

ENVIRONMENTAL SCREENING AND SITE SELECTION REPORT

RICHARDS BAY COMBINED CYCLE GAS TURBINE (CCGT) POWER PLANT AND ASSOCIATED INFRASTRUCTURE ON A SITE NEAR RICHARDS BAY, KWAZULU-NATAL PROVINCE

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1 BACKGROUND AND PURPOSE OF THE SCREENING STUDY

Eskom Holdings SoC Limited (Eskom) proposes to develop a combined-cycle Gas Turbine (CCGT) power plant, with an installed capacity of 3 000 MW and an inclusive footprint of approximately 40 to 60 hectares (ha), at a site near Richards Bay, KwaZulu-Natal Province. The CCGT power plant will use gas as a fuel supply, with diesel as a back-up fuel supply. Four sites have been identified for consideration within the Richards Bay area, namely Site 4A; Site 5, Site 6 and Site 7 (refer to Figure 1.1).

These four sites have been subjected to an environmental screening study in order to inform site selection. The Environmental Screening and Site Selection Study approach followed serves as a site risk assessment tool from an environmental acceptability perspective – that is, a process to highlight or red-flag potential environmental issues of concern within each of the potential project sites prior to initiating a full EIA process for the preferred project site. This study has been informed by a site visit, specialist screening studies and sensitivity mapping. The consideration of technical factors such as proximity to the electricity grid, access to water supplies, fuel supply, etc. was not included in the siting assessment.

Following confirmation of the preferred project site through this Environmental Screening Study and technical inputs from Eskom, the identified site will undergo an EIA process in support of an application for Environmental Authorisation for the construction and operation of the power plant. This EIA process will include layout alternatives within the preferred project site which will be assessed through specialist input. This Environmental Screening and Site Selection Study will be utilised within the EIA process to provide motivation regarding the assessment of only one project site alternative for the development.

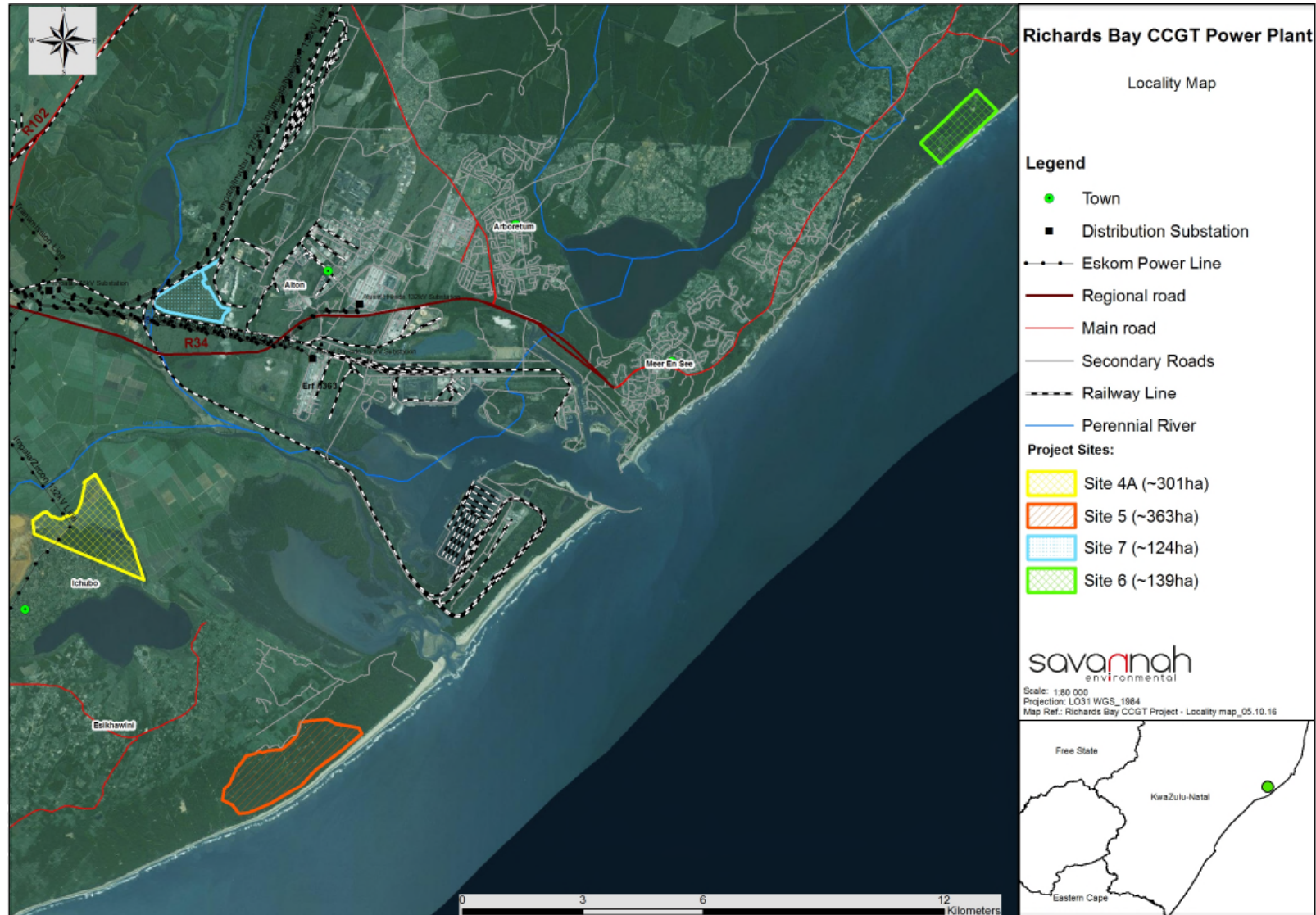


Figure 1.1: Locality map of the four potential project sites identified for the development of the Richards Bay CCGT Power Plant

2 OVERVIEW OF THE PROJECT

Eskom proposes to develop a Combined Cycle Gas Turbine (CCGT) power plant, with an installed generation capacity of 3000MW, and an inclusive development footprint of 60ha, at a site near Richards Bay, KwaZulu-Natal Province. The CCGT power plant will use gas, which may be piped from a supply from Mozambique or which may be Liquid Nitrogen Gas (LNG) shipped to Richards Bay. The supply of natural gas from the gas supply take-off point at the harbour to the power station will be via a pipeline. Diesel will be used as a back-up fuel supply if and when natural gas is not available for power generation. A diesel truck off-loading facility is to be built which will include storage tanks able to hold a capacity of ~4-4.5 million litres for an 8 hour operation period. The CCGT power plant will comprise of the gas turbines, Heat Recovery Steam Generators (HRSGs), steam turbines, diesel storage, and balance of plant, buildings and auxiliaries to support power generation. **Figure 2.1** provides an illustration of a typical CCGT power plant.

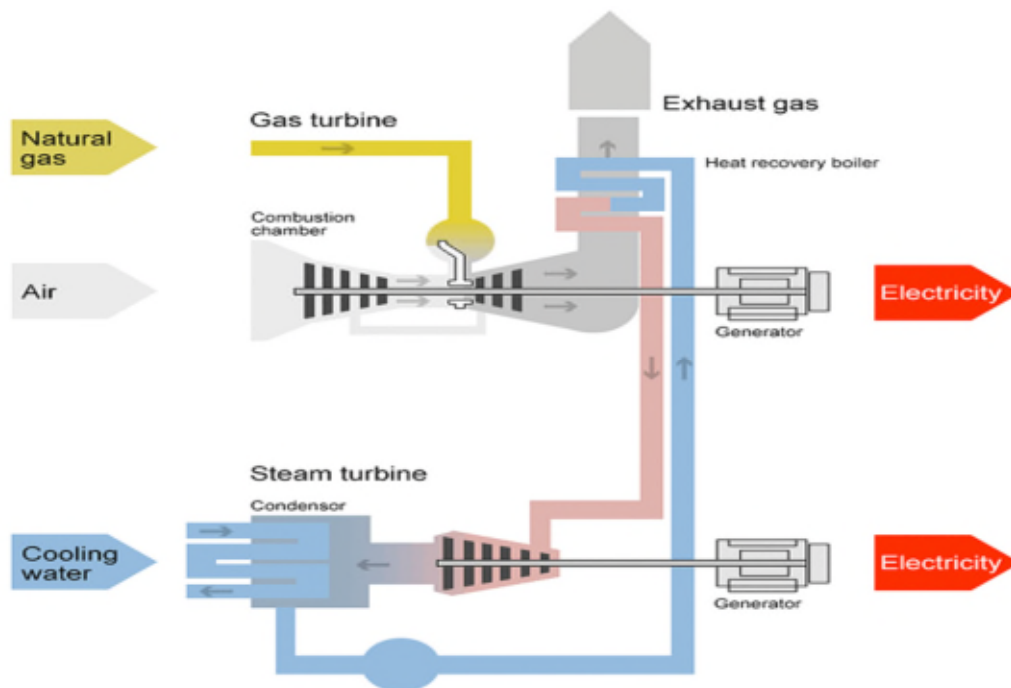


Figure 2.1: Typical Combined Cycle Gas Turbine (courtesy of E-On)

A water pipeline to supply potable water from a potential water source to the power station is planned. Water required for the power plant (cooling, HSRG make-up waters, etc.) will be sourced from existing municipal sources, wastewater from existing or planned Mhlatuze Water wastewater treatment facilities or from a desalination facility, which will include sea water abstraction, discharge of brine into the sea outfall system and conveyance of water to the preferred CCGT power plant site.

2.1 Purpose of the Proposed Project

The purpose of the project is to reduce transmission losses from generation facilities supplying KwaZulu-Natal, by having a generation centre in KwaZulu-Natal and also to aid in reducing Eskom's carbon footprint per Unit of electricity produced, as power plants using natural gas emit approximately half the carbon of coal-fired power plants while using considerably less water, thus supporting Government's commitment to reduce carbon emissions.

2.2 Siting of the Proposed Project

Four potential project sites have been identified by Eskom for the development of the project. All four sites are located near Richards Bay and fall under the jurisdiction of the Uthungulu District Municipality (refer to **Figure 2**).

A description of the respective project sites is included in **Table 2.1**. The environmental suitability for the development of a CCGT Plant within the identified potential project sites is considered in further detail in this screening report.

The identified project sites are located between approximately 100m and 12km from the east coast and near Richards Bay. The sites are also located in close proximity to Port Richards Bay which is located central to all four potential project sites. Accessibility to the sites is possible via various routes, however the main route within the area is the national road, N2. Regional roads also provide access which includes the R34 and the R619 which is linked to the N2. Smaller secondary roads within the area provide direct access to the sites which are linked either to the N2 or the regional roads, i.e. R34 and R619.

Table 2.1: Description of Project Sites considered within the Environmental Screening and Siting Study

Project Site	District Municipality	Local Municipality	Ward	Affected Property(ies)	SG-Code	Size of Project Site	Landowner	Nearest Town(s)	Current Land-Use(s)
Site 4A	Uthungulu District Municipality	uMhlathuze Local Municipality	2 & 12	» Erf 16859 » Erf 2/11454 » Erf RE/11454 » Erf 17/11454	» N0GV042100 01685900000 » N0GV042100 01145400002 » N0GV042100 01145400000 » N0GV042100 01145400017	~301ha	Umhlatuzi Valley Sugar Co Ltd	Ichubo and Esikhawini	Sugar Cane and timber farming
Site 5	Uthungulu District Municipality	uMhlathuze Local Municipality	13	Farm 191/2001	N0GU000000015 83000003	~363ha	Ingonyama Trust	Ichubo and Esikhawini	Reclaimed land of Richards Bay Minerals used for mining. The site is also dedicated to form part of a conservation area as proposed by the Local Municipality ¹ .
Site 6	Uthungulu District Municipality	Mfolozi Local Municipality	5 & 16	Farm 29/15823	N0GV000000015 82300029	~139ha	Republic of South Africa	Meer en See and Arboretum	Reclaimed land of Richards Bay Minerals used for mining
Site 7	Uthungulu District Municipality	uMhlathuze Local Municipality	26	» Erf 1/11376 » Erf 2/11376 » Erf 3/11376	» N0GV042100 01137600001 » N0GV042100 01137600002 » N0GV042100 01137600003	~124ha	uMhlathuze Local Municipality	Alton and Arboretum	Located in the Richards Bay Industrial Development Zone (IDZ) Phase 1D. A portion along the northern boundary of the site has been allocated as a biodiversity offset area by the Local Municipality due to ecological sensitivities identified on the site during a previous EIA process.

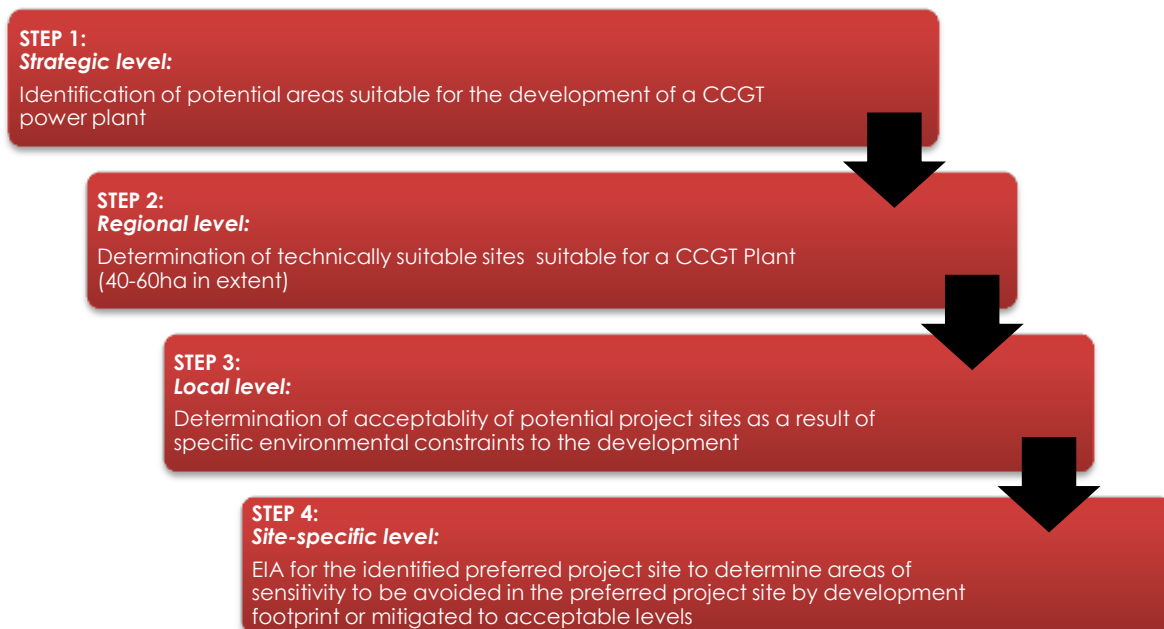
¹ Information provided by the Environmental Manager of the uMhlathuze Local Municipality

3 APPROACH AND METHODOLOGY

3.1 Approach to the Study

The proposed location of a CCGT power plant is constrained by land availability for the development within a location that is considered suitable from an environmental and technical perspective. The location of the development needs to adhere to certain requirements for the successful operation of a facility of this nature including the supply of the energy resource which is gas (and in some cases diesel) and the supply of water to the plant for cooling purposes.

The process required to be followed in order to assess the environmental suitability of the identified potential project sites for the CCGT power plant includes the following steps – a typical funnel-down process with an increased degree of refinement of information as the project proceeds:



The strategic level inputs (Steps 1 and 2) have been provided by Eskom (four potential project sites have been identified for further investigation), and it is assumed that Eskom is able to defend the selection of the project sites from a technical perspective. This Environmental Screening and Site Selection study is a local level assessment (Step 3), with a site-specific screening assessment of each potential project site and the elimination of the least preferred project sites in order to guide the decision regarding which site to focus on going forward. Therefore, this study forms part of the site selection process. The Environmental Impact Assessment (Step 4), being the subsequent and final step, will consider alternative development areas within the preferred project site in order to support the application for Environmental Authorisation.

3.2 Methodology

The methodology utilised is a *regional* or *local level* planning tool to guide project development planners (and ultimately decision-makers) with regards to the appropriate areas for development and/or the environmental suitability of the potential project sites and the identified preferred project site, as well as the identification of potential fatal flaws that may hinder the development. The objectives for the assessment of the potential project sites were therefore to:

1. Conducted a site inspection on the 16 of January 2017 (Refer to Appendix C for the site visit report).
2. Conducted interviews with Sharin Govender from the City of uMhlathuzi Municipality and Percy Langa and Joe Muller from the R IDZ in order to obtain additional site specific information and information on future development on the 17 January 2017.
3. Test the appropriateness of the four potential project sites identified for the establishment of a CCGT power plant (ensuring that environmental constraints are minimised as far as possible).
4. Define and understand any constraints within the potential project sites for development.
5. Identify any fatal flaws which may hinder the development of the CCGT power plant within the potential project sites.
6. Eliminate the potential project sites considered to be unsuitable or the least preferred for the development.
7. Guide the decision regarding which site to focus on going forward.

The study has included the following:

3.2.1 Baseline Data Collection from Known Sources and Review

Baseline data collection included:

- » Collection of information from various sources, including information relating to:
 - * Formal environmental sensitivity data of the country and the Kwa-Zulu Natal Province (including that relating to biodiversity, including issues relating to vegetation, fauna, critical biodiversity areas (CBAs), sensitive habitats, wetlands, etc).
 - * Agricultural potential of the affected sites and land use.
 - * Heritage sites/areas (from the on line SAHRIS database).
- » Mapping of information for each area indicating sensitive environments. The mapping of the formal environmental sensitivity data provided a better understanding of the four project sites and the presence of sensitive features including ecosystem classification in terms of the vegetation type and Critical Biodiversity Areas.
- » Review of other studies undertaken within the vicinity of the sites (EIAs, etc.).
- » Review of relevant legislation, planning documentation and policies.

3.2.2 Environmental screening study

Specialist screening assessments were undertaken to provide the required inputs to the screening study. The specialist studies undertaken as part of the Environmental Screening and Site Selection Study are detailed in **Table 3.1**.

Table 3.1: Specialist studies undertaken as part of the Environmental Screening and Site Selection Study

Study	Relevant Specialist	Appendix
Terrestrial Ecology Assessment	Ross Goode and Anita Reuentebach of Afzelia Environmental Consultants	B1
Wetland/ Agricultural Assessment	Brett Reimers of Afzelia Environmental Consultants	B2
Aquatic Ecology	Andrew Hustled and Wayne Jackson of Afzelia Environmental Consultants	B3
Hydrological and Flood Line Assessment	Flip Kriger of Afzelia Environmental Consultants	B4
Geo-hydrological Baseline Assessment	John Kalala Ngeleka of Afzelia Environmental Consultants	B5
Geotechnical Study	Stuart Morgan of Geoid Geotechnical Engineers (Pty) Ltd	B6
Heritage Assessment (Archaeological)	Jaco van der Walt of Heritage Contracts and Archaeological Assessments	B7
Palaeontological Assessment	Elize Butler of the National Museum of Bloemfontein	B8
Socio- Economic Screening Assessment	Elena Broughton of Urban Econ Development Economists	B9
Noise Assessment	Morne de Jager of Enviro Acoustic Research cc	B10
Traffic Assessment	Stephen Fautley of Techo	B11
Air Quality Assessment	Terri Bird of AirShed Planning Professionals	B12
Visual Assessment	Jon Marshall of Afzelia Environmental Consultants	B13
Agricultural, Land Capability and Soils Assessment	Ashleigh Blackwell of Savannah Environmental	B14
Marine Study	Roy van Ballegooyen of WSP Parsons Brinchenoff	B15

Specialist studies included a desk-top review of existing information as well as a site visit where required for further verification of site sensitivity. The specific methodology employed by each specialist is detailed within the specialist reports contained within refer to **Appendix B**. Each specialist study includes the following:

- » Identification of environmentally sensitive areas within the identified areas in order to define any environmental constraints to the proposed development.
- » Consideration of legislative requirements and any constraints identified in this regard.
- » Identification of the most preferred project site for the development, including a motivation in this regard.

- » Identification of the least preferred project sites and whether this should be excluded from further consideration.

Information from the specialist studies was evaluated and consolidated for each site to provide:

- i) an overall description of the environment for each site,
- ii) the expected impacts which may occur as identified in the specialist studies,
- iii) the criteria used to assess the site and identify the preferred option, and
- iv) the feasibility of the site for the development.

A comparative assessment of the environmental feasibility of the four sites was then in order to identify an overall preferred site from an environmental perspective.

4 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations form part of this Site Screening Assessment:

- » All information provided by the developer to the environmental team was correct and valid at the time it was provided.
- » The four potential project sites identified by Eskom for the development of a CCGT power plant are technically feasible for the development.
- » Not all specialists conducted field surveys at this stage in the process.
- » Studies assume that any potential impacts on the environment associated with the Project will be assessed further during the EIA Process.

5 RELEVANT LEGISLATION AND POLICIES

Several requirements in terms of environmental legislation have been identified at this stage as being applicable to the establishment of the proposed power station. These are detailed in Table 5.1. More information is also provided in this regard within the specialist reports contained in Appendix B.

Table 5.1: Relevant legislation and policies identified at this stage as being applicable to the establishment of the proposed power station

Issue	Legislation/Policy and Applicable Requirements	Relevant Authority
Noise	<p><u>Environment Conservation Act (Act No 73 of 1989)</u></p> <p>Allows the Minister of Environmental Affairs to make regulations regarding noise, among other concerns.</p> <p>In terms of section 25 of the ECA, the national noise-control regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.</p> <p>Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996, legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. KwaZulu-Natal has not yet adopted provincial regulations.</p> <p>An increase of more than 7 dBA is defined as a disturbing noise and prohibited (National Noise Control Regulations).</p> <p><u>National Standards</u></p> <p>There are a few South African national scientific standards (SANS) relevant to noise from mines, industry and roads. They are:</p> <ul style="list-style-type: none"> » SANS 10103:2008. The measurement and rating of environmental noise with respect to annoyance and to speech communication; » SANS 10210:2004. Calculating and predicting road traffic noise; » SANS 10328:2008. Methods for environmental noise impact assessments. 	<ul style="list-style-type: none"> » National Department of Environmental Affairs (DEA) » KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development » uMhlatuze Local Municipality » Mfolozi Local Municipality

Issue	Legislation/Policy and Applicable Requirements	Relevant Authority
	<ul style="list-style-type: none"> » SANS 10357:2004. The calculation of sound propagation by the Concave method; » SANS 10181:2003. The Measurement of Noise Emitted by Road Vehicles when Stationary; and » SANS 10205:2003. The Measurement of Noise Emitted by Motor Vehicles in Motion. <p>The document that addresses the issues concerning environmental noise is SANS 10103:2008. It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed. SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance:</p> <ul style="list-style-type: none"> » $\Delta \leq 3$ dBA: An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable. » $3 < \Delta \leq 5$ dBA: An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area. » $5 < \Delta \leq 15$ dBA: An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'. 	
Water resources	<p><u>National Water Act (Act No 36 of 1998)</u></p> <p>Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under general authorisation in terms of S39 and GN 1191 of GG 20526 October 1999. The following water uses are potentially applicable to the project:</p> <ul style="list-style-type: none"> » Section 21 a – abstraction of water from a natural water resource » Section 21 b – storage of water (should raw water be required to be stored on site) » Section 21 c – impacts on watercourses/wetlands » Section 21 i – impacts on watercourses/wetlands 	<ul style="list-style-type: none"> » Department of Water and Sanitation (DWS) » Catchment Management Agency

Issue	Legislation/Policy and Applicable Requirements	Relevant Authority
	<p>In terms of Section 19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing or recurring.</p>	
<p>Air Quality</p>	<p><u>National Environmental Management: Air Quality Act (Act No 39 of 2004)</u></p> <p>The minister must in accordance with the National Environmental Management Air Quality Act (NEMAQA) (Act No. 39 of 2004) publish a list of activities which result in atmospheric emissions and which is believed to have significant detrimental effects on the environment and human health and social welfare. All scheduled processes as previously stipulated under the Air Pollution Prevention Act (APPA) are included as listed activities with additional activities being added to the list. The Listed Activities and NMES were published on the 31st of March 2010 (Government Gazette No. 33064) and the revised NMES on 22 November 2013 (Government Gazette No. 37054). NMES applicable to the proposed CCGT include:</p> <ul style="list-style-type: none"> » Gas Turbine units – Gas combustion used primarily for steam raising or electricity generation (more than 50 mega Watt (MW) heat input per unit). NMES subcategory 1.4 are applicable. » Steam Turbine units – Electricity is generated (more than 50 mega Watt (MW) heat input per unit) through the combustion of diesel. NMES for liquid fuel combustion installations (Subcategory 1.2) are applicable. » Diesel Storage – The storage and handling of petroleum products within permanent immobile liquid tanks larger than 500 m3 in total triggers Subcategory 2.4. <p><u>Ambient Air Quality Guidelines and Standards</u></p> <p>The South African Bureau of Standards (SABS) was engaged to assist the DEA in the facilitation of the development of ambient air quality standards. Standards were determined based on international best practice for particulate matter with an aerodynamic diameter of less than 10µm (PM10), particulate matter with an aerodynamic diameter of less than 2.5µm (PM2.5), dustfall, SO₂, NO₂, ozone (O₃), carbon monoxide (CO), lead (Pb) and benzene (C₆H₆). The final revised NAAQS for CO, C₆H₆, NO₂, O₃, Pb, PM10 and SO₂, were published in the Government Gazette (no. 263) on 24 December 2009. Standards for PM2.5 and dustfall were subsequently published in June 2012 (Government Gazette No. 486) and November 2013 (Government Gazette No. 827) respectively.</p>	<ul style="list-style-type: none"> » National Department of Environmental Affairs (DEA) » Department of Agriculture and Environmental Affairs (DAEA)

Issue	Legislation/Policy and Applicable Requirements	Relevant Authority
Heritage	<p><u>National Heritage Resources Act (Act No 25 of 1999)</u></p> <p>The following sites and features are protected under this Act:</p> <ol style="list-style-type: none"> a. Archaeological artefacts, structures and sites older than 100 years b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography c. Objects of decorative and visual arts d. Military objects, structures and sites older than 75 years e. Historical objects, structures and sites older than 60 years f. Proclaimed heritage sites g. Grave yards and graves older than 60 years h. Meteorites and fossils i. Objects, structures and sites of scientific or technological value. <p>The national estate includes the following:</p> <ol style="list-style-type: none"> a. Places, buildings, structures and equipment of cultural significance b. Places to which oral traditions are attached or which are associated with living heritage c. Historical settlements and townscapes d. Landscapes and features of cultural significance e. Geological sites of scientific or cultural importance f. Archaeological and palaeontological importance g. Graves and burial grounds h. Sites of significance relating to the history of slavery i. Movable objects (e.g. archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.) <p>Section 34 (1) of the Act deals with structures that are older than 60 years. Section 35(4) of this Act deals with archaeology, palaeontology and meteorites. Section 36(3) of the Act, deals with human remains older than 60 years. Unidentified/unknown graves are also handled as older than 60 years until proven otherwise.</p>	<ul style="list-style-type: none"> » Amafa Heritage KwaZulu Natali » SAHRA – National heritage sites (grade 1 sites) as well as all historic graves and human remains.

Issue	Legislation/Policy and Applicable Requirements	Relevant Authority
	<p>Section 38 of the Act states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including</p> <ul style="list-style-type: none"> » the construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; and » any development or other activity which will change the character of a site exceeding 5000m² in extent. 	
Biodiversity	<p>key legislation relevant to biodiversity and conservation in KwaZulu-Natal</p> <ul style="list-style-type: none"> » The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973) » The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979) » The National Environmental Management Act (No. 107 of 1998) » NEMA: Protected Areas Act (No. 57 of 2003) » National Environmental Management Biodiversity Act (No.10 of 2004) * A list of threatened and protected species has been published in terms of section 56(1) - Government Gazette 29657. * Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). * Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN R1002), 9 December 2011). * The Proponent has a responsibility for: <ul style="list-style-type: none"> ▪ The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). 	<ul style="list-style-type: none"> » National Department of Environmental Affairs (DEA) » Department of Agriculture and Environmental Affairs (DAEA) » Ezemvelo KZN Wildlife » Department of Agriculture, Forestry and Fisheries (DAFF)

Issue	Legislation/Policy and Applicable Requirements	Relevant Authority
	<ul style="list-style-type: none"> ▪ Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity. ▪ Limit further loss of biodiversity and conserve endangered ecosystems. <ul style="list-style-type: none"> » The Environment Conservation Act and associated EIA Regulations (No. 73 of 1989) » National Protected Areas Expansion Strategy » Natural Scientific Professions Act (No. 27 of 2003) » National Forest Act (No 84 of 1998) <ul style="list-style-type: none"> * Prohibits the destruction of indigenous trees in any natural forest without a licence. * According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister. » Conservation of Agricultural Resources Act (No. 43 of 1983) » Natal Nature Conservation Ordinance (No. 15 of 1974) » KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill, 2014 (KZN-EBPA) <ul style="list-style-type: none"> * Stipulates which species, how wild species are to be protected and managed in terms of human use such as collecting, fishing, hunting, capture, transport and trade. It deals with rare and endangered species within the KZN Province and the powers needed to protect them from exploitation and damage. » KwaZulu-Natal Nature Conservation Management Act (No. 9 of 1997) » KwaZulu-Natal Planning and Development Act (No 6 of 2008) » Local Government Municipal System's Act (No. 32 of 2000) <p>Relevant National and Regional guidelines include:</p> <ul style="list-style-type: none"> » Guidelines for Biodiversity Impact Assessments in KZN (2013) » KwaZulu-Natal Systematic Conservation Plan (KZNSCP, 2012) and KwaZulu-Natal Biodiversity Sector Plan (KZNBSP, 2014) 	

Issue	Legislation/Policy and Applicable Requirements	Relevant Authority
	<ul style="list-style-type: none"> * Identify and map critical biodiversity areas and ecological support areas within the Province. Biodiversity mapping covers terrestrial, aquatic and marine environs at Provincial and District scale and is reflected as biodiversity sector maps consisting of two main layers, namely Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). * Categorical classes of CBAs and ESAs are reflected differently in the SCP and BSP planning products respectively. The SCP planning product highlights the key priority areas for biodiversity conservation as reflected against a uniform biome, i.e. the marine, estuarine, freshwater and terrestrial biomes analyzed separately. The BSP is a higher order spatial planning tool which takes into consideration locally identified CBA and ESA localities, as well as incorporates priorities identified at a national level. » UThungulu District Municipality: Biodiversity Sector Plan (2014) » Ezemvelo KZN Wildlife Strategy (2009 – 2014) 	
Marine environment	<p><u>National Environmental Management: Integrated Coastal Management Amendment Act (Act No. 36 of 2014)</u></p> <p>Provide a system of integrated coastal and estuarine management in order to promote the conservation of the coastal environment, and maintain the natural attributes of coastal landscapes and seascapes, and to ensure that development and use of natural resources within the coastal zone is socially and economically justifiable and ecologically sustainable.</p> <p>It also defined the rights and duties in relation to coastal areas and controls inappropriate development of the coastal environment and other adverse effects on the coastal environment</p>	<ul style="list-style-type: none"> » National Department of Environmental Affairs (DEA): Marine and Coastal Management » Department of Agriculture and Environmental Affairs (DAEA)
Planning	<ul style="list-style-type: none"> » uMhlathuze Spatial Development Framework <ul style="list-style-type: none"> * Details desired spatial land uses and plans for the uMhlathuze Local Municipality * Indicates planning for Conservation, Environmental Corridors, Port Offset Area and Proposed development * Details planned expansion of the Industrial Development Zone/Special Economic Zone » Spatial Development Framework for Mfolozi Local Municipality <ul style="list-style-type: none"> * Details desired spatial land uses and plans for the Mfolozi Local Municipality * Includes Mfolozi Local Municipality Housing Plan 	<ul style="list-style-type: none"> » uMhlathuze LM » Mfolozi LM

6 POTENTIAL IMPACTS

The development of the CCGT power plant will result in environmental impacts, the severity of which is largely associated with the specific location and site sensitivity. To the extent that it is understood how, when, and where such developments will adversely affect the environment, and if it will be possible to mitigate future impacts through careful siting decisions. This section of the report details the potential impacts, which can be associated with proposed project based on international, regional and local experience with such developments.

Environmental impacts of the proposed gas to power plant and its associated infrastructure are expected to be associated with the construction, operation and decommissioning of the facility. The majority of the environmental impacts associated with the facility will occur during the construction phase. The construction activities for a CCGT facility include land clearing for site preparation and access/haul roads; transportation of supply materials and fuels; construction of foundations involving excavations and cement pouring; compaction of laydown areas and roadways, manoeuvring and operating machinery for unloading and installation of equipment; laying cabling; and commissioning of new equipment. Decommissioning activities may include removal of the temporary project infrastructure and site rehabilitation. Environmental issues associated with these construction and decommissioning activities are generally of a temporary nature and may include, among others:

- » *Threats to biodiversity and ecological processes*, resulting directly or indirectly from habitat loss and transformation, impacts on sensitive features (such as wetlands), soil disruption and potential for erosion, impacts to wildlife through mortality, injury, habitat loss and disturbance due to human presence and activities, and creation of conditions for the establishment and spreading of alien and/or invasive plant species. This is particularly of concern in areas where Threatened Ecosystems and/or Critical Biodiversity Areas have been defined and development may result in impacts on ecological processes and connectivity.
- » *Potential impact on surface water bodies and groundwater (Receptors)* as a results of on-site accidental fuel spills and leaks (source) from construction vehicles and/or fuel storage areas. Fuel spills can either migrate off-site to surrounding surface water bodies by mean of rain surface runoff or seep into groundwater by mean rain water seepage (pathway).
- » *Impacts to sites of heritage value* as a result of direct loss or disturbance of sites of significance. These potential impacts are largely dependent on the micro-siting of infrastructure within a site. Mitigation includes the identification and protection of known and above ground heritage resources (e.g. cultural sites and historical structures), as well as the implementation of management measures to ensure the minimisation of potential impacts on underground heritage resources (e.g. the potential presence of fossils or middens), which usually only become evident after excavation.

- » *Nuisance noise, air quality and social impacts* from the movement of people and vehicles transporting equipment and materials during construction and construction activities.
- » *Positive socio-economic impacts* during construction associated with job creation and local and regional business opportunities.

Environmental issues specific to the **operation** of a CCGT facility include:

- » *Impacts on air quality.* Primary pollutants from gas turbine engines are NO_x, CO and to a lesser extent, VOCs. PM is also a primary pollutant for gas turbines using liquid fuels – in this case back-up diesel. NO_x formation is strongly dependent on the high temperatures developed in the combustor. CO, VOC, hazardous air pollutants (HAP), and PM are primarily the result of incomplete combustion. Trace to low amounts of HAP and SO₂ are emitted from gas turbines. Ash and metallic additives in the fuel may also contribute to PM in the exhaust. Oxides of sulphur (SO_x) will only appear in a significant quantity if heavy oils are fired in the turbine. SO₂ emissions are directly related to the sulphur content of the fuel. In addition to the above, VOC emissions will also be released from diesel storage tanks vents as well as the off-loading and handling of diesel fuel. As natural gas and diesel are fossil fuels, the project will also contribute greenhouse gas emissions to some extent, specifically in terms of CO₂ and CH₄.
- » *Visual impacts,* including light and illumination issues and impacts on the cultural landscape. CCGT facilities, including supporting infrastructure such as power lines, are perceived as industrial structures, which have the potential to negatively impact on sensitive landscapes. The natural and cultural landscape characteristics of an area generally encompass visual, scenic, aesthetic and amenity values, which contribute to the overall 'sense of place'. The characteristics of CCGT facility developments, which have the potential to have an impact on landscapes and sensitive visual receptors such as residents and tourist destinations include the buildings and associated stacks (size, height, material and colour), access roads, substation buildings, and power lines.
- » *Noise impacts* resulting from, inter alia, the gas turbines, air intake fans, exhaust stacks. At any given location, the noise within or around a facility can vary considerably depending on a number of factors including the layout of the facility, the particular technology installed, the local topography and the background noise. The significance of noise impacts is directly related to the separation distance between the facility and noise sensitive developments. In South Africa, it is generally considered that any noise sensitive receptors within 2km of a noise source could be impacted from a noise perspective.
- » *Potential impacts on land use,* resulting from the actual footprint of the development on the site as well as from conflicts with existing or planned land uses. Land use compatibility is salient for the harmony of daily activities in urban areas.

The CCGT Power Plant is classified as an industrial activity and thus, will change the land use where it is to be located to an industrial land use.

These and other environmental issues have been identified through a desktop evaluation of the Identified CCGT sites. Potentially significant impacts identified will be required to be assessed within the EIA phase of the study.

7 DESCRIPTION OF THE IDENTIFIED SITES

This section of the report provides a description of the regional and site specific environment that may be affected by the proposed project against which the potential impacts of the proposed facility can be identified and considered. Aspects of the regional, local, and site-specific 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 both existing information available for the area as well as desktop and field data collected by the Savannah Environmental team and specialist project team. A more detailed description of each aspect of the affected environment is included within the specialist reports contained within **Appendices B1 – B13**.

7.1 Regional setting

The four sites under consideration are located in uThungulu District Municipality in the Richards Bay area on the north coast of KwaZulu-Natal, approximately 170 km north of Durban (refer to Figure 1.1). The area is characterised by a subtropical climate. Summers are warm and wet, and winters are mild, moist to dry, and frost free. The Richards Bay area has an average annual rainfall ranges between 994mm and 1500mm. The average annual temperature is 21.5 °C, with daytime temperatures peaking from January to March at 29°C. Daytime highs in winter from June to August are 23°C, with minimum temperatures of 12°C.

The Richards Bay area is located on a flat coastal plain, with the terrain rising slightly towards the west. Coastal dune forest is abundant in the area, most notably along the coastal dune belt.

7.2 Topography and Drainage

The study area lies at an elevation ranging approximately from 0 to 80 meters above mean sea level meters (m amsl). Beside steep dune cordon of 40 to 50 metres above mean sea level (mamsl) along the eastern part of the study area, the topography is fairly flat-lying.

Surface water bodies within the study area include Lake Mzingazi, Richards Bay harbour, Mhlathuze lagoon, Lake Qhubu, Lake and Lake Nsezi. The main rivers identified include perennial rivers such as Nseleni River, Mhlathuze River and Mzangazi and non-perennial streams such as Mzingwenya, Mbabe, Nundwane, Kondweni, Mdibi and Mpisini as shown in Figure 7.1. Wetlands are also present within the study area.

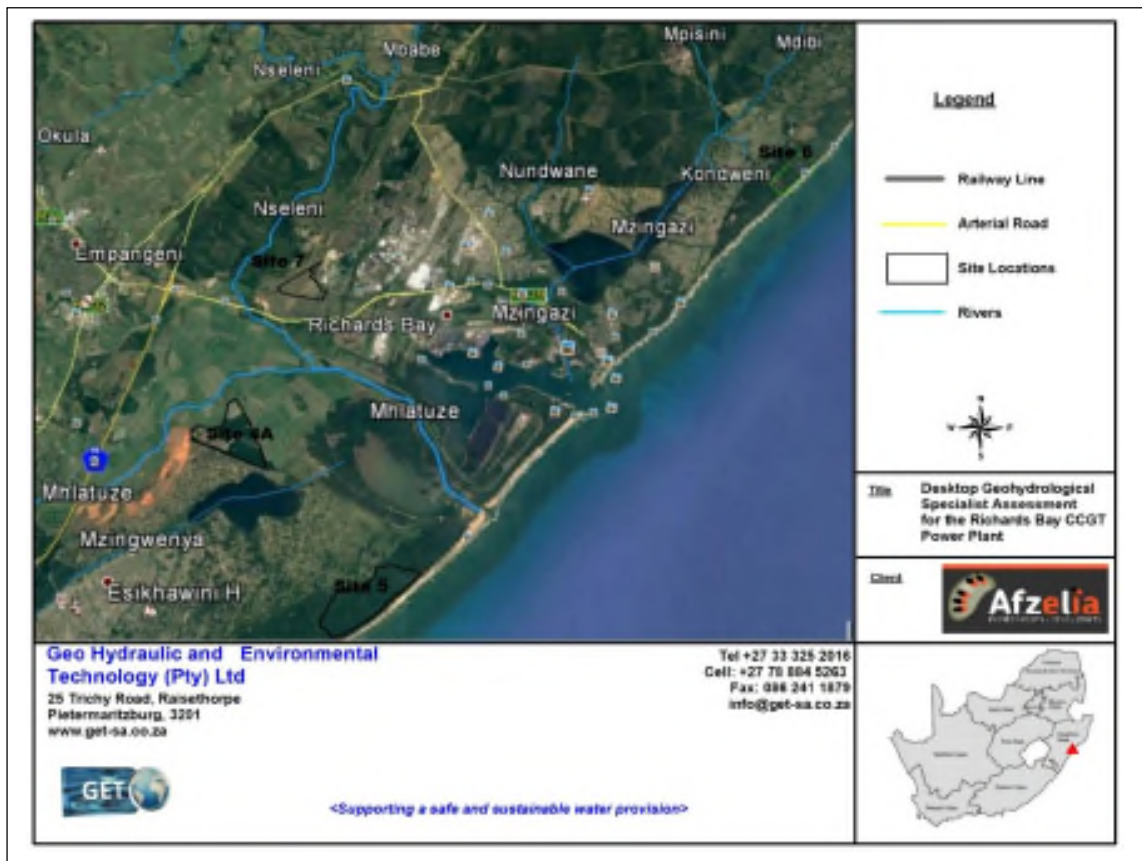


Figure 7.1: Map showing the location of the proposed sites in relation to the main rivers drainage identified, perennial and non-perennial rivers

7.2.1 Flood Hydrology

The TR137 method (Francou-Rodier method) was used as the catchments areas are very large, which out-rules methods such as the Rational and Alternative Rational method. A K-value of 5.6 was used for the uMhlatuze, Nseleni and Estuary catchments. Quaternary catchments W12A, W12B, W12C, W12D, W12E, W12F contribute to the uMhlatuze River run-off and W12G and W12H contribute to the Nseleni River. Quaternary catchments W12A to W12H contribute to the Estuary run-off.

Table 7.1: Catchment areas as well as the predicted floods

River/Place	Catchment Area (km ²)	Flood (m ³ /s)				
		RMF	1:200	1:100	1:50	1:20
Nseleni Roiver	811	5754	4621	3844	3090	1151
uMhlatuze River	2946	10156	8338	7059	5789	2031
Estuary	3877	11454	9598	8293	6952	2334

Hec-Ras software was used to simulate the effect of the above floods along the rivers and adjacent flood plains. Cross-sections were obtained from existing 25m x 25m aerial

survey points. Although these points are fairly accurate, there may be inaccuracies depending on vegetation and structures in the survey area. This will however not affect the flood heights significantly since the areas where inaccuracies are expected are very wide and will therefore not influence the flood depth.

All proposed sites lie outside the Regional Maximum Flood (RMF) and obviously all the lesser floods.

7.3 Geohydrological profile of the region

The study area is underlain by quaternary yellowish distributed sand which overlain the mudstone, shale, sandstone, lignite and sand of Port Durnford formation. Groundwater occurs within the inter-granular primary aquifer in the semi consolidated and unconsolidated materials deposited during the Tertiary and Quaternary periods.

Available data reviewed indicated no abstraction boreholes within the study area and surface water bodies are used as source of water supply to industries and mines. Groundwater levels data was not available from the National Groundwater Data Base (NGDB). It was understood that groundwater flow mimics the topography. The topography being fairly flat within the study area, groundwater flow direction cannot clearly be defined. It is likely to follow rivers drainage which flow towards lakes and towards the Indian Ocean.

7.3.1 Aquifer Characteristics

According to the 1:500 000 scale hydrogeological map series (Vryheid, Map sheet 2730) and from available hydrogeological information, groundwater occurs within the inter-granular primary aquifer in the semi consolidated and unconsolidated materials deposited during the Tertiary and Quaternary periods. Hydrological Research & Training Specialists cc, (2006) as cited in SRK (2008) indicated that the study area is underlain mainly by unconsolidated formation with high hydraulic conductivity including Qs (1m/day). According to Golder (2014) the depths of boreholes measured within the study area varies from 30 and 45 metres below ground level (mbgl) and the aquifer testing conducted indicated the hydraulic conductivity ranging from 0.5 to 5 m/d.

It was also indicated that main annual rainfall in the Richards Bay area ranges between 994 and 1500 mm/year and the main annual evaporation ranges from 1410 to 1923 mm/year, Germishuyse (1999). The effective groundwater recharge is estimated to range from 450 to 750mm/year. Existing data indicated that the groundwater level measured in the Richards Bay Mineral monitoring boreholes ranges from approximately 1.5 to 70 mbgl. Generally, it is expected that the groundwater table across the study area mimics the surface topography.

7.3.2 Groundwater Usage

Germishuise (1997) indicated that there were no groundwater extractions in the Richards Bay area, since private boreholes were prohibited by the uMhlathuze Municipality by-laws. The uMhlathuze Local Municipality Water Services By-laws 2010 allowed the sinking of abstraction boreholes only above the 50m mean sea level contour line. The interaction between surface water and groundwater need to be considered in assessing baseline geohydrological conditions. Surface water including Lake Nsezi and Mzingazi are the main water supply reservoirs under the jurisdiction of Mhlathuze water for the region, including several industries and local mining houses. Besides river drainage and rainfall, these lakes are also replenished by groundwater seepages from local primary aquifer.

7.3.3 Groundwater Flow Direction

Generally the groundwater levels mimic topographic levels. The topography being fairly flat within the study area, groundwater flow direction cannot clearly defined. It is likely to follow rivers drainage which flow towards lakes and towards the Indian Ocean.

7.3.4 Groundwater Quality

The 1:500 000 scale hydrogeological map (Vryheid, Map sheet 2730) indicates that EC ranges from 0 to 70mS/m. No recent groundwater quality data was available for the study area in the WMS database but recent surface water quality data are available.

7.4 Site specific description of the environment and its surroundings

7.4.1 Site 4a

Ecological Profile	
Vegetation type	<ul style="list-style-type: none"> » Maputaland Coastal Belt: a 35 km broad strip extending along the Indian Ocean coast from the Mozambique border in the north, to Mtunzini in the south, at an altitude that varies from approximately 20 – 120 masl. Historically, the flat coastal plains were densely covered in places with a wide range of interspersed non-forest plant communities, including dry grasslands, hygrophilous grasslands and thicket groups. » Conservation status: Endangered (EN) » Subtropical Freshwater Wetlands: ordinarily occurred in low lying areas and dominated by reeds, sedges, rushes and water logged meadows dominated by grasses. » Conservation status: Vulnerable (VU)
Protected Areas and other Conservation Areas	<ul style="list-style-type: none"> » Richards Bay Nature Reserve and IBA – 3.19 km to the east » Umlalazi Nature Reserve and IBA – 19.1 km to the southwest » Ngoye Forest Reserve and IBA – 19.3 km to the west » Thukela NPAES focus area – 19.3 km to the west
Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)	No CBAs or ESA were identified.
Flora Species of Conservation Concern	Two tree species, namely <i>Barringtonia racemosa</i> and <i>Ficus trichopoda</i> were identified within the study area
Current conditions of the study area	Currently, with the exception of the Isigonyane Dam, the entire study area has been transformed by extensive timber plantations and sugarcane crops. The dam margins are covered by mowed grass and reedbeds, with several scattered trees such as <i>Barringtonia racemosa</i> (Powder-puff tree) and <i>Ficus trichopoda</i> (Swamp fig) present.
Wetlands	Site 4a, is located approximately 30m from areas delineated as wetland areas. According to the Biodiversity Impact Assessment guidelines for KwaZulu-Natal, a standard buffer zone of 30m should be applied to wetlands.
National Estuaries	Site 4a extends into the 5m functional zone of the estuary. This may present legal and ecological complications for the project (refer to Figure 7.2 below).

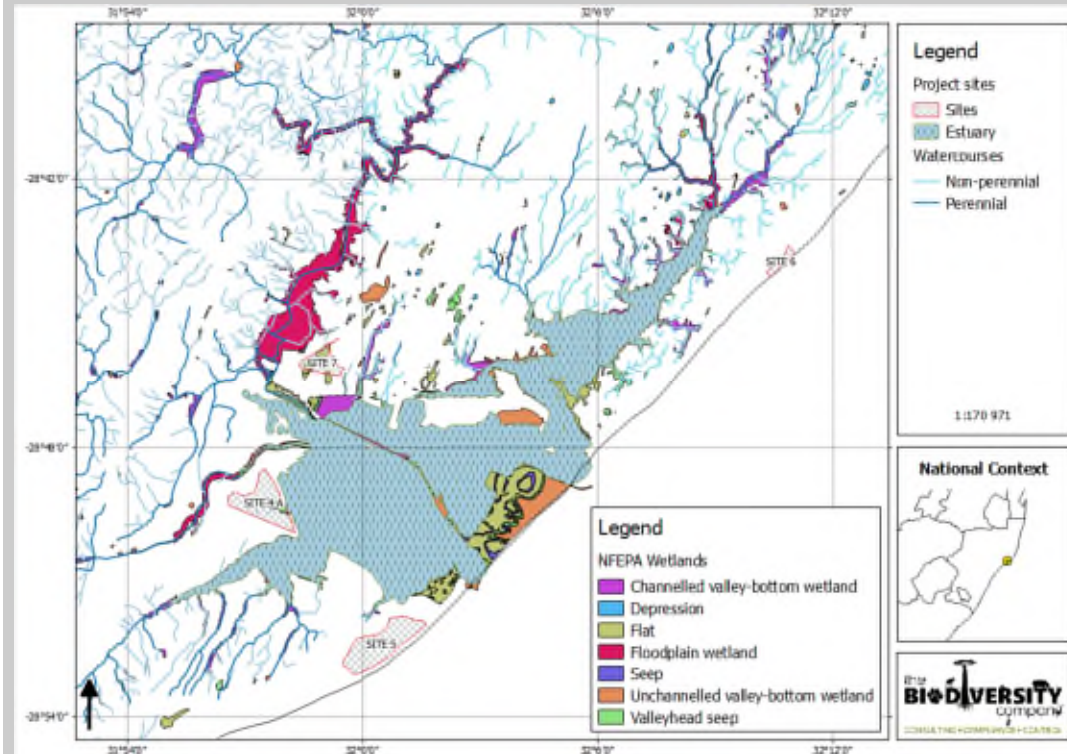


Figure 7.2: The NFEPA and estuarine 5m functional zone for the study

Air Quality

Air Quality Sensitive Receptors nearby	Mandlankala (directly SSW) Felixton (6.2 km SW) Richards Bay (8.6 km NE)
Other pollution sources	Hillendale mine is directly SSW of the site, with sugar cane farms around.
Wind Influence	Potential for windblown dust from Hillendale mine due to SW & SSW winds to impact on CCGT Potential to impact on Mandlankala (SSW)

Archaeological and Paleontological features

Archaeology	The site is mostly cultivated which would have impacted on surface indicators of heritage sites. A large water body also occurs in the study area with various water furrows. Cultural Heritage surveys for the
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Hillendale mine (Anderson 2004 and 2007) and Umhlatuze Valley Sugar (from the Pietermaritzburg Museum Database) to the south west of Site 4A revealed a concentration of Stone Age sites (Figure 7.3). It can be deduced that a similar manifestation of archaeological sites can be expected within Site 4A.



Figure 7.3. Known sites in relation to Site 4A indicated with yellow pins.

Palaeontology

The KwaZulu-Natal Province is completely underlain by Quaternary sediments of the Maputuland Group (Late Caenozoic Era) which is approximately up to about 18 000 year old. The largest portion of the Uloa Formation is known for the wealth of the bivalve *Aeqipectenuloa*. Gastropods, brachiopods, coralline algae, corals, polychaeta, foraminifera and echinoids are present, as well as isolated teeth of the extinct giant shark *Carcharodon megalodon*. The Port Durnford Formation comprising fossils of terrestrial vertebrates such as antelope, buffalo, elephant, hippopotamus, rhinoceros as well as marine fossils and fragments of turtles and crocodiles. Formations in this group have a moderate palaeontological sensitivity.

Geology of the site

Soil Profile

The soil/rock profile at the site comprises of a combination of grey and brown fine-grained sand and brownish-red clayey sand (south-west) and trace alluvium overlay Cretaceous age margine glauconitic siltstone, or sandstone/ clastic limestone/ conglomerate or conquina

Land Type	Hb76 and Ab86- Dominantly red, highly weathered, structure less soils, usually deep, may contain some grey sands and an E horizon associated with soil wetness.
Agricultural Potential	The main variables determining the soil's agricultural potential are effective depth, clay content and rainfall. The Land Capability is based on soil physical and chemical characteristics. Three classes of land capability have been identified, these include Arable land, grazing and wilderness. Overall the Agricultural potential of the sites is low to low – medium.
Socio-Economic Profile	
Land use	<p>The site is bisected by the P106. The Umhlatuzi Valley Sugar Company's offices, workshop area and staff accommodation lies to the northwest of the P106. Areas east and south of the P106 are covered by Eucalyptus plantations. The Isigonyane Dam lies towards the central and eastern portion of the site. Surrounding land uses comprise of sugarcane farming and residential settlements. The proposed development, therefore, conflicts with the surrounding land uses.</p> <p>Directly adjacent to an urban township comprising of such areas as Mhlatuze Flats, Bhiliya and Madlhangala, which host 1 854 households (Stats SA, 2011). In addition, a portion of the township is situated within the proposed site. Therefore, residents from Mhlatuze Flats, Bhiliya and Madlhangala will be subject to environmental effects and change in sense of place.</p>
Alignment with a local Spatial Development Framework (SDF)	Located within the City of uMhlatuze Local Municipality. The municipality's SDF indicates that the desired plan for the site is a port offset area and an environmental corridor.
Visual aspects	Located on the coastal plain immediately adjacent to an urban area (Isikhawini) and a local distributor road (P102). There is potential that the proposed development could overshadow houses and the R102 and introduce a significant industrial element feel to adjacent residential areas. The development of site 4a will also extend the visual influence of heavy industry that is generally located to the north of the port and to the south of Richards Bay. There are currently other industrial activities scattered through the coastal plain including mining but these generally are not as obvious in the landscape as the large industrial structures within the Richards Bay area that are visible over a wide area.
Current Sense of Place	The current sense of place is a highly populated residential area with a strong natural aesthetic. Agricultural landscapes dominate. Site 4a is directly adjacent to an urban township comprising of areas such as Mhlatuze Flats, Bhiliya and Madlhangala, which host 1 854 households (Stats SA, 2011).
Site Access	Bounded by the P106 on the western side, and by unpaved/gravel tracks on the southern, eastern and northern sides. The P106, between the P496 (John Ross Highway) and Site 4a is a two lane (one lane per direction) road, with wide paved shoulders with few accesses (apart from large properties such as farms), which is typical of a class R2 or R3 road (Rural Arterial Road).

	<p>Southwards from Site 4a the P106 enters the township of eSikhaleni and the nature of the P106 changes to the nature of a class U4 road (a collector road) with a multitude of accesses to small properties and businesses and with speed-bumps to limit the speed of passing vehicles. Numerous pedestrians, non-motorised transport and animals are found along this section of the P106.</p> <p>Even though the site could be accessible from the National route 2 (N2) via the P535 and the P106, the nature of the route would tend to discourage drivers from using it. Use of the P106 through eSikhaleni should also be discouraged because of the sensitive nature thereof (i.e. with animals, pedestrians and general urban/suburban environment).</p> <p>Based on the above observations, the only access route to the site that is considered to be feasible is via the P496 which runs between the N2 and Richards Bay central, in combination with the P106 from the John Ross Highway to Site 4a. The John Ross Highway has two, and sometimes three, lanes per direction and is a major rural arterial (class R2). Given the volume of predicted traffic, both during construction and operation the P496 and P106 is expected to be comfortably able to cater for the additional traffic.</p>
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7.4.2 Site 5

Ecological Profile	
Vegetation type	<ul style="list-style-type: none"> » Maputaland Coastal Belt: a 35 km broad strip extending along the Indian Ocean coast from the Mozambique border in the north, to Mtunzini in the south, at an altitude that varies from approximately 20 – 120 masl. Historically, almost the entire area on Site 5 was covered by Maputaland Dune Forest, with a small area towards the north-western site boundary falling into the Maputaland Coastal Belt » Conservation status: EN » Maputaland Dune Forest: generally extended along the seaboards of the Indian Ocean of KwaZulu-Natal Province and is particularly well developed in Maputaland. Typically this vegetation type is composed of species-rich, tall/medium height subtropical forests on coastal plains and stabilized coastal dunes. On dunes, these forests have well developed tree, shrub and herb layers and species such as <i>Mimusops caffra</i>, <i>Sideroxylon inerme</i>, <i>Dovyalis longispina</i>, <i>Acacia kosiensis</i> and <i>Psyrdrax obovata</i> subsp. <i>obovate</i> are common constituents of the tree layer. » Conservation status: EN
Protected Areas and other Conservation Areas	<ul style="list-style-type: none"> » Richards Bay Nature Reserve and IBA – 2.03 km to the north » Enseleni Nature Reserve – 18.3 km to the north » Umlalazi Nature Reserve and IBA – 18.8 km to the southwest

	<ul style="list-style-type: none"> » Ngoye Nature Reserve and IBA – 23.07 km to the west » Thukela NPAES focus area – 25.59 to the southwest
Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)	<ul style="list-style-type: none"> » The study area falls within CBA: Irreplaceable areas are critical for meeting biodiversity targets and thresholds, and need to therefore be maintained in a natural state with limited to no biodiversity loss. It should be noted that biodiversity features contained within these areas are not always applicable to the area's entire extent, and are often confined to a specific niche habitat, for example, forest or wetland areas (KZN BSP, 2014). » The study area is located in ESAs: ESAs are functional areas and need not necessarily be in pristine natural areas. ESAs are however, required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within CBAs, and also contribute significantly to the maintenance of ecological infrastructure.
Flora Species of Conservation Concern	One tree species, namely <i>Sclerocarya birrea</i> is expected to occur within the study area and is listed as 'Protected' by the National Forest Act (Act 84 of 1998).
Current conditions of the study area	At present the area is still covered with natural vegetation, with the tree and understory layers well represented. However, alien invasive plant species such as <i>Lantana camara</i> and <i>Cromolaena odorata</i> , amongst, others are present, specifically along the margins of several sandy tracks bisecting the area.
Wetlands	Located more than 30m from areas delineated as wetland areas. According to the Biodiversity Impact Assessment guidelines for KwaZulu-Natal, a standard buffer zone of 30m should be applied to wetlands. None of the sites are associated with wetlands which are classified as ecological priority areas
National Estuaries	The site is not located within the 5m functional zone of the estuary.
Air Quality	
Air Quality Sensitive Receptors nearby	Gubhethuka (directly N) Empembeni (directly NW) Richards Bay (6 km NNE)
Other pollution sources	Proposed Zulti South Sand mine is directly WSW Residential area around the site
Wind Influence	No identified sources to impact on CCGT Low potential for impact in Gubhethuka and Empembeni
Archaeological and Paleontological Features	
Archaeological Features	The site is a Greenfields site. Cultural Heritage surveys conducted by Gavin Anderson adjacent and to the north of Site 5 (Pietermaritzburg Museum Database) recorded shell middens that usually contain burial sites

(Figure 7.4). It can be deduced that a similar manifestation of archaeological sites can be expected within Site 5.



Figure 7.4: Known sites in relation to Site 5 indicated with yellow pins

Palaeontological Features

The KwaZulu-Natal area is completely underlain by Quaternary sediments of the Maputland Group (Late Caenozoic Era) which is approximately up to about 18 000 year old. The largest portion of the Uloa Formation is known for the wealth of the bivalve *Aeqipectenuloa*. Gastropods, brachiopods, coralline algae, corals, polyzoa, foraminifera and echinoids are present, as well as isolated teeth of the extinct giant shark *Carcharodon megalodon*. The Port Durnford Formation comprising fossils of terrestrial vertebrates such as antelope, buffalo, elephant, hippopotamus, rhinoceros as well as marine fossils and fragments of turtles and crocodiles. Formations in this group have a moderate palaeontological sensitivity.

Geology of the site

Soil Profile

The soil/rock profile at the site comprises of dune and beach sand or (Berea Formation) red dune cordon sand overlying (Bluff Formation) calcareous sandstone.

Land Type

Hb61- Typically yellow-brown structure less sands and other soils

Agricultural Potential	<p>The main variables determining the soils agricultural potential are effective depth, clay content and rainfall. The Land Capability is based on soil physical and chemical characteristics. Three classes of land capability have been identified, these include Arable land, grazing and wilderness. Overall the Agricultural potential of the sites is low to low – medium.</p>
Socio-Economic Profile	
Land Use	<p>No land use practices were evident at the time of the site inspection. Local reports indicate the use of this area as an access point to the beach by local fisherman. The area is covered by natural vegetation with mild to moderate infestations of alien invasive plants such as <i>Lantana camara</i> and <i>Cromolaena odorata</i> along sandy tracks.</p> <p>The surrounding land uses include forests and residential. The proposed development, therefore, conflicts with the surrounding land uses.</p> <p>Located 0.2 km from the urban village, Empembeni, which is home to 563 households (Stats SA, 2011). Therefore, environmental effects such as noise, air quality, and visual change are likely to disturb the current sense of place.</p>
Alignment with a local Spatial Development Framework (SDF)	<p>Site 5 is located within the City of uMhlatuze Local Municipality. The municipalities SDF indicates that the site is located on an area demarcated as an environmental corridor; therefore, the natural environment is sought to be retained</p>
Visual Aspects	<p>Located on the coastal dune to the south of Richards Bay. The topography of the site is such that:</p> <ul style="list-style-type: none"> » If elements of the development were located to the eastern, seaward, edge then these structures may be hidden from inland areas but would be highly visible from the coast and out to sea. » If elements of the development were to be located on the dune top then they are likely to be visible both from coastal areas / out to sea and from inland. » If elements of the development were to be located on the western, inland, edge of the site then the structures are likely to be largely hidden from coastal areas / out to sea but are likely to be highly visible from inland areas. <p>The site appears to be largely covered with relatively natural coastal forest.</p> <p>Possible inland sensitive receivers that are in relatively close proximity to the site include:</p> <ul style="list-style-type: none"> » Local traditional rural homesteads that are located immediately inland of the site. The closest is approximately 350m from the edge of the site; and

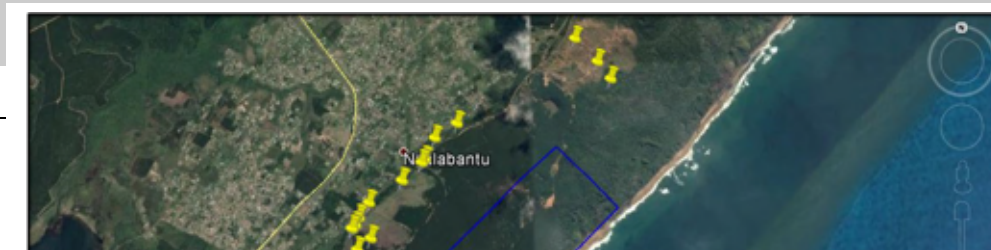
	» The Richards Bay Game Reserve that lies within 2km to the north.
Current Sense of Place	The sense of place is characteristic of a high density residential area surrounded by natural features such as the expansive plantation and sugar cane plantation.
Site Access	<p>The closest route practically accessible with a normal passenger vehicle is the P537. This route can in turn be accessed via two (2) possible options, namely the P106 and the D2056, as indicated below:</p> <ol style="list-style-type: none"> 1. From the P106, travelling south to become the P744, then turning left onto the D877, which eventually becomes the P537. The P744 has the same characteristics as the P106 and is also of type R4 (rural collector road) with several informal accesses, speed-bumps, and pedestrians. The D877 is currently being rehabilitated, but will also result in a class 4 collector road. The P537 is partially surfaced but in a very poor state and serves as a class 4 or 5 collector road. From the P537 the only current access routes in the direction of Site 5 are sandy /gravel roads in poor state. 2. The D2056. This route is accessed from the P106 at the northern border of the eSikhaleni Township. This route is a gravel/dirt road which is in a poor state. While some portions (as in the picture above) appear to be in reasonable state other portions of the route have very poor geometric layout and winds its way through closely neighbouring rural residential properties. <p>In light of the above, access to Site 5 poses many challenges, and without the upgrading of several roads, or ideally the construction of a new road bordering the northern edge of eSikhaleni, construction of the development at this site is discouraged from a transportation perspective.</p>


7.4.3 Site 6

Ecological Profile	
Vegetation type	<p>» Maputaland Coastal Belt: is a 35 km broad strip extending along the Indian Ocean coast from the Mozambique border in the north, to Mtunzini in the south, at an altitude that varies from approximately 20 – 120 masl. Historically, almost the entire area on Site 6 was covered by Maputaland Dune Forest.</p> <p>» Conservation status: EN</p> <p>» Maputaland Dune Forest: generally extended along the seaboard of the Indian Ocean of KwaZulu-Natal Province and is particularly well developed in Maputaland. Typically this vegetation type is composed of species-rich, tall/medium height subtropical forests on coastal plains and stabilized coastal dunes. On dunes, these forests have well developed tree, shrub and herb layers and species such as <i>Mimusops caffra</i>, <i>Sideroxylon inerme</i>, <i>Dovyalis longispina</i>, <i>Acacia kosiensis</i> and <i>Psyrax obovata</i> subsp. <i>obovate</i> are common constituents of the tree layer.</p> <p>» Conservation status: EN</p>

	<ul style="list-style-type: none"> » Subtropical Seashore Vegetation: A very narrow band of Subtropical Seashore Vegetation extends along the southern site boundary, it should however be noted that this vegetation type falls outside the site boundaries. » Conservation status: Least threatened.
Protected Areas and other Conservation Areas	<ul style="list-style-type: none"> » Nhlabane Nature Reserve – 12.4 km to the northeast » Enseleni Nature Reserve – 16.4 km to the northwest » Richards Bay Nature Reserve and IBA – 16.9 km to the southwest
Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)	<ul style="list-style-type: none"> » A portion of Site 6 falls within CBA: Irreplaceable areas are critical for meeting biodiversity targets and thresholds, and need to therefore be maintained in a natural state with limited to no biodiversity loss. However, it should be noted that the biodiversity features contained within these areas is not always applicable to the area's entire extent, and is often confined to a specific niche habitat, for example, forest or wetland areas. » A narrow band of coastal vegetation on Site 6 is located in ESAs: ESAs are functional areas and need not necessarily be in pristine natural areas. ESAs are however, required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within CBAs, and also contribute significantly to the maintenance of ecological infrastructure.
Sensitive Terrestrial Ecosystems	<ul style="list-style-type: none"> » Site 6 is located within Critically Endangered ecosystems: Kwambonambi Dune Forest ecosystem extends from Richards Bay in the south to the isiMangaliso Wetland Park in the north and includes the dune forest on the primary dunes in this region. Key biodiversity features include four millipede species, <i>Centrolobus fulgides</i>, <i>Centrolobus richardi</i>, <i>Centrolobus rugulosus</i> and <i>Doratogonus zuluensis</i>; one plant species, <i>Kniphofia leucocephala</i>, and six vegetation types, the KwaZulu-Natal Coastal Forest, KwaZulu-Natal Dune Forest, Mangrove Forest, Maputaland Wooded Grassland, Maputaland Coastal Belt and Swamp Forest. » Less than 1% of the original area ecosystem is protected in the Nhlabane Nature Reserve and isiMangaliso Wetland Park. » This ecosystem is listed under Criterion F in the National List of Ecosystems which categorizes it as priority areas for meeting explicit biodiversity targets as defined by a systematic biodiversity plan, including DAFFs systematic biodiversity plans for the Forest biome » Threatened Ecosystem Status: CR
Flora Species of Conservation Concern	<ul style="list-style-type: none"> » One tree species, namely <i>Sclerocarya birrea</i> is expected to occur within the study area and is listed as 'Protected' by the National Forest Act (Act 84 of 1998).
Current conditions of the study area	<p>At present, the entire area of Maputaland Coastal Belt grassland on this site, has been transformed by timber plantations, and is completely devoid of undergrowth. The narrow band of Maputaland Dune</p>

	Forest vegetation adjacent to the Subtropical Seashore vegetation appeared to be relatively intact, with well-developed tree and understory layers present. Several plantation 'escapees' were noted in the Maputaland Dune Forest.
Wetlands	Site 6, is located approximately 30m from areas delineated as wetland areas. According to the Biodiversity Impact Assessment guidelines for KwaZulu-Natal, a standard buffer zone of 30m should be applied to wetlands. None of the sites are associated with wetlands which are classified as ecological priority areas
National Estuaries	The site is not located within the 5m functional zone of the estuary.
Air Quality	
Air Quality Sensitive Receptors nearby	Nzalabantu (directly NW) Ntshingimpisi (directly SW) Richards Bay (7.6 km SW)
Other pollution sources	RBM (5.6 km NW) Residential areas to the NW and SW
Wind Influence	No identified sources to impact on CCGT Low potential for impact in Nzalabantu and Ntshingimpisi
Archaeological and Paleontological Features	
Archaeological Features	Several sites are on record at the edge of this Greenfields area with a single site that is on record for Site 6 at the Pietermaritzburg database consisting of a Stone Age site referred to as Ntogande (Figure 7.5). This site has a field rating of 3B and it can be deduced that a similar manifestation of archaeological sites can be expected within Site 6. Anderson (2013) indicated that surveys for the Zulti North Mining Project identified 494 sites in the areas adjacent to Site 6 and it is expected that the proposed Site 6 will also have a high concentration of heritage sites.



	 <p>Figure 7.5: Known sites in relation to Site 6 indicated with yellow pins.</p>
<p>Palaeontology</p>	<p>The KwaZulu-Natal area is completely underlain by Quaternary sediments of the Maputland Group (Late Caenozoic Era) which is approximately up to about 18 000 year old. The largest portion of the Uloa Formation is known for the wealth of the bivalve <i>Aeqipectenuloa</i>. Gastropods, brachiopods, coralline algae, corals, polyzoa, foraminifera and echinoids are present, as well as isolated teeth of the extinct giant shark <i>Carcharodon megalodon</i>. The Port Durnford Formation comprising fossils of terrestrial vertebrates such as antelope, buffalo, elephant, hippopotamus, rhinoceros as well as marine fossils and fragments of turtles and crocodiles. Formations in this group have a moderate palaeontological sensitivity.</p>
<p>Geology of the site</p>	
<p>Soil Profile</p>	<p>The soil/rock profile at the site comprises of dune and beach sand or (Berea Formation) red dune cordon sand overlying (Bluff Formation) calcareous sandstone.</p>
<p>Land Type</p>	<p>Hb61- Typically yellow-brown structure less sands and other soils.</p>
<p>Agricultural Potential</p>	<p>The main variables determining the soils agricultural potential are effective depth, clay content and rainfall. The Land Capability is based on soil physical and chemical characteristics. Three classes of land capability have been identified, these include Arable land, grazing and wilderness. Overall the Agricultural potential of the sites is low to low – medium.</p>

Socio-Economic Profile	
Land use	The land uses on adjacent land parcels include residential, commercial forestry plantations, and indigenous forests. The proposed development is therefore, not compatible with the aforementioned land uses.
Alignment with a local Spatial Development Framework (SDF)	Site 6 is located within the Mfolozi Local Municipality. The municipal SDF indicates that Site 6 is situated in an area envisaged for high population density. As indicated in the municipal SDF, the area where Site 6 is located is further planned to house a residential area in the future. The residential area is planned to reflect a sustainable human settlement, with all basic amenities in close proximity to residents.
Visual	<p>Site 6 is located on the Coastal Dune to the east of Richards Bay. It should be noted that the development will not visually impact on the Richards Bay Game Reserve or on protected areas in the vicinity. The topography is such that almost the entire site slopes from west to east towards the sea and there appears to be a large amount of forestry plantation within the site. This means that:</p> <ul style="list-style-type: none"> » Development anywhere on the site is likely to be highly obvious from the coastal strip and out to sea; and » Development is not as likely to affect natural dune forest, however, the fact that the forestry plantation provides the impression of a continuous green dune system that will be interrupted by the project.
Current Sense of Place	The urban village's sense of place is a dense residential area surrounded by plantations. Site 6 is located 0.2 km from the urban village, Nzalabantu comprised of 2676 households.
Site Access	<p>To gain access to the site from local areas and other regional destinations (i.e. Richards Bay area and the N2) one would need to travel along the P496 (John Ross Highway), through the Richards Bay residential areas of Meer en See, and through the township of Ntshingimpisi and Nzalabantu. The John Ross Highway, begins as a dual carriageway of 2 to 3 lanes per direction (class R2) and eventually becomes Anglers Road (as it traverses through Meer en See), a single carriageway, with one lane per direction and no shoulder as it passes through Meer en See (typical of a class U4 road). The route remains one lane per direction through Ntshingimpisi and Nzalabantu. This is a distance of approximately 12km through suburban and rural-suburban areas, with speed-bumps and often encountered pedestrians and animals.</p> <p>In Nzalabantu there is a four-way junction at which one has to turn south-east toward Site 6 (route number not known). From here the road has no road markings and appears to be seldom used judging by the deposits of sand and litter, but is paved until it enters the forestry area in which Site 6 is located.</p> <p>Access to Site 6 poses many challenges, there is a high likelihood of incidents, where the road passes through some 12 km of residential areas, with many pedestrians, animals, bicycles, and other Non-</p>

motorised transport (NMT). Many speed-bumps are already in place to limit speeds, which makes the road less desirable for a site access route. There are many intersections along Mzingazi Road and absence of alternative routes in the event of incidents blocking the road is a concern. Absence of alternative routes also limits distribution of traffic.

7.4.4 Site 7

Ecological Profile	
Vegetation type	<ul style="list-style-type: none"> » Alluvial Wetlands: vegetation covered a small area on the western side of Site 7. This vegetation type typically supported an intricate complex of macrophytic vegetation, marginal reed belts as well as extensive flooded grasslands, ephemeral herblands and riverine thickets. » Conservation status: VU
	<ul style="list-style-type: none"> » Subtropical Freshwater Wetlands: ordinarily occurred in low lying areas and dominated by reeds, sedges, rushes and water logged meadows dominated by grasses. » Conservation status: VU
	<ul style="list-style-type: none"> » Maputaland Wooded Grassland: The largest portion of Site 7 was previously covered by Maputaland Wooded Grassland. This vegetation type typically supported coastal sandy grasslands rich in geoxyllic suffrutices, dwarf shrubs, small trees and very rich herbaceous flora. » Conservation status: EN
Protected Areas and other Conservation Areas	<ul style="list-style-type: none"> » Richards Bay Nature Reserve and IBA – 5.1 km to the southeast » Enseleni Nature Reserve – 7.8 km to the north » Ngoye Nature Reserve and IBA – 23.3 km to the southwest » Thukela NPAES focus area – 22.9 km to the west
Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)	<ul style="list-style-type: none"> » Site 7 falls within CBA: Irreplaceable areas are critical for meeting biodiversity targets and thresholds, and need to therefore be maintained in a natural state with limited to no biodiversity loss. However, it should be noted that the biodiversity features contained within these areas is not always applicable to the area's entire extent, and is often confined to a specific niche habitat, for example, forest or wetland areas. » Study area does not fall within an ESA.
Sensitive Terrestrial Ecosystems	<ul style="list-style-type: none"> » Site 7 is located within Critically Endangered ecosystems: Kwambonambi Hygrophilous Grassland ecosystem which lies inland, but adjacent to the Kwambonambi Dune Forest ecosystem. It

	<p>incorporates the hygrophilous grasslands behind the primary dune system as well as swamp forests, including the Richards Bay surrounds up to the lower Umfolozi Flats.</p> <ul style="list-style-type: none"> » This ecosystem contains six threatened or endemic plant and animal species, including one amphibian species, <i>Hyperolius pickersgilli</i>, four millipede species, <i>Centrobolus fulgidus</i>, <i>Centrobolus richardi</i>, <i>Centrobolus rugulosus</i> and <i>Doratogonus zuluensis</i>; one plant species, <i>Kniphofia leucocephala</i>; and six vegetation types viz. KwaZulu-Natal Coastal Forest, KwaZulu-Natal Dune Forest, Mangrove Forest, Maputaland Wooded Grassland, Maputaland Coastal Belt and Swamp Forest. » Approximately 8% of the original area of this ecosystem is protected in the Enseleni Nature Reserve, Richards Bay Game Reserve, Nhlabane Nature Reserve and isiMangaliso Wetland Park (Goodman, 2007). » This ecosystem is listed under Criterion F in the National List of Ecosystems which categorizes it as priority areas for meeting explicit biodiversity targets as defined by a systematic biodiversity plan, including DAFF's systematic biodiversity plans for the Forest biome » Threatened Ecosystem Status: Critical (CR)
<p>Current conditions of the study area</p>	<p>Currently the area has relatively low and sparse grass cover, with a few medium sized trees scattered across the site. Several areas, specifically towards the southern site boundary are infested by alien invasive plant species such as <i>Lantana camara</i> and <i>Psidium guajava</i>. Some areas towards the north are relatively densely covered with <i>Dichrostachys cinerea</i>.</p> <p>Water on the marshy areas on the southern boundary is covered with duckweed, and these areas are relatively sparsely fringed with reeds. Some hygrophilous plant species were noted in depressions towards the northern, western, southern and central sections of the site, indicating the presence of water, however at the time of the site visit the area was quite dry.</p>
<p>Wetland Features</p>	<p>Several wetland areas are located within Site 7. The western portion of the site consists of undisturbed mosaic of small depression wetlands and pans with a largely natural Kwambonambi grassland. Wetlands on the eastern portion of the site have been impacted as a result of the construction of the rail line and Mondi plant). The wetlands and grasslands on the western portion of the site are of very high conservation significance.</p> <p>The wetlands on the western portion remain largely undisturbed and the habitat integrity is high. In compensation for conservation of the western portion of the IDZ 1D by the City of uMhlatuze Local Municipality and the KZN Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) relaxation of the constraints on the eastern portion of the site has been accepted.</p>



Figure 7.6: Map illustrating the wetlands identified with the IDZ 1D boundary (Site 7)- Source SIVEST Environmental Risk Assessment for Richards Bay IDZ 1A-D & F, August 2010

National Estuaries

The site is not located within the 5m functional zone of the estuary.


Air Quality

Air Quality Sensitive Receptors nearby

Richards bay Central (6.3 km ENE)
 Arboretum (6.7 km E)
 Empangeni (7.3 km W)

Other pollution sources

Mondi Richards Bay (next door)
 Other industries in Richards Bay (Lafarge, TATA Steel and Pulp United)

Wind Influence	Likely to be impacted on by Mondli. Potential to impact on Richards Bar residential areas to the NE
Archaeological and Paleontological Features	
Archaeological Features	<p>The site is covered in short grass and previously impacted on by an old railway line. Cultural Heritage surveys for the Swaziland Railway Link Ermelo to Richards Bay (Anderson and Anderson 2009) recorded a Stone Age site within Site 7 (Figure 7.7). This site has a field rating of 3B as per the Pietermaritzburg Museum database.</p>  <p>Figure 7.7: Known sites in relation to Site 7 indicated with yellow pins.</p>
Palaeontology	<p>The KwaZulu-Natal area is completely underlain by Quaternary sediments of the Maputland Group (Late Caenozoic Era) which is approximately up to about 18 000 year old. The largest portion of the Uloa Formation is known for the wealth of the bivalve <i>Aeqipectenuloa</i>. Gastropods, brachiopods, coralline algae, corals, polyzoa, foraminifera and echinoids are present, as well as isolated teeth of the extinct giant shark <i>Carcharodon megalodon</i>. The Port Durnford Formation comprising fossils of terrestrial vertebrates such as antelope, buffalo, elephant, hippopotamus, rhinoceros as well as marine fossils and fragments of turtles and crocodiles. Formations in this group have a moderate palaeontological sensitivity.</p>
Geology of the site	

Soil Profile	The soil/rock profile at the site comprises of grey and brown-grained sand and trace alluvium overlying Cretaceous age marine glauconitic siltstone, or red feldspathic and micaceous sandstone with subordinate quartz arenite, mudrook, granulestone and conglomerate
Land Type	Hb75- An organic A horizon overlying deep structure less sands with a E horizon and a marked clay increase into the B horizon associated with clay eluviation.
Agricultural potential	The main variables determining the soils agricultural potential are effective depth, clay content and rainfall. The Land Capability is based on soil physical and chemical characteristics. Three classes of land capability have been identified, these include Arable land, grazing and wilderness. Overall the Agricultural potential of the site is low to low – medium.
Social Profile	
Land use	<p>The area surrounding Site 7 is inclusive of open fields, industrial activities, and pockets of commercial activities. The proposed development on Site 7 is, therefore, compatible with the surrounding land uses.</p> <p>Communal cattle grazing appears to be undertaken on the site. A cattle boma and informal dwelling is located on the northern sections of the site.</p>
Alignment with a local Spatial Development Framework (SDF)	Site 5 is located within the City of uMhlathuze Local Municipality. The municipal SDF indicates that a portion of the site should be conserved and the remaining portion is available for the proposed development. The proposed development is located within an Industrial Development Zone (IDZ)- classified as phase 1-D of the planned IDZ. The available portion of Site 7 therefore, conforms to the future plans of the area.
Visual	<p>Site 7 is located to the west of Richards Bay within an area that is planned for heavy industry and immediately adjacent to existing heavy industrial installations. The closest sensitive receptors to the development are likely to be travellers on the R34 that runs within approximately 1km of the southern end of the site. This road is the main access route into Richards Bay. From the affected section of the road, views over other heavy installations are obvious.</p> <p>Whilst this site is highly visible, the development would be seen from all but the closest viewpoints, in the context of other heavy industrial structures.</p>
Current Sense of Place	The sense of place associated with this site is an industrial activity comprising of the Mondi factory and IDZ, which will host primarily industrial facilities. The closest residential settlement to Site 7 is Arboretum, located 5.6 km from the proposed site.
Site Access	Site 7 is located on a Road called the Western Arterial that leads from the John Ross Highway into an industrial area. It is approximately the shape of a triangle, where two sides are bounded by a railway line, and the third side by the Western Arterial. It is therefore presumed that Site 7 would receive access from

Western Arterial. Western Arterial is a one-lane per direction road of class 3 or 4. It provides only access to large industrial sites (like the Mondi Factory) in the vicinity of Site 7. It is approximately the shape of a triangle, where two sides are bounded by a railway line, and the third side by the Western Arterial. It is therefore presumed that Site 7 would receive access from Western Arterial. Western Arterial is a one-lane per direction road of class 3 or 4. It provides only access to large industrial sites (like the Mondi Factory) in the vicinity of Site 7. The Western Arterial has a signalised junction with the John Ross Highway.

The site is ideally located next to existing industrial sites along Western Arterial, and is approximately 900m from the John Ross Highway. There are no sensitive communities in the area and it is centrally located between the N2, the CBD and the suburbs of Richards Bay.

8 OUTCOMES OF THE SITE SCREENING AND SELECTION PROCESS – COMPARISON OF ALTERNATIVES

This section of the report provides a comparative screening assessment of the sites considered within this study based on the outcomes of the various specialist studies undertaken.

8.1 Ecological Screening Study

Site 4a	Site 5	Site 6	Site 7
<p>The natural fauna and flora of Site 4A has deteriorated in species richness and environmental well-being as a result of land clearance for timber plantations and sugarcane crops. As a result, species richness is in a downward cycle with no prospects of improving.</p> <p>The Isigonyane Dam potentially offers suitable habitat for several Red Listed/Protected fauna species and should thus be regarded as sensitive and be safeguarded by a buffer zone.</p> <p>Due to the transformed nature of the area, including areas surrounding Site 4A, connectivity is impaired and possible only to small undeveloped but environmentally compromised patches of natural vegetation.</p>	<p>The natural flora on this site is still largely intact. However, ecological integrity is impaired by the presence of several alien invasive plant species along a number of sandy tracks bisecting the area. The area is still representative of CBA: Irreplaceable and ESA areas.</p> <p>Based on quantitative and qualitative habitat availability, several Red Listed/Protected fauna and flora species have a high probability of occurrence. Connectivity is not impaired and possible to similar vegetation types along the coastline. This entire area should be regarded as sensitive.</p>	<p>The natural fauna and flora on Site 6 has deteriorated in species richness and environmental wellbeing as a result of land clearance for timber plantations. As a result, species richness is in a downward cycle with no prospects of improving.</p> <p>Except for the Dune Forest, the terrestrial habitat on the rest of this site is in a poor state of ecological repair, with none of the original vegetation remaining. Several Red Listed/Protected fauna and flora species are expected in the Dune Forest. The Dune Forest should thus be regarded as sensitive and be safeguarded by a buffer zone.</p>	<p>The natural fauna and flora on Site 7 has deteriorated in species richness and environmental wellbeing as a result of overgrazing and alien plant invasions. Consequently, species richness is in a downward cycle with little prospects of improving.</p> <p>The terrestrial habitat is in a poor state of ecological repair, with only a few remnants of the original vegetation remaining. This area is not representative of a CBA area. However, a few wetlands, although in poor ecological condition, should be regarded as sensitive and should be safeguarded by buffer zones.</p> <p>Due to the transformed nature of the area, including surrounding areas, connectivity is impaired and possible only to small undeveloped but</p>

Site 4a	Site 5	Site 6	Site 7
Site most favourable location for the development of the Richards Bay CCGT project. However, the Isigonyane Dam, identified as a sensitive area, should be precluded from the development and be safeguarded by the implementation of a buffer zone			environmentally compromised patches of natural vegetation.

8.2 Wetland Screening Study

Site 4a	Site 5	Site 6	Site 7
<p>Site 4A is in excess of 30m from areas delineated as wetland areas. According to the Biodiversity Impact Assessment guideline for KwaZulu Natal, a standard buffer zone of 30m should be applied to wetlands. Site 4a is the least preferred and this is attribute to the current land uses and land capacity in support of agricultural development</p> <p>Based on the cumulative scoring, Site 4a is not recommended for development.</p>	<p>Site 5 is in excess of 30m from areas delineated as wetland areas. According to the Biodiversity Impact Assessment guideline for KwaZulu Natal, a standard buffer zone of 30m should be applied to wetlands. Based on the cumulative scoring and considering the low/poor agricultural potential, Sites 5 is preferred as it is located</p>	<p>Site 6 is in excess of 30m from areas delineated as wetland areas. According to the Biodiversity Impact Assessment guideline for KwaZulu Natal, a standard buffer zone of 30m should be applied to wetlands. Based on the cumulative scoring and considering the low/poor agricultural potential, Site 6 is preferred site for development from a wetland perspective.</p>	<p>Several wetland areas are located within Site 7. The western portion of the site consists of undisturbed mosaic of small depression wetlands and pans with a largely natural Kwambonambi grassland. Wetlands on the eastern portion of the site have been impacted as a result of the construction of the rail line and Mondi plant). The wetlands and grasslands on the western portion of the site are of very high conservation significance.</p> <p>The wetlands on the western portion remain largely undisturbed and the habitat integrity is high. In compensation for conservation of the western portion of the IDZ 1D by the City of uMhlatuze</p>

Site 4a	Site 5	Site 6	Site 7
			<p>Local Municipality and the KZN Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) relaxation of the constraints on the eastern portion of the site has been accepted.</p> <p>Based on the cumulative scoring, Site 7 is considered to be acceptable for development from a wetland perspective.</p>

8.3 Marine and Estuarine Screening Study

Site 4a	Site 5	Site 6	Site 7
<p>There is little new development of marine infrastructure associated with development options at Site 4a. It is possible that a new intake might be required in the Port of Richards Bay or possibly modification of existing intake facilities. Construction impacts associated with this are likely to be of Low significance. No new outfalls will be needed as effluent disposal will be via an existing Mhalthuze A-line outfall. Potential impacts that could arise for these sites include:</p> <p>» The intake waters will be via existing intakes or further</p>	<p>Site 5 is located approximately 2.5 km south of the mouth of the Umhlatuze Estuary. Potential constraints at Site 5 are the shallow slope of the offshore bathymetry requiring the construction of longer marine tunnels/pipelines at this site to reach the required discharge depths, as well as indication that the geology of the offshore region may prove challenging for some of the construction activities considered for this site. Given the above, Site 5 is the least favourable site for development from the perspective</p>	<p>Site 6 is located 11 km north of the port entrance. The offshore bathymetry at this site is more steeply sloping than at Site 5, particularly further offshore. This implies shorter tunnels/pipelines at this site to achieve an equivalent level of environmental performance of the outfalls to that at Site 5. Seemingly the geology of the offshore region is less challenging than at Site 5, however this remains to be confirmed. Overall the environmental risks are less significant at Site 6 than for Site 5, the main reasons being its distance from the Mhalthuze Estuary (and the Port of</p>	<p>There is little new development of marine infrastructure associated with development options at Site 7. It is possible that a new intake might be required in the Port of Richards Bay or possibly modification of existing intake facilities. Construction impacts associated with this are likely to be of Low significance. No new outfalls will be needed as effluent disposal will be via an existing Mhalthuze A-line outfall. Potential impacts that could arise for these sites include:</p> <p>» The intake waters will be via existing intakes or further development</p>

Site 4a	Site 5	Site 6	Site 7
<p>development thereof. In terms of the intake seawater volumes required for the development of the CCGT power plant at these inland sites, the requirements are modest compared to the seawater intake volumes already required from the current intake facilities in the port to support existing industrial (Foskor) and desalination activities (i.e. the Hullside and Alkanstrand RO plants).</p> <p>» The addition of brine and other co-discharges from the proposed desalination plant will alter the density (and hence the plume behaviour of the effluent) and potentially the environmental toxicity of the effluent. Impacts are expected to be of Low significance as these additional volumes of effluent will be small compared to the existing volumes currently discharged through the A-line. The effluent streams from Site 4a will be significantly diluted with approximately 80 MLD of A-line effluent and seawater used to make up a total effluent volume of</p>	<p>of marine (and estuarine) environmental impacts.</p>	<p>Richards Bay) and a likely lower abundance of reef habitat at Site 6. The impacts at Site 6 are nevertheless more significant than impacts associated with the development of the plant at either Site 4A or Site 7.</p>	<p>thereof. In terms of the intake seawater volumes required for the development of the CCGT power plant at these inland sites, the requirements are modest compared to the seawater intake volumes already required from the current intake facilities in the port to support existing industrial (Foskor) and desalination activities (i.e. the Hullside and Alkanstrand RO plants).</p> <p>» The addition of brine and other co-discharges from the proposed desalination plant will alter the density (and hence the plume behaviour of the effluent) and potentially the environmental toxicity of the effluent. Impacts are expected to be of Low significance as these additional volumes of effluent will be small compared to the existing volumes currently discharged through the A-line. The effluent streams from Site 7 will be significantly diluted with approximately 80 MLD of A-line effluent and seawater used to make up a total effluent volume of 120 MLD before being discharged</p>

Site 4a	Site 5	Site 6	Site 7
<p>120 MLD before being discharged offshore. A potential source of concern are the recent changes in the A-line effluent composition due to the inclusion of RO plant reject brine effluent streams from both the Hillside RO plant (reportedly 4.5 MLD) and the Alkanstrand RO plant (presently estimated to be 4 to 5 MLD but could increase to 15 MLD when the plant reaches its full capacity of 10 MLD). These cumulatively may already have changed the A-line effluent density sufficiently to have caused a change in near-field plume dispersion. Additional effluent streams from Site 4a, could then be considered to be exacerbating the existing situation.</p> <p>The limited impact described above, renders Site 4A as the most preferable site from a marine (and estuarine) environmental perspective.</p>			<p>offshore. A potential source of concern are the recent changes in the A-line effluent composition due to the inclusion of RO plant reject brine effluent streams from both the Hillside RO plant (reportedly 4.5 MLD) and the Alkanstrand RO plant (presently estimated to be 4 to 5 MLD but could increase to 15 MLD when the plant reaches its full capacity of 10 MLD). These cumulatively may already have changed the A-line effluent density sufficiently to have caused a change in near-field plume dispersion. Additional effluent streams from Site 4A and 7, could then be considered to be exacerbating the existing situation.</p> <p>The limited impact described above, renders Site 7 as the most preferable site from a marine (and estuarine) environmental perspective.</p>

8.4 Aquatic Ecology Assessment

Site 4a	Site 5	Site 6	Site 7
Contains within the site boundary either a lake or pan (Isigonyane) as well as close proximity to Qhubu Lake increase the risks of this site above acceptable levels rendering it fatally flawed .	Site 5 is the most preferred site from an aquatic ecology perspective as it is the greatest distance from any aquatic ecosystem.	Site 6 are the most preferred site from an aquatic ecology perspective as it is the greatest distance from any aquatic ecosystem.	Site 7 may also be suitable/ acceptable as it is an adequate distance from the nearest apparent aquatic ecosystem.

8.5 Hydrological and flood line Assessment

The specialist study assessed the Hydrological and flood line conditions on a regional scale. No preferred site was identified.

8.6 Geohydrological Baseline Assessment

The specialist study reviewed and assessed the baseline groundwater conditions within the study area surrounding four selected sites (Site 4A, 5, 6 and 7) and provided an indication of potential impacts that the proposed project. The assessment concluded that site 6 is well located to be preliminarily considered for the power plant erection. This choice was based on the assumption that the regional groundwater flows mimic the regional topography of the study area, therefore all environmental sensitive zones including water supply resources (lakes and Rivers) would be hydraulically up-gradient from any sources of contamination.

8.7 Air Quality

Site 4a	Site 5	Site 6	Site 7
Site 4a is considered to be least preferred due to the medium-high background PM ₁₀ and low-medium	Site 5 is considered to be acceptable site due to the medium-high background PM ₁₀ and low-medium	Site 6 is the preferred site due to the low background PM ₁₀ and SO ₂ concentrations and the low-medium	Site 7 is not preferred due to the -high background PM ₁₀ and SO ₂ concentrations and the medium-high

Site 4a	Site 5	Site 6	Site 7
SO ₂ concentrations and the low-medium potential for cumulative contributions from the CCGT Project on the surrounding environment. The proposed development has potential to impact on Mandlankala (located SSW of the site).	SO ₂ concentrations and the low-medium potential for cumulative contributions from the CCGT Project on the surrounding environment. The proposed development has low potential for impact in Gubhethuka and Empembeni.	potential for cumulative contributions from the CCGT Project on the surrounding environment and the site's location away from other sources of pollution (RBM is 5.6 km to the northwest, outside the prevailing wind direction).	potential for cumulative contributions from the CCGT Project on the surrounding environment. The proposed development has low potential for impact in Gubhethuka and Empembeni.

8.8 Heritage screening – Archaeology

Site 4a	Site 5	Site 6	Site 7
Site 4A is considered to be acceptable if the correct management and mitigation measures are implemented.	Site 5 is considered to be of high sensitivity and this site is not recommended for the proposed development.	Site 6 is considered to be of high sensitivity and this site is not recommended for the proposed development.	Site 7 is from a heritage point of view the preferred site. Site 7 has previously been disturbed and it is expected that identified heritage resources in this area can be mitigated.

8.9 Heritage screening – Palaeontology

Site 4a	Site 5	Site 6	Site 7
The entire development footprint is underlain by Quaternary sediments of the Maputuland Group (Late Caenozoic Era) there is no preferred site.	The entire development footprint is underlain by Quaternary sediments of the Maputuland Group (Late Caenozoic Era) there is no preferred site.	The entire development footprint is underlain by Quaternary sediments of the Maputuland Group (Late Caenozoic Era) there is no preferred site.	The entire development footprint is underlain by Quaternary sediments of the Maputuland Group (Late Caenozoic Era) there is no preferred site.

8.10 Geotechnical

Site 4a	Site 5	Site 6	Site 7
<p>From a geotechnical perspective Site 4a represents a better option from the most critical parameters, the overall assessment remains negative, largely due to the perceived socio-environmental issues.</p>	<p>Site 5 is ranked very poorly from both a geotechnical and general civil engineering perspective, with limited mitigating factors.</p>	<p>Site 6 is ranked very poorly from both a geotechnical and general civil engineering perspective, with limited mitigating factors.</p>	<p>From a geotechnical perspective Site 7 clearly presents the most favourable alternative in virtually all parameters considered, with sub-optimal anticipated foundations and construction materials, and possible risk of flooding / drainage / groundwater problems downgrading its status to a B-class site, in our opinion.</p>

8.11 Soils and Agricultural Potential

Site 4a	Site 5	Site 6	Site 7
<p>In terms of the structural integrity of the soil, Site 4a inland of the dunes, was found to have a higher clay content than the soils found in the dune cordon. Sands vary in particle size and in compaction, and some types of sand have low bearing capacity. If construction is to take place here, methods would need to be employed to ensure that structures do not shift in loose sand. In terms of the existing land capability, Site 4a is acceptable as this land has/had commercial development, thus the soil environment is already to some degree compromised.</p>	<p>The soils of site 5 occur on dunes/dune crests. These soils are very well drained, highly leached (dystrophic) soils with poor moisture holding capacity and are low in plant nutrients. Their low carbon exchange capacity means that they have a low ability to hold plant nutrients. As a result of this, the capability of the land for irrigated crop potential is low. The site can however support timber production and is dominated by dune forests with deep rooting capabilities. Site 5 is moderate to highly prone to water and wind erosion and is favourable for forests or timber plantations. Site</p>	<p>The soils of site 6 occur on dunes/dune crests. These soils are very well drained, highly leached (dystrophic) soils with poor moisture holding capacity and are low in plant nutrients. Their low carbon exchange capacity means that they have a low ability to hold plant nutrients. As a result of this, the capability of the land for irrigated crop potential is low. The sites can however support timber production and are dominated by dune forests with deep rooting capabilities. Site 6 is moderate to highly prone to water and wind erosion and is favourable for forests or timber plantations. Site 6 is not</p>	<p>In terms of the structural integrity of the soil, Site 7 inland of the dunes, were found to have a higher clay content than the soils found in the dune cordon. Sands vary in particle size and in compaction, and some types of sand have low bearing capacity. If construction is to take place here, methods would need to be employed to ensure that structures do not shift in loose sand. In terms of the existing land capability, Site 7 is preferred as this land has/had commercial development, thus the soil environmental is already to some degree compromised. In terms of the agricultural potential of the land,</p>

Site 4a	Site 5	Site 6	Site 7
Site 4A is currently a productive landscape and thus should remain as such. Site 4a is considered acceptable for development from a soil and agricultural perspective.	5 is not preferred for development from a soil and agricultural perspective.	preferred for development from a soil and agricultural perspective.	Site 7 is the least productive and is thus preferred for development.

8.12 Social Screening

Site 4a	Site 5	Site 6	Site 7
<ul style="list-style-type: none"> » Site 4A is directly adjacent to an urban township comprising of areas such as Mhlatuze Flats, Bhiliya and Madhangala, which host 1 854 households (Stats SA, 2011). Therefore, residents from Mhlatuze Flats, Bhiliya and Madhangala will be subject to environmental effects and change in sense of place. » The proposed development is not compatible with the surrounding land uses, which comprise of sugarcane farming and residential settlements. » The SDF indicates that the desired plan for the site is a port offset area and an environmental corridor. Thus, the development of the CCGT Power Plant on that site will not conform to this plan. 	<ul style="list-style-type: none"> » Site 5 is located 0.2 km from the urban village, Empembeni, which is home to 563 households (Stats SA, 2011). Therefore, environmental effects such as noise, air quality, and visual change are likely to disturb the current sense of place. » The surrounding land uses are plantations and residential. The proposed development, therefore, conflicts with the surrounding land uses. » The SDF indicates that the desired plan for the site is an environmental corridor. Thus, the establishment of the CCGT Power Plant on the site will not correlate with this plan. » No activities are taking place on the indigenous forest. 	<ul style="list-style-type: none"> » Site 6 is located 0.2 km from the urban village, Nzalabantu comprised of 2676 households. Therefore, environmental disturbances such as noise, air quality and visual change will alter the current sense of place. » The land uses on adjacent land parcels include residential, commercial forestry plantations, and plantations. The proposed development is therefore, not compatible with the aforementioned land uses. » According to the Mfolozi LM's Reviewed SDF, Site 6 is located in an area of high population density and environmental significance. Furthermore, a sustainable human settlement is planned as indicated in Map 2-6. Therefore, the planned construction of the CCGT Power 	<ul style="list-style-type: none"> » The closest residential settlement to Site 7 is Arboretum, located 5.6km from the proposed site. Therefore, environmental effects such as noise, air quality and visual shifts are less likely to be an issue for this community, especially when compared to the other sites » The area surrounding Site 7 is inclusive of open fields, industrial activities, and pockets of commercial activities. The proposed development on Site 7 is, therefore, compatible with the surrounding land uses. » The SDF shows that a portion of the site should be conserved and the remaining portion is available for the proposed development. The proposed development is located within an Industrial Development Zone (IDZ). Map 2-5 demonstrates that the site is classified as phase 1-

Site 4a	Site 5	Site 6	Site 7
<p>» A loss of sugarcane and commercial forestry plantations will result. The loss of revenue derived from these activities will emerge, which in turn can potentially jeopardise activities further downstream of the respective industries' value chains. In addition, a possible loss of employment may ensue. The residents of the settlement located within Site 4A as well as the residents directly adjacent to the proposed site will need to be relocated. This may result in the disconnection of established social networks for affected families, as well as lead to costs associated with necessary relocation.</p> <p>» This site is not preferred from a Social perspective.</p>	<p>Therefore, no disruption of activities will occur.</p> <p>» This site is not preferred from a Social perspective.</p>	<p>Plant does not correlate with the municipal plans for the site.</p> <p>» Agricultural and mining activities are taking place on the land. Therefore, the loss of revenue and employment may ensue if these are closed due to the land use change. In addition, Richards Bay Minerals is reclaiming the proposed site.</p> <p>» This site is not preferred from a Social perspective.</p>	<p>D of the planned IDZ. The available portion of Site 7 therefore, conforms to the future plans of the area.</p> <p>» Site 7 is a greenfield site, with no existing built structures or commercial activities taking place.</p> <p>» This site is preferred from a Social perspective.</p>

8.13 Visual Screening Study

Site 4a	Site 5	Site 6	Site 7
<p>» The development of site 4a will extend the visual influence of heavy industry that is generally located to the north of the port and to the south of Richards Bay. There are currently other industrial</p>	<p>» The introduction of a large industrial development is likely to be highly obvious and could result in a character change that will change the perception of a natural coastline that is</p>	<p>» Visual impacts on the coastal strip are unlikely to be avoidable. From a visual perspective therefore this site is not preferred from a visual perspective.</p>	<p>Whilst this site is highly visible, the development would be seen from all but the closest viewpoints, in the context of other heavy industrial structures. Development of this site therefore will not extend the influence of industry over</p>

Site 4a	Site 5	Site 6	Site 7
<p>activities scattered through the coastal plain including mining but these generally are not as obvious in the landscape as the large industrial structures within the Richards Bay area that are visible over a wide area.</p> <ul style="list-style-type: none"> » Should this site be selected, serious consideration should be given to mitigation measures in the form of screening which is likely to address mainly local impacts as well as a selection of finishes that will help the structures blend into the surrounding landscape particularly when viewed from a distance. » This site is acceptable from a visual perspective. 	<p>experienced from the eastern side of the dune.</p> <ul style="list-style-type: none"> » Due to its elevation and the likely stark differences between the development and surrounding dune vegetation, this development could be highly visible from out to sea, along the coastline and from inland: <ul style="list-style-type: none"> • Possible inland sensitive receivers that are in relatively close proximity to the site include; • Local traditional rural homesteads that are located immediately inland of the site. The closest is approximately 350m from the edge of the site; and • The Richards Bay Game Reserve that lies within 2km to the north. » It is possible that there is sufficient space to soften the visual impact of the development from these receptors. If this is not possible however, the development is 		<p>the landscape surrounding Richards Bay.</p> <p>From a visual perspective, Site 7 is the preferred alternative site for development.</p>

Site 4a	Site 5	Site 6	Site 7
	<p>likely to result in significant local impacts.</p> <ul style="list-style-type: none"> » Impacts on the coastal strip may be avoidable with this alternative. If this is not the case however, then from a visual perspective this site is not favoured. » This site is acceptable from a visual perspective. 		

8.14 Traffic and Access

Site 4a	Site 5	Site 6	Site 7
<p>The John Ross Highway (P496) has two, and sometimes three, lanes per direction and is a major rural arterial (class R2). The P496 and P106 provides good access to Site 4A and is expected to comfortably accommodate additional traffic.</p>	<p>Access to Site 5 poses many challenges, and without the upgrading of several roads, or ideally the construction of a new road bordering the northern edge of eSikhaleni, construction of the development at this site is discouraged from a transportation perspective.</p>	<p>The route to Site 6 remains one lane per direction through the Meer and See residential area and through Ntshingimpisi and Nzalabantu. This is a distance of approximately 12km through suburban and rural-suburban areas, with speed-bumps and often encountered pedestrians and animals. From Nzalabantu the road has no road markings and appears to be seldom used judging by the deposits of sand and litter, but is paved until it enters the forestry area in which Site 6 is located. This route is not favourable for the development</p>	<p>Site 7 is ideally located next to existing industrial sites, and a short distance along Western Arterial (approximately 900m) from the John Ross Highway. There are no sensitive communities in the area and it is centrally located between the N2, the CBD and the suburbs of Richards Bay.</p>

[REDACTED] due to high pedestrian numbers along the route. [REDACTED]

9 CONCLUSIONS AND RECOMMENDATIONS

Table 9.1 provides a summary of site screening considerations and comparison of sites based on the findings of the desk-top assessment and specialist input, as summarised in the previous section and presented in detail in Appendix B.

Table 9.1: Summary of site screening considerations and comparison of sites

Field of Study	Site 4a	Site 5	Site6	Site 7
Terrestrial Ecology	Preferred	Not preferred	Acceptable	Acceptable
Wetland	Not preferred	Preferred	Preferred	Acceptable
Aquatic Ecology	Not preferred	Preferred	Preferred	Acceptable
Hydrological and Floodline	N/A	N/A	N/A	N/A
Geotechnical	Acceptable	Not preferred	Not preferred	Preferred
Ground Water	Acceptable	Acceptable	Preferred	Acceptable
Archaeology	Acceptable	Not preferred	Not preferred	Preferred
Palaeontology	Acceptable	Acceptable	Acceptable	Acceptable
Socio-Economic	Not preferred	Not preferred	Not preferred	Preferred
Noise	Not preferred	Acceptable	Acceptable	Preferred
Traffic	Acceptable	Not preferred	Not preferred	Preferred
Air Quality	Not preferred	Acceptable	Preferred	Not preferred
Visual	Acceptable	Acceptable	Not preferred	Preferred
Agricultural, Land Capability and Soils	Acceptable	Not preferred	Not preferred	Preferred
Marine	Preferred	Not preferred	Acceptable	Preferred

All identified, feasible alternatives are required to be assessed in terms of social, biophysical, economic and technical factors. In order to achieve this, the 'funnel down' process was followed during site selection specifically in order to allow the environmental sensitivity investigation to inform the site selection process. In determining the preferred site, the sites were considered in line with the mitigation hierarchy:

1. First, avoidance of adverse impacts as far as possible by use of preventative measures (in this instance a sensitivity analysis assisted in the identification of a project site and the avoidance of identified ecological and aquatic sensitive areas).
2. Second, minimisation or reduction of adverse impacts to 'as low as practicable' (in this instance minimisation of impact on identified ecological and aquatic sensitive areas through facility micro-siting and implementing mitigation).
3. Third, remedy or compensation for adverse residual impacts, which are unavoidable and cannot be reduced further (in this instance, the implementation of mitigation, or consideration of acceptable loss).

Considering this mitigation hierarchy and the findings of the screening assessment, the following conclusions can be drawn:

- » **Site 7** is considered to be the **most preferred** alternative considered within this Environmental Screening and Site Selection Study. Mitigation in terms of air quality through appropriate design of the facility will however be required.
- » **Site 4a** is considered **acceptable** from an environmental perspective but would require mitigation to minimise impacts on sensitive social receptors, specifically regarding noise and air quality. Impacts on the aquatic ecology and wetlands may however present an impact of high significance if these areas cannot be avoided.
- » **Site 6** is considered to be **acceptable** in terms of some environmental factors. However, from a social perspective, specifically in terms of visual impacts and access, this site is not preferred. Issues in these instances could be addressed through mitigation and appropriate design.
- » **Site 5** is considered to be **acceptable** in terms of some environmental factors. However, from a social perspective, specifically in terms of access (where the recommendation was that this site not be considered further), this site is not preferred. Issues in these instances could be addressed through mitigation and appropriate design.

The preferred site identified for the development of the CCGT Plant should ideally be located on a site that is classified as being a target area for this type of development as well as the areas are considered to acceptable or preferred from an environmental and technical perspective, with the least constraining factors and in areas that will most likely require more and intense mitigation measures.

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