highly probable as the plant infrastructure will have to be built before the plant can begin its operations.	

Nature: **[Increase Gross Value Add (GVA)]**			
Impact description: The process of constructing the PRBGP3 will result in greater economic activity in the region which will largely impact the region at which the plant is based.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period will last for a period of 3 years	**Low Positive (12)**
Extent	Regional (3)	Given the nature of the proposed plant and its role to society, the regional gross value add will be positively impacted by the construction and operation of the plant.	
Magnitude	Low (4)	The magnitude of the GVA impact from the proposed development will be low. will be low since there are large of.	
Probability	Probable (3)	The possibility of the impact on GVA creation in the region will be highly probable if the plant is developed.	
Mitigation/Enhancement Measures			
Mitigation: Increase in GVA is a positive impact. South Africa is currently experiencing constrained energy resource.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	The construction period will last for a period of 3 years	**Low Positive (12)**
Extent	Regional (3)	The impact of GVA from the proposed plant might also contribute at a national level as material and equipment used in constructing the plant will likely be	

		sourced from other South African provinces.	
Magnitude	Low (4)	The magnitude of the GVA impact from the proposed development will be low.	
Probability	Probable (3)	The possibility of the impact on GVA creation in the region will be highly probable during the development of the plant.	

Nature: **[Property Values]**			
Impact description: The operation of the highly technical power plant which uses an advanced method of energy generation will have a positive impact on the property values of surrounding establishments.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	The operational period of the plant will last for 20 years.	**Low Positive (10)**
Extent	Local (1)	There will likely be a positive impact on property values for neighbouring establishments.	
Magnitude	Minor (2)	The magnitude of the property values impact from the proposed development will be very low and mainly focused on the property values surrounding the site.	
Probability	Probable (3)	The possibility of the impact on the property values is likely to occur since the property will be developed in a area which is surrounded by other establishments.	
Mitigation/Enhancement Measures			
Mitigation: To further enhance this impact, the local municipality of uMhlathuze could develop an investment strategy with the intention of attracting more investors to the region.			
Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	The operational period of the plant will last for 20 years.	**Low Positive (12)**
Extent	Local (1)	There will likely be a positive impact on property values for neighbouring establishments.	
Magnitude	Low (4)	Marketing the various developments and investments attracted to the site might attract further investment and enhance the value of property in the area. This would enhance this positive impact.	
Probability	Probable (3)	The possibility of the impact on the property values is likely to occur since the property will be develops in a area which is surrounded by other establishments.	

8.11.4. Implications for Project Implementation

the proposed development will result in both negative and positive impacts. All identified economic impacts will be positive and some social identified impacts are negative in nature. The following main conclusions are reached from the specialist study undertaken:

- South Africa is experiencing high energy demand and as a result of the gap between the high demand and low supply there has been continued load-shedding and therefore a need for additional electricity supply.
- High dependence on coal as an energy source has attracted growing national and international criticism due to greenhouse gas emissions the contribute significantly to climate change and air pollution. Due to the impact of coals as energy source there is a need for South Africa to diversify the sources of electricity generation.
- The proposed Phakwe Richards Bay Gas Power 3 CCPP and its associated infrastructure which is to be located at the Richards Bay IDZ Phase 1F, aims to supply natural gas-based electricity which is less harmful to the environment when compared to coal produced energy.
- The socio-economic impact assessment in this report focuses on the social impacts which are likely to arise from the development of the proposed plant as well as the various economic impacts which might arise from the proposed development. Under the social impacts, several the impacts have been identified as being negative and these include air pollution, expected increase in noise levels, expected increase in traffic level and possible increases on the crime levels of the area.
- The mitigation measures are specific to a particular impact and these can be summarized as follows:
  - Community Impact
    - The negative visual effect and the pollution levels can be mitigated by planting trees around the plant establishment.
  - Population Levels Impact
    - To reduce the magnitude of the population levels, mitigation measures such as prioritising local workers for employment should be applied.
  - Crime Levels Impact
    - The magnitude of potential crime levels can be reduced by ensuring that there is good security measure on the premises of the plant.
  - Standard of Living Impact
    - To mitigate the magnitude of the impact occurring, proper employment procedures have to be followed with workers being part of a labour union to ensure that their concerns noted
- All identified economic impacts from the proposed development are expected to be of a positive nature and these include the following:
  - Employment creation
    - A total of 2 484 jobs are expected to be created during the construction phase of the proposed PRBGP3 and a further 157 jobs are expected to be created during the operational phase of the project. This includes direct, indirect and induced job opportunities.
  - Increase Gross Value Add
    - During the construction of and operational phases of the project, the total contribution to GVA from the plant is expected to be more than R25 Billion rands.
  - Property Values
    - The operation of the highly technical power plant which uses an advanced method of energy generation will have a positive impact on the property values of surrounding establishments.

- The Phakwe Richards Bay Gas Power 3 CCPP development also has a larger positive economic contribution in terms of contributing energy towards the national electric grid which will ease load shedding and allow reduced power costs for the reopening of industry.
- The overall status of the proposed development is considered to be positive given the high demand for energy generation in South Africa as well as other factors such as the needed jobs which will be created by this project.
- All these findings support the proposal of proceeding with the development of the Phakwe Richards Bay Gas Power 3 CCPP at the identified site in Phase 1F of the Richards Bay IDZ.

8.12. Assessment of Impacts on Traffic

Impacts on traffic associated with the development are expected to occur during both the construction and operation phases of the project. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix M** for more details).

8.12.1. Results of Traffic Impact Assessment

The proposed site is located within the Richards Bay Industrial Development Zone, a fully serviced industrial estate with prime rail, road and port access. The proposed facility will be located on an access road off Alumina Alley. The site is bounded by the R619 to the east and the R34 to the west, as shown in **Figure 8.10**.

The R34 is a 4-lane dual carriageway carrying high volumes of heavy vehicles travelling to and from the Richards Bay Port, which accommodates one of the largest liquefied petroleum gas (LPG) import terminals in South Africa. The site is deemed well located and connected for its purpose.

Figure 8.10: Aerial View of Proposed Site

The potential main access roads to the site are located off the R34 and R619 (shown in **Figure 8.11**). As traffic delays are experienced on the R619 during peak periods, the proposed access roads located off the R619 are to be avoided during peak periods. Since residential areas are located along the R619, the two proposed access roads located along the R619 viz. Alumina Alley and Gulden Gracht (shown in yellow and cyan in **Figure 8.11**) should only be used when the other potential access roads are not accessible.

The potential access roads located off the R34 viz. Western Arterial, Alumina Alley and Bullion Road are deemed the preferred access roads to the site.

Figure 8.11: Potential Main Access Roads

The proposed access point, located on the access road located off Alumina Alley, will need to be upgraded to cater for the construction vehicles and abnormal load vehicles. Generally, the road width at the access point needs to be a minimum of 8m and the access roads on site a minimum of 5m. The radius at the access points needs to be large enough to allow for all construction vehicles to turn safely. It is recommended that the access point be surfaced and the internal access roads on site remain gravel.

It is recommended that the site access be controlled via a boom and gatehouse. It is also recommended that security staff be stationed on site at the access booms during construction. A minimum stacking distance of 25m should be provided between the road edge of the external road and the boom.

8.12.2. Description of Traffic Impacts Assessment

The potential transport related impacts are described below.

Construction Phase

» Construction traffic would also lead to noise and dust pollution.

» This phase also includes the construction of roads, excavations, trenching and ancillary construction works that will temporarily generate the most traffic.

Operational Phase

During operation, it is expected that staff and security will visit the facility. Approximately 60 full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

Decommissioning Phase

This phase will result in the same impact as the Construction Phase as similar trips are expected.

8.12.3. Assessment of Impacts

Construction Phase

Nature: Traffic congestion during the construction phase and the associated noise and dust pollution			
Impact description: The impact will occur due to added pressure on the road network due to the increase in traffic associated with the transport of equipment, material and staff to site during the construction phase.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period will last between 1 – 2 years.	**Medium Negative (40)**
Extent	Local (2)	Pressure will only be added on the local road network.	
Magnitude	Moderate (6)	The increase in traffic will have a moderate impact on traffic operations.	
Probability	Highly Probable (4)	The possibility of the impact on the traffic operations is highly probable.	
Mitigation/Enhancement Measures			
Mitigation: » Stagger component delivery to site. » Reduce the construction period, if feasible. » The use of mobile batching plants and quarries near the site would decrease the impact on the surrounding road network by reducing the construction trips and the distance travelled to transport the materials to the site. » Staff and general trips should occur outside of peak traffic periods. » Regular maintenance of gravel roads (if applicable) by the Contractor during the construction phase and by Client/Facility Manager during operation phase. » Dust suppression of gravel roads during the construction phase, as required.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (1)	The construction period will last between 1 – 2 years.	**Low Negative (15)**
Extent	Local (2)	Pressure will only be added on the local road network.	
Magnitude	Low (2)	The increase in traffic will have a low impact on traffic operations.	
Probability	Probable (3)	The possibility of the impact on the traffic operations is probable.	
Residual Risks: Traffic will return to normal levels after construction is completed.			

Dust and noise pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust and noise pollution are limited to the construction period.

Operation Phase

IMPACT TABLE – OPERATION PHASE
The traffic generated during this phase will be minimal and will have not have any impact on the surrounding road network.

Decommissioning Phase

IMPACT TABLE – DECOMMISSIONING PHASE
This phase will have a similar impact as the Construction Phase i.e., traffic congestion, air pollution and noise pollution, as similar trips/movements are expected.

8.12.4. Implications for Project Implementation

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Phakwe Richards Bay Gas Power 3 (PRBGP3) 2000 MW Combined Cycle Gas to Power Plant were identified and assessed.

- The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal load vehicles was estimated and found to be able to be accommodated by the road network.
- During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately 60 full-time employees will be stationed on site (subject to change). Based on experience with similar projects, the number of full-time employees is generally low and consequently, the associated trips are negligible. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.
- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation.
- The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.
- The proposed access point, located on the access road located off Alumina Alley, will need to be upgraded to cater for the construction vehicles and abnormal load vehicles.
- As traffic delays are experienced along the R619, the access roads located off the R619 should be avoided or if necessary, used during off peak hours.
- The preferred access roads to the site are the roads located off the R34 viz. Western Arterial, Alumina Alley and Bullion Road.

The construction and decommissioning phases are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is short term i.e., the impact on the surrounding road network is temporary and the facility, when operational, will not add any significant traffic to the road network.

The development is supported from a traffic and transport engineering perspective provided that the recommendations and mitigations contained in this report are adhered to.

The potential impacts associated with the facility and associated infrastructure are acceptable from a traffic and transport engineering perspective and it is therefore recommended that the proposed facility be authorised

8.13. Quantitative Risk Assessment (Impacts associated with Unexpected Events)

Potential risk impacts and the relative significance of the impacts associated with the development of the Phakwe Richards Bay Gas Power 3 CCPP are summarised below (refer to **Appendix N**).

8.13.1. Results of the Risk Assessment (Impact of unplanned events)

The main aim of the investigation was to quantify the risks to employees, neighbours and the public with regard to the proposed Phakwe Richards Bay Gas Power 3 CCPP facility at Richards Bay.

This risk assessment was conducted in accordance with the MHI regulations and can be used as notification for the facility. The scope of the risk assessment included:

1. Development of accidental spill and fire scenarios for the facility;
2. Using generic failure rate data (for tanks, pumps, valves, flanges, pipework, gantry, couplings and so forth), determination of the probability of each accident scenario;
3. For each incident developed in Step 2, determination of consequences (such as thermal radiation, domino effects, toxic-cloud formation and so forth);
4. For scenarios with off-site consequences (greater than 1% fatality off-site), calculation of maximum individual risk (MIR), taking into account all generic failure rates, initiating events (such as ignition), meteorological conditions and lethality.

The main activity of the proposed Phakwe Richards Bay Gas Power 3 CCPP would be the generation of mid-merit power supply to the South African electricity grid. The fuel used to generate power would be LNG or the mixture of natural gas and Hydrogen, that will be delivered to site via pipeline.

The main hazards that would occur with a loss of containment of hazardous components at the proposed PRBGP3 facility in Richards Bay include exposure to:

» Thermal radiation from fires;
» Overpressure from explosions.

A risk assessment was done of each processing unit by firstly selecting a scenario and then completing consequence and outflow modelling. Consequences with possible impacts beyond the site boundary were retained for risk analysis of the unit.

The combined site risks (i.e. the summation of all risks posed by the site onto works or the public) were calculated. These are represented as Maximum Individual Risks or Societal Risks. The investigation concluded that under the current design conditions, the proposed project would be considered as a Major

Hazard Installation and would require notification in accordance with the MHI regulations. An MHI Risk Assessment should be completed prior to construction of the terminal once final designs are available.

8.13.2. Description of Risk Impacts

The following negative risk impacts, which could occur through unplanned event, have been identified and assessed for the Phakwe Richards Bay Gas Power 3 CCPP:

» Catastrophic rupture of natural gas pipeline leading to a fireball event, flammable vapour dispersion and ignition leading to flash fire thermal radiation effects and/or vapour cloud explosion overpressure effects.

8.13.3. Assessment of Impacts

Nature: Impact Assessment of natural gas pipeline

Worst case loss of containment scenario – catastrophic rupture of natural gas pipeline leading to a fireball event, flammable vapour dispersion and ignition leading to flash fire thermal radiation effects and/or vapour cloud explosion overpressure effects.

	Without Mitigation	**With Mitigation**
Extent	Low (2)	Low (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (6)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (15)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible (worst case: death)	Irreversible (worst case: death)
Irreplaceable loss of resources?	Yes (human)	Yes (human)
Can impacts be mitigated?	Yes	Yes

Mitigation:
Mitigation would include emergency response arrangements and systems, such as alarms and shutdown systems to allow for personnel to muster in case of emergency, as well as fire-fighting systems and cooperation with emergency responders. Preventive measures would include maintenance procedures to prevent the occurrence of a catastrophic loss of containment from corrosion, fire and gas detection and firewater systems to prevent escalation as well as strict control of ignition sources and other measures, which may be required according to standards such as those prescribed by the South African National Standards system.

Residual Risks:
Even with mitigation, there may be residual risk of occurrence due to failures in protection systems and break-down in procedures and documented systems.

Nature: Impact Assessment of Diesel Installations

Worst case loss of containment scenario – catastrophic rupture of diesel storage vessel leading to a pool fire with impacts not extending beyond the site boundary.

	Without Mitigation	**With Mitigation**
Extent	Low (2)	Low (1)
Duration	Very short (5)	Very short (5)
Magnitude	High (6)	High (6)
Probability	Very improbable (1)	Very improbable (1)

Significance	**Low (13)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible (worst case: death)	Irreversible (worst case: death)
Irreplaceable loss of resources?	Yes (human)	Yes (human)
Can impacts be mitigated?	Yes	Yes
Mitigation: Mitigation would include emergency response arrangements and systems, such as alarms to allow for personnel to muster in case of emergency, as well as fire-fighting systems and cooperation with emergency responders. Preventive measures would include maintenance procedures to prevent the occurrence of a catastrophic loss of containment from corrosion, fire and gas detection and firewater systems to prevent escalation, as well as strict control of ignition sources and other measures, which may be required according to standards such as those prescribed by the South African National Standards system.		
Residual Risks: Even with mitigation, there may be residual risk of occurrence due to failures in protection systems and break-down in procedures and documented systems.		

Nature: Impact Assessment of Hydrogen storage

Worst case loss of containment scenario – catastrophic rupture of hydrogen storage vessel leading to leading to a fireball event, flammable vapour dispersion and ignition leading to flash fire thermal radiation effects and/or vapour cloud explosion overpressure effects.

	Without Mitigation	**With Mitigation**
Extent	Low (2)	Low (1)
Duration	Very short (5)	Very short (5)
Magnitude	High (6)	High (6)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (13)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible (worst case: death)	Irreversible (worst case: death)
Irreplaceable loss of resources?	Yes (human)	Yes (human)
Can impacts be mitigated?	Yes	Yes
Mitigation: Mitigation would include emergency response arrangements and systems, such as alarms to allow for personnel to muster in case of emergency, as well as fire-fighting systems and cooperation with emergency responders. Preventive measures would include maintenance procedures to prevent the occurrence of a catastrophic loss of containment from corrosion, fire and gas detection and firewater systems to prevent escalation, as well as strict control of ignition sources and other measures, which may be required according to standards such as those prescribed by the South African National Standards system.		
Residual Risks: Even with mitigation, there may be residual risk of occurrence due to failures in protection systems and break-down in procedures and documented systems.		

Nature: Impact Assessment of ammonia storage

Worst case loss of containment of ammonia scenario – leading to a release of toxic airborne plumes.

	Without Mitigation	**With Mitigation**
Extent	Low (2)	Low (1)
Duration	Very short (5)	Very short (5)
Magnitude	High (8)	High (6)

Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (15)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible (worst case: death)	Irreversible (worst case: death)
Irreplaceable loss of resources?	Yes (human)	Yes (human)
Can impacts be mitigated?	Yes	Yes
Mitigation: Mitigation would include reduction of ammonia or substitution for a less toxic component emergency response arrangements and systems, such as alarms to allow for personnel to muster in case of emergency, and cooperation with emergency responders. Preventive measures would include design, installation according to the vendor requirements. Furthermore, the layout separation distances between battery storage units and other units to prevent knock-on effects.		
Residual Risks: Even with mitigation, there may be residual risk of occurrence due to failures in protection systems and break-down in procedures and documented systems.		

8.13.4. Implications for Project Implementation

As a result of the risk assessment study conducted for the proposed PRBGP3 facility in Richards Bay, a number of events were found to have risks beyond the site boundary. These risks could be mitigated to acceptable levels, as shown in the report.

No fatal flaws that would prevent the project proceeding to the detailed engineering phase of the project were identified, and the specialist would support the project under the following conditions most of which will be detailed in the MHI study:

- Compliance with all statutory requirements, i.e., pressure vessel designs.
- Compliance with applicable SANS codes, i.e., SANS 10087, SANS 10089, SANS 10108, etc.
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs.
- Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.
- Full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm:
  - Including demonstration from the designer that sufficient and reliable instrumentation would be specified and installed at the facility.
- Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment:
  - Including compliance to statutory laws, applicable codes and standards and world's best practice;
  - Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
  - Including the auditing of the built facility against the safety document;
  - Noting that codes such as IEC 61511 can be used to achieve these requirements;
- Demonstration by the PRBGP3 owner or their contractor that the final designs would reduce the risks posed by the installation to the South African requirements as prescribed in SANS 1461 (2018).

- Signature of all terminal designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs.
- Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (with input from local authorities).
- Any increases to the product list or product inventories must be with the approval of the authorities under NEMA.
- Final acceptance of the facility risks with an MHI risk assessment that must be completed in accordance with the MHI regulations;
  - Basing such a risk assessment on the final design and including engineering mitigation.

8.14. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Phakwe Richards Bay Gas Power 3 CCPP. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a CCPP facility.

8.14.1. Costs and Benefits associated with the Project

The implementation of the Phakwe Richards Bay Gas Power 3 CCPP at the proposed site is expected to result in a number of social and environmental costs and benefits.

Environmental costs identified for the project include:

- Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the project (which is limited to the development footprint). The site has been historically disturbed and was concluded to have a moderate ecological importance.
- Visual impacts associated with the project. The location of the facility within an area characterised by industrial development mitigates the visual impact of the facility to a large extent.
- Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is nil due to the designation of the property for industrial use and no potential for agriculture.
- Impacts on ambient air quality. The results of the impact assessment indicate that the operational phase of the project will have a low impact (based on design mitigation measures) on ambient SO_2, PM, CO, and VOC concentrations with the implementation of recommended mitigation measures.
- Impacts in terms of GHG emissions. The potential for avoided emissions as a result of the project to facilitate the introduction of additional renewable energy facilities into the national grid will assist in mitigating this impact.

The positive implications of establishing the project on the demarcated site include:

- The project will result in important socio-economic benefits at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development. These will persist during the pre-construction, construction and operational phases of development.
- The project is considered to be a suitable land use for the proposed site due to the designated industrial land use zoning and designation of the site for noxious industry. Development of the facility will require

the implementation of appropriate management actions which could have positive impacts on the surrounding areas specifically in terms of alien vegetation and erosion management.

» The project contributes towards the development of additional power generation sources as outlined in the IRP 2019.

Apart from impacts associated with GHG emissions, the costs associated with the project are anticipated to occur at a site specific level, the significance of which can be largely reduced through the application of appropriate mitigation measures, and through the appropriate placement of infrastructure within areas of lower sensitivity. The inclusion of the Phakwe Richards Bay Gas Power 3 CCPP onto the grid could contribute to a potential net reduction in GHG emissions. The total avoided emissions are 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this, there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget.

8.14.2. Impacts of the Do Nothing Alternative

Impacts of not implementing the project on the identified site largely relate to lost opportunities from a socio-economic perspective, as follows:

Employment:
The proposed power plant will create around 60 permanent employment opportunities during operation. A portion of this labour will be sourced from the City of uMhlathuze Municipality while the rest can be expected to be sourced from KwaZulu-Natal and the rest of South Africa. The operations of the CCPP will therefore increase the number of employed working age individuals, thus slightly combating local unemployment.

Indirect job opportunities created will amount to about 53 Full Time Equivalent Jobs (FTEJ) per annum over a 20-year period life-cycle of the plant which are created as a result of Phakwe Richards Bay Gas Power 3 CCPP's transactional trade with other businesses, new business sales, increased production and economic growth. This is based on a typical average number of jobs created in each sector, as a result of every rand spent in the operational phase of the Phakwe Richards Bay Gas Power 3 CCPP. The Phakwe Richards Bay Gas Power 3 CCPP is anticipated to create employment opportunities in the local area and surrounding City of uMhlathuze LM communities, the supply chains of service providers and trading linkages will determine the localisation of these opportunities

Given the above, the upliftment and socio-economic benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative. Therefore, from an employment perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of employment opportunities.

Skills development:
The specialty of the CCPP requires and creates scarce skills that will be imperative in the long run if other CCPPs are developed as envisaged in policy. 60 jobs are planned to be created for the operations of the CCPP. From this, ~24 jobs are to be filled by highly skilled employees, and ~36 are dedicated to semi-skilled or unskilled employees.

The employment opportunities are for a long-term period of 25 years and are thus sustainable and will have a positive impact on skills for benefitting employees. Furthermore, as production and consumption effects filter through the economy creating a demand for more labour, human resources will be trained and skilled within aligned industries. Ultimately, the plant's construction will lead to enhanced skills through training and experience in the wider national economy.

The above-mentioned skills training and transfer benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative.

District and Local Planning goals:
From a District level, the Richards Bay Industrial Development Zone (RB IDZ) is identified as a catalytic project (uThungulu DM, 2016). The objective is to promote economic growth in the District and improve the socio-economic conditions of the residents. The Phakwe Richards Bay Gas Power 3 CCPP will be located in the IDZ Phase 1F, and is therefore considered to contribute to the achievement of the IDP's goals relating to economic growth and social upliftment through employment creation and skills development.

In addition to the above, the objective of the Integrated Development Plan (IDP) is to promote economic growth in the District and improve the socio-economic conditions of residents (uMhlathuze LM, 2016). The unsustainable use of resources, including energy, will ultimately compromise the Municipality's energy security. Challenges similar to these prompted the IDP to focus on sustainable solutions to the energy crisis. Therefore, the aim is to reduce the demand for energy and simultaneously investigate alternative energy sources. The development of the Phakwe Richards Bay Gas Power 3 CCPP will assist with the energy security within the area. The development will also create employment opportunities which will strengthen the current socio-economic conditions of the area, as well as improve the standard of living.

Moreover, amongst other industrial efforts, the RB IDZ has assumed a role in stewarding the establishment of an energy production hub (Richards Bay IDZ SOC, 2016). In addition, energy is one of the economic comparative advantages and there are key opportunity areas for gas-to-power facilities, such as the project site (Phase 1F), which form part of the IDZ. There are on-going collaborations with the DMRE to ensure that the province of KwaZulu-Natal contributes significantly to the diversification of the energy mix and the supply of clean and affordable electricity. Furthermore, these efforts will produce diversified energy generation capacity. Through the development of the Phakwe Richards Bay Gas Power 3 CCPP within the preferred project site (IDZ – Phase 1F), the establishment of energy production projects within the IDZ will be realised.

The no-go alternative will therefore result in the above energy security benefits and economic benefits not being realised, and a subsequent loss of income and opportunities to local people. From this perspective the no-go alternative is not preferred.

Regional scale impact:
At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of gas-to-power energy would not be realised. The Phakwe Richards Bay Gas Power 3 CCPP is proposed to contribute a contracted capacity of 2 000MW to the grid capacity, which would assist in meeting the electricity demand and security supply issues throughout the country, and would also assist in meeting the government's goal for alternative energy generation in the energy mix. The

generation of electricity from gas-to-power energy offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

- Increased energy security;
- Resource saving (i.e. fossil fuels and water);
- Pollution reduction;
- Support for international agreements;
- Employment creation;
- Acceptability to society; and
- Support to a new industry sector.

South Africa's electricity supply remains heavily dominated by coal-based power generation, with the country's gas-to-power energy potential largely untapped to date.

The Integrated Resource Plan (IRP) 2019 includes provision for 3000MW from gas to power technology by the end of 2030. The IRP essentially drives the assortment of energy to be implemented for South Africa which is known as the energy mix of the country, considering various generation technologies. The no-go alternative will result in the above alternative energy generation sources and energy security benefits not being realised. From this perspective the no-go alternative is not preferred.

8.14.3. Conclusion

Although a number of impacts of potential high significance have been identified, no environmental fatal flaws were identified to be associated with the Phakwe Richards Bay Gas Power 3 CCPP through the specialist studies undertaken. Where impacts cannot be avoided, appropriate mitigation has been identified to minimise impacts to acceptable levels. A number of negative impacts have been identified to be associated with the implementation of the do nothing alternative.

The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of Phakwe Richards Bay Gas Power 3 CCPP.

CHAPTER 9: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 8, the Phakwe Richards Bay Gas Power 3 CCPP may have effects (positive and negative) on natural resources, the social environment and on the people living in the project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the Phakwe Richards Bay Gas Power 3 CCPP largely in isolation (from other similar developments).

The IRP includes provision for 3 000MW of gas to power as part of the energy mix up to 2030. In addition to this, the DMRE, under the Emergency Procurement Programme in accordance with the IRP 2019, released a Request for Proposals to meet a stated electricity supply shortfall of 2000MW of generation capacity. As a result, there has been a substantial increase in interest in gas to power facility developments in South Africa (largely in Richards Bay and other port cities where importing various forms of gas is possible). It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts[30] is considered and avoided as far as possible.

This chapter assesses the potential for the impacts associated with the Phakwe Richards Bay Gas Power 3 CCPP to become more significant when considered in combination with the known or proposed gas to power projects and other industrial developments within the Richards Bay area.

9.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Impact Assessment Report

This chapter of the EIA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 3: Scope of Assessment and Content of Environmental Impact Assessment Report:

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of the Phakwe Richards Bay Gas Power 3 CCPP are included and assessed within this chapter.

9.2. Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the Phakwe Richards Bay Gas Power 3 CCPP and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to test, and assess, if such impacts are relevant to the Phakwe Richards Bay Gas Power 3 CCPP within the project site being considered for the development:

- Unacceptable impacts to air quality and contributions to pollutant levels.
- Unacceptable risks and contributions to climate change.

[30] Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R326) as the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

- Unacceptable loss of threatened or protected vegetation types, habitat or species through clearing, resulting in an impact on the conservation status of such flora, fauna or ecological functioning.
- Unacceptable risk to water resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- Complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion.
- Unacceptable increase in ambient noise conditions.
- Unacceptable impact to socio-economic factors and components.
- Unacceptable risk and degradation due to traffic related impacts.

It is important to explore the potential for cumulative impacts as this will lead to a better understanding of these impacts and the potential for mitigation that may be required. The scale at which the cumulative impacts are assessed is important. For example, the significance of the cumulative impact on the regional or national economy will be influenced by gas to power facility developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by industrial facility developments that are in closer proximity to each other. For practical purposes, a sub-regional scale of 10km has been selected for this cumulative impact evaluation. The potential for cumulative impacts is summarised in the sections which follow and has been considered within respective specialist studies (refer to **Appendices D – M**). The approach taken by the various specialists in assessing cumulative impacts is informed by the scale at which the impact is likely to occur, as well as surrounding developments.

9.3. Relevant Development Considerations within the 10km area surrounding the proposed project

The Phakwe Richards Bay Gas Power 3 CCPP is proposed to be located in the Richards Bay Industrial Development Zone Phase 1F which falls within the jurisdiction of the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality, KwaZulu-Natal Province. The Richards Bay IDZ has been identified by City of uMhlathuze Local Municipality as an area of focus for the development of industrial development (refer to **Figure 9.1**). As such, it can be expected that various industrial developments will take place in addition to the already industrial nature of the area. The closest existing industrial development located near the project site is Tata Steel, which is located directly adjacent to the south of the site.

Figure 9.2 indicates the location of the Phakwe Richards Bay Gas Power 3 CCPP in relation to all known and viable large-scale industrial developments located within a radius of 10km from the project site. These developments were identified during stakeholder consultations and using information available in the public domain at the time of this assessment. In the case of Phakwe Richards Bay Gas Power 3 CCPP there are fourteen (14) large-scale industrial developments within the 10km radius of the project site, including a number of gas to power projects (refer to **Figure 9.2** and **Table 9.1**), all at various stages of development.

Table 9.1: Large-scale industrial developments within a 10km radius of the Phakwe Richards Bay Gas Power 3 CCPP project site

Development Name	Project Status
Industrial developments	
Bayside Aluminum Richards Bay	Existing
Chlor-Alkali Plant	Authorised
Hulamin (previously Isizinda)	Existing

Development Name	Project Status
Fementech Fertilizer Supplier	Existing
Foskor Richards Bay	Existing
Mondi Richards Bay	Existing
Port Richards Bay	Existing
Richards Bay Coal Terminal	Existing
South32 Aluminium	Existing
Tata Steel	Existing (non-operational)
Bidvest Tank Terminals	Existing
Fermentech Fertilizer Supplier	Existing
Elegant Afro Chemicals Chlor Alkali Plant	Authorised
Gas-to-power projects	
Eskom Richards Bay CCPP (3000MW)	Authorised
Phinda Power 320MW RMPP (320MW)	Authorised
Richards Bay Gas to Power (400MW)	Authorised
Karpowerships floating powership (450MW)	In process[31]

Under the existing power procurement programmes announced by the government there are two phases of power development nationally that will, in worst case scenario, contribute to cumulative impact in Richard's Bay, i.e. the emergency procurement process (RMIPPPP) completed in 2021, and the 3000MW gas to power procurement process which is still in the planning phase and yet to commence. Under these programmes, only those projects selected as Preferred Bidder following the adjudication of bids and that subsequently achieve financial close to commence construction, will be implemented. The authorised Eskom CCPP falls outside of the current 3000MW gas to power allocation as the Minister has determined that this allocation will be procured from independent power producers and not from Eskom.

Therefore, not all proposed developments will be granted the relevant permits by the relevant authorities (DFFE, DMRE, NERSA and Eskom) and not all gas to power projects listed above will be developed and implemented. This is because of the following reasons:

- There may be limitations to the capacity of the existing or future Eskom grid.
- Not all applications will receive a positive Environmental Authorisation.
- There are stringent requirements to be met by applicants in terms of the Government procurement programme and private off-taker bids, and a highly competitive process that only selects the best projects.
- Not all proposed projects will be able to reduce the associated negative impacts to acceptable levels or be able to mitigate the impacts to acceptable levels (fatally flawed).
- Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom.
- Not all developers will be successful in securing financial support to advance their projects further.

[31] The project was selected as a Preferred Bidder Project under the RMIPPPP. A negative Environmental Authorisation was however issued for this project, which is currently under appeal. A precautionary approach has been taken and therefore this project has been included in the cumulative assessment.

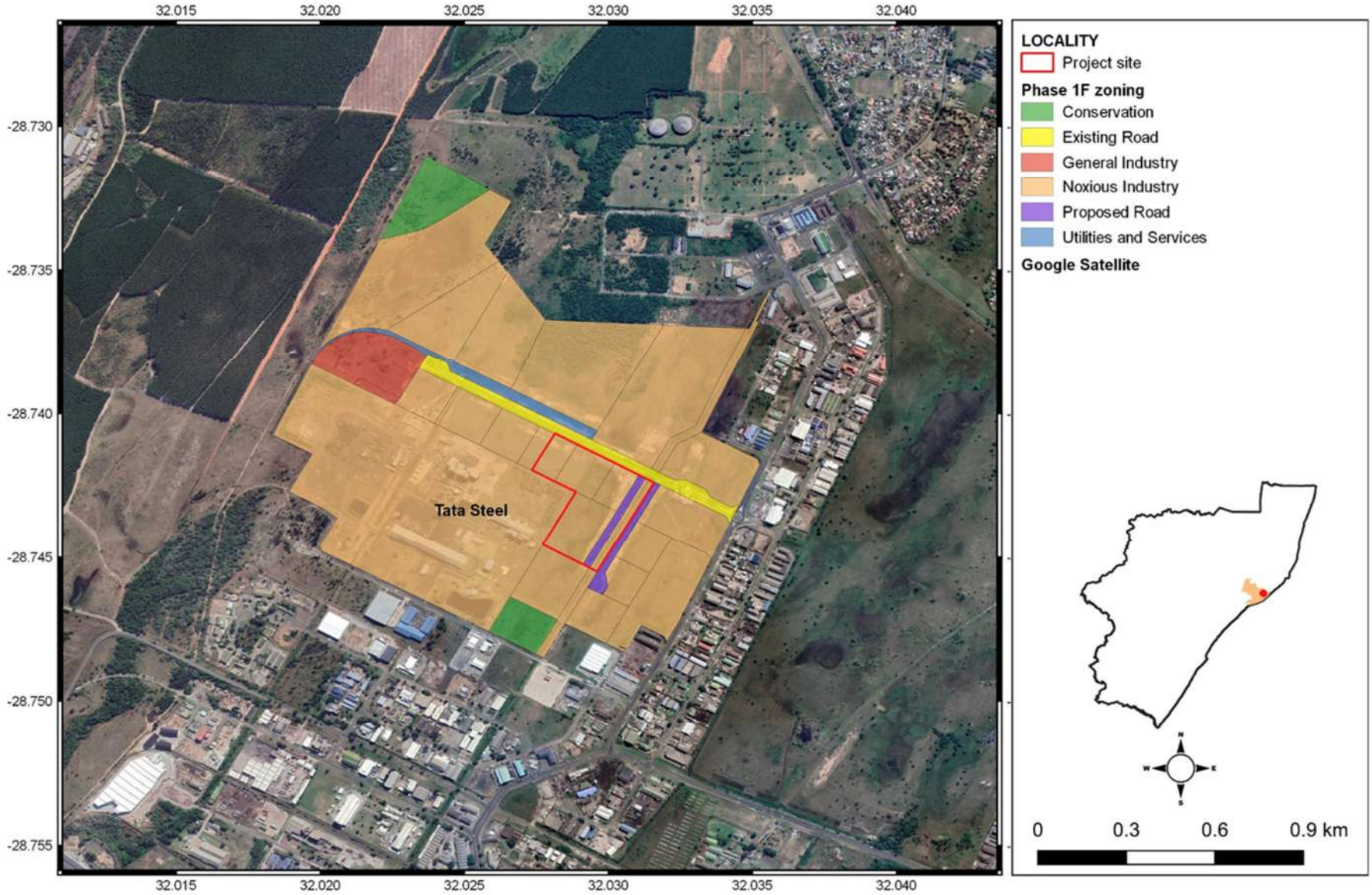

Figure 9.1: Zoning of Phase 1F of the RBIDZ, showing the location of the proposed development

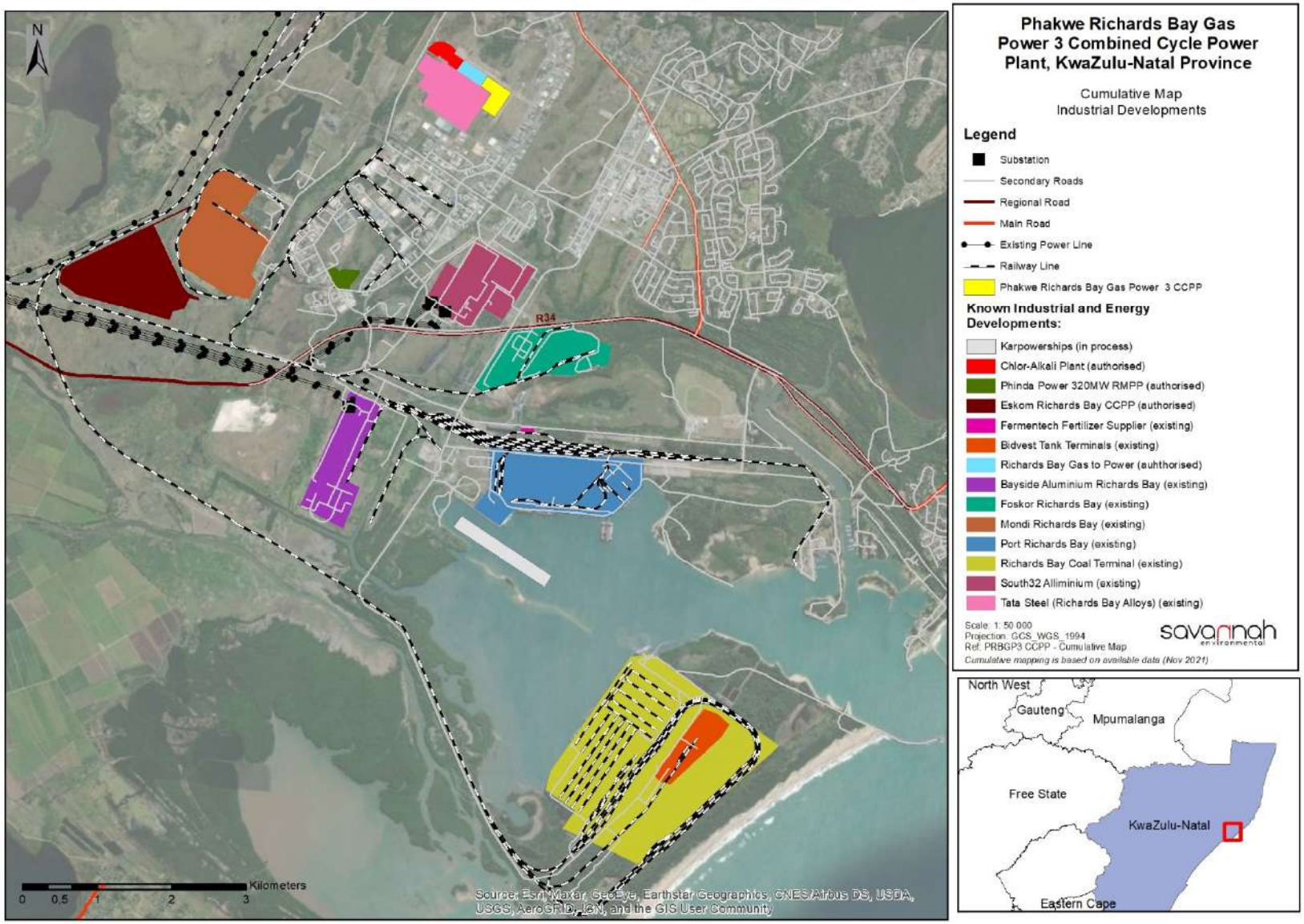

Figure 9.2: Identified large scale industrial developments located within a 10km radius of Phakwe Richards Bay Gas Power 3 CCPP project site that are considered as part of the cumulative impact assessment for the project.

As there is uncertainty whether all the above-mentioned renewable energy projects will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known projects in the broader area and the Phakwe Richards Bay Gas Power 3 CCPP are therefore qualitatively assessed in this Chapter.

9.4. Potential Cumulative Impact Associated with the project

This assessment is based on information which is currently available. The following potential impacts are considered:

- Cumulative impacts on terrestrial biodiversity and ecology
- Cumulative impacts on aquatic resources
- Cumulative impacts on air quality
- Cumulative impacts to climate change
- Cumulative visual impacts
- Cumulative noise impacts
- Cumulative socio-economic impacts
- Cumulative impacts on traffic

No cumulative impacts associated on heritage resources have been identified and are therefore not assessed within this section of the report.

9.4.1. Cumulative Impact on Terrestrial Ecology

The approach to assessing cumulative ecological impacts affecting the same Valued Ecosystem Components (VECs)[32] is to screen potential interactions with other projects based on:

- Past ecological impacts.
- Present ecological impacts.
- Future ecological impacts/development pressure.

At a regional scale, uMhlathuze Municipality has a longstanding history of anthropogenic disturbance. The once continuous ecosystems and vegetation types in the municipality have been significantly transformed and fragmented over time by urban and rural expansions, agriculture, and multiple linear infrastructure developments, with remaining natural habitat in many instances small and highly fragmented. The extent of transformation and habitat fragmentation is shown **Figure 9.3**.

At a local scale, Phase 1F of the IDZ is zoned for the development of noxious industries (refer to **Figure 9.1**). It is still largely undeveloped but has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services infrastructure (i.e., water, sewer, stormwater, electricity, roads, artificial drainage canals), and the more recent infilling of the wetlands as authorised for the development of the IDZ. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO_2 Pilot plant which covers approximately a third of Phase 1F. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds (**Figure 9.4**).

[32] VECs are defined as elements of the environment that have scientific, ecological, economic, social, or cultural significance.

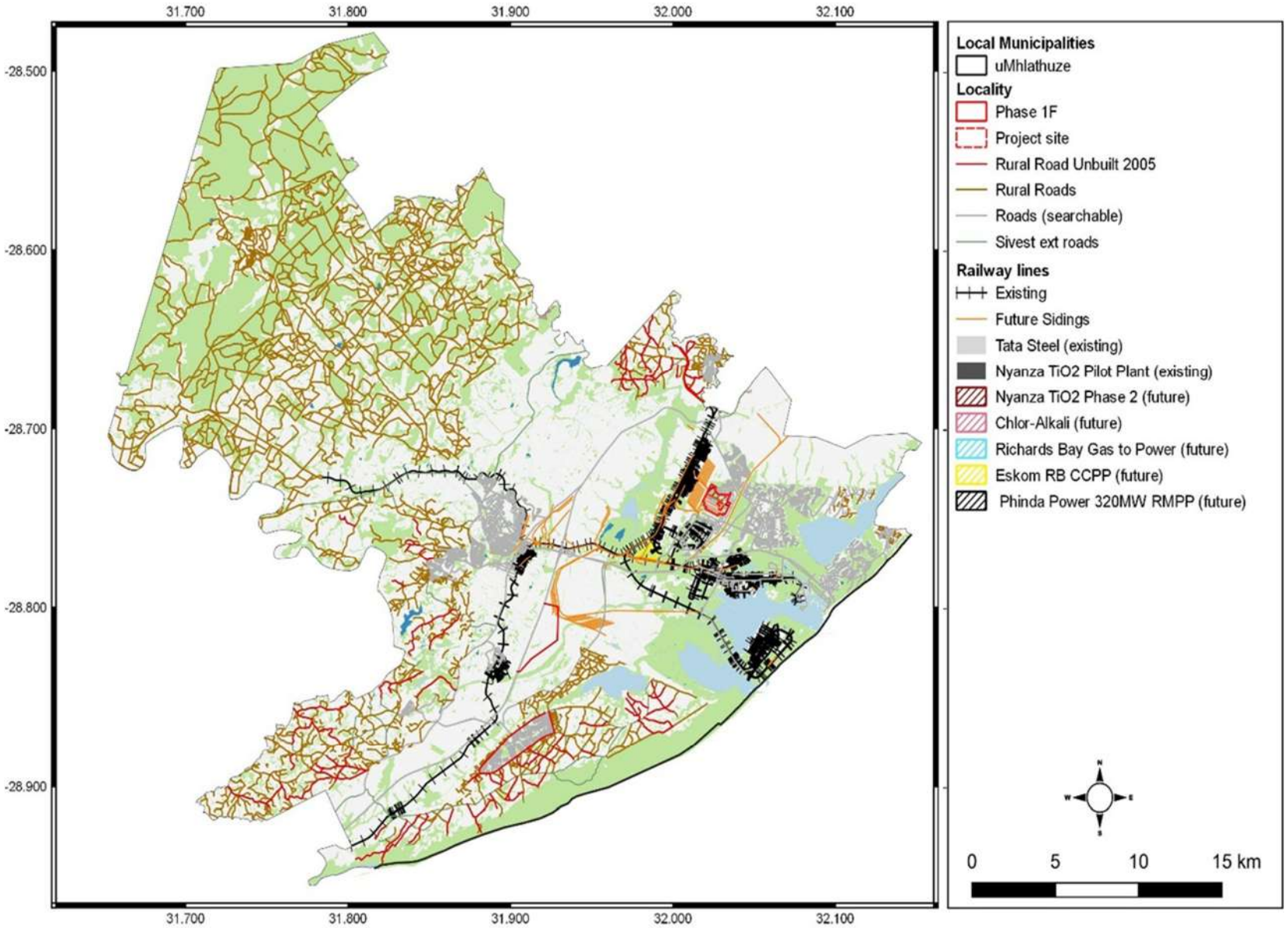

Figure 9.3: Cumulative ecological impacts in uMhlathuze Municipality

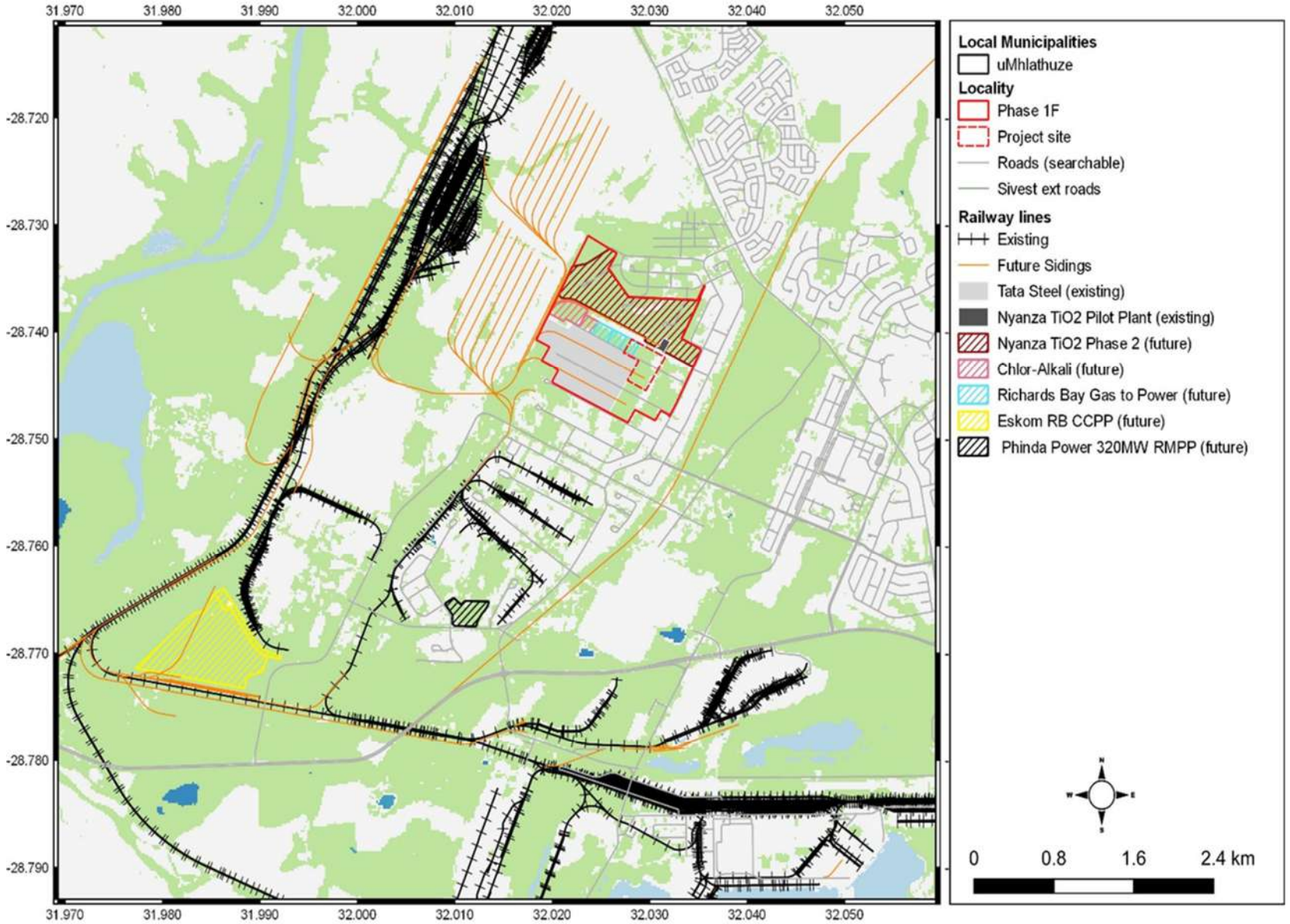

Figure 9.4: Cumulative ecological impacts phase 1F and surroundings

The project site on Phase 1F has experienced past environmental disturbances that were judged to have had a negative influence on its biodiversity and ecology and included the following:

» Land clearance on the project site resulted in the direct loss of indigenous vegetation.
» The wetlands on the proposed development site were fragmented by the construction of a drainage line and roads.
» The wetlands on the project site were infilled to prepare the area for future development.

In addition to the known developments within the area, the uMhlathuze Municipality Spatial Development framework lists several future planned developments within the area. Since no detailed information was available for these developments, the cumulative assessment was limited to the known projects in the area.

Nature: Permanent loss of habitat in sensitive environmental areas

To evaluate the cumulative contribution of habitat loss in sensitive environmental areas, the extent of the VECs on the respective project sites were measured using QGIS 3.14 software. For each project it was assumed that vegetation clearance will result in the absolute loss of biodiversity within the impact footprint. The cumulative loss of habitat within the respective VECs is summarised below.

VEC	CUMULATIVE LOSS (ha)
Kwambonambi Hygrophilous Grassland Ecosystem	227,7
Maputaland Wooded Grassland	214,74
Subtropical Freshwater Wetlands	12,88
CBAs National (Very High Sensitivity)	189,94
CBAs Provincial	
• CBA3: Optimal	106,77
• Biodiversity areas	115,07
CBA: Irreplaceable (District scale)	189,94
NPAES focus areas importance for terrestrial biodiversity	201
ESMP Draft	
• Conservation	30,54
• Corridors/linkages	26,12

The cumulative contribution of railway sidings was excluded from this evaluation since the width of the servitudes is unknown. The loss of habitat within the respective VECs is thus an underestimation of habitat loss within the VECs for the projects listed above.

Kwambonambi Hygrophilous Grassland Ecosystem

Historically this ecosystem measured 34 000 ha and lies inland but adjacent to the Kwambonambi Dune Forest ecosystem, extending from Richards Bay to St Lucia Estuary (National List of Threatened ecosystems in South Africa, 2011). The Biodiversity Summary for uMhlathuze Municipality (https://bgis.sanbi.org/LUDS/Home/Municipality/117) reported that 12 205,1 ha is present in the Municipality. The cumulative loss of habitat within this ecosystem based on the data provided in Table 18 will therefore represent a 1,86% loss of the ecosystem extent within the Municipal area. Important to note is that the ecosystems data presented in the Biodiversity Summaries project was done prior to the enlargement of the Municipal area in 2016 and is therefore outdated.

THREATENED VEGETATION TYPES

Maputaland Wooded Grassland

The Draft Baseline Environmental Management Framework Report compiled by Coastal and Environmental Services in 2018 reported that historically this vegetation type covered 31 192 ha in King Cetshwayo District, with the remaining extent in 2018 estimated at 3 316 ha. The cumulative loss of vegetation from the developments listed

in Table 18 will therefore represent a loss of 6.47 % of this Endangered vegetation type within King Cetshwayo District. National and Provincial conservation targets was set at 25% for this vegetation type, with a protection level of Moderately Protected, indicating that the vegetation type is under-protected (South African National Biodiversity Institute 2006- 2018; Jewitt 2018). Thus, additional loss of vegetation within this vegetation type could potentially affect the ability to meet provincial conservation targets.

Subtropical Freshwater Wetlands

The Draft Baseline Environmental Management Framework Report compiled by Coastal and Environmental Services in 2018 reported that historically this vegetation type covered 9 454 ha in King Cetshwayo District, with the remaining extent in 2018 estimated at 5 060 ha. The cumulative loss of vegetation from the developments listed in Table 18 will therefore represent a loss of 0,25%. This vegetation type was listed by Jewitt (2018) as Vulnerable and Moderately Protected, indicating that the vegetation type is under-protected. Additional loss of vegetation within this vegetation type could potentially affect the ability to meet provincial conservation targets.

CBA areas

CBA areas are considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. The cumulative loss of CBA areas could potentially affect the ability to meet national and provincial conservation targets.

NPAES focus areas

NPAES focus areas are areas identified as priority areas for protected areas expansion. The aim of NPAES focus areas is to improve the representativity and efficiency of the protected areas network in South Africa. South Africa's current protected area network still falls far short of sustaining biodiversity and ecological processes. The cumulative loss of habitat within NPAES focus areas could therefore potentially affect the ability to reach national conservation targets.

ESMP areas

Areas identified as conservation zones and corridor/linkage zones were identified on four of the projects evaluated (Table 18). Within the ESMP, conservation zones are defined as areas of biodiversity/environmental significance, which are not viable for proclamation as nature reserves, but that require some form of legal protection. Included are unique or regionally important natural habitats; wetland and forest areas that are protected in terms of national legislation; and all areas that fall within the 1:100-year flood line. No transformation of the natural assets or the development of land for purposes other than conservation should be permitted in this zone. Sustainable use of renewable resources is permitted.

Corridors/linkages are defined as areas that provide a natural buffer for Protected areas and Conservation zones, areas that provide a natural link between Protected areas and Conservation zones; areas that supply, or ensure the supply of, significant environmental services. Transformation of natural assets and the development of land in these zones should only be permitted under controlled conditions.

The cumulative contribution of the developments will result in a loss of 30,54 ha in conservation areas, and 26,12 ha in corridors/linkages. This will reduce the availability of habitat for local fauna populations, limits fauna dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease at at greater risk of extinction.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). The limited space to accommodate the growth demand in the area will increase the conflict between conservation and development. Within the context of this assessment, it is evident that the current and future developments reviewed (Table 18) conflicts with National, Provincial, District and Municipal scale conservation planning initiatives and management objectives. The situation highlights the need for closer collaboration and coordinated planning between environmental stakeholders and prospective developers.

	Overall impact of the proposed project considered in isolation (post-mitigation)	Cumulative impact of the project and other projects in the area
Duration	Permanent (5)	Permanent (5)
Extent	Site (1)	National (4)
Magnitude	Minor (2)	Very High (10)
Probability	Improbable (2)	Probable (3)
Significance	**Minor Negative (4)**	**High (76)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Yes	To an extent
Confidence in findings:	Low – insufficient information	

Nature: Loss of SCC flora & and associated habitats

To evaluate this impact, it was assumed that each development will result in the absolute loss of biodiversity value within the respective project footprints. The clearing of 227,7 ha of habitat could invariably lead to the destruction of Red Listed flora and their associated habitat. At least 28 Red Listed flora species typically found in grassland and wetland habitats are known to be present within the Richards Bay area.

The greater uMhlathuze municipal area falls within the Maputaland-Pondoland Biodiversity hotspot which is recognized as the second richest floristic region in Africa. This area containings approximately 80 % of the of South Africa's remaining forests, rich birdlife and many other significant flora and fauna species. The greater uMhlathuze Municipal area supports more than 170 Red Data species, which has been reported as amongst the highest in the country for an area of its size.

Nevertheless, the most recent land-use cover dataset (SANLC 2020) indicated that the once continuous ecosystems and vegetation types within the municipal area was significantly transformed and fragmented over time by urban and rural expansions, agriculture, and multiple linear infrastructure developments. The remaining undeveloped areas with indigenous land cover within the Richards Bay area is for the most part considered as irreplaceable by Ezemvelo KZN, mainly because of the large concentration of Red Data species present in the municipality.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). This will reduce the availability of habitat for Red Listed flora, limits dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease and at greater risk of extinction. In general, plant diversity and population size decrease with decreasing size of habitats and habitat connectivity.

	Overall impact of the proposed project considered in isolation (post-mitigation)	Cumulative impact of the project and other projects in the area
Duration	Short duration (1)	Permanent (5)
Extent	Site (1)	National (4)
Magnitude	Small (0)	Moderate (6)
Probability	Improbable (2)	Highly probable (4)
Significance	**Minor (4)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Yes	To an extent
Confidence in findings:	Low – insufficient information	

Nature: Loss of Red Listed fauna & associated habitats

To evaluate this impact, it was assumed that each development will result in the absolute loss of biodiversity value within the respective project footprints. The clearing of 227,7 ha of habitat could invariably lead to the destruction of Red Listed fauna species and their associated habitat. At least 16 Red Listed fauna species found in grassland and wetland habitats are known to be present within the Richards Bay area.

This area contains approximately 80% of the of South Africa's remaining forests, rich birdlife and many other significant flora and fauna species. The greater uMhlathuze Municipal area supports more than 170 Red Data species, which has been reported as amongst the highest in the country for an area of its size.

Nevertheless, the most recent land-use cover dataset (SANLC 2020) indicated that the once continuous ecosystems and vegetation types within the municipal area was significantly transformed and fragmented over time by urban and rural expansions, agriculture, and multiple linear infrastructure developments. The remaining undeveloped areas with indigenous land cover within the Richards Bay area is for the most part considered as irreplaceable by Ezemvelo KZN, mainly because of the large concentration of Red Data species present in the municipality.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). This will reduce the availability of habitat for Red Listed fauna, limits dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease and at greater risk of extinction.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Permanent (5)	Permanent (5)
Extent	National (4)	National (4)
Magnitude	Minor (2)	Moderate (6)
Probability	Probable (3)	Highly probable (4)
Significance	**Low (33)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	To an extent	To an extent
Confidence in findings:	Low – insufficient information	

Nature: Loss/disturbance of local fauna populations

To evaluate this impact, it was assumed that each development will result in the absolute loss of biodiversity value within the respective project footprints. The clearing of 227,7 ha of habitat will invariably lead to the destruction of fauna and their associated habitat.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). This will reduce the availability of habitat for local fauna populations, limits dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease and at greater risk of extinction.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Permanent (5)	Permanent (5)
Extent	Local (2)	Region (3)

Magnitude	Minor (2)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**Moderate (50)**	**High (70)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Replaceable
Can impacts be mitigated?	To an extent	To an extent
Confidence in findings:	Low – insufficient information	

Nature: Artificial light disturbance

Impacts from artificial light disturbance are associated with the changes to the night-time visual landscape. All the proposed developments considered in the cumulative impact assessment will introduce light into the landscape. These projects will substantially increase overall artificial light levels and lead to an increase in the overall levels of sky glow in the area. Sky glow impacts may extend into areas some distance from the facilities themselves.

Potential negative ecological consequences of artificial light disturbance have been discussed under the Construction phase impacts and will therefore not be repeated. Mitigation measures for cumulative impacts of artificial light disturbance are however limited to mitigating impacts directly with each development.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Permanent (5)	Permanent (5)
Extent	Local (2)	Region (3)
Magnitude	Minor (2)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Low (24)**	**High (70)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Replaceable
Can impacts be mitigated?	To an extent	To an extent
Confidence in findings:	Low – insufficient information	

9.4.2. Cumulative Impact on Aquatic Ecology

Three HGM units were identified within the 500 m regulated area, of which two have been classified as unchanneled valley bottom wetlands and one classified as a hillslope seep. The HGM units consist of one dominant soil form was identified within the identified wetland, namely the Manguzi soil form.

The Richards Bay Industrial Development Zone received environmental authorisation, which includes the development of two of the wetland areas. The remaining third wetland is not in a position in the landscape to be affected by the development. Therefore, no additional contribution to cumulative impact is expected through the development of the proposed PRBGP3 project.

9.4.3. Cumulative impacts on Soils and Agricultural Potential

Cumulative impacts within the proposed gas power area and its surroundings have been determined to be high. Soil resources in the area have been impacted upon by means of built-up areas, yet, not to such an extent that the larger utilisation of such resources in respect to forestry and/or cultivation has been affected.

Nature: Loss of land capability		
	Cumulative impact of the project and other projects in the area	**Cumulative impact of the project and other projects in the area**
Extent	Moderate (3)	Moderate (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	

Mitigation:

Planning and Construction:

- Investigate the possibility of avoiding large concrete areas
- Demarcate all access routes
- Vegetate all stockpiles after stripping/removing soils
- Storage of potential contaminants in bunded areas
- All contractors must have spill kits available and be trained in the correct use thereof.
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".
- No cleaning or servicing of vehicles, machines and equipment in water resources.
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems.
- Continuously monitor erosion on site

Operation:

- Continuously monitor erosion on site
- Monitor compaction on site

9.4.4. Cumulative impacts on Air Quality

The project is proposed for development in an already industrialised area and therefore the project will add to the existing operational sources. Due to the proclamation of the RB IDZ, there is a growth of industries that have environmental authorisation but have not yet been commissioned that will make further contributions to the airshed.

The following cumulative impact scenarios were considered:

1. Scenario 1: PRBGP3 and existing baseline sources
2. Scenario 2: PRBGP3, authorised gas to power projects, and existing baseline sources.

Although a chlor-alkali plant has been authorised for development within Zone 1F of the RB IDZ (DC28/0003/2018: KZN/EIA/0000823/2018), the air quality specialist report with the required quantitative detail was not available for inclusion as part of the cumulative assessment.

i) Cumulative Impact – PRBGP3 and Existing Sources

The simulated and measured Richards Bay baseline annual average pollutant concentrations were added to the simulated concentrations because of the PRBGP3 project. Cumulative SO_2 and NO_2 concentrations are likely to be lower than the applicable NAAQS across the domain and the contribution from PRBGP3 is low for SO_2 and moderate for NO_2 (less than 0.3% for hourly, daily and annual SO_2; less than 30% for hourly and annual NO_2).

Cumulative PM_{10} concentrations may exceed the daily NAAQS at Brackenham (RBCAA), Arboretum (uMthlathuze), Harbour West, and Scorpio monitoring stations due to the elevated baseline concentrations in those areas. However, the contribution from PRBGP3 will be minor at less than 4% on both daily and annual averaging periods.

ii) Cumulative Impact - Proposed Gas-to-Power Developments, and Existing Sources

There are a number of gas-to-power projects proposed within the Richards Bay area. In considering the cumulative impact, it is important to consider the policy framework for gas to power generation and the likelihood of proposed projects proceeding to implementation. As stated previously, the IRP provides for a maximum of 3 000 MW of power to be generated by gas to power technologies up to 2030. There are three (3) gas to power facilities that have the required environmental authorisation to proceed with development, located within a 10 km radius of the project site.

To quantitatively assess the cumulative impact of the proposed PRBGP3, other authorised (but not yet commissioned) facilities and the existing sources of air pollution in the Richards Bay area, the following approach was adopted. Maximum 1 hour, 24 hour, and annual average SO_2, NO_2, and PM concentrations due to the projects were gathered from simulations or from the respective Environmental Impact Assessment reports or specialist Air Quality specialist assessment reports as available to Interested and Affected Parties. These maximum values were either for the domain or receptors, depending on what level of detail was available for the respective projects. The additive effect of the identified projects to the current baseline was calculated using extrapolated, simulated and/or measured concentrations to estimate the range of cumulative impact.

The findings of the cumulative impact estimation indicate that:

- the range of cumulative hourly, daily, and annual SO_2 concentrations are lower than the applicable NAAQS;
- the lower end of the range of cumulative hourly NO_2 concentrations is lower than the NAAQ limit concentration but the upper end of the range suggests that exceedances of the NAAQ limit could occur in some areas of the domain and are associated with existing developments, the 3 000 MW Eskom facility, followed by the proposed PRBGP3;
- the range of cumulative annual NO_2 concentrations is close to the NAAQS where the largest contributions are associated with the existing sources and the Eskom facility;
- cumulative daily and annual PM_{10} - based on an atypically high measured concentration - exceeds the NAAQS, however, the contribution from the gas-to-power projects is low (less than 15%).

Based on the existing sources in the airshed, SO_2, particulate matter, and total reduced sulfides are the pollutants of current concern based on measured and simulated impacts and the gas-to-power projects are unlikely to result in substantial contributions to the ambient concentrations of these pollutants. The

additive effect of the projects equate to less than 15% of the applicable NAAQ limit concentrations and standards for SO_2 and PM_{10} and is therefore in line with the general guideline suggested by the International Finance Corporation that individual projects contribute less than 25% of air quality guidelines and standards to allow for future sustainable development in the airshed (IFC, 2007). The combined impact of PRBGP3 and the authorised gas-to power facilities equates to 53% and 60% of the respective hourly and annual NO_2 NAAQS. Potential exceedances of the NAAQS for PM_{10} are associated with the existing baseline sources.

The main findings of the cumulative assessment were:

1. Cumulative SO2 concentrations (hourly, daily, and annual) are likely to be below the applicable NAAQS across the domain, however, elevated concentrations in some areas are likely to be associated with the existing sources contributing to baseline air quality.
2. Cumulative NO2 concentrations may be higher than the applicable NAAQS in the long-term if all proposed large generating capacity gas-to-power projects are commissioned. The contribution of the PRBGP3 is likely to be less than 30% of the cumulative impact.
3. Cumulative PM10 concentrations (daily and annual) may exceed NAAQS at Harbour West, Scorpio, and Arboretum monitoring stations due to the elevated baseline concentrations. However, the contribution PRBGP3 is low and acceptable.
4. Cumulative impact of the facility and other projects in the area on the ambient air quality in the Richards Bay area is likely to be "medium" if unmitigated with the potential to reduce to low if industry and community initiatives can minimise the combined impact on air quality.

Nature: Cumulative impact of the project on SO_2 and NO_2 concentrations		
The Cumulative Impact of the proposed facility and the existing baseline would result in elevated ambient air pollutant concentrations. The normal operation of the proposed gas-to-power plant, using natural gas, will result in emission of gaseous and particulate pollutants including: SO_2 and, NO_2. Increased ambient concentrations of these pollutants may result in negative human health impacts, and nuisance dustfall. Cumulative impacts, to short- and long-term ambient concentrations, were assessed to be minor since the pollutants of current concern in Richards Bay (SO_2 and PM) will have relatively small incremental increases from the normal operation of the project. The cumulative impact of the project and other projects in the area may result in short-term ambient NO_2 concentrations above NAAQS within the domain but these are likely to be localised near the source(s).		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Duration	4	4
Extent	1	3
Magnitude	2	6
Probability	3	3
Significance	**21**	**39**
	Low	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	No
Can the impacts to mitigated?	To some extent	To some extent
Confidence in findings:	Moderate to High	
Potential mitigation measures:		

» Requiring co-ordinated response all stakeholders (authorities, industrial sources, and community groups); such that: ∗ Industries optimise abatement controls to minimise emissions. ∗ Use community and industry fora to discuss air pollution issues and progress towards minimising impacts. ∗ Promote the use of cleaner heat sources (electricity, LPG, and/or bioethanol gel) for cooking, heating and lighting by residents.
Residual impacts: Expected to be low if mitigation measures can be effectively implemented.

Nature: Cumulative impact of the project on particulate matter concentrations		
The Cumulative Impact of the proposed facility and the existing baseline will not add substantively to the existing baseline even though the normal operation of the proposed gas-to-power plant will result in emission of particulates (PM_{10} and $PM_{2.5}$). However, the baseline particulate concentrations across Richards Bay are elevated with exceedances of the NAAQS measured at monitoring stations near the harbour operations. Ambient concentrations of these pollutants may result in negative human health impacts, and nuisance dustfall. Although the over impact of the proposed project considered in isolation will have relatively small incremental increase from the normal operation of the gas-to-power station, the cumulative impact of the project and other projects in the area is likely to result in human health impacts.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Duration	4	4
Extent	1	4
Magnitude	2	6
Probability	3	4
Significance	**21**	**56**
	Low	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	No
Can the impacts to mitigated?	To some extent	To some extent
Confidence in findings:	Moderate to High	
Potential mitigation measures:		
» Requiring co-ordinated response all stakeholders (authorities, industrial sources, and community groups); such that: ∗ Industries optimise abatement controls to minimise emissions. ∗ Use community and industry fora to discuss air pollution issues and progress towards minimising impacts. ∗ Promote the use of cleaner heat sources (electricity, LPG, and/or bioethanol gel) for cooking, heating and lighting by residents.		
Residual impacts: Expected to be low if mitigation measures can be effectively implemented.		

9.4.5. Cumulative Health Impacts

Construction (and decommissioning) and operation activities associated with the Phakwe Richards Bay Gas Power 3 CCPP are likely to result in a negligible impact on health in the receptor communities. Therefore, no additional contribution to cumulative impact is expected through the development of the proposed PRBGP3 project.

9.4.6. Cumulative impacts to Climate Change

The impact of a project on climate change through the emissions of GHGs into the global atmosphere is, by its very nature, a cumulative impact. Therefore, one cannot disaggregate the singular impact from the cumulative impact due to the nature of anthropogenic GHG emissions and climate change.

As detailed in Chapter 8, the proposed Phakwe Richards Bay Gas Power 3 CCPP will emit GHGs into the atmosphere and is expected to have an impact of high significance. The positive impact of the project on climate change with respect to the avoided emissions from the coal baseline, and the potential avoided emissions through the increase of the grid to accept intermittent renewable energy, far outweighs the contribution of the project to national GHG inventory.

9.4.7. Cumulative Visual impacts

The proposed Phakwe Richards Bay Gas Power 3 CCPP is located entirely within the existing Alton industrial area, and more specifically within the RB IDZ Phase 1F. The viewshed analyses of the proposed project infrastructure as presented in Appendix J illustrated the ability of the existing industrial and commercial structures and buildings to largely absorb the potential short distance visual exposure, and to contain the potential visual impacts within a 1km radius of the structures. The intention of the establishment of the Alton industrial area, and ultimately the RB IDZ, is to concentrate industrial development within a specific area, and to avoid the scattered proliferation of industrial style infrastructure within the region.

To this end, and also considering the existing and authorised large scale industrial developments related to the port of Richards Bay, e.g. the Hillside and Bayside smelters, the cumulative visual impacts are considered to be within acceptable limits. It is further recommended that proposed future industrial developments should be contained within established or zoned industrial areas, rather than be located further afield and ultimately spreading the visual impacts over larger areas.

Nature of Impact: The potential cumulative visual impact of industrial infrastructure and activities on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation (with mitigation)	**Cumulative impact of the project and other projects within the area (with mitigation)**
Extent	Short distance **(3)**	Short distance **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Moderate (45)**	**Moderate (45)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the power plant. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: Potential permanent scarring of the landscape if no rehabilitation is undertaken.

9.3.8. Cumulative Noise Impacts

There is a very low risk of cumulative noises during the construction phase, as noises from other construction activities (such as the authorized Richards Bay Gas to Power project, or the authorized Chlor-Alkali Plant are highly unlikely to result in cumulative construction noise impacts.

Noises from the existing Tata Steel (Richards Bay Alloys) and authorised Richards Bay Gas to Power project will result in a cumulative noise impact during operation, potentially raising the total noise levels with a maximum of 3 dBA. Other industrial projects are too far from this project to pose any potential risk for cumulative effects and their contribution can be excluded.

Nature of Impact: Cumulative effects of numerous industrial projects operating simultaneously in the vicinity of the proposed Phakwe Gas to Power project. The projected cumulative noise level, the change in ambient sound levels as well as the potential noise impact is expected to be low for all the NSDs identified.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels**	
All NSDs	Noise levels less than 45 dBA	Noise levels less than 45 dBA
	Overall impact of the proposed Phakwe Gas to Power project considered in isolation	**Cumulative impact of the project and other projects in the area**
Status (positive/negative)	Negative	Negative
Magnitude	Minor	Low
Duration	Long-term	Long-term
Extent ($\Delta L_{Aeq,D}$>7dBA)	Local	Local
Probability	Improbable	Possible
Magnitude	**Low Risk (6)**	**Low Risk (20)**
Reversibility	High	High
Loss of resources	Low	Low
Can impacts be mitigated?	Yes, but not required.	Yes, but not required.
Confidence in findings: High. Worst-case scenario evaluated.		
Mitigation: Significance of noise impact is low for the scenario as conceptualized.		

9.3.9. *Cumulative Socio-economic impacts*

The location where the proposed plant is to be situated has been identified as a potential location to house other energy generation plants which are currently busy with applications for electricity generation plant developments. The cumulative impacts of these potential developments as well as the proposed Phakwe Richards Bay Gas Power 3 CCPP will have a greater impact significance rating.

Nature: The overall impacts and cumulative impacts are made up of a combination of social and economic impacts.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Probable (4)
Significance	**Low (10)**	**Low (16)**
Status (positive or negative)	Positive	Neutral
Reversibility	Medium	Low
Irreplaceable loss of resources?	No	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		

Mitigation:

- The overall impact of the proposed project has a low significance of 10 when considered in isolation. The overall status of the proposed development is considered to be positive given the high demand for energy generation in South Africa as well as other factors such as the needed jobs which will be created by this project.
- On the other hand, the cumulative impact of the project and other projects in the area will result in increased negative impacts such as air pollution, noise pollution, visual impacts, and traffic congestion.
- To mitigate these negative impacts, the following steps can be taken:
  - Limit the number of energy generation licenses approved in the study area
  - Prioritise cleaner energy producers over those which might result in relatively higher pollution levels
  - Prioritize the license approval for producer who will result in greater social benefits such as employment creation opportunities.

9.3.10. *Cumulative impacts on Traffic*

To assess the cumulative impact, it was assumed that all projects within 50km currently proposed and authorised, would be constructed at the same time. This is the precautionary approach as in reality; authorities will consider all application and construction is likely to be staggered depending on project-specific issues.

The construction and decommissioning phases are the only significant traffic generators. The duration of these phases is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and the facility, when operational, is not expected to add any significant traffic to the road network). Even if all projects within the area are constructed at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

Nature: Traffic congestion caused by the traffic generated by the proposed development and the associated noise and dust pollution.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**

	(post mitigation)	
Extent	Local (2)	High (5)
Duration	Short (1)	Medium-term (3)
Magnitude	Low (2)	High (8)
Probability	Probable (3)	Improbable (2)
Significance	**Low (15)**	**Medium (32)**
Status (positive/negative)	Negative	Negative
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: » Stagger component delivery to site. » Dust suppression. » Reduce the construction period, is feasible. » The use of mobile batching plants and quarries near the site would decrease the impact on the surrounding road network by reducing the construction trips and the distance travelled to transport the materials to the site. » Staff and general trips should occur outside of peak traffic periods.		

9.3.11. Cumulative impacts of Unplanned Events

The risks of the site are dominated by the ammonia storage, and thus the cumulative impact will be identical to the impacts predicted for ammonia storage presented in Chapter 8.

Nature: Worst case loss of containment of ammonia scenario – leading to a release of toxic airborne plumes.		
	Without Mitigation	**With Mitigation**
Extent	Low (2)	Low (1)
Duration	Very short (5)	Very short (5)
Magnitude	High (8)	High (6)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (15)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible (worst case: death)	Irreversible (worst case: death)
Irreplaceable loss of resources?	Yes (human)	Yes (human)
Can impacts be mitigated?	Yes	Yes
Mitigation: Mitigation would include reduction of ammonia or substitution for a less toxic component emergency response arrangements and systems, such as alarms to allow for personnel to muster in case of emergency, and cooperation with emergency responders. Preventive measures would include design, installation according to the vendor requirements. Furthermore, the layout separation distances between battery storage units and other units to prevent knock-on effects.		
Residual Risks: Even with mitigation, there may be residual risk of occurrence due to failures in protection systems and break-down in procedures and documented systems.		

9.4. Conclusion on Cumulative impacts

Cumulative impacts are expected to occur with the development of the Phakwe Richards Bay Gas Power 3 CCPP throughout all phases of the project life cycle. The main aim for the assessment of cumulative impacts is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The assessment of the cumulative impacts was undertaken through the consideration of impacts in isolation and compared to the cumulative impacts of the Phakwe Richards Bay Gas Power 3 CCPP and other industrial developments at a scale specifically identified by each specialist.

The significance of the cumulative impacts associated with the development of Phakwe Richards Bay Gas Power 3 CCPP ranges from low to medium, depending on the impacts being considered. Cumulative impacts no climate change are expected to be high. A summary of the cumulative impacts as assessed in this chapter is included in **Table 9.2** below.

Table 9.2: Summary of the cumulative impact significance for the Phakwe Richards Bay Gas Power 3 CCPP

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Terrestrial Biodiversity	Medium	Medium
Aquatic Biodiversity	None	Not rated
Soils and Agricultural Potential	Medium	Medium
Air Quality	Low	Medium
Health	None	Not rated
Climate Change	High	High
Visual	Medium	Medium
Noise	Low	Low
Socio-Economic	Low	Low
Traffic	Low	Medium
Risk Assessment (unplanned events)	Low	Low

Based on the specialist cumulative assessment and findings, the development of the Phakwe Richards Bay Gas Power 3 CCPP, other industrial activities, and gas to power developments within a 10km radius, it can be concluded that cumulative impacts will be of a low to medium significance, depending on the impact being considered. Impacts associated with climate change are potentially high but can be mitigated through avoided emissions as the addition of the Phakwe Richards Bay Gas Power 3 CCPP to the national grid has the potential to enable the expansion of South Africa's renewables generation capacity in execution of South Africa's energy transition strategy. There are no impacts or risks identified as unacceptable with the development of Phakwe Richards Bay Gas Power 3 CCPP when considered together with other developments within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

The limited potential for cumulative impacts and risks makes the location of this project within the identified site of the Richards Bay IDZ Zone 1F a desirable location for the proposed project, provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS

Phakwe Richards Bay Gas Power 3 (Pty) Ltd (PRBGP3), an Independent Power Producer (IPP), proposes the development of a combined cycle (CC) gas to power plant, with a capacity of up to 2 000MW, on various erven within the Richards Bay IDZ Phase 1F, Richards Bay. The proposed project is to be known as the Phakwe Richards Bay Gas Power 3 CCPP. The project site is located approximately 5km north-east of Richards Bay and 1km north of the suburb of Alton, within the jurisdiction of the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality, KwaZulu-Natal Province.

The Combined Cycle Power Plant and associated infrastructure is proposed in response to the provision for gas-to-power technology as part of the energy mix within the Integrated Resource Plan (IRP), 2019, and is planned to be bid into future procurement processes to be initiated by the Department of Mineral Resources and Energy (DMRE).

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction and operation of the project. The nature and extent of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure, as well as potential environmental impacts associated with the construction, operation and decommissioning phases are explored in more detail in this EIA Report.

10.1. Legal Requirements as per the EIA Regulations, 2014 (as amended). For the undertaking of an EIA Report

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of EIA Report.

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	A summary of the findings of the specialist studies undertaken for Phakwe Richards Bay Gas Power 3 CCPP has been included in section 10.2.
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement containing the key findings of the environmental impacts of Phakwe Richards Bay Gas Power 3 CCPP has been included as section 10.4. Sensitive environmental features located within the study area and development area, overlain with the proposed development footprint have been identified and are shown in Figure 10.1. A summary of the positive and negative impacts associated with Phakwe Richards Bay Gas Power 3 CCPP has been included in section 10.2.
h (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	A concluding statement indicating the preferred alternatives and the preferred location of the activity is included in section 10.5.

Requirement	Relevant Section
3(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of the Phakwe Richards Bay Gas Power 3 CCPP have been included in section 10.5.
3(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether the Phakwe Richards Bay Gas Power 3 CCPP should be authorised has been included in section 10.5.

10.2. Evaluation of the Phakwe Richards Bay Gas Power 3 CCPP

The preceding chapters of this report together with the specialist studies contained within **Appendices D-N** provide a detailed assessment of the potential impacts that may result from the development of the proposed Phakwe Richards Bay Gas Power 3 CCPP. This chapter concludes the environmental assessment of the Phakwe Richards Bay Gas Power 3 CCPP by providing a summary of the results and conclusions of the assessment of the development area. In so doing, it draws on the information gathered as part of the EIA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws were identified in the detailed specialist studies conducted It is recommended that mitigation measures are implemented to reduce impacts to acceptable levels. The potential environmental impacts associated with Phakwe Richards Bay Gas Power 3 CCPP identified and assessed through the EIA process include:

- Impacts on Terrestrial Biodiversity
- Impacts on Aquatic Ecology
- Impacts on Soils and Agricultural Potential
- Impacts on Air Quality
- Health Impacts
- Impacts on Climate Change
- Visual impacts
- Impacts on ambient Noise Levels
- Socio-Economic impacts
- Traffic impacts
- Impact due to unplanned events

10.2.1. Impacts on Terrestrial Biodiversity

The project under consideration is located within areas recognised as of national, provincial, district or municipal conservation significance (Valued Ecosystem Components (VECs)[33]) considered important in terms of habitats, species, ecosystems, and ecosystem services conservation that are required to meet national, provincial, district and municipal conservation targets. Despite the presence of VECs within Phase 1F, this area was incorporated into the Industrial Development Zone and received authorisation for industrial development in 2016.

[33] VECs are defined as elements of the environment that have scientific, ecological, economic, social, or cultural significance.

Phase 1F of the IDZ is still largely undeveloped but has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services infrastructure (i.e., water, sewer, stormwater, electricity, roads, artificial drainage canals), and the more recent infilling of the wetlands as authorised for the development of the IDZ. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO_2 Pilot plant which covers approximately a third of Phase 1F. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds.

The project site on Phase 1F has experienced past environmental disturbances that were judged to have had a negative influence on its biodiversity and ecology and included the following:

» Land clearance on the project site resulted in the direct loss of indigenous vegetation.
» The wetlands on the proposed development site were fragmented by the construction of a drainage line and roads.
» The wetlands on the project site were infilled to prepare the area for future development.

The site has been determined to have a moderate Ecological Importance. In this context, development activities of medium impact are considered acceptable followed by appropriate restoration activities. Many of the anticipated project-specific impacts during the construction and operational phases can be successfully mitigated to moderate, low, and minor levels of significance, and are thus considered acceptable.

10.2.2. Impacts on Aquatic Ecology

Three hydrogeomorphic (HGM) units were identified within the 500 m regulated area, of which two have been classified as unchanneled valley bottom wetlands and one classified as a hillslope seep. The HGM units consist of one dominant soil form was identified within the identified wetland, namely the Manguzi soil form.

The Richards Bay Industrial Development Zone received environmental authorisation, which includes the development of two of the wetland areas. The remaining third wetland is not in a position in the landscape to be affected by the development. Therefore, no additional authorisation or WUL is required for the proposed PRBGP3 project.

It is recommended that the conceptual wetland plan developed for the industrial zone (Royal Haskoning DHV, 2015) be implemented for the project.

10.2.3. Impacts on Soils and Agricultural Potential

Various soil forms have been identified which have been divided into four main land capability classes according to depth, texture, hydromorphic properties etc. (namely land capability class II, III, IV and V). From these four classes as well as the ideal climatic capability of "C1", three land potential levels were calculated, namely land potential 1, 2 and "vlei". Therefore, the overall land potential ranges from "Low" (for the wetland areas characterised by non-arable conditions) to "Very High".

The 50 m regulated area comprises of land potential resources characterised by "Very High" arable potential under natural conditions, owing to the ideal climatic conditions of the region as well as the

physical properties of the classified soil forms. The high sensitivity of these soils emphasises the potential loss of highly valued land. It is worth noting that the agricultural land use in the surrounding area needs to be considered holistically.

High potential arable land is only useful to agricultural land use, with limited significance outside of such a land use. It is worth considering the locality of the proposed project area being on the outskirts of the Richards Bay CBD. Therefore, regardless of whether or not the proposed activities proceed, the soil will not be used for agriculture due to the zoning of the area. Therefore, it is the specialist's opinion that even though significant impacts towards soil resources are expected, no impacts towards agricultural land use are foreseen. The soil resources will ultimately never be of value to farming practices reliant on high potential arable land. Therefore, the proposed activities should proceed as have been planned.

10.2.4. Impacts on Air Quality

The CALPUFF/CALMET model suite was selected for use in the Air Quality Impact Assessment investigation to predict maximum short-term (1 and 24-hour) and annual average ground-level concentrations at various receptor locations within the computational domain. The main findings of the simulated incremental assessment were:

15. The construction phase of the project could result in off-site exceedances of inhalable particulate matter of less than 10 µm in diameter - PM_{10} daily and annual National Ambient Air Quality Standards (NAAQS) over the 36-month construction phase.
    c. It is likely that the construction (and decommissioning) phase(s) may have a "low" impact on the ambient air quality before and after effective mitigation measures are implemented.
16. Compliance with hourly, daily and annual NAAQS under normal operations for hourly, daily and annual average pollutant concentrations as applicable to sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$ – inhalable and respirable particulate matter of less than 10 µm and 2.5 µm in diameter, respectively), carbon monoxide (CO) and total volatile organic compounds (TVOCs). Exceedances of the nitrogen dioxide (NO_2) NAAQ Limit Concentration could result from the normal operation of the facility using natural gas, but the frequency of exceedance is likely to be within that allowed by the NAAQS.
    e. The operational phase of the project will have a low impact significance (based on design mitigation measures) on ambient SO_2, PM, CO, and VOC concentrations, with no additional mitigation required.
    f. The operational phase is likely to have a "medium" impact significance for NO_2; however, if additional mitigation measures are implemented, the significance could be reduced to "low".
17. Due to the inherently low sulfur content of natural gas, SO_2 emissions from the turbines will not reach the emission standard and therefore the facility's impact on SO_2 was also assessed using mass balance calculations for combined cycle turbines using the default sulfur content of the emission factor (4600 g/lE+06 Nm^3).
    c. Compliance the NAAQS was simulated for hourly, daily, and annual average SO2 for the operational scenario based on emission factor calculations.
18. The impact of start-up on ambient nitrogen dioxide (NO_2) concentrations was estimated, and exceedances of the NAAQS could result at residential receptors, schools and medical facilities. The impacts can be reduced if the turbines reach Minimum Emission Standards in less than 30 minutes, and if the frequency of start-up events is reduced.

19. Annual SO_2 and NO_2 concentrations are unlikely to affect vegetation productivity or animal health off-site.
20. The impact of the facility was simulated to be below the National Dust Control Regulations (NDCR) acceptable dustfall rates for all project phases.
21. While hydrogen (or natural gas – hydrogen mixture) could significantly reduce emissions of SO2, CO, PM and VOCs from the facility, emissions of oxides of nitrogen (NOX) could potentially be similar to those from natural gas combustion.

From an air quality perspective, it is the opinion of the specialist that the Phakwe Richards Bay Gas Power 3 Combined Cycle Gas to Power Plant be authorised, on condition that:

» Emissions be monitored as per standard practice for the appropriate listed activity.
» Emissions are maintained at or lower than the Minimum Emission Standards appropriate for the listed activity.
» Conformance with the other environmental management programme requirements for air quality are met.

10.2.5. Health Impacts

A rapid appraisal health impact assessment (RAHIA) was undertaken for the proposed project, supported by a Baseline Health Assessment Report and a Human Health Risk Assessment. This assessment was informed by the outcomes of the Air Quality Impact Assessment. According to the Good Practice guidance of the IFC, a RAHIA is suitable for the project, because an influx of people settling in the area, due to the construction and operation of the facility, is not foreseen.

It was concluded that:

» The assessment has been conducted with consideration of the health vulnerabilities of certain age groups in the receptor population, as indicated in the community baseline health report.
» Impacts on health associated with PM2.5, SO2, NO2, CO and VOC emissions from the proposed Phakwe power plant project during the construction, operational and decommissioning phases are assessed as of low significance, with a neutral status.
» Implementation of the proposed power plant is associated with low impact on health, even in sensitive receptor communities.

10.2.6. Impacts on Climate Change

The assessment of the climate change impact of this project considered the impact of the project on climate change, the resilience of the project to climate change, as well as the options for mitigation of the impacts.

The impact of the project on climate change was assessed in the context of both GHG emissions from the project, as well as the potential positive impact the project can have through the avoidance of emissions. This was assuming natural gas is the only fuel used. The results are compared to South Africa's carbon budget for the NDC Low Emission Scenario, which was calculated as 7 760 million tons CO_2e.

The project will emit 82 ktCO_2e during the construction phase, 7 870 ktCO_2e/year during the operational phase and 236 000 ktCO_2e over its lifetime. The portion of these emissions emitted inside the borders of

South Africa represents 1.9% of the low emission NDC carbon budget calculated, for the lifetime of the project.

When considering the potential positive impact of the proposed project, the expected GHG emissions from the project will avoid emissions through the displacement of coal. In addition to this, the project will enable an increased level of intermittent renewable energy capacity to be placed onto the South African grid. In the long-term, hydrogen can be a potential fuel source used to offset the projects carbon emissions. The total avoided emissions is 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget

The positive impact of the project on climate change with respect the avoided emissions from the coal baseline, and the potential avoided emissions through the increase of the grid to accept intermittent renewable energy far outweighs the contribution of the project to national inventory.
With respect to the resilience of the project to climate change, we found that there are no significant risk factors that should be considered in the environmental authorisation.

There are limited mitigation measures available to this proposed project, and as a result this project will be exposed to a low residual risk of lock in emissions, due to the combustion of natural gas.

In accordance with the findings of this CCIA, the specialist has concluded that the proposed Phakwe Richards Bay Gas Power 3 CCPP should not be refused environmental authorisation on climate change related issues.

10.2.7. Visual Impacts

The development and operation of the proposed Phakwe Richards Bay Gas Power 3 CCPP and its associated infrastructure is not expected to have a significant visual impact within the larger study area. The location of the proposed power plant within an established industrial area is in line with the principle of consolidating industrial infrastructure within allocated areas. It is also not expected to significantly increase the potential cumulative visual impacts of industrial developments within the region, given the existing industrial nature of the port of Richards Bay, the Alton industrial area and the RB IDZ Phase 1F developments, and the planned port expansion endeavours.

Overall, the significance of the visual impacts (should any occur) is expected to range from moderate to low as there are no known potential sensitive visual receptors within close proximity of the proposed development. There are no residences located within a 1km radius of the proposed development and no tourist attractions or tourist routes that would be significantly impacted.

A number of mitigation measures have been proposed. Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should be implemented and maintained throughout the construction, operational and decommissioning phases of the proposed power plant.

If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the development of the Phakwe Richards Bay Gas Power 3 CCPP would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

10.2.8. Noise Impacts

Potential scenarios were conceptualized for the future proposed construction and operational phases, with the output of the modelling exercise indicating a potential noise impact of low significance for both the day- and night-time periods for all the project phases. No mitigation or management measures are required or recommended to reduce noise levels (when considering Environmental Noise). The power generation facility still has to comply with the relevant Health and Safety Regulations and Guidelines that my stipulate periodic noise monitoring (Noise-Induced Hearing Loss Regulations [GNR 307 of 2020] as well as the Occupational Health and Safety Act, 1993 [Act 85 of 1993]).

Similarly, no additional acoustic studies are recommended for this development, and it will not be required to develop or implement an environmental noise monitoring programme considering:

» the developmental character of the area;
» the results from the night-time ambient sound level measurements;
» the projected low significance of the noise impacts

It is therefore recommended that the proposed 2 000MW Phakwe Gas to Power Project be authorized from an acoustic perspective.

10.2.9. Socio-economic Impacts

the proposed development will result in both negative and positive impacts. All identified economic impacts will be positive and some social identified impacts are negative in nature. The following main conclusions are reached from the specialist study undertaken:

» South Africa is experiencing high energy demand and as a result of the gap between the high demand and low supply there has been continued load-shedding and therefore a need for additional electricity supply.
» High dependence on coal as an energy source has attracted growing national and international criticism due to greenhouse gas emissions the contribute significantly to climate change and air pollution. Due to the impact of coals as energy source there is a need for South Africa to diversify the sources of electricity generation.
» The proposed Phakwe Richards Bay Gas Power 3 CCPP and its associated infrastructure which is to be located at the Richards Bay IDZ Phase 1F, aims to supply natural gas-based electricity which is less harmful to the environment when compared to coal produced energy.
» The socio-economic impact assessment in this report focuses on the social impacts which are likely to arise from the development of the proposed plant as well as the various economic impacts which might arise from the proposed development. Under the social impacts, several the impacts have been identified as being negative and these include air pollution, expected increase in noise levels, expected increase in traffic level and possible increases on the crime levels of the area.
» The mitigation measures are specific to a particular impact and these can be summarized as follows:

- Community Impact
  - The negative visual effect and the pollution levels can be mitigated by planting trees around the plant establishment.
- Population Levels Impact
  - To reduce the magnitude of the population levels, mitigation measures such as prioritising local workers for employment should be applied.
- Crime Levels Impact
  - The magnitude of potential crime levels can be reduced by ensuring that there is good security measure on the premises of the plant.
- Standard of Living Impact
  - To mitigate the magnitude of the impact occurring, proper employment procedures have to be followed with workers being part of a labour union to ensure that their concerns noted

» All identified economic impacts from the proposed development are expected to be of a positive nature and these include the following:
- Employment creation
  - A total of 2 484 jobs are expected to be created during the construction phase of the proposed PRBGP3 and a further 157 jobs are expected to be created during the operational phase of the project. This includes direct, indirect and induced job opportunities.
- Increase Gross Value Add
  - During the construction of and operational phases of the project, the total contribution to GVA from the plant is expected to be more than R25 Billion rands.
- Property Values
  - The operation of the highly technical power plant which uses an advanced method of energy generation will have a positive impact on the property values of surrounding establishments.

» The Phakwe Richards Bay Gas Power 3 CCPP development also has a larger positive economic contribution in terms of contributing energy towards the national electric grid which will ease load shedding and allow reduced power costs for the reopening of industry.

» The overall status of the proposed development is considered to be positive given the high demand for energy generation in South Africa as well as other factors such as the needed jobs which will be created by this project.

» All these findings support the proposal of proceeding with the development of the Phakwe Richards Bay Gas Power 3 CCPP at the identified site in Phase 1F of the Richards Bay IDZ.

10.2.10. Traffic Impacts

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Phakwe Richards Bay Gas Power 3 (PRBGP3) 2000 MW Combined Cycle Gas to Power Plant were identified and assessed.

» The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal load vehicles was estimated and found to be able to be accommodated by the road network.

» During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately 60 full-time employees will be stationed on site (subject to change). Based on experience with similar projects, the number of full-time employees is generally low and consequently, the associated trips are negligible. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation.
- The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.
- The proposed access point, located on the access road located off Alumina Alley, will need to be upgraded to cater for the construction vehicles and abnormal load vehicles.
- As traffic delays are experienced along the R619, the access roads located off the R619 should be avoided or if necessary, used during off peak hours.
- The preferred access roads to the site are the roads located off the R34 viz. Western Arterial, Alumina Alley and Bullion Road.

The construction and decommissioning phases are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is short term i.e., the impact on the surrounding road network is temporary and the facility, when operational, will not add any significant traffic to the road network.

The development is supported from a traffic and transport engineering perspective provided that the recommendations and mitigations contained in this report are adhered to.

The potential impacts associated with the facility and associated infrastructure are acceptable from a traffic and transport engineering perspective and it is therefore recommended that the proposed facility be authorised

10.2.11. Impact of Unplanned Events

As a result of the risk assessment study conducted for the proposed PRBGP3 facility in Richards Bay, a number of events were found to have risks beyond the site boundary. These risks could be mitigated to acceptable levels, as shown in the report.

No fatal flaws that would prevent the project proceeding to the detailed engineering phase of the project were identified, and the specialist would support the project under the following conditions most of which will be detailed in the MHI study:

- Compliance with all statutory requirements, i.e., pressure vessel designs.
- Compliance with applicable SANS codes, i.e., SANS 10087, SANS 10089, SANS 10108, etc.
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs.
- Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.
- Full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm:
  - Including demonstration from the designer that sufficient and reliable instrumentation would be specified and installed at the facility.

- Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment:
  - Including compliance to statutory laws, applicable codes and standards and world's best practice;
  - Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
  - Including the auditing of the built facility against the safety document;
  - Noting that codes such as IEC 61511 can be used to achieve these requirements;
- Demonstration by the PRBGP3 owner or their contractor that the final designs would reduce the risks posed by the installation to the South African requirements as prescribed in SANS 1461 (2018).
- Signature of all terminal designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs.
- Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (with input from local authorities).
- Any increases to the product list or product inventories must be with the approval of the authorities under NEMA.
- Final acceptance of the facility risks with an MHI risk assessment that must be completed in accordance with the MHI regulations;
  - Basing such a risk assessment on the final design and including engineering mitigation.

10.2.12. Assessment of Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Phakwe Richards Bay Gas Power 3 CCPP throughout all phases of the project life cycle. The main aim for the assessment of cumulative impacts is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The assessment of the cumulative impacts was undertaken through the consideration of impacts in isolation and compared to the cumulative impacts of the Phakwe Richards Bay Gas Power 3 CCPP and other industrial developments at a scale specifically identified by each specialist.

Based on the specialist cumulative assessment and findings, the development of the Phakwe Richards Bay Gas Power 3 CCPP, other industrial activities, and gas to power developments within a 10km radius, it can be concluded that cumulative impacts will be of a low to medium significance, depending on the impact being considered. Impacts associated with climate change are potentially high but can be mitigated through avoided emissions as the addition of the Phakwe Richards Bay Gas Power 3 CCPP to the national grid has the potential to enable the expansion of South Africa's renewables generation capacity in execution of South Africa's energy transition strategy. There are no impacts or risks identified as unacceptable with the development of Phakwe Richards Bay Gas Power 3 CCPP when considered together with other developments within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

The limited potential for cumulative impacts and risks makes the location of this project within the identified site of the Richards Bay IDZ Zone 1F a desirable location for the proposed project, provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

10.2.13. Assessment of the Do Nothing Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Phakwe Richards Bay Gas Power 3 CCPP. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a CCPP facility.

In terms of the cost-benefit analysis of the project it was concluded that, apart from impacts associated with GHG emissions, the costs associated with the project are anticipated to occur at a site-specific level, the significance of which can be largely reduced through the application of appropriate mitigation measures, and through the appropriate placement of infrastructure within areas of lower sensitivity. The inclusion of the Phakwe Richards Bay Gas Power 3 CCPP onto the grid could contribute to a potential net reduction in GHG emissions. The total avoided emissions are 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this, there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget.

Impacts of not implementing the project on the identified site largely relate to lost opportunities from a socio-economic perspective relating to employment, skills development, contribution to local and provincial development goals and the addition of 2000MW to the electricity grid and support for the introduction of more renewable energy into the technology mix.

Although a number of impacts of potential high significance have been identified, no environmental fatal flaws were identified to be associated with the Phakwe Richards Bay Gas Power 3 CCPP through the specialist studies undertaken. Where impacts cannot be avoided, appropriate mitigation has been identified to minimise impacts to acceptable levels. A number of negative impacts have been identified to be associated with the implementation of the do nothing alternative.

The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of Phakwe Richards Bay Gas Power 3 CCPP.

10.3. Environmental Sensitivity Mapping

As part of the specialist investigations undertaken within the project site, specific environmental features and areas were identified which will be impacted by the placement of the Phakwe Richards Bay Gas Power 3 CCPP (refer to **Figure 10.1**). These include wetland features and medium sensitivity vegetation (Maputaland Wooded Grassland) within the project site, as well as potentially sensitive noise and air quality receptors further afield (>2km).

Regarding the wetland features, Richards Bay Industrial Development Zone SoC Ltd received Environmental Authorisation (EA) for the IDZ Phase 1F in September 2016 (DFFE Ref No.: 14/12/16/3/3/3/665). This EA included the infilling of some of the wetlands on site to release the land for development. Other wetland features identified within the 500m regulated zone will not be impacted by the proposed development.

Impacts on sensitive noise and air quality receptors were determined to be of low significance.

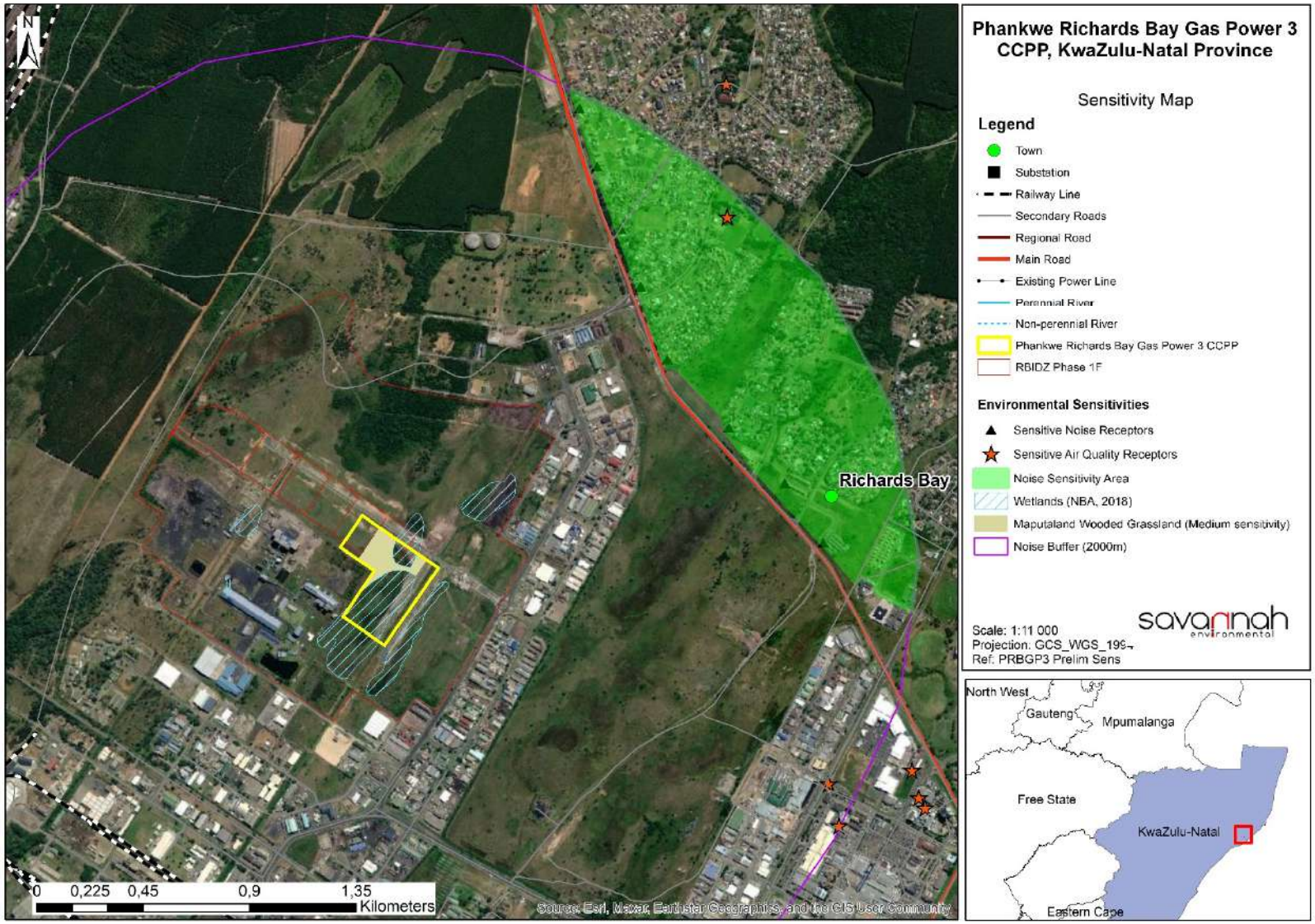

Figure 10.1: Environmental sensitivity map of the project site overlain by the layout assessed for Phakwe Richards Bay Gas Power 3 CCPP

10.4. Overall Conclusion (Impact Statement)

The construction and operation of the Phakwe Richards Bay Gas Power 3 CCPP on the project site located within the Richards Bay IDZ Phase 1F, Richards Bay in the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality has been proposed by Phakwe Richards Bay Gas Power 3 (Pty) Ltd. The preferred activity was determined by the developer to be the development of a gas to power combined cycle power plant. A technically viable project site and development footprint was proposed by the developer and assessed as part of the EIA process. The environmental assessment of the development footprint within the project site was undertaken by independent specialists and their findings have informed the results of this EIA Report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

From a biodiversity perspective, features in the study area include wetlands and medium sensitivity vegetation (Maputaland Wooded Grassland) within the project site. The site has been determined to have a moderate Ecological Importance. In this context, development activities of medium impact are considered acceptable followed by appropriate restoration activities. Many of the anticipated project-specific impacts during the construction and operational phases can be successfully mitigated to moderate, low, and minor levels of significance, and are thus considered acceptable.

The Richards Bay Industrial Development Zone received environmental authorisation, which includes the development of two of the wetland areas. The remaining third wetland is not in a position in the landscape to be affected by the development. Therefore, no additional authorisation or WUL is required for the proposed PRBGP3 project.

From a land use perspective, the site is located within the Richards Bay Industrial Development Zone, Phase 1F. The site is designated for noxious industry such as the proposed gas to power plant. The land potential resources of some areas within the site are characterised by "Very High" arable potential under natural conditions, owing to the ideal climatic conditions of the region as well as the physical properties of the classified soil forms. High potential arable land is however only useful to agricultural land use, with limited significance outside of such a land use. It is worth considering the locality of the proposed project area being on the outskirts of the Richards Bay CBD. Therefore, regardless of whether or not the proposed activities proceed, the soil will not be used for agriculture due to the zoning of the area. Therefore, even though significant impacts towards soil resources are expected, no impacts towards agricultural land use are foreseen. The soil resources will ultimately never be of value to farming practices reliant on high potential arable land.

From a social perspective, the project has the potential to impact negatively on ambient air quality, human health, ambient noise levels and sense of place. As a result of the nature of the proposed project and the location of the proposed development site in relation to sensitive receptors, impacts in this regard are expected to be limited. Positive socio-economic impacts of the project, including employment and skills development opportunities as well as the supply of reliable electricity to the grid, are expected at a regional and national level.

The project is expected to have a high impact on climate change. The inclusion of the Phakwe Richards Bay Gas Power 3 CCPP onto the grid could, however, contribute to a potential net reduction in GHG emissions. The total avoided emissions are 236 million tCO_2e over the lifetime of the project through the displacement of the coal baseline. This represents 3% of the South African carbon budget associated with NDC low emission pathway. In addition to this, there is a possibility that the project could avoid 556 million tons through increasing the ability of the Eskom grid to accept intermittent renewable energy over the lifetime of the project. This represents 7.2% of the carbon budget.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Phakwe Richards Bay Gas Power 3 CCPP. All impacts associated with the project can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

Through the assessment of the development of the Phakwe Richards Bay Gas Power 3 CCPP within the project site it can be concluded that the development of the facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

10.5. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the development of the Phakwe Richards Bay Gas Power 3 CCPP is acceptable within the landscape and can reasonably be authorised. The recommended validity period for the environmental authorisation is **10 years**.

The authorisation would include the following key infrastructure and components:

- Up to 4 gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- Up to 4 Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- Up to 4 steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
- Water retention pond
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines

- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, waste water
- Fire water (FW) storage and FW system
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal);
  - Warehousing and buildings;
  - Workshop building;
  - Fire water pump building;
  - Administration and Control Building;
  - Ablution facilities;
  - Storage facilities;
  - Guard House;
  - Fencing;
  - Maintenance and cleaning area;
  - Operational and maintenance control centre;
- Electrical facilities including:
  - Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
  - Generators and auxiliaries;
- Service infrastructure including:
  - Stormwater channels;
  - Water pipelines
  - Temporary work areas during the construction phase (laydown areas)

The following key conditions would be required to be included within an authorisation issued for the Phakwe Richards Bay Gas Power 3 CCPP:

- The Phakwe Richards Bay Gas Power 3 CCPP must be located within the Richards Bay IDZ Phase 1F on the following erven:
  - Erf 16820
  - Erf 16819
  - Erf 1/16674
  - Subdivision of Erf 17442
- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within **Appendices D to N**, are to be implemented.
- The EMPr as contained within **Appendix O** of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the Phakwe Richards Bay Gas Power 3 CCPP in order to ensure compliance with environmental specifications and management measures. The

implementation of this EMPr for all life cycle phases of the project is considered key in achieving the appropriate environmental management standards as detailed for this project.

- A pre-construction walk-through of the final development footprint for species of conservation concern that may be affected and that can be translocated as well as comply with the KZN Nature Conservation Ordinance and DEDT&EA permit conditions, must be undertaken prior to the commencement of the construction phase.
- Before construction commences individuals of listed species within the development footprint that would be affected, must be counted, and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey, if required. Permits from the relevant provincial authorities, i.e. the KZN DEDT&EA, must be obtained before the individuals are disturbed.
- The project footprint must be kept as small as possible.
- An alien vegetation management plan should be compiled during the planning phase and implemented concurrently with the commencement of construction. Regular inspection for alien and invasive vegetation, to limit their spread into the wetland.
- Obtain all other mandatory and environmental permits for the project, as required.

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