PROPOSED PHAKWE RICHARDS BAY GAS POWER 3 (PRBGP3) COMBINED CYCLE POWER PLANT (CCPP), KWAZULU-NATAL PROVINCE

VISUAL IMPACT ASSESSMENT

Produced for:

Phakwe Richards Bay Gas Power 3 (Pty) Ltd

On behalf of:

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1. STUDY APPROACH

1.1. Qualification and experience of the practitioner

Lourens du Plessis (t/a LOGIS) is a *Professional Geographical Information Sciences (GISc) Practitioner* registered with The South African Geomatics Council (SAGC), and specialises in Environmental GIS and Visual Impact Assessments (VIA).

Lourens has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modeling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are often utilised in Environmental Impact Assessments, Environmental Management Frameworks, State of the Environment Reports, Environmental Management Plans, tourism development and environmental awareness projects.

He holds a BA degree in Geography and Anthropology from the University of Pretoria and worked at the GisLAB (Department of Landscape Architecture) from 1990 to 1997. He later became a member of the GisLAB and in 1997, when Q-Data Consulting acquired the GisLAB, worked for GIS Business Solutions for two years as project manager and senior consultant. In 1999 he joined MetroGIS (Pty) Ltd as director and equal partner until December 2015. From January 2016 he worked for SMEC South Africa (Pty) Ltd as a technical specialist until he went independent and began trading as LOGIS in April 2017.

Lourens has received various awards for his work over the past two decades, including EPPIC Awards for ENPAT, a Q-Data Consulting Performance Award and two ESRI (Environmental Systems Research Institute) awards for *Most Analytical* and *Best Cartographic Maps*, at Annual International ESRI User Conferences. He is a co-author of the ENPAT atlas and has had several of his maps published in various tourism, educational and environmental publications.

He is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, the core elements are more widely applicable (i.e. within the KwaZulu-Natal Province).

Savannah Environmental (Pty) Ltd appointed Lourens du Plessis as an independent specialist consultant to undertake the visual impact assessment for the proposed Phakwe Richards Bay Gas Power 3 Combined Cycle Power Plant (PRBGP3CCPP) and associated infrastructures. He will not benefit from the outcome of the project decision-making.

1.2. Assumptions and limitations

This assessment was undertaken during the planning stage of the project and is based on information available at that time.

1.3. Level of confidence

Level of confidence[1] is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
  - 3: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
  - 2: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
  - 1: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

- The information available, understanding of the study area and experience of this type of project by the practitioner:
  - 3: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
  - 2: A moderate level of information and knowledge is available of the project and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.
  - 1: Limited information and knowledge is available of the project and/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 1: Level of confidence.

	Information on the project & experience of the practitioner			
Information on the study area		**3**	**2**	**1**
	3	9	6	3
	2	6	4	2
	1	3	2	1

*The level of confidence for this assessment is determined to be **9** and indicates that the author's confidence in the accuracy of the findings is high:*

- The information available, and understanding of the study area by the practitioner is rated as **3**, and
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**.

1.4. Methodology

The study was undertaken using Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed power plant facility. A detailed Digital Terrain Model

[1] Adapted from Oberholzer (2005).

(DTM) for the study area was created from topographical data provided by NASA in the form of a 30m SRTM (Shuttle Radar Topography Mission) elevation model.

Visual Impact Assessment (VIA)

The VIA is determined according to the nature, extent, duration, intensity or magnitude, probability and significance of the potential visual impacts, and will propose management actions and/or monitoring programs, and may include recommendations related to the gas power plant and associated infrastructure placement.

The visual impact is determined for the highest impact-operating scenario (worst-case scenario) and varying climatic conditions (i.e. different seasons, weather conditions, etc.) are not considered.

The VIA considers potential cumulative visual impacts, or alternatively the potential to concentrate visual exposure/impact within the region.

The following VIA-specific tasks were undertaken:

- **Determine potential visual exposure**

The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if the proposed power plant facility and associated infrastructure were not visible, no impact would occur.

The first step in determining the visual impact of the proposed facility is to identify the areas from which the structures would be visible. The type of structures, the dimensions, the extent of operations and their support infrastructure are taken into account.

Features such as vegetation, man-made topographical features and other existing structures (that make up the visual absorption capacity of the environment surrounding the proposed development) that might shield the facility are built into the model to ensure that the result of the visibility analysis is as accurate as possible.

- **Determine visual distance/observer proximity to the power plant**

In order to refine the visual exposure of the facility on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for each type of structure.

Proximity radii for the proposed power plant are created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed facility.

- **Determine viewer incidence/viewer perception (sensitive visual receptors)**

The next layer of information is the identification of areas of high viewer incidence (i.e. main roads, residential areas, settlements, etc.) that would be exposed to the project infrastructure.

This is done to focus attention on areas where the perceived visual impact of the facility will be the highest and where the perception of affected observers will be negative.

Related to this data set, is a land use character map, that further aids in identifying sensitive areas and possible critical features (i.e. tourist facilities, national parks, residential areas, etc.), that should be addressed.

- **Determine the visual absorption capacity (VAC) of the landscape**

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC.

The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernable detail in visual characteristics of both environment and structure decreases.

- **Calculate the visual impact index**

The results of the above analyses are merged to determine the areas of likely visual impact and where the viewer perception would be negative. An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This focusses the attention to the critical areas of potential impact and determines the potential **magnitude** of the visual impact.

Geographical Information Systems (GIS) software will be used to perform the analyses and to overlay relevant geographical data sets to generate a visual impact index.

- **Determine impact significance**

The potential visual impacts are quantified in their respective geographical locations to determine the significance of the anticipated impact on identified receptors. Significance is determined as a function of extent, duration, magnitude (derived from the visual impact index) and probability. Potential cumulative and residual visual impacts are also addressed. The results of this section is displayed in impact tables and summarised in an impact statement.

- **Propose mitigation measures**

The preferred layout alternative (or a possible permutation of the alternatives) will be based on its potential to reduce the visual impact. Additional general mitigation measures will be proposed in terms of the planning, construction, operation and decommissioning phases of the project.

- **Reporting and map display**

All the data categories, used to calculate the visual impact index, and the results of the analyses will be displayed as maps in the accompanying report. The methodology of the analyses, the results of the visual impact assessment and the conclusion of the assessment will be addressed in the VIA report.

- **Site visit**

Undertake a site visit in order to verify the results of the spatial analyses and to identify any additional site specific issues that may need to be addressed in the VIA report. The site visit was undertaken in October 2020. The season and climatic conditions do not have any influence on the outcome of the VIA.

2. BACKGROUND

Phakwe Richards Bay Gas Power 3 (Pty) Ltd (PRBGP3) intends developing a Combined Cycle Power Plant (CCPP) located on various properties within the Richards Bay (RB) Industrial Development Zone (IDZ) Phase 1F, Richards Bay, KwaZulu-Natal Province. The project will be abbreviated as PRBGP3CCPP in this report.

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

- Up to four 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 four Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust).
- Up to four 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.

Table 2: Project components and requirements.

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 selected Eskom grid connection point A 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 • Refuse removal on a weekly basis by the uMhlathuze Municipality.

	Confirmation of services from the IDZ is included in the EIA
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.

Figure 1: Regional locality of the proposed project area.

PRBGP3 has appointed Savannah Environmental (Pty) Ltd ("**Savannah**") as the independent environmental consultant to undertake the EIA for the CCPP. The EIA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations, as amended, promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

Figure 2: Proposed infrastructure layout.

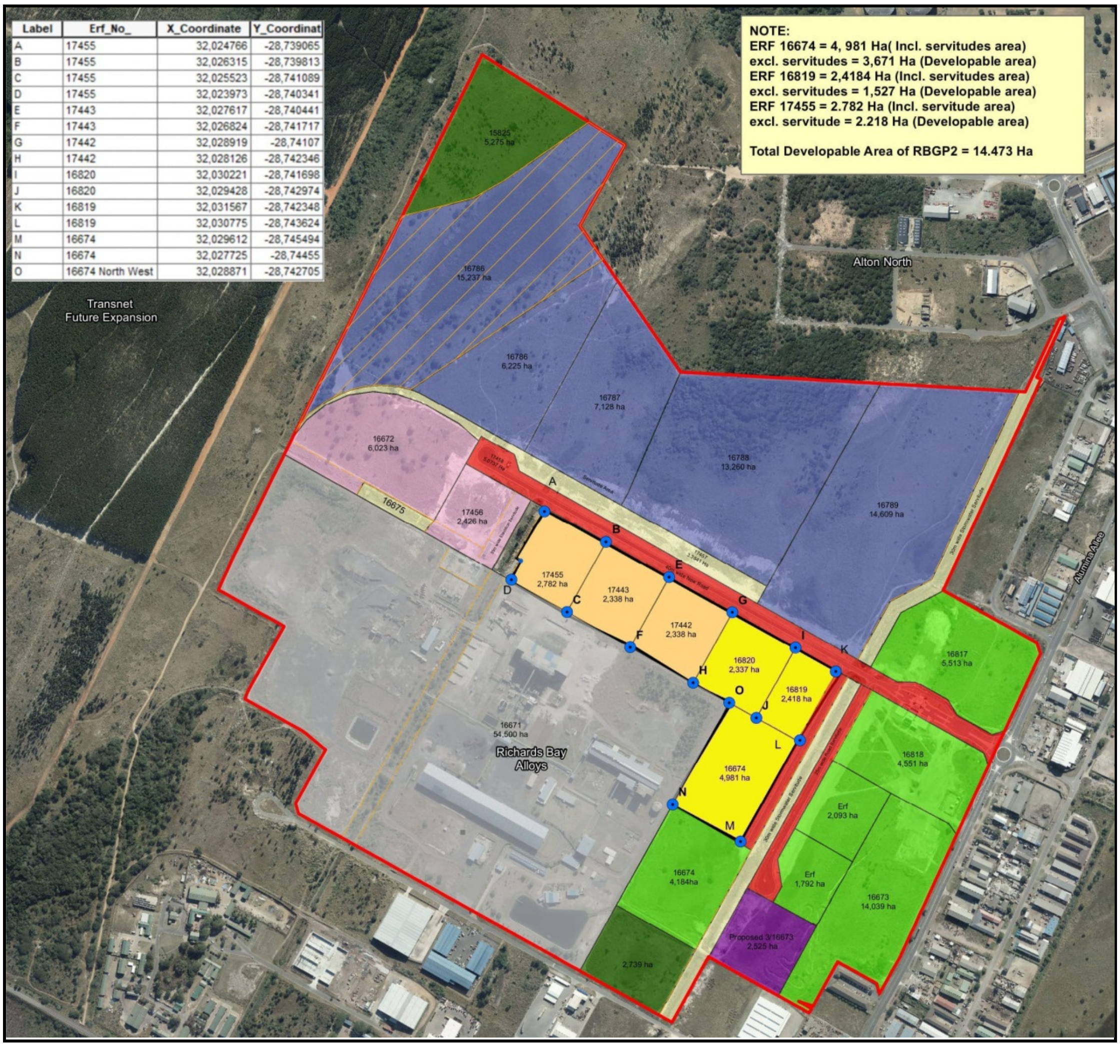


Figure 3: Location of the PRBGP3CCPP (yellow) within the RB IDZ Phase 1F (red outline).

3. SCOPE OF WORK

This report is the undertaking of a Visual Impact Assessment (VIA) of the proposed PRBGP3CCPP as described above.

The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

The study area for the visual assessment encompasses a geographical area of 171km² (the extent of the full page maps displayed in this report) and includes a minimum 6km buffer zone (area of potential visual influence) from the development footprint. The study area includes the Alton industrial area, a section of the Richards Bay harbour, the central business district (CBD) and a number of residential areas.

Anticipated issues related to the potential visual impact of the proposed power plant and ancillary infrastructure as identified in the Scoping Phase 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.

4. RELEVANT LEGISLATION AND GUIDELINES

The following legislation and guidelines have been considered in the preparation of this report:

- National Environmental Management Act 107 of 1998 (NEMA);
- The Environmental Impact Assessment Regulations, 2014 (as amended);
- Guideline on Generic Terms of Reference for EAPS and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011); and
- Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.

5. THE AFFECTED ENVIRONMENT

The proposed project is located within the uMhlathuze Local Municipality, in the King Cetshwayo District Municipality of the KwaZulu-Natal Province. The project site falls within the Richards Bay city limits, approximately 2km north-west of the CBD and 5km north of the harbour. It is located within the Alton industrial area, and more specifically centrally within the RB IDZ Phase 1F, a proclaimed special economic zone aimed at attracting investment to the region. It should be noted that large tracts of land within the RB IDZ Phase 1F are still vacant.

Even though Alton is a predominantly light industrial area, there are a large number of major industries within the larger area, namely; the Hillside and Bayside aluminium smelters, the Mondi paper plant, the Foskor plant, the Tata Steel factory and a large number of industrial structures related to coal storage and transportation at the Port of Richards Bay.

Topography, vegetation and hydrology

The proposed project site is located at approximately 45m above sea level. 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 falls within the Mhlatuze River quaternary catchment and the Nseleni River floodplain (a tributary of the Mhlatuze) is prominent to the west of the study area.

The larger part of the study area falls within the *Indian Ocean Coastal Belt* bioregion comprising of *Maputaland Wooded Grassland*, interspersed with *Subtropical Alluvial Vegetation, Swamp Forests, Subtropical Freshwater Wetlands* and *Freshwater Lakes*. It must be noted though, that large parts of the study area, especially to the north, have been transformed by forestry (exotic plantations) and sugar cane cultivation, and industrial development. The dominant land cover types, where intact, are described as *Thicket* and *Dense Bushland* and *Grassland*.

Refer to **Maps 1** and **2** for the topography and land cover maps of the study area.

Land use and settlement patterns

The industrial activities, the RB IDZ and the transportation infrastructure related to the port, as mentioned earlier, are the primary land use activities within the study area. This and the intensive forestry and sugar cane production to the north (and further 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.

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. The Whistling Woods (Insezi) self-catering cottages are located approximately 4km north-west of the RB IDZ, north of the Nseleni River. Other than this tourist facility and the abovementioned protected areas, and potentially along the Indian seaboard, there are no identified tourist attractions or destinations in closer proximity to the development site.[2]

[2] Sources: DEAT (ENPAT KwaZulu-Natal), NBI (Vegetation Map of South Africa, Lesotho and Swaziland), NLC2018 (ARC/CSIR) and SAPAD2021_Q1 (DFFE).

Figure 4: Entrance gate to the RB IDZ.

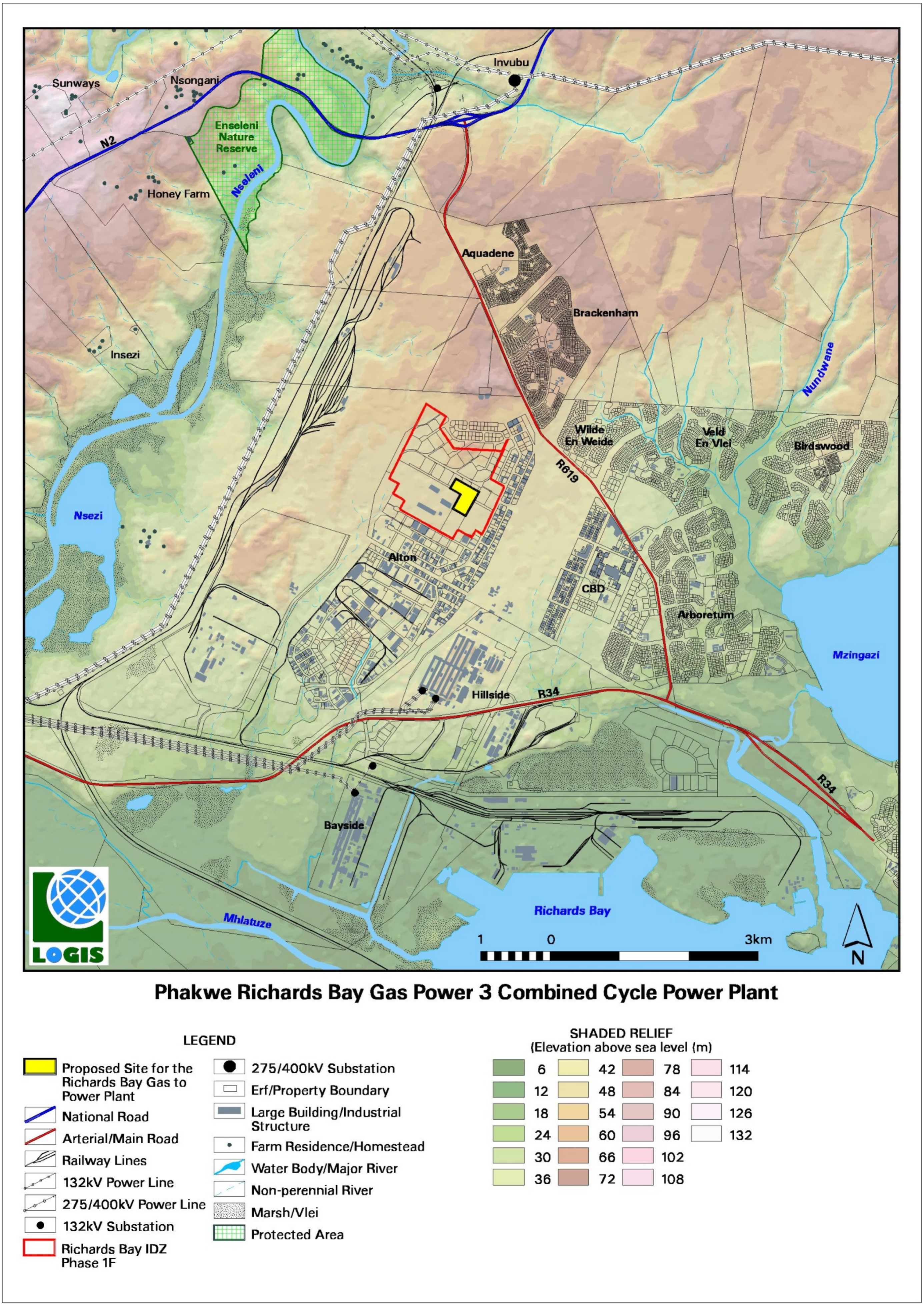
Figure 5: Existing steel works west of the proposed development site.

Figure 6: Forestry along the R619 main road.

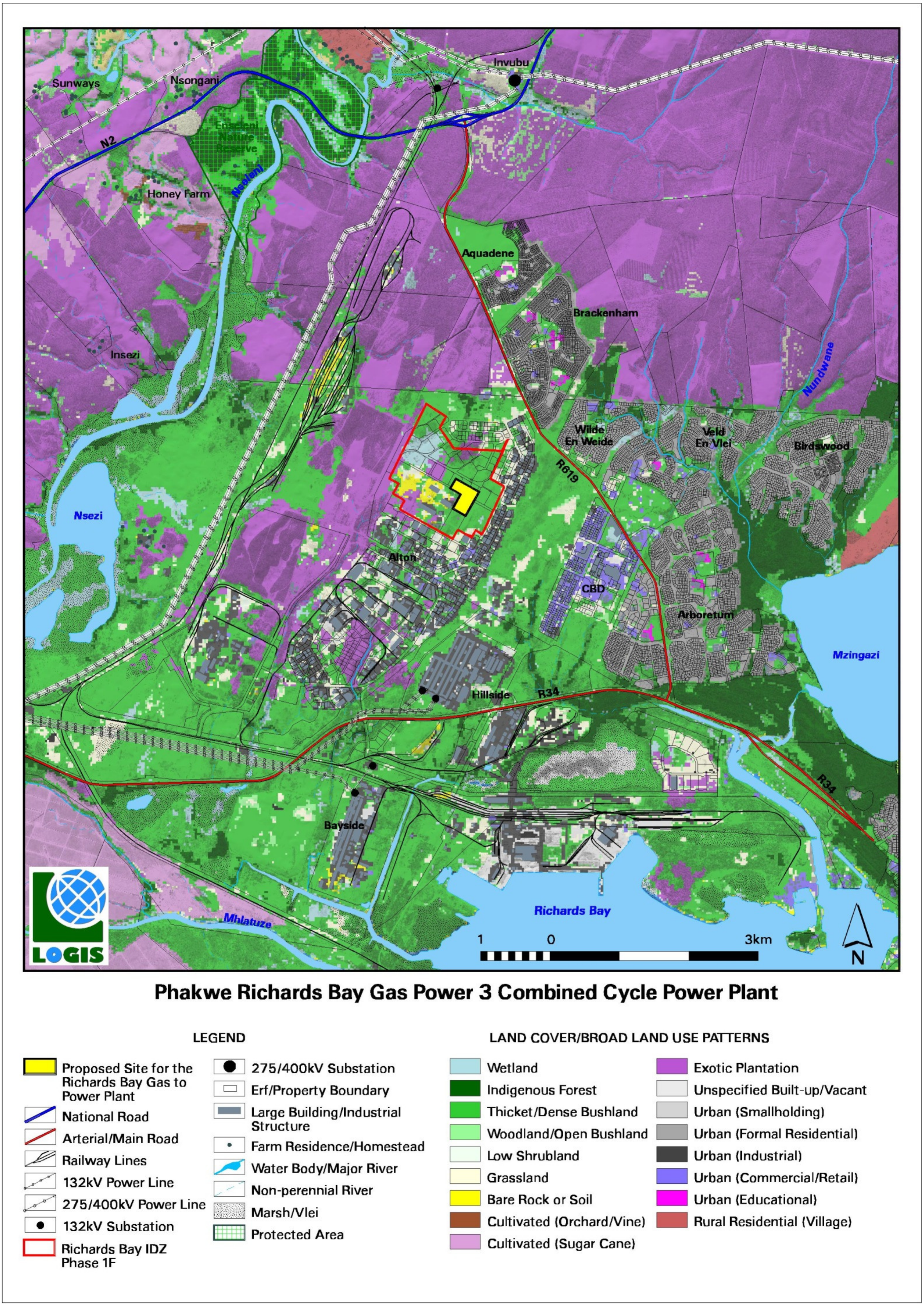
Figure 7: General environment within the Alton industrial area.

Figure 8: Vacant lot within the RB IDZ.

Figure 9: Longer distance view of the development site from the R619 main road.



Map 1: Shaded relief map of the study area.



Map 2: Land cover and broad land use patterns.

6. RESULTS

6.1. Potential visual exposure

The result of the viewshed analysis for the proposed PRBGP3CCPP is shown on **Map 3** (at the end of this section). The viewshed analyses were undertaken from the project components (four CCPP units) as discussed in **Section 2**, and include 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.

Map 3 also indicates proximity radii from the footprint of the proposed structures/activities to show the viewing distance (scale of observation) of the facility in relation to its surrounds. The digital terrain model (DTM) utilised for the viewshed analyses include the elevated footprints of existing industrial structures and buildings within and surrounding the Alton Industrial Area, thereby influencing the potential visual exposure of the structures (i.e. the model considers the shielding effect of existing buildings).

Results

The visual exposure of the core power plant structures (i.e. gas turbines, heat recovery steam generators, steam turbines and balance of plant systems) modelled at 10m above ground level, will largely be absorbed by the existing industrial buildings/structures east and south of the proposed development footprint. The visual exposure of these components will predominantly be contained within a 1km radius of the structures, due to the relatively constrained vertical dimensions. The majority of exposed terrain will fall within the RB IDZ and surrounding industrial areas (i.e. areas generally expected to be devoid of potentially sensitive visual receptors).

The only longer distance exposure of these components will be to the north-west of the study area, beyond 5km from the structures. This includes theoretical visibility from the Insezi (Whistling Woods) dwellings, the Honey Farm homestead, sections of the Nseleni Nature Reserve and a short section of the N2 national road (beyond 6km).

The smokestacks, modelled at respectively 45m and 90m above ground level, will obviously be more exposed. It is expected that the smoke stacks may be visible from (besides the above-mentioned receptor sites) short sections of the R619 main road (just beyond 1km), the R34 arterial road (just under 3km), and potentially the eastern outlying parts of Brachenham south, Wilde-en-Weide, and Arboretum west. Visual exposure will be from under 3km from the proposed development site.

Visibility of the smoke stacks (within a 3 – 6km radius) to the north-east and south-west will largely be from forest plantation and vacant open space. Visual exposure to the south-east may include parts of the Richards Bay harbour.

Visual exposure beyond 6km is highly unlikely, due to the distance between the object (development) and the observer. It should also be noted that the visual exposure, from any of the above receptor sites, will not be in isolation, but rather within the context of the existing industrial structures and buildings within and around the Alton industrial area.

Conclusion

It is envisaged that the PRBGP3 CCPP structures will primarily be visible within and in close proximity to the Alton industrial area and will likely be viewed by observers associated with the industrial area i.e. people employed at businesses within the industrial area. It is possible that the smoke stacks may be seen from further afield, primarily from the R34 and R619 arterial/main roads, but possibly also from the outlying surrounds of some residential areas, potentially causing a visual impact.

Phakwe Richards Bay Gas Power 3 Combined Cycle Power Plant

LEGEND

- Proposed Site for the Richards Bay Gas to Power Plant
- National Road
- Arterial/Main Road
- Railway Lines
- 132kV Power Line
- 275/400kV Power Line
- 132kV Substation
- Richards Bay IDZ Phase 1F
- 275/400kV Substation
- Erf/Property Boundary
- Large Building/Industrial Structure
- Farm Residence/Homestead
- Water Body/Major River
- Non-perennial River
- Marsh/Vlei
- Protected Area

VISIBILITY ANALYSIS

- Visual Exposure of the Smoke Stacks at Maximum 90m
- Visual Exposure of the Smoke Stacks at Minimum 45m
- Visual Exposure of Gas Turbine Power Plant (calculated at 10m above ground level)
- Proximity Radii to the Proposed Development Site (1km, 3km and 6km)

Notes:
- The viewshed analysis includes the effect of arge industrial buildings and structures.

Map 3: Viewshed analysis of the proposed PRBGP3CCPP.

6.2. Potential cumulative visual exposure

Cumulative visual impacts can be defined as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments. In practice the terms 'effects' and 'impacts' are used interchangeably.

Cumulative visual impacts may be:

- Combined, where several industrial structures are within the observer's arc of vision at the same time;
- Successive, where the observer has to turn his or her head to see the various structures; and
- Sequential, when the observer has to move to another viewpoint to see different industrial structures, or different views of the same industrial development (such as when travelling along a route).

The visual impact assessor is required (by the competent authority) to identify and quantify the cumulative visual impacts and to propose potential mitigating measures. This is often problematic as most regulatory bodies do not have specific rules, regulations or standards for completing a cumulative visual assessment, nor do they offer meaningful guidance regarding appropriate assessment methods. There are also not any authoritative thresholds or restrictions related to the capacity of certain landscapes to absorb the cumulative visual impacts of the facility.

To complicate matters even further, cumulative visual impact is not just the sum of the impacts of two developments. The combined effect of both may be much greater than the sum of the two individual effects, or even less.

The cumulative impact of the proposed PRBGP3 CCPP on the landscape and visual amenity is a product of:

- The distance between individual industrial structures;
- The distance over which the structures are visible;
- The overall character of the landscape and its sensitivity to the structures;
- The siting and design of the plant's layout; and
- The way in which the landscape is experienced.

The specialist is required to conclude if the proposed development will result in any unacceptable loss of visual resource considering all the industrial infrastructure proposed in the area.

Results

The proposed PRBGP3 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 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.

Conclusion

To this end, and also considering the existing and authorised large scale industrial developments related to the port of Richards Bay (see **Figure 10** below) 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.

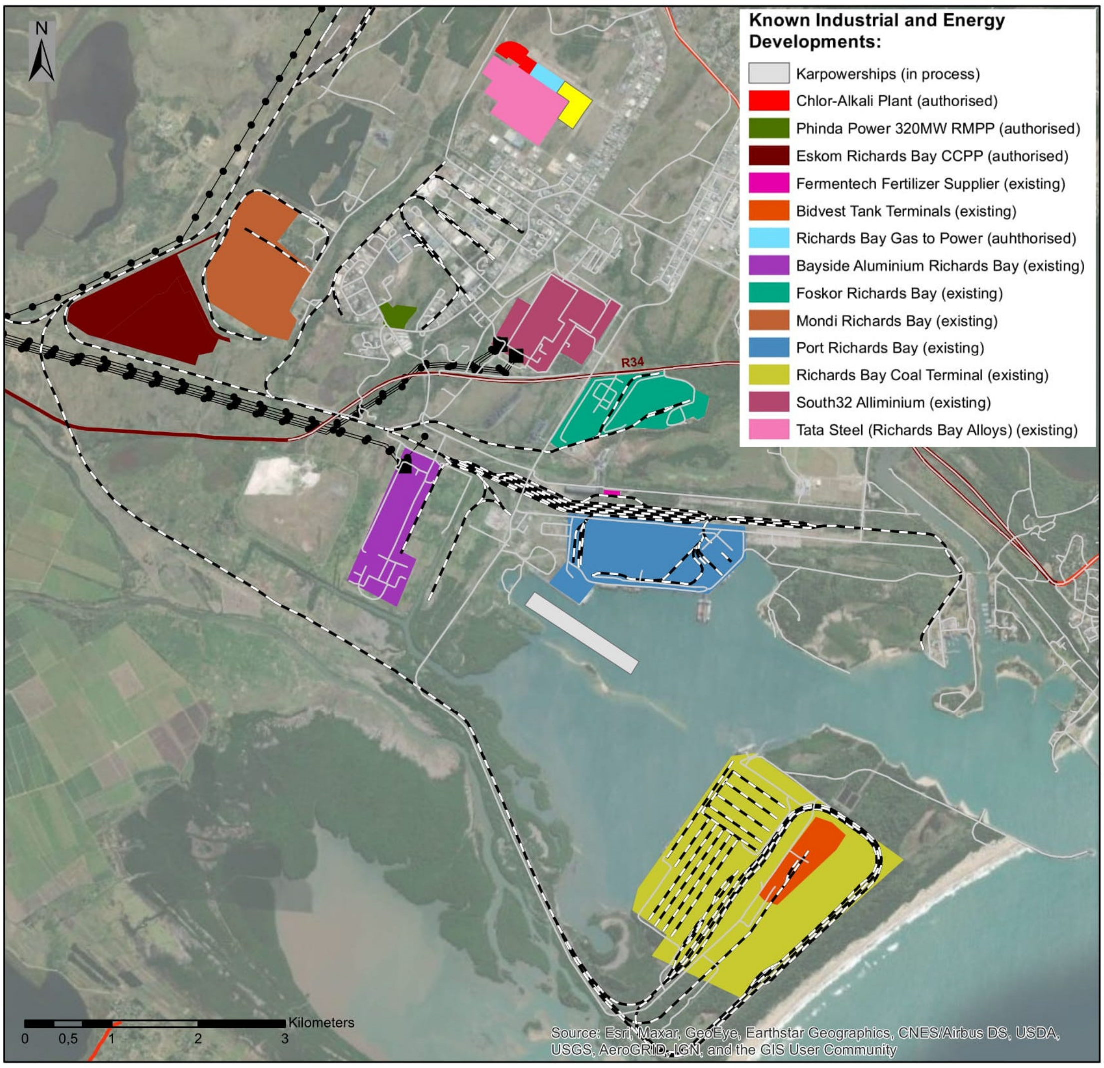


Figure 10: Known industrial and energy developments within the study area.

6.3. Visual distance / observer proximity

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger industrial developments (e.g. larger infrastructure associated with power plants such as coal-fired power stations) and downwards for smaller developments (e.g. smaller infrastructure associated with combined cycle power plants). This methodology was developed in the absence of any known and/or accepted standards for South African power plants.

The principle of reduced impact over distance is applied to determine the core area of visual influence for the power plant structures. It is envisaged that the presence of existing industrial structures will absorb the visual exposure to some degree.

The proximity radii for the PRBGP3 CCPP were created to indicate the scale and viewing distance of the facility and to determine the prominence of the structures and activities in relation to their environment. It should be noted that even though the proximity radii are indicated as (near) concentric circles from the PRBGP3CCPP infrastructure, the visual prominence of the structures will only apply where they are visible, as determined in the previous section (**Section 6.1**) of this report.

The proximity radii, based on the dimensions of the proposed power plant footprint are indicated on **Map 4**, and include the following:

- 0 - 1km. Very short distance view where the facility would dominate the frame of vision and constitute a very high visual prominence.
- 1 – 3km. Short distance view where the structures and activities would be easily and comfortably visible and constitute a high visual prominence.
- 3 - 6km. Medium to longer distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
- > 6km. Long distance view of the facility where the structures and activities are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed infrastructure.

6.4. Viewer incidence / viewer perception

The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

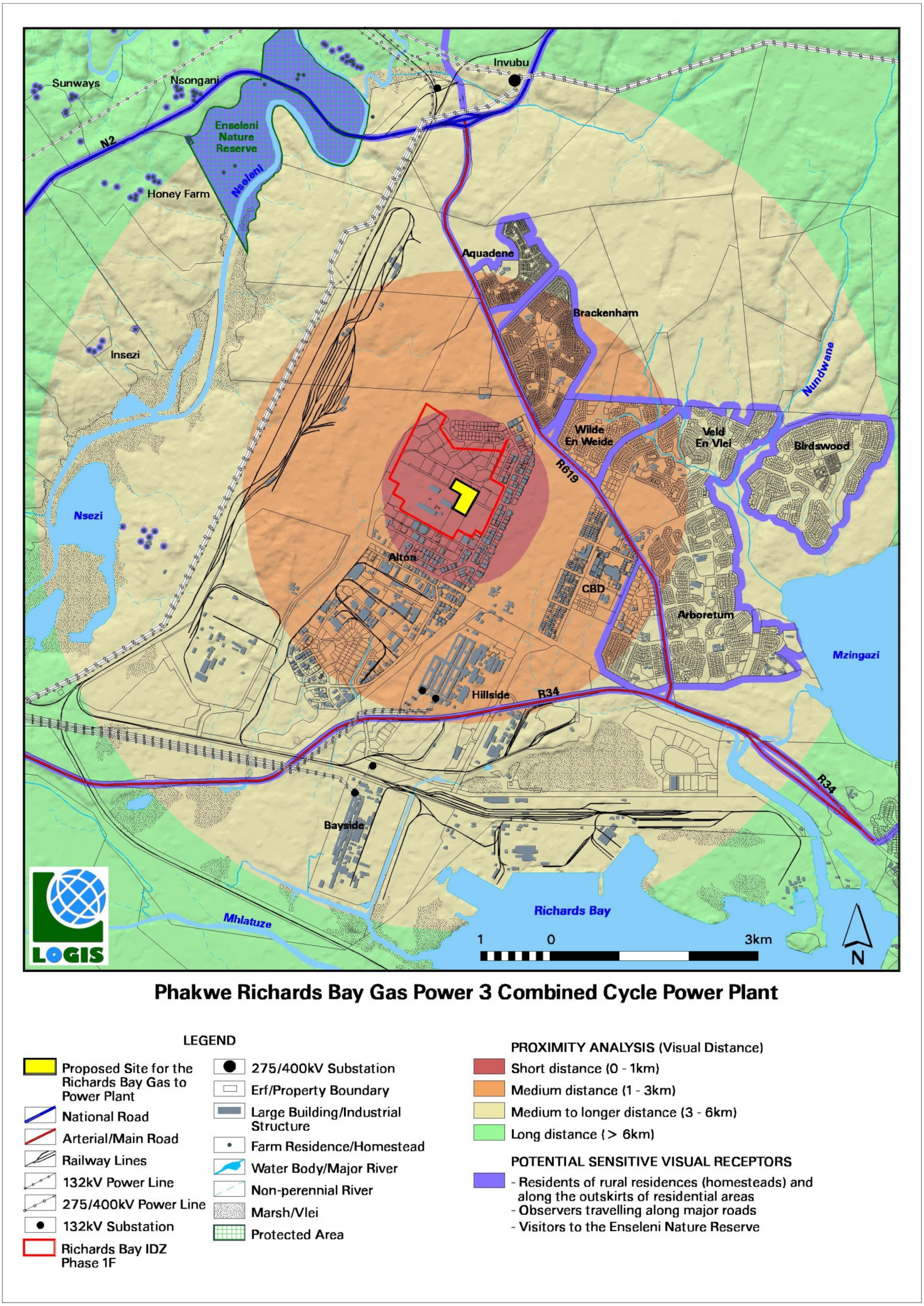
It is necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed power plant and its related infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer: regularity of sighting, cultural background, state of mind, purpose of sighting, etc. which would create a myriad of options.

Viewer incidence is calculated to be the highest along the major roads within the study area. Travellers or visitors to the region using these roads may be negatively impacted upon by visual exposure to the proposed infrastructure.

Additional sensitive visual receptors are located at homesteads (farm dwellings and the Whistling Woods cottages) within the north-west of the study area, the Nseleni Nature Reserve as well as residential areas (suburbs) to the east and north-east of the proposed project site. It is expected that the viewer’s perception, unless the observer is associated with (or supportive of) the proposed power plant, would generally be negative.

Visitors to or employees of businesses and industries located within or around the Alton industrial area is not expected to be visually perturbed as they go about their daily tasks. As mentioned earlier, their purpose for viewing the industrial infrastructure is to earn a living and will likely be indifferent to the proposed PRBGP3 CCPP being located within the industrial area.

Refer to **Map 4** below.



Map 4: Proximity analysis and potential sensitive visual receptors.

6.5. Visual absorption capacity

The largest part of the natural vegetation surrounding the Alton industrial area consists of grassland interspersed with thicket and dense bushland. In the grassland sections of the study area, the Visual Absorption Capacity (VAC) of the receiving environment is deemed low by virtue of the nature of the vegetation cover (see **Figure 11**).

In the thicket and bushland areas of the study area the VAC will be high, considering the presence of denser and taller vegetation cover. Refer to **Figure 12** for an example of the shielding effect of the vegetation cover along the R34 arterial road (John Ross Parkway) south-east of the Alton Industrial Area. Observers travelling along this road will likely be shielded from the power plant structures.

Additional VAC is brought about by the considerable amount of existing built structures within and surrounding the industrial area. This phenomenon is addressed in **Section 6.1** and illustrates how the built structures influence the visual exposure of the power plant.

Overall, the VAC within the study area, especially within populated built-up areas, is expected to be high. The grassland sections of the study area are largely vacant natural land, generally devoid of potential sensitive visual receptors.

Figure 11: Grassland with low visual absorption capacity along the R619.

Figure 12: Thicket and bushland along the R34 (high visual absorption capacity).

6.6. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed PRBGP3 CCPP are displayed on **Map 5**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged to calculate the visual impact index.

The criteria (previously discussed in this report) which inform the visual impact index are:

- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections to the structures (if applicable)
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

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 **Map 5** 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 Map 5)
- 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.

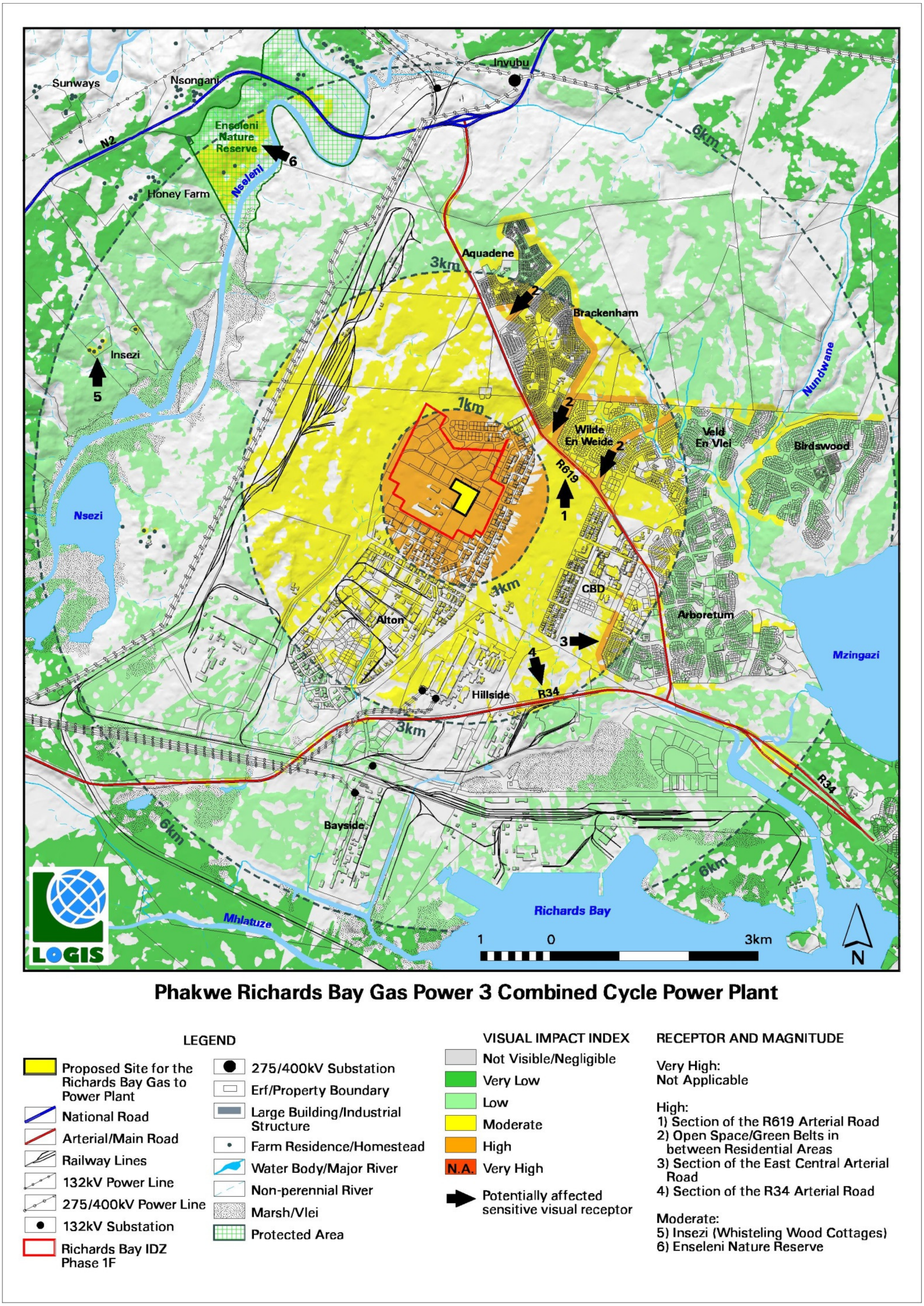
3 – 6km

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.



Map 5: Visual impact index and potentially affected sensitive visual receptors.

6.7. Visual impact assessment: impact rating methodology

The previous section of the report identified specific areas where likely visual impacts would occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see **Section 3: SCOPE OF WORK**) related to the visual impact.

The methodology for the assessment of potential visual impacts states the **nature** of the potential visual impact (e.g. the visual impact on users of major roads in the vicinity of the proposed infrastructure) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - long distance (very low = 1), medium to longer distance (low = 2), short distance (medium = 3) and very short distance (high = 4)[3].
- **Duration** - very short (0-1 yrs. = 1), short (2-5 yrs. = 2), medium (5-15 yrs. = 3), long (>15 yrs. = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10)[4].
- **Probability –** very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5).
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e. **significance = consequence (magnitude + duration + extent) x probability**).

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 30-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

6.8. Visual impact assessment

The primary visual impacts of the proposed PRBGP3CCPP are assessed below. Activities and infrastructure that may result in potential visual impacts are listed and the significance of these impacts is assessed in the following sub-sections.

6.8.1. Construction impacts

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[3] Long distance = > 6km. Medium to longer distance = 3 – 6km. Short distance = 1 – 3km. Very short distance = < 1km (refer to Section 6.3. Visual distance/observer proximity).

[4] This value is read from the visual impact index. Where more than one value is applicable, the higher of these will be used as a worst case scenario.

6.8.1.1. Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed power plant and ancillary infrastructure.

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.

Construction activities may potentially result in a **moderate** (significance rating = 56) temporary visual impact, both before and after mitigation (significance rating = 36).

Table 3: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed power plant.

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed power plant.		
	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.

6.8.2. Operational impacts

6.8.2.1. Potential visual impact on sensitive visual receptors located within a 1km radius of the operational power plant

There are no residences or public roads within a 1km radius of the proposed PRBGP3 CCPP.

The power plant is expected to have a **moderate** visual impact (significance rating = 32) should observers find themselves within this zone. This impact may be mitigated to **low** (significance rating = 28).

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended. The table below illustrates this impact assessment.

Table 4: Visual impact on observers in close proximity to the proposed power plant.

Nature of Impact: Visual impact on observers within a 1km radius of the power plant		
	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: <u>Planning:</u> ➢ 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. <u>Operations:</u> ➢ 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. <u>Decommissioning:</u> ➢ 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.

6.8.2.2. Potential visual impact on sensitive visual receptors within a 1 – 3km radius

The operation of the PRBGP3CCPP 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.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 5: Visual impact of the proposed power plant structures within a 1 – 3km radius.

Nature of Impact: Potential visual impact on sensitive visual receptors within a 1 – 3km radius		
	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.

6.8.2.3. Potential visual impact on sensitive visual receptors within the region (3 – 6km radius)

The operational power plant could have a **low** visual impact (significance rating = 24) on observers located between a 3 – 6km radius of the power plant, both before and after the implementation of mitigation measures.

Table 6: Visual impact of the proposed operational power plant within the region.

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.

6.8.2.4. Lighting impacts

Potential visual impact of operational, safety and security lighting of the facility at night on observers 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.

The following table summarises the assessment of this anticipated impact, which is likely to be of **moderate** significance, and may be mitigated to **low**.

Table 7: Impact table summarising the significance of visual impact of lighting at night on visual receptors in close proximity to the proposed power plant.

Nature of Impact: Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed power plant.		
	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.

6.8.2.5. Ancillary infrastructure

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.

Table 8: Visual impact of the ancillary infrastructure.

Nature of Impact: Visual impact of the ancillary infrastructure during the operational phase on observers in close proximity to the structures.		
	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.

6.9. Visual impact assessment: secondary impacts

The potential visual impact of the proposed power plant 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.

Table 9: The potential impact on the sense of place of the region.

Nature of Impact: The potential impact on the sense of place of the region.		
	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: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the power plant. <u>Operations:</u> ➢ Maintain the general appearance of the facility as a whole. <u>Decommissioning:</u> ➢ 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 cumulative visual impact of industrial infrastructure and activities on the visual quality of the landscape.

The anticipated cumulative visual impact of the proposed power plant is expected to be of **moderate** significance, which is considered to be acceptable from a visual perspective. This is once again due to the transformed nature and industrial developments already present at the proposed development site. See **Table 10** below.

Table 10: The potential cumulative visual impact of industrial infrastructure and activities on the visual quality of the landscape.

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: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the power plant. <u>Operations:</u> ➢ Maintain the general appearance of the facility as a whole. <u>Decommissioning:</u> ➢ 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.		

6.10. 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.

7. CONCLUSION AND RECOMMENDATIONS

The development and operation of the proposed PRBGP3CCPP 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 (**Section 6.10.**). 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 PRBGP3CCPP would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

8. IMPACT STATEMENT

The findings of the Visual Impact Assessment undertaken for the proposed PRBGP3CCPP are that the visual environment surrounding the site is not expected to be significantly influenced by the construction and operation of the power plant.

These findings are applicable to the power plant and to the potential cumulative visual impact of the development in relation to the existing industrial activities and structures within the region. The potential cumulative visual impact is therefore deemed to be within acceptable limits, considering the proposed location of the power plant within an existing industrial area.

The following is a summary of impacts remaining, assuming mitigation as recommended, is exercised:

- Construction activities may potentially result in a **moderate** temporary visual impact, both before and after mitigation.

- There are no residences or public roads within a 1km radius of the proposed power plant. The power plant infrastructure and operational activities is therefore expected to have a **moderate** visual impact on observers within the Alton industrial area. This impact may be mitigated to **low**.

- The operation of the PRBGP3CCPP is expected to have a **moderate** visual impact on observers traveling along the arterial and main roads, and residents of the surrounding residential areas, within a 1 - 3km radius of the power plant structures.

- The operational power plant could have a **low** visual impact on observers located between a 3 – 6km radius of the power plant, both before and after the implementation of mitigation measures.

- The anticipated impact of lighting at the power plant facility is likely to be of **moderate** significance, and may be mitigated to **low.**

- The anticipated visual impact resulting from the construction of on-site ancillary infrastructure (e.g. offices, workshop, storage facilities, etc.) is likely to be of **low** significance both before and after mitigation.

- 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 the proposed development site.

- The anticipated cumulative visual impact of the proposed power plant is expected to be of **moderate** significance, which is considered to be acceptable from a visual perspective. This is once again due to the transformed nature and industrial developments already present at the proposed development site.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from **moderate** to **low** significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed power plant.

Considering all factors, it is recommended that the PRBGP3CCPP project as proposed be supported; subject to the implementation of the recommended mitigation measures (**Section 6.10.**) and management programme (**Section 9.**).

9. MANAGEMENT PROGRAMME

The following management plan tables aim to summarise the key findings of the visual impact report and suggest possible management actions to mitigate the potential visual impacts. Refer to tables overleaf.

Table 11: Management programme – Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the proposed power plant.

Project Component/s	The power plant, activities, equipment and ancillary infrastructure (i.e. access roads, offices, workshop, etc.).
Potential Impact	Primary visual impact of the facility due to the presence of the power plant, power generating activities and associated infrastructure as well as the visual impact of lighting at night.
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 1km of the site) as well as within the region.
Mitigation: Target/Objective	Optimal planning of infrastructure to minimise the visual impact.

Mitigation: Action/control	**Responsibility**	**Timeframe**
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.	Project proponent / design consultant / EPC	Early in the planning phase.
Retain and maintain natural vegetation immediately adjacent to the development footprint/servitude.	Project proponent / design consultant / EPC	Early in the planning phase.
Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.	Project proponent / design consultant / EPC	Early in the planning phase.
Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised. Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.	Project proponent / design consultant / EPC	Early in the planning phase.
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the mine and the ancillary infrastructure. The following is recommended: o Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). o Limit mounting heights of fixtures, or use foot-lights or bollard lights. o Make use of minimum lumen or wattage in fixtures. o Making use of down-lighters or shielded fixtures. o Make use of Low Pressure Sodium lighting or other low impact lighting. o Make use of motion detectors on security lighting, so allowing the site to remain in darkness until lighting is required for security or maintenance purposes.	Project proponent / design consultant / EPC	Early in the planning phase.

Performance Indicator	Minimal exposure (limited or no complaints from I&APs) of ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 1km) and within the region.
Monitoring	Not applicable.

Table 12: Management programme – Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the proposed power plant.		
Project Component/s	Construction site and activities	
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate construction work areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that vegetation is not unnecessarily cleared or removed during the construction phase.	Project proponent / EPC contractor	Early in the construction phase.
Reduce the construction phase through careful logistical planning and productive implementation of resources.	Project proponent / EPC contractor	Early in the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Project proponent / EPC contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Project proponent / EPC contractor	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Project proponent / EPC contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Project proponent / EPC contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes, etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.	Project proponent / EPC contractor	Throughout and at the end of the construction phase.
Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.	
Monitoring	Visual monitoring and supervision of vegetation clearing during construction (by contractor as part of construction contract). Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).	

Table 13: Management programme – Operation.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the proposed power plant.		
Project Component/s	The power plant, activities, equipment and ancillary infrastructure (i.e. access roads, offices, workshop, etc.).	
Potential Impact	Visual impact of power plant infrastructure degradation and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Well maintained and neat power plant facility.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Maintain the general appearance of the plant as a whole, including the equipment, servitudes and the ancillary structures.	Project proponent / operator	Throughout the operation phase.
Maintain roads and servitudes to forego erosion and to suppress dust.	Project proponent / operator	Throughout the operation phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Project proponent / operator	Throughout the operation phase.
Investigate and implement (should it be required) the potential to screen visual impacts at affected receptor sites.	Project proponent / operator	Throughout the operation phase.
Performance Indicator	Well maintained and neat power plant facility with intact vegetation on and in the vicinity of the facility.	
Monitoring	Monitoring of the entire site on an ongoing basis (by operator).	

Table 14: Management programme – Decommissioning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed power plant.		
Project Component/s	The power plant, activities, equipment and ancillary infrastructure (i.e. access roads, offices, workshop, etc.).	
Potential Impact	Visual impact of residual visual scarring and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Only the infrastructure required for post decommissioning use of the site retained and rehabilitated vegetation in all disturbed areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Remove infrastructure not required for the post-decommissioning use of the site.	Project proponent / operator	During the decommissioning phase.
Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.	Project proponent / operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Project proponent / operator	Post decommissioning.
Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.	
Monitoring	Monitoring of rehabilitated areas quarterly for at least a year following decommissioning.	

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