Climate Change Impact Assessment for the Newcastle Gas Engine Power Plant, KwaZulu-Natal

Report Prepared for

Newcastle Energy (Pty) Ltd.

Report Number 566508/FCCIA

Report Prepared by

srk consulting

June 2021

Climate Change Impact Assessment for the Newcastle Gas Engine Power Plant, KwaZulu-Natal

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd. (SRK) by Newcastle Energy (Pty) Ltd. (Newcastle Energy). The opinions in this Report are provided in response to a specific request from Newcastle Energy to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

BBBEE	Broad-Based Black Economic Empowerment
CCAM	Conformal-cubic atmospheric model
CCGT	Combine Cycle Gas Turbines
CCIA	Climate Change Impact Assessment
CCRE	Combine Cycle Reciprocating Engines
CDP	Carbon Disclosure Project
COP	Conference of the Parties
DC	Direct current
DEA	Department of Environmental Affairs
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
GCB	Gas circuit breakers
GHG	Greenhouse Gas
GIL	Gas-insulated lines
GIS	Gas insulated switchgear
GIT	Gas-insulated transformers
GTST	Gas fired boiler/steam turbine systems
GWC	Growth without constraints
HV	High voltage
IDP	Integrated Development Plans
IPCC	Intergovernmental Panel on Climate Change
LNG	Liquefied Natural Gas
LTAS	Long Term Adaptation Scenarios
MDG	Millennium Development Goals
MPA	Mitigation Potential Analysis
MRG	Methane Rich Gas
MW	Mega Watt
NAEIS	National Atmospheric Emission Inventory System
NCCAS	National Climate Change Adaptation Strategy
NCCRP	National Climate Change Response Policy
NDC	Nationally Determined Contributions
NDP	National Development Plan
NEMA	National Environmental Management Act (Act No 107 of 1998)
NGEPP	Newcastle Gas Engine Power Plant

NGERS	National Greenhouse and Energy Reporting
OCGT	Open Cycle Gas Turbines
OCRE	Open Cycle Reciprocating Engines
PPD	Peak, Plateau and Decline
RBS	Required by Science
RCPS	Representative Concentration Pathways
RH	Relative Humidify
RMIPP	Risk Mitigation Independent Power Producer
S&EIR	Scoping and Environmental Impact Reporting
SARS	South African Revenue Service
SDG	Sustainable Development Goals
SETs	Sectoral Emissions Targets
SERPS	Sectoral Emission Reduction Plans
TNC	Third National Communication
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction and Scope of Report

Newcastle Energy (Pty) Ltd. (Newcastle Energy), a subsidiary of Vutomi Energy (Pty) Ltd. (Vutomi), own an 18.5 megawatt (MW) capacity gas fired cogeneration (stream and power) plant within the Karbochem Industrial Complex in Newcastle, KwaZulu-Natal.

During August 2020, the Department of Mineral Resources and Energy (DMRE) released a tender calling for qualifications and proposals for new electricity generation capacity under the Department's Risk Mitigation Independent Power Producer (RM IPP) Procurement Programme (Tender No.: DMRE001/2020/21). Through the Newcastle Gas Engine Power Plant (NGEPP) Independent Power Producer (IPP) project, Newcastle Energy proposes to increase its electricity generation capacity to approximately 100 MW and intends to submit a bid for the above RM IPP Procurement Programme Tender.

In terms of the latest amendments to the 2014 Environmental Impact Assessment (EIA) Regulations[1], as published on 07 April 2017, a power generation project of this magnitude requires an application for Environmental Authorisation via a Scoping and Environmental Impact Reporting (S&EIR) process.

SRK Consulting (South Africa) (Pty) Ltd. (SRK) has been appointed as the Environmental Assessment Practitioner (EAP) to undertake the required environmental applications on behalf of Newcastle Energy for the proposed project. As part of the EIA, the need for a Climate Change Impact Assessment (CCIA) has been identified and SRK has also been appointed to undertake the CCIA. This report constitutes the product of the CCIA and includes the following:

- Details of the specialists that prepared the CCIA;
- Details of the scope, purpose and methodology;
- Description of the project and the receiving environment;
- Greenhouse Gas (GHG) quantification;
- Assessment of climate change impacts (both impacts of the development on climate change and risks climate change poses to the project); and
- Recommendations to promoting wider resilience and adaptation to climate change and encourage low-carbon development.

2 Details of the Specialist

In accordance with Item 1.(1)(a) in Appendix 6 of GN 326, this chapter provides details of:

(i) The specialist who prepared this report; and

(ii) The expertise of the specialist.

2.1 SRK Consulting

SRK was established in South Africa in 1974 and has expanded over the years with the SRK Group Consulting Practices now employing approximately 1 400 professional staff operating from more than 45 established offices on six continents.

SRK offers expertise in a wide range of environmental and engineering disciplines whilst implementing rigorous quality assurance standards in accordance with SRK's International Standards Organisation (ISO) 9001 accreditation.

SRK's independence is ensured by the fact that it is strictly a consultancy organisation, not holding equity in any project and with ownership primarily by staff. SRK's senior technical staff also maintain

[1] The EIA Regulations, as amended in 2017, are promulgated under the National Environmental Management Act (No. 107 of 1998) (NEMA).

independent accreditation with the relevant professional accreditation bodies. This permits its consultants to provide clients with conflict-free and objective support on crucial issues.

2.2 Details of the Specialist Team

The team for this assessment is lead by Ms. Philippa Burmeister, Principal Environmental Scientist at SRK. Ms. Ashleigh Maritz, Senior Scientist and Mr. Nigel Govender Environmental Scientist both employed at SRK, where responsible for the preparation of components of the assessment. More details of the team are included below:

Table 2-1: Specialist Team

Name	Role	Qualification and Registration	Experience
Philippa Burmeister	Project lead, risk and impact assessment	BSc (Hons) Environmental Science Planning for Climate Change in African Cities (2019) from IHS and University of Rotterdam Climate Change Mitigation in Developing Countries (2019) from University of Cape Town Pr.Sci.Nat, South Africa, 400195/08 Registered Environmental Assessment Practitioner (2020/896)	Philippa has been involved in integrated environmental management for the past 17 years. She partners with business to identify and execute innovative sustainability solutions to strategic resource challenges. Philippa specialises in sustainability assessment including the use of a range of integrated environmental management tools. Most recently she has focussed attention on a specialisation in Air Quality and Climate Change.
Ashleigh Maritz	Risk identification and development of resilience and adaptation measures	MSc Biochemistry Pr.Sci.Nat, South Africa, 400331/11 Registered Environmental Assessment Practitioner 2020/547	Ashleigh has 13 years' experience in the mining, agricultural, water, climate change, energy and infrastructure sectors. Her core expertise lies in project management of environmental and social impact assessments (within South African and Africa), auditing and due diligence/technical reviews. Recently, Ashleigh has being involved in mega infrastructure and energy projects and her experience also spans into the mining and governmental sectors. She has worked extensively in the Engineering, Procurement, Management and Construction (EPCM) environment and therefore as a thorough understanding of the project life cycle as well as how to provide an interface role between the technical engineering teams and environmental advisors on projects.
Nigel Govender	Greenhouse Gas (GHG) quantification and impact assessment	BSc, Hons (Environmental Monitoring and Modelling) GHG and Carbon Foot printing	Nigel has 3 years' experience in Air Quality and Climate Change modelling and GHG quantification.

For further details, refer to the specialist's curriculum vitae (CV) in **Appendix A.**

Contact details for the specialist are provided below:

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2.3 Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK's fee for conducting this assessment is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the assessment.

3 Scope, purpose and methodology

3.1 Purpose

The objective of this CCIA is to identify and assess climate change impacts and provide recommendations to mitigate the impacts associated with the development of the proposed project. This includes an assessment of both impacts of the development on climate change and risks that climate change poses to the project. Based on the impacts identified, opportunities to reduce the projects carbon footprint have been identified and together with opportunities to promote wider resilience and adaptation to climate change for the project and the surrounding communities.

3.2 Scope of the assessment

The scope of the CCIA (as specified in the specialist appointment letter and the plan of study) includes the following:

- Quantify the Scope 1 and 2 GHG inventory of the operational phase of the project. In this context:
  - Determine the project boundaries;
  - Identify sources of greenhouse gas emissions and priority pollutants;
  - Calculate the project's carbon footprint; and
  - Provide guidance on reporting and verification.
- Climate change impact assessment:
  - Determine a climate change baseline for the project;
  - Determine the impact of the project's greenhouse gas emissions (carbon dioxide, methane and nitrous oxide) on climate change;
  - Conduct impact assessment in terms of the methodology to be provided by the EAP including an assessment of cumulative impacts;

  - Include any potential alternatives or mitigation measures proposed in the impact assessment; and
  - Propose practical options to reduce the impact of the facility on climate change.
- Climate change vulnerability assessment:
  - Provide a climate baseline for the project area;
  - Identify potential risks to the project posed by climate change based on available modelling;
  - Assess the project risks according to the impact assessment methodology in the context of the site socio-economic conditions, project value chain and broader environmental risks;
  - Identify and analyse any project alternatives or adaptation measures proposed in the impact assessment; and
  - Propose practical options to adapt to the climate change risks identified.

3.3 Methodology

3.3.1 Greenhouse Gas (GHG) emissions quantification

GHG emissions for this assessment where calculated in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004): National Greenhouse Gas Emission Reporting Regulations (NGERs) (2016), as amended. NGERS provides the legislative framework of GHG reporting and provides a single national reporting system for the transparent reporting of GHG emissions within South Africa. Initially published in 2017 they were amended in September 2020. In addition, general and technical reporting guidance was undertaken in line with the Technical Guidelines for Monitoring, Reporting and Verification of Greenhouse Gas Emissions by Industry, 2017 (Technical Guidelines), as published by the Department of Environmental Affairs (DEA) (now referred to as the Department Forestry Fisheries and Environment, (DFFE)). SRK has also been mindful of the draft technical guidelines for quantification of greenhouse gas emissions published for comment in February 2021.

Where limitations to the quantification of GHG may arise from the use of the technical guidelines (i.e. no calculation methodology, lack of calorific values, etc.), SRK's has based the quantification of GHGs on international good practice and followed the guidelines set out in the 2016 Guidance document published by the Carbon Disclosure Project (CDP), Corporate Accounting and Reporting Standard published by the GHG Protocol and ISO14064.

3.3.2 Boundary setting

This boundary refers to the delineation of the organisation and if the organisations has direct control over the sources of the emissions. The Organisational Boundary is defined in ISO standard ISO 14064-1:2006 as *"an organization shall consolidate its facility level GHG emissions and removals by one of the following approaches:*

- ***Control**: the organization accounts for all quantified GHG emissions and/or removals from facilities over which it has financial or operational control; and/or*
- ***Equity Share**: the organization accounts for its portion of GHG emissions and/or removals from respective facilities."*

As per Section 8(1) of NGERs the reporting boundary is to be based on operational control. As per the technical guidelines, companies need to exclude emissions from facilities in other countries in their calculations and only direct emissions are to be reported on (i.e. on-site emissions). The quantification of GHG emissions therefore considers all Scope 1 and 2 emissions from the proposed NGEPP IPP project. As NGEPP does not have operational control over the construction related emissions, these have not been included in the assessment.

3.3.3 Impact Assessment

The impact assessment methodology used was specified by the EAP and was based on the requirements of the 2014 Environmental Impact Assessment (EIA) Regulations[2], as published on 07 April 2017 under the National Environmental Management Act (No. 107 of 1998) (NEMA).

The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur. The criteria that are used to determine impact consequences are presented in Table 3-1 below.

Table 3-1: Criteria used to determine the Consequence of the Impact

Rating	Definition of Rating	Score
A. Extent– the area over which the impact will be experienced		
None		0
Local	Confined to project or study area or part thereof (e.g. site)	1
Regional	The region, which may be defined in various ways, e.g. cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. Intensity– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
None		0
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration– the time frame for which the impact will be experienced		
None		0
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

The combined score of these three criteria corresponds to a Consequence Rating, as shown in Table 3-2.

Table 3-2: Method used to determine the Consequence Score

Combined Score (A+B+C)	0 – 2	3 – 4	5	6	7	8 – 9
Consequence Rating	Not significant	Very low	Low	Medium	High	Very high

Once the consequence has been derived, the probability of the impact occurring will be considered using the probability classifications presented in Table 3-3.

[2] The EIA Regulations, as amended in 2017, are promulgated under the National Environmental Management Act (No. 107 of 1998) (NEMA).

Table 3-3: Probability Classification

Probability– the likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall significance of impacts will be determined by considering consequence and probability using the rating system prescribed in Table 3-4 below.

Table 3-4: Impact Significance Ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally, the impacts will also be considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The system for considering impact status and confidence (in assessment) is laid out in Table 3-5 below.

Table 3-5: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

3.4 Assumptions and limitations

The following assumptions and limitations apply to the assessment:

- All data received from the client is deemed correct and has been verified by the client at the time of the assessment;
- Start-up and shutdown fuel consumption was not available at the time of developing the GHG emissions inventory and is therefore excluded from the quantification. Should the information be available during detailed design the inventory can be updated accordingly;
- Sources of GHG emissions were identified in accordance with the activities listed in Annexure 1 of the NGERs;
- The methodology for the quantification of GHG for the proposed project is primarily guided by the Technical Guidelines and therefore only direct emissions arising from the operation activities have been accounted for;

- The GHG's relevant to the proposed project, and upon which the climate change assessment was conducted, are carbon dioxide, methane and nitrous oxide, however, as prescribed in NGERs, only the following are relevant GHGs:
  - Carbon dioxide (CO_2);
  - Methane (CH_4);
  - Nitrous oxide (N_2O);
  - Hydrofluorocarbons (HFCs);
  - Perfluorocarbons (PFCs); and
  - Sulfur hexafluoride (SF_6).
- As NGEPP does not have operational control over the construction related emissions these have not been included in the assessment;
- For stationary combustion, the default emission factors used are for natural gas. Annexure A of the technical guidelines does not specific emission factors for Methane Rich Gas (MRG);
- The default calorific value for stationary combustion was used from Table D1 of the technical guidelines and is specific for Sasol MRG;
- Due to the proposed nature of the project the pressure, temperature and density relationship for SF6 used convert the amount of gas from litres to kilograms (kg) was adopted from the Guidelines by Horizon Power (2016);
- The quantification of GHG emission from the substation and switch gear is based on an assumed leakage rate of 100 % as a conservation means to estimate a worst-case scenario;
- A tax liability assessment was not included in the scope of work. While SRK can calculate the worst-case tax liability by applying the Tax rate to the GHG emissions calculation there are a number of tax-free allowances and other measures that NGEPP could employ to reduce their Carbon Tax liability. SRK would advise that after detailed design the GHG inventory be updated and that at that point a carbon tax expert advise on the liability and measures to be implemented to reduce the liability; and
- Risks have been identified based on climate change modelling undertaken as part of South Africa's Third National Communication (TNC) under the United Nations Framework Convention on Climate Change (UNFCCC). Site specific climate modelling has not been undertaken as part of this impact assessment.

4 Project description

4.1 Project overview

Vutomi Energy is a Level 1 Broad-based Black Economic Empowerment (BBBEE) start-up energy company based in Mbombela (Nelspruit) with its flagship being the Newcastle Energy Cogeneration Plant at the Karbochem Industrial Complex in Newcastle, KwaZulu-Natal.

Vutomi Energy was formed in 2019 following the acquisition of the Newcastle Cogeneration Plant and the company is 100% owned by Mr. Timothy Simon Whati.

Through its strategic alliance with Rolls Royce, Vutomi has been seeking out opportunities to refurbish its cogeneration plant and other power generation opportunities within the Sub-Saharan region. The company's vision is to develop clean, renewable energy projects in emerging markets and empower developing country populations with sustainable power.

The overall project would broadly involve the following components which are further described in the subsections that follow:

- Decommissioning, demolition and removal of the existing cogeneration plant (i.e. to make space for the NGEPP); and

- Engineering, procurement, construction, commissioning and operation of the new 100 MW NGEPP and associated infrastructure.

4.1.1 Decommissioning and demolition of existing 18.5 MW Cogeneration Plant

The existing 18.5 MW cogeneration plant (Figure 4-1 (a)) consists of the following:

- Two gas Alstom/Siemens Tornado combustion turbines, two Aalborg supplementary gas fired heat recovery boilers, a single Siemens steam turbine, three gas engine generators, one Deutz 1.3 MW containerised engine (Figure 4-1 (b));
- Two Jenbacher (2 MW each) engines in acoustic hoods and inside a powerhouse, with external radiator cooling towers (Figure 4-1(c));
- Associated infrastructure within the Karbochem Industrial Complex, on the other side of the fence, but belonging to Newcastle Energy, will be left in place. This includes inter alia:
  - Water supply pipes;
  - Sewer infrastructure;
  - Gas supply pipeline;
  - Electricity grid tie in points for temporary power only;
  - Stormwater infrastructure;
  - Steam export infrastructure;
  - Entrance gate and existing fence of the complex; and
  - Information and communications technology infrastructure.

The methodology for demolition will be devised with the assistance of demolition contractors.

Where practicable, equipment and materials with value will be sold and removed from the site. All other equipment will be demolished and disposed of on-site. Equipment with scrap or salvage value will be removed from the plant and stored either in a salvage yard or in a facility designated for this purpose during the demolition period.

Typical closure and demolition actions will include:

- All power and water services to be disconnected, cut back to the existing fence and certified as safe prior to commencement of any demolition works;
- All remaining inert equipment and demolition debris will be sent to nearest general waste disposal facility;
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition;
- All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary disposal yards;
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residue remains;
- All above ground electrical, water and other service infrastructure and equipment to be removed and placed designated temporary salvage yards;
- All underground pipes, cables and steel structures will be dug up to an appropriate depth as specified by the design team to allow for new gas engine concrete foundations;
- Non-hazardous concrete slabs and footings will be broken up and disposed of;
- All concrete below 500 mm depth will remain underground;
- All on-site power lines, above ground pipelines, will be removed or demolished and the areas rehabilitated;

- All tanks, sumps and pipes containing non-biodegradable chemicals (liquid, solid or gas) will be flushed or emptied to ensure that chemical residues are removed from the site;
- Liquid storage tanks (including septic tanks, if applicable) will be emptied, the structure demolished and sub-surface holes filled;
- All equipment and plant in which chemicals have been stored or transported will be cleaned and disposed of in a suitable disposal facility;
- The yard areas (e.g. platforms created for buildings, laydown areas, salvage yards, and other disturbed areas) will be closed and re-graded to control storm water runoff and erosion. Once the structures and foundations are demolished, removed, or buried, the yard areas will be inspected for any areas of hydrocarbon contamination.

Figure 4-1 (a): View of cogeneration plant

Figure 4-1 (b): Deutz containerised engine

Figure 4-1 (c): Powerhouse containing Jenbacher engines

srk consulting	NEWCASTLE GAS ENGINE POWER PLANT PHOTOGRAPHS OF THE EXISTING COGENERATION PLANT	Project No. 566508

Figure 4-1: Photographs of the existing cogeneration plant

4.1.2 NGEPP and associated infrastructure

The proposed NGEPP project entails the construction of a gas fired open cycle thermal power generating plant, with a nominal generation capacity of approximately 100 MW. The 100 MW capacity will be achieved via 13 Rolls-Royce (Bergen B3540V20) gas engines of 8.8 MW each.

Note: Although the directly calculated output would be around 121 MW, one engine will always be on stand-by while the 12 others will output the nominal 100 MW, with allowance made for a 2.5% parasitic plan loss which would bring the output capacity down to approximately 100 MWe.

The fuel interface point for the new plant will be located at the existing gas metering station supplying methane rich gas to the existing cogeneration plant (i.e. Spring Lights Gas /Sasol Gas transported via Lily Pipeline). For the electricity produced, the connection to the grid is proposed to be via the existing 132 kV switchyard located within the Karbochem Industrial Complex where it interconnects with the external Eskom Grid system, making use of existing servitudes (note: the feasibility of using the existing 132 kV switchyard is still to be confirmed).

Water and effluent systems will be supplied by Karbochem. All plant interfaces are existing.

The overall project would broadly involve the following components:

1) Main gas station, including gas distribution piping to gas engines at 4 to 6 bar pressure and gas flow meters;
2) Portable water supply;
3) Raw water supply points;
4) Fire water supply, including underground fire water ring main, fire hydrants, fire hose reels;
5) Demineralised water supply points;
6) Engine house, including:
    - Rolls-Royce Gas Engines 13 X 8.8 MW B35:40V20AG2 (N+1) coupled to 11kV/50Hz alternators fitted on a main frame and suspended on rubber vibration damping mountings;
    - Noise supressing sheet metal powerhouse structure;
    - 5 000 kg crane to run along the length of the engine house to facilitate maintenance activities.
    - Engines main gas supply piping;
    - Compressed air system for starting the engines including 30 bar receiver, starting air module and piping;
    - Silencers (45 dBA) and exhaust stacks with 33 m height. The stacks are grouped together to support each other and to reduce construction cost;
    - Engines oil cooling system;
    - Engines oil filling system;
    - Oil storage area for new oil;
    - Oil storage area for used oil;
    - Engines intercooler and jacket water cooling radiators fitted with electric fan motors mounted at ground level so as to optimize construction cost and to facilitate maintenance activities;
    - Header tanks at normal atmospheric pressure with a surface area of approximately 1 m^2, to facilitate coolant level maintenance;
    - Air intake system with filtration elements;
    - Air ventilation system to remove heat generated by air flow through the alternators and radiation from other hot surfaces from the powerhouse;
    - Fire protection system;
    - Gas and fire detectors; and
    - Offloading bay.
7) High voltage (HV) yard to step up from 11 kV to 132 kV, including interconnecting transformers, line feeders and Eskom tie in point;
8) HV Substation, including switchgear, synchronising breakers, uninterrupted power supply and direct current (DC) systems;
9) Compressor room with 30 bar starting air compressors;

10) Effluent management infrastructure, including sump and electric pump and piping to Karbochem;
11) Main gate security office, including toilets;
12) Road access and storm drainage;
13) Office block, including:
    - Admin office;
    - Power plant manager office;
    - CEO office;
    - Boardroom;
    - Control room including layout plan;
    - Library/documentation centre;
    - Storeroom;
    - Kitchen;
    - Toilets;
    - Staff parking; and
    - Visitors parking.
14) Maintenance workshop, including:
    - Working and tool areas;
    - Offices;
    - Spares storeroom;
    - Kitchen;
    - Toilets;

A conceptual block diagram showing what infrastructure will be located within the site boundary (i.e. inside battery limits (IBL)) and what infrastructure will be located outside of the site boundary (i.e. outside battery limits (OBL)) is shown in **Figure 4-2**.

A provisional general arrangement layout for the above is shown in **Figure 4-3**below.

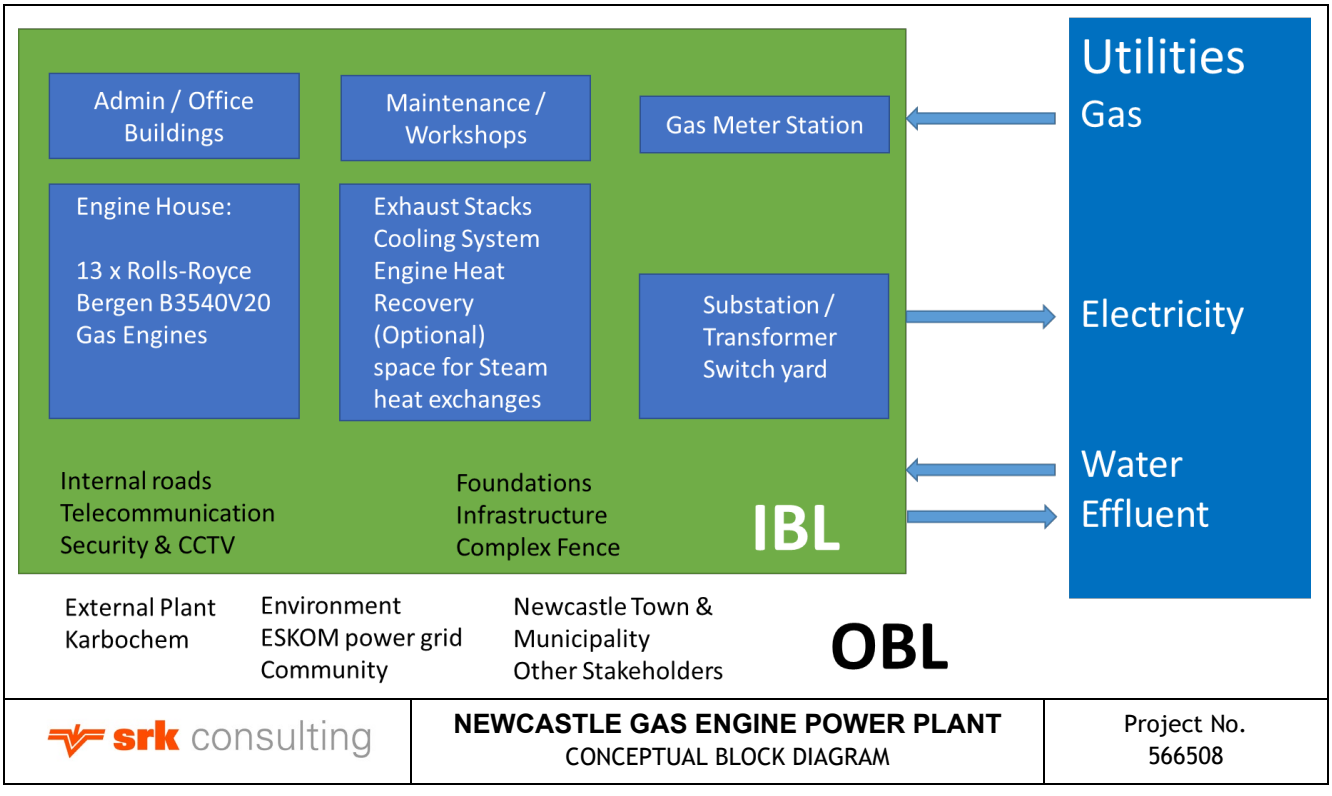
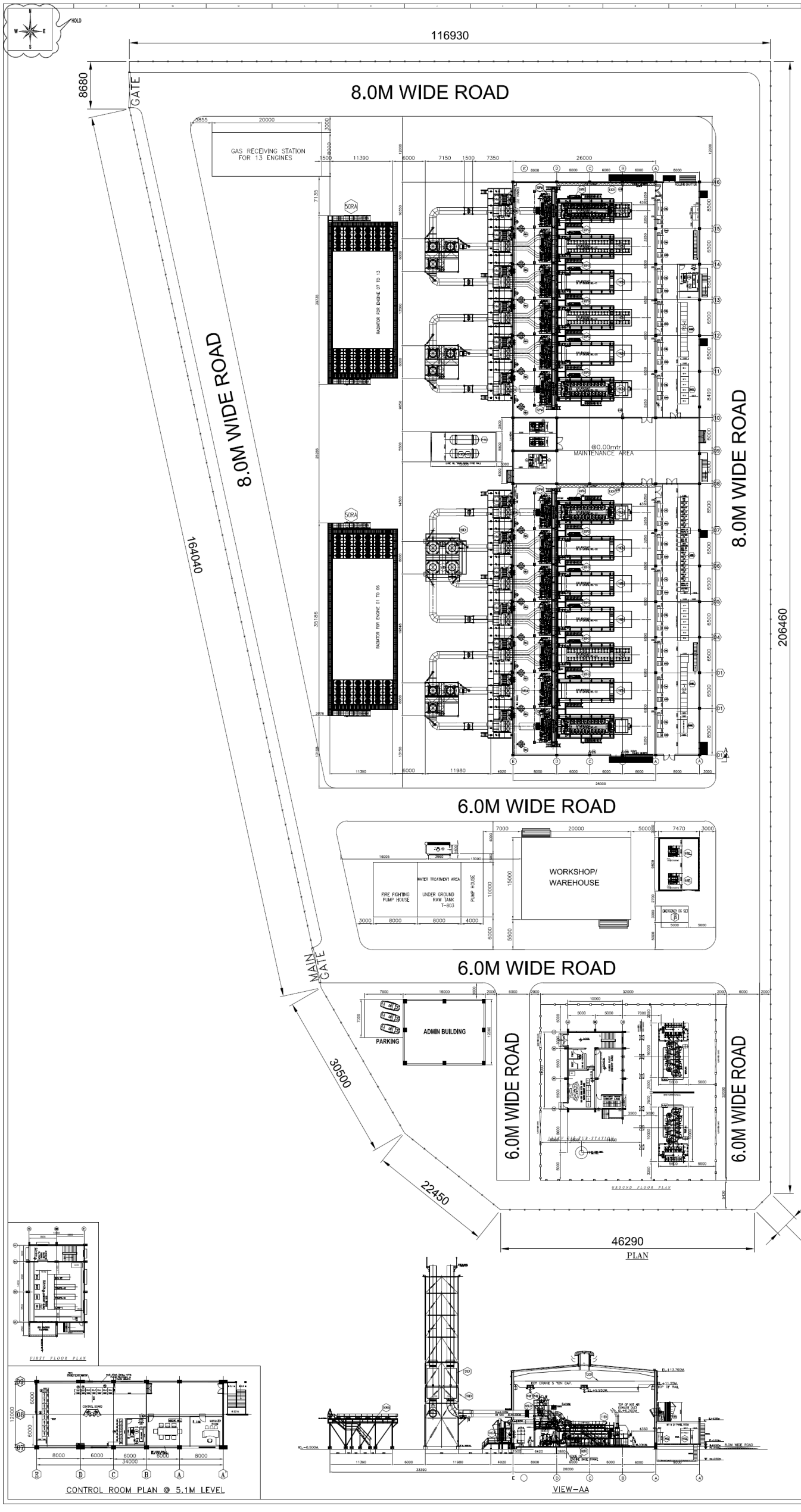


Figure 4-2: Conceptual block diagram



NOTES:-

1. All dimensions are in mm, Elevations are in metres, unless otherwise specified.
2. Elevation 0.00m corresponds to Finished Floor Level (FFL) of Engine hall.
3. Outside Engine hall floor FGL is 0.500m minimum.
4. North direction to be confirmed depends on site location,(Indicated Tentatively)
5. Explosion Relief Valve location Qty decided during engineering.

SCHEDULE OF MECHANICAL EQUIPMENT

Tag. No.	EQUIPMENT DESCRIPTION	QTY.	WT/Unit, kg
11EN	ENGINE B35:40V20AG1	13 NOS.	
12PM	AUXILIARY MODULE	13 NOS.	
13CR	EOT CRANE ENGINE HALL (5TON)	01 NO.	
14CR	EOT CRANE WORKSHOP (2TON)	01 NO.	
14VA	VENTILATION UNIT	13 SET	
30SA	STARTING AIR COMPRESSOR	02 NOS.	
43LO	LUBE OIL TRANSFER PUMP	01 NO.	
44LO	USED LUBE OIL DRAIN TRANSFER PUMP	01 NO.	
50RA	RADIATOR-02 Nos/Engine	13 SET	
51EX	EXHAUST SILENCER	13 NOS.	
54CA	CHARGE AIR FILTER (BUILT IN WITH SILENCER)	13 NOS.	
59EX	EXHAUST CHIMNEY STRUCTURES	13 NOS.	
84SA	START AIR BOTTLE 3000 Ltrs	13 NOS.	
84LT	LT EXPANSION TANK	13 NOS.	
84HT	HT EXPANSION TANK	13 NOS.	
86LO	CRANKCASE VENTILATION UNIT	13 NOS.	
90EX	PRE-VENTILATION SYSTEM	13 NOS.	
90FG	FUEL GAS MODULE	13 NOS.	
94SA	CONTROL AIR MODULE	06 NOS.	
100SA	MOUNTING PLATE	13 NOS.	
ERV	EXPLOSION RELIEF VALVE	26 NOS.	
-	GAS RECEIVING STATION	01 NO.	
68FG	SLAM SHUT OFF VALVE	01 NO.	
77FG	BLEED OFF VALVE	01 NO.	
99FG	MAIN GAS FILTER	01 NO.	
T-301	LUBE OIL MAKE UP TANK-10KL	01 NO.	
T-302	USED LUBE OIL TANK-10KL	01 NO.	
T-303	LUBE OIL MAINTENANCE TANK-10KL	01 NO.	
T-304	USED LUBE OIL DRAIN TANK-1KL	01 NO.	
T-802	POTABLE WATER TANK 20KL-	01 NO.	
T-803	RAW WATER TANK UNDERGROUND	01 NO.	
T-804	MAKE UP WATER TANK-2KL /06 ENGINE	02 NOS.	

SCHEDULE OF ELECTRICAL EQUIPMENT

TAG NO	EQUIPMENT DESCRIPTION	QTY.	WT/Unit, kg
10EL	MV PANEL BOARD	01 NO	-
20EL	BATTERY CHARGER	01 NO	-
21EL	220V DC BATTERY BANK	01 NO	-
30EL	ENGINE CONTROL CABINET (ECC)	13 NOS	-
31EL	ENGINE MOTOR CONTROL CABINET (EMCC)	13 NOS	-
50EL	NEUTRAL GROUNDING TRANSFORMER (NGT)	13 NOS	-
60EL	PLANT CONTROL CABINET (PCC)	02 NOS	
70EL	UTILITY CONTROL CABINET (U1)	02 NOS	-
71EL	BATTERY CONTROL CABINET (B1)	07 NOS	-
80EL	GENERATOR CONTROL CABINET (G1)	13 NOS	-
91EL	EMERGENCY PUSH BUTTON	04 NOS	-
98EL	AUXILIARY TRANSFORMER	02 NOS	-
99EL	BLACK START D.G SET	01 NO	-
101EL	PCCP	01 NO	-
-	BSDG DISTRIBUTION PANEL	01 NO	-
-	MLDB	01 NO	-
-	MPDB	01 NO	-
-	NETWORK SWITCH PANEL	01 NO	
-	WEATHER STATION PANEL	01 NO	

AREA REQUIRED : 19732.00 Sqmtr / 4.86 Acres

NOTES & LEGENDS FOR 132KV GIS SUB-STATION:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. THE PHYSICAL APPEARANCE AND THE DIMENSIONS OF ALL PANELS ARE INDICATIVE ONLY, THE EXACT DIMENSIONS SHALL BE INCORPORATED AFTER THE APPROVAL OF GA DRAWINGS OF THE RESPECTIVE EQUIPMENTS OR PANELS.
3. THIS DRAWING SHALL BE REFERED ONLY FOR PANEL ARRANGEMENT PURPOSE TO CHECK ADEQUATE CLEARANCES.
4. HEIGHT OF ACID PROOF TILEING SHALL BE UP TO 2.1 MTR. IN BATTERY ROOM
5. DOORS IN SWITCHGEAR ROOM/CABLE VAULTS/BATTERY ROOM SHALL BE FIRE RATED FOR 2 HOURS,
6. BATTERY ROOM FLOOR SHALL BE WITH ACID PROOF TILES.
7. 132KV LA FOR TRANSFORMER TO BE FITTED ALONG WITH BUSHING.

LEGENDS :-

PANEL NO.	PANEL DESCRIPTION
1CRP	O/G-1 CONTROL & RELAY PANEL
2CRP	BUS PT
T1CRP	TRAFO.1 CONTROL & RELAY PANEL
T2CRP	TRAFO.2 CONTROL & RELAY PANEL
RT1	RTCC PANEL TRAFO.-1
RT2	RTCC PANEL TRAFO.-2
SCP	SCADA PANEL
BC	BATTERY CHARGER

FOR TENDER PURPOSE ONLY
PRELIMINARY ISSUE

Rev.	Date:	Revision Note:	Drawn By:	Checked By:	Approved By:
0	13.10.2020	PRELIMINARY ISSUE	N.S	G.S	BHASKAR

CUSTOMER : VUTOMI - NEW CASTLE - SOUTH AFRICA

PROJECT : 13 X B35:40 V20 AG GAS BASED ENGINE 100MW COMBINED CYCLE POWER PLANT

Title: POWER PLANT LAYOUT

Rolls Royce Power System Bergen Engines | Reference: XXXXXX | Originator: Rolls-Royce | Date: 13.10.2020 | Scale: 1:235 | Format: A0 | Sheet: 01/02 | Mass (Kg): NA | Drawing No: 13ST-11-001 | Revision: 1

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NEWCASTLE GAS ENGINE POWER PLANT
PLANT GENERAL ARRANGEMENT LAYOUT

Project No. 566508

Figure 4-3: Plant general arrangement layout (Source: Rolls Royce)

4.1.3 Gas Engine Details

Bergen Engines supplies medium-speed engines for marine and power generation applications, and for the oil and gas industry. Marine engines are marketed through the Rolls-Royce Marine sales organization while engines for the power and for the oil and gas industry via the Rolls-Royce Power Systems sales organization. Since 1984, Rolls-Royce have developed, manufactured and installed more than 600 lean-burn gas engines for industrial power stations and municipal uses. The B-gas engine's design philosophy is to achieve increasingly stringent exhaust emission standards, industry leading electrical and heat recovery efficiency and high and dependable power levels to suit present and future applications.

The B-gas engine produces low emissions of Nitrogen oxides (NO_x), Carbon monoxide (CO) and UHC combined, due to its efficient combustion technology that is aimed at minimum environmental impact coupled with improved performance. Their lean-burn gas engines are based on Otto principle, using Miller cycle in combination with Variable Turbine Geometry to achieve optimized combustion. By using a strong ignition source and an optimized pre-chamber, the gas-air mixture in the cylinder can effectively be 'leaned-out' to reduce emissions and achieve improved engine performance. These improvements include higher efficiency, lower emissions (particularly of nitrous oxides) and significantly increased specific power.

4.1.4 Merits of Gas Engine Generation

Newcastle Energy have noted that there are several advantages and disadvantages of gas engine power generation. These are as outlined below:

- Advantages:
  - Lower lead time to construction;
  - Limited number of service parts and items;
  - Lower environmental impact than coal fired stations;
  - Lower capital cost;
  - Well-established and experienced service network worldwide;
  - Location closer to gas source and grid tie-in; and
  - Long-Term Service Agreements provide flexible options to match all customers' priorities.

    [Note: A site specific advantage is that there is existing infrastructure at the NGEPP site (e.g. gas source and grid tie in points).]
- Disadvantages:
  - Gas price volatility and cost of fuel; and
  - Growing concerns over global and local gas supply.

4.1.5 Backup fuel

The primary fuel Newcastle Energy are proposing to supply the power plant with is MRG via the existing gas pipeline. The secondary fuel, or backup fuel, to satisfy a three-day reserve, is proposed to be in the form of Liquefied Natural Gas (LNG).

In this regard, Newcastle Energy proposes to develop a 2 100m^3 LNG storage facility comprising of:

- 7 x 300 m^3 cryogenic tanks;
- A regassification facility;
- An LNG offloading skid; and
- Pressure reduction station.

The above is proposed to be located within the Karbochem Industrial Complex, on the site immediately to the north of the NGEPP site.

4.2 Location of the project

The proposed NGEPP IPP plant has a development footprint of 1.26 hectare (ha) (12 600 m^2) and is proposed to be constructed within the 1.78 ha site located on the southwestern boundary of the Karbochem Industrial Complex. Other industries within the Karbochem Industrial Complex include/ed: African Amines (alkyl amines plant), Brother CISA (formerly Lanxess CISA) (chrome chemicals plant) and SA Calcium Carbide.

Details of the NGEPP project location are as follows:

Country:	South Africa
Province:	KwaZulu-Natal
District:	Amajuba District Municipality
Municipality:	Newcastle Local Municipality
Town:	Newcastle
Zone:	Lease 1, Karbochem Industrial Complex
Erven:	Erf 15618 Newcastle
Address:	3 Karbochem Road, Newcastle

The extent and SG codes for the single erf comprising the project site is provided in Table 4-1.

Table 4-1: Project Site Erf, Extent and SG Code

Site Erven	Erf Extent	SG Code
Erf 15618 Newcastle	1.78 ha	N0HS02210001561800000

The coordinates of the boundary of the property are provided in Table 4-2.

Table 4-2: Geographical Coordinates for the Site

Latitude /Longitude	Degrees	Decimal Minutes
South	27°	47.114’
East	29°	58.156’

[Note: The coordinates in decimal degrees are: -27.785233; 29.969267.]

Refer to Figure 4-4 for a map showing an aerial view of the NGEPP project site.

29°58.0001'E
29°58.5'E
29°59.0001'E
29°59.5'E
27°46.5'S
27°47'S

Karbochem Industrial Complex containing NGEPP Project Site

N

Inset of NGEPP Project Site

LNG Dispensing Station

2100m^3 LNG Tank Farm (including pump station and bound area)

LNG pipeline system

Regas facility (including vaporizers and gas oderization system)

0 125 250 500 Meters

Legend

- Proposed area for LNG Facilities
- NGEPP Project Site
- Karbochem Industrial Complex

Data Source: ESRI Basemap Imagery	
Scale: 1:10 000	
Projection: TM	Datum: HH94
Central Meridian/Zone: Lo 29	
Date: 15/10/2020	Compiled by: INBRO
Project No: 566508	Fig No: 4-4

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NEWCASTLE GAS ENGINE POWER PLANT (NGEPP)

AERIAL VIEW OF NGEPP SITE

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\566508_F4_4_NGEPP_ArealView_A3CL_20210412.mxd

Revision: A Date: 12 04 2021

4.3 Surrounding land use

The proposed development is situated within the Karbochem Industrial Complex in Newcastle. The surrounding land use within 5 km of the project area is detailed in Table 4-3. In addition to the areas identified below there are guest house and bed and breakfast establishments, as well as several small holdings located between 500 m and 800 m to the west and north west of the proposed project site.

Table 4-3: Details of the locality within 5 km of the project area

Area name	Area Classification	Approximate Distance from Project Area (km)	Direction	X Coordinate	Y Coordinate
Arbor Park	Residential	4.2	Northwest	-27.7709	29.9503
Fairleigh	Residential	4.3	West	-27.7822	29.9261
Newcastle Central	Commercial/ Residential	4.3	Northwest	-27.7611	29.9345
Vlam	Commercial	3.2	Northwest	-27.7612	29.9507
Riverside Industrial	Industrial	4.1	North-Northeast	-27.7504	29.9845
Airport Industrial	Industrial	2.4	Northeast	-27.7693	29.9857
KwaMathukuza	Residential	4.5	East-Northeast	-27.7659	30.0096
Tuam	Residential	3.4	Southeast	-27.8060	29.9951

5 Receiving Environment

5.1 Macroscale Climate

Climate conditions in South Africa range from Mediterranean in the south-western part of the country to temperate in the interior plateau and subtropical in the north-east. There is also evidence of a desert climate in the north-western part of the country.

South Africa experiences summer between December and February when most of the country is characterised by hot weather and afternoon thunderstorms. The winter season, experienced between June and August, is usually mild and dry except for the south-western parts of the country. During summer, localised weather systems to the east of the south-easterly trade winds causes turbulence and uplift and the potential for precipitation over the eastern part of the country, resulting in summer rains. On the western side of the easterly waves, upper-level convergence and surface-level divergence causes clear conditions with no precipitation over the western part of the country. During winter, westerly waves significantly influence the weather of the country. Upper-level divergence and surface-level convergence occurs to the rear of the trough, which causes uplift and cloud formation resulting in precipitation and winter rains over the western coast. Rainfall will also occur with the passing of cold fronts, which are associated with the westerly waves.

5.2 Regional Climate

The Newcastle Local Municipality has a temperate climate with warm to hot summers and mild winters, with nighttime temperatures cold enough for frost formation. The area receives predominantly summer rainfall as a result of low-pressure troughs that form over the central plateau. Summer rainfall events are generally associated with severe thunderstorms

5.3 Climate conditions at the project site

The climate in the project area is seasonal with wet summer periods (September to February) and dry winters (March to August). According to the Köppen Climate Classification System, the project area is classified as a Category “C” climate type, which is a moist mid-latitude climate with mild winters. The project site itself falls into subcategory “Cwa” which is classified as having a warm temperate climate.

The Fifth Generation Mesoscale Model (MM5) CALMET-ready meteorological data was obtained from Lakes Environmental for the period January 2017 to December 2019 for the approximate coordinates of the Newcastle Energy operations and has informed the summary of the site’s baseline climate. In addition, meteorological data was acquired from www.worldweatheronline.com for Newcastle (the project area).

Table 5-1: Summary of data acquired from January 2017 to December 2019 for this study

Source	Rainfall	Wind speed	Wind direction	Ambient Temperature
Newcastle (World Weather Online)	✔	-	-	✔
Lakes Environmental	✔	✔	✔	✔

5.3.1 Rainfall

Rainfall patterns will be affected by climate change. It is therefore important to understand the seasonal trends in rainfall to contextualise how they may be affected in the future as a result of climate change predictions.

Total monthly rainfall is presented in Table 5-2 for the 2017, 2018 and 2019. The observed trend is that during summer, the study area receives the majority of its rainfall. The monthly average rainfall is presented graphically in Figure 5-1.

Table 5-2: Monthly rainfall for Newcastle

Month	2017	2018	2019
Units	mm	mm	mm
January	36.6	10.3	69.8
February	76.8	12.4	77.4
March	8.4	45.0	42.2
April	8.4	7.8	70.3
May	21.3	11.4	0.8
June	0.8	0.3	0.3
July	0.5	0.5	0.0
August	1.6	9.8	0.3
September	2.3	2.2	39.3
October	16.3	18.8	50.3
November	23.2	19.0	127.9
December	22.5	22.1	148.7
Total	**218.7**	**159.3**	**627.3**

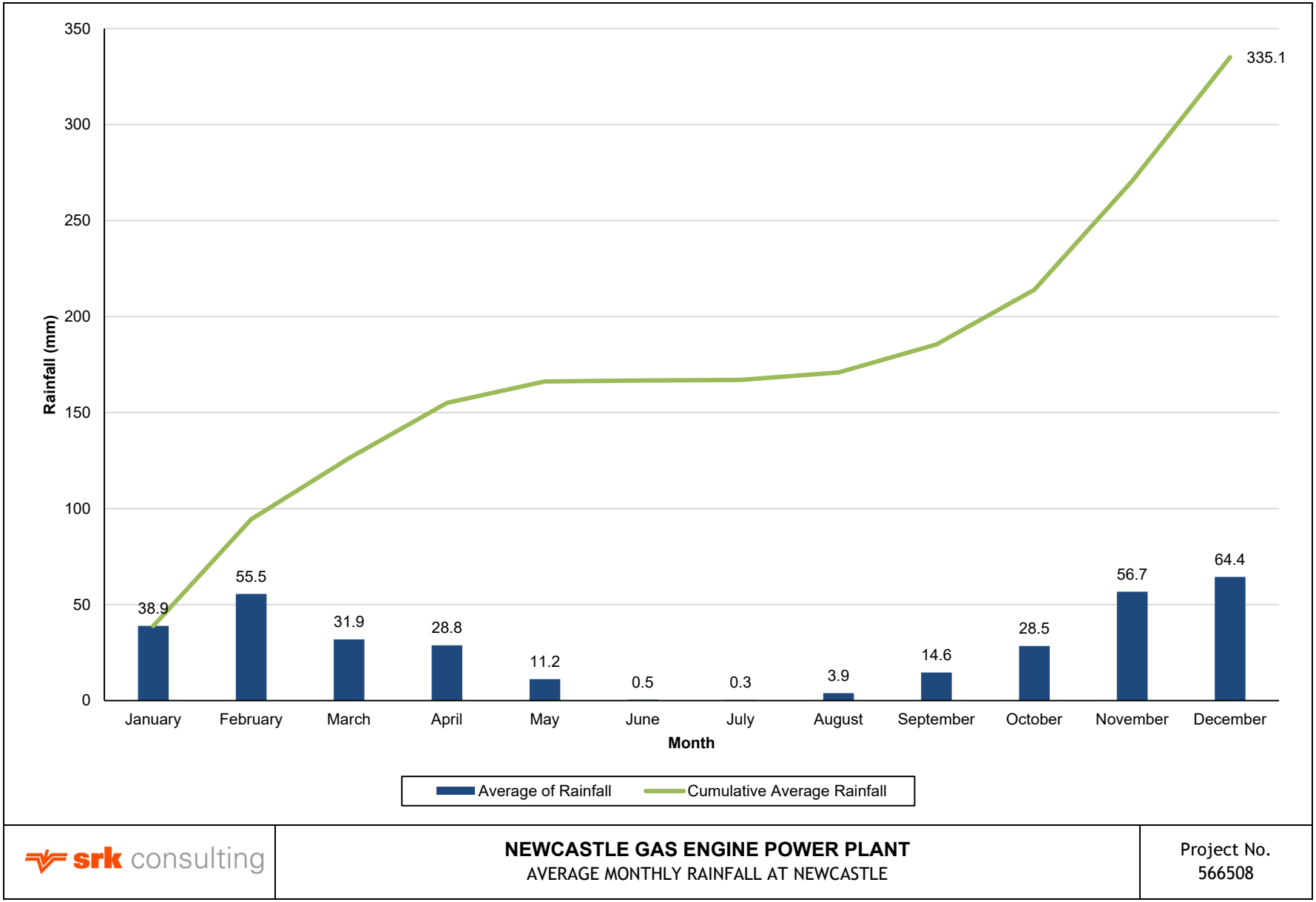


Figure 5-1: Average monthly rainfall for Newcastle for the period January 2017 to December 2019

5.3.2 Temperature

Climate change is expected to result in increased annual average temperatures. Further, heatwaves and extreme weather are also expected to increase in frequency. The seasonal trends in temperature are therefore important to contextualise the risks and when these risks may be realised. A seasonal variation is evident in the temperature dataset where higher average temperatures are recorded during summer (September to March) and lower average temperatures are recorded during winter (April to August). The monthly average, maximum and minimum temperatures for the period January 2017 and December 2019 is presented in Table 5-3 and Figure 5-2 below.

Average monthly temperatures range from 17 °C to 27°C in 2019, with the maximum temperature measured at 31°C (January/ February) and the minimum monthly temperature measured at 5°C (July).

Table 5-3: Average monthly temperature for Newcastle (January 2017 to December 2019)

Month	2017			2018			2019		
	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Unit	°C	°C	°C	°C	°C	°C	°C	°C	°C
Jan	13	19	25	13	20	28	22	27	31
Feb	14	18	24	13	19	27	19	27	31
Mar	10	17	24	12	18	25	15	26	30
Apr	8	15	23	11	16	23	12	22	26
May	7	12	19	8	13	20	10	20	25
Jun	6	11	19	6	12	19	6	17	21
Jul	6	12	20	5	10	18	5	17	23
Aug	7	13	21	9	15	22	8	21	26
Sep	12	19	26	11	19	27	8	22	26
Oct	11	18	25	11	18	25	12	26	30
Nov	11	19	26	12	20	28	15	26	29
Dec	13	19	27	15	22	30	14	24	27
Average	10	16	23	11	17	24	12	23	27

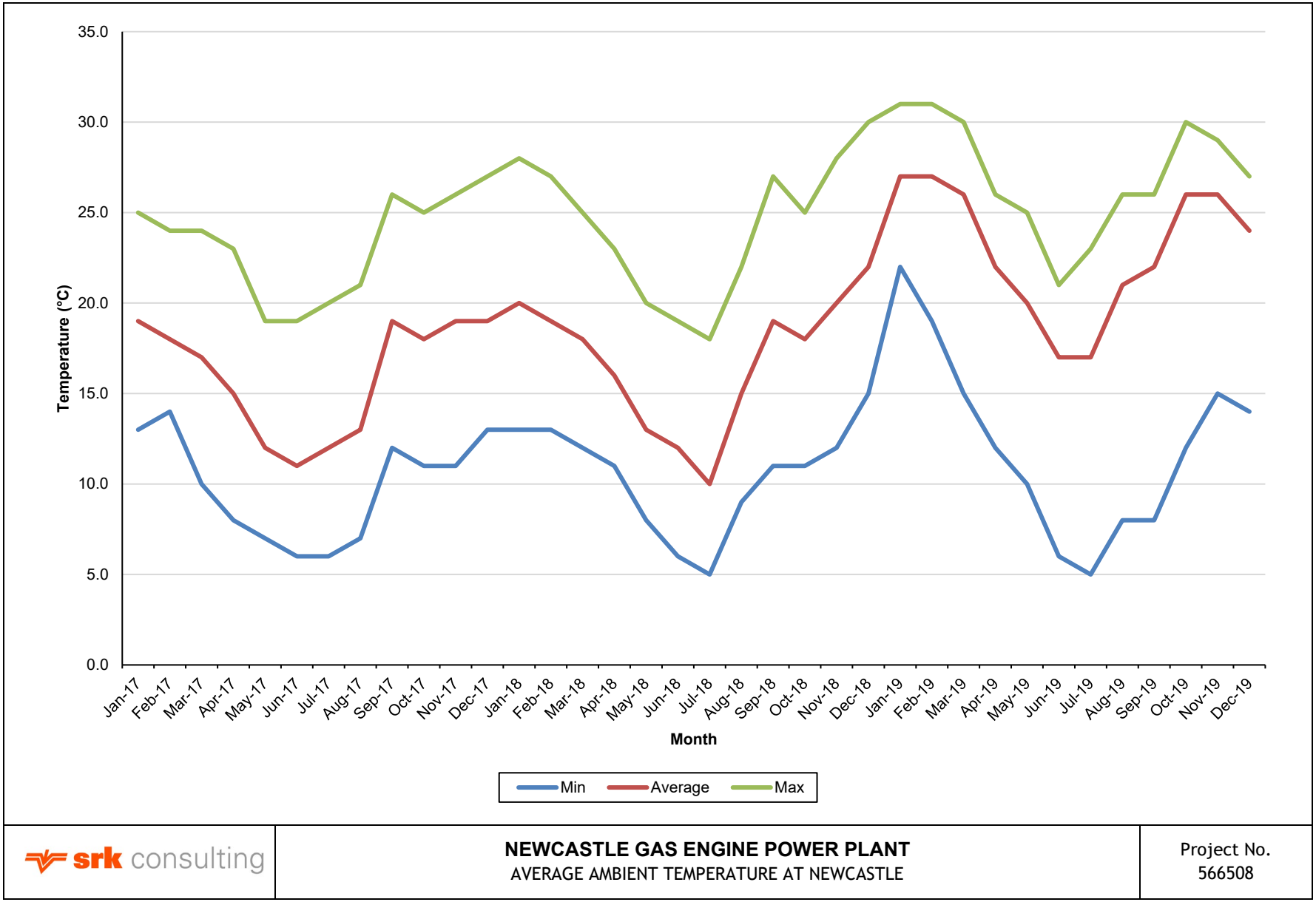


Figure 5-2: Average ambient temperatures for Newcastle for the period January 2017 to December 2019

5.3.3 Wind Field

While not highlighted in the risks in terms of the TNC, there remains the possibility that winds speeds may be affected by climate change particularly during extreme weather like thunderstorms. To identify any potentials risks the wind class (wind speed) frequency distribution is provided in Figure 5-3: Wind class frequency distributionFigure 5-3. The period average wind speed is 2.35 m/s with calm conditions at 7.6% of the time. Day time wind speed average is 2.43 m/s with calm conditions at 10.78%. Night-time wind speed average is 2.28 m/s with calm conditions at 2.71%.

The highest average wind speeds were recorded during spring with a speed of 2.71 m/s and calm conditions at 6.17% of the time. The lowest average wind speeds were recorded in August with speeds at 2.07 m/s and calm conditions at 8.27% of the time. Winds are predominately from the north-northwest, northwest and west-northwest with lower occurrences of winds from the directions between the northeast and southwest.

Based on the current windspeed frequency distribution risks to infrastructure as a result of high winds is not anticipated.

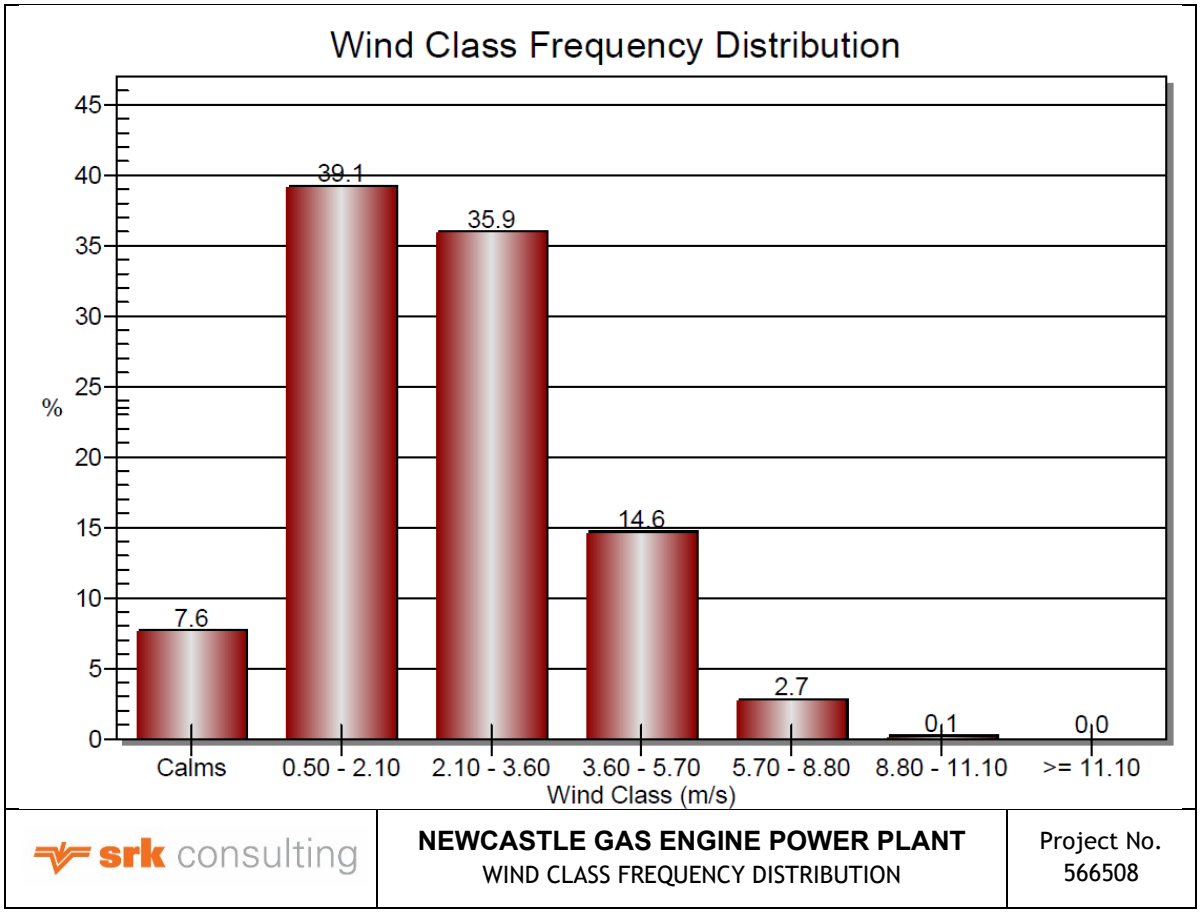


Figure 5-3: Wind class frequency distribution

6 South Africa's Climate Change Response

There are several legal and regulatory frameworks with which Newcastle Energy must comply. These include the following key legislation and guideline documents:

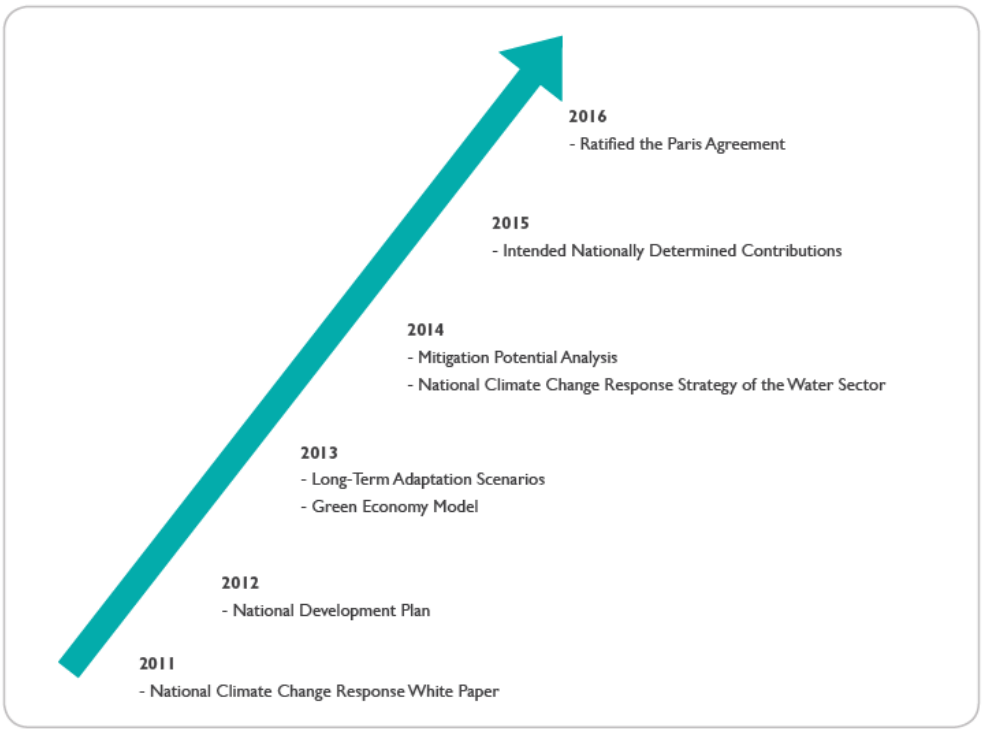
- Constitution of the Republic of South Africa (Act 108 of 1996) (Constitution);
- National Environmental Management Act (Act 107 of 1998) (NEMA);
- National Environmental Management: Air Quality Act (Act 39 of 2004) (NEM:AQA);
- National Climate Change Adaptation Strategy (Version UE10 of 13 November 2019); and

- 2017 South Africa's Third National Communication under the United Nations Framework Convention on Climate Change.

The transition of South Africa's climate change response through national development programmes, plans and strategies from 2011-2015 is highlighted in Figure 6-1 and is further discussed in this chapter, to give context to the regulatory framework associated with greenhouse gas (GHG) emissions and the likely impact that climate change will have on the project and surrounding areas.

The National Development Plan (NDP) (NPC, 2012) and the National Climate Change Response Policy (NCCRP) White Paper (Department of Environmental Affairs, 2011) provide the strategy for South Africa's transition to a lower carbon and climate resilient society, as it outlines long term goals for climate change adaptation and mitigation. The Sustainable Development Goals (SDG) are directly linked to the objectives of the NDP, as climate change is a cross-cutting issue that affects sustainable development.

There are also global agreements and decisions that South Africa participates in that aim to respond to and prepare for the impacts of climate change. South Africa is a Party to the United Nations Framework Convention on Climate Change (UNFCCC). The two key Conference of Parties (COPs) to the UNFCCC that prioritised the importance of climate change adaptation were COP16 held in Cancun in 2010 and COP21 held in Paris in 2015.



srk consulting	NEWCASTLE GAS ENGINE POWER PLANT TRANSITION OF SOUTH AFRICA'S CLIMATE CHANGE RESPONSE	Project No. 566508

Figure 6-1: Transition of South Africa's climate change response (DEA, 2018)

6.1 National Climate Change Response Policy (NCCRP) White Paper

The South African national government's approach to climate change is provided in the NCCRP White Paper. It documents the country's commitments and plans to address climate change challenges and outlines what is required by all provinces and municipalities. The response policy aims are to manage inevitable climate change impacts and to make a fair contribution to the global effort to stabilize GHG concentrations at a level that avoids dangerous anthropogenic interference with the climate system.

The NCCRP adopted the "Peak, Plateau and Decline" (PPD) emissions trajectory as the benchmark against which South Africa's future mitigation actions will be measured.

The NCCRP highlights a suite of sectors that need to consider climate change impacts in their planning, namely water, agriculture and commercial forestry, health, biodiversity and ecosystems, and human settlements (urban, coastal and rural). Additionally, the policy identifies a number of actions to be undertaken by various sectors and governmental departments.

Climate change considerations and constraints will need to be integrated into municipal development planning tools such as Integrated Development Plans (IDPs) and municipal service delivery programmes.

6.2 National Development Plan (NDP)

The NDP (NPC, 2013), developed by the National Planning Commission, aims to eliminate poverty and reduce inequality by 2030 within South Africa. Climate change considerations are well represented in the plan. The NDP indicates that South Africa needs to enhance the resilience of its people and the economy to climate change, reduce greenhouse gas emissions and improve energy efficiency to reduce our vulnerability of climate change to livelihoods, health and economic growth. The plan recognizes that the competition for land, water and energy will intensify as the effects of climate change become apparent.

The main inclusion of climate change in the NDP is provided in Chapter 5 entitled "Environmental sustainability and an equitable transition to a low-carbon economy". This chapter sets out specific objectives and actions related to climate change and are implemented through a vision for 2030. The vision states that by 2030, South Africa's transition to an environmentally sustainable, climate-change resilient, low-carbon economy and just society will be well under way.

Climate change considerations are also included in various other chapters in NDP. Reference is made to a transition towards a green and low carbon economy, fostering development in green product and service developments, promotion of an integrated and inclusive rural economy that is resilient to the effects of climate change and transforming human settlements that focus on green cites and sustainable development.

While the NDP calls upon policy to integrate climate change considerations, the NCCRP White Paper outlines the government's commitments to addressing the challenges of climate change and provides the required responses for all levels of governance.

6.3 Millennium Development Goals (MDG)

During the United Nations (UN) Millennium Summit in New York in 2000, world leaders signed the UN Millennium Declaration, which was the foundation of the Millennium Development Goals (MDG). The MDG's was a set of 8 measurable goals Figure 6-2 for 2015, which focused on improving human conditions around the globe.

srk consulting	NEWCASTLE GAS ENGINE POWER PLANT MILLENNIUM DEVELOPMENT GOALS	Project No. 566508

Figure 6-2: Millennium Development Goals

According to the MDG report (UN, 2015), addressing the rise in GHG emissions and the resulting likely impacts of climate change (altered ecosystems, weather extremes and risks to society), remains an urgent, critical challenge for the global community. Furthermore, water scarcity is projected to increase. Livelihoods of the poor are highly reliant on natural resources and are therefore more vulnerable to environmental degradation. In trying to attain MDG 7 – Ensuring Environmental Sustainability, South Africa has significant challenges, due to the high reliance on coal for power generation. Four (4) of the eight (8) MDG's reflected progress towards attainment (StatsSA, 2015b), namely:

- MDG 1: Eradication of extreme poverty and hunger;
- MDG 2: Achieve universal primary education;
- MDG 3: Promote gender equality and empower women; and
- MDG 6: Combat HIV and AIDS, malaria and other diseases.

6.4 Sustainable Development Goals (SDG)

In 2015, the same year that the Paris Agreement was signed, the 2030 Agenda for Sustainable Development was adopted, along with a set of 17 Sustainable Development Goals (SDGs) (Figure 6-3) which will guide policy and funding for the next decade. South Africa adopted the SDG's in September 2015. The SDG's speak to eradicating poverty and reducing inequalities and are therefore directly linked to the objectives of South Africa's National Development Plan (NDP). Climate change has the potential to affect all aspects of sustainable development. Climate action is therefore essential for achievement of the SDG's.

The SDGs support the Paris Agreement as climate change is specifically highlighted under SDG 13 which mentions targets relating to strengthening resilience and adaptive capacity.

srk consulting	NEWCASTLE GAS ENGINE POWER PLANT SUSTAINABLE DEVELOPMENT GOALS	Project No. 566508

Figure 6-3: Sustainable Development Goals

6.5 Long Term Adaptation Scenarios (LTAS)

The Long-Term Adaptation Scenarios (LTAS) (DEA, 2013), established a collective understanding on South Africa's climate change trends and projections. It summarised key climate change impacts and identified potential response options for primary sectors, namely:

- Water;
- Agriculture and forestry;
- Human health;
- Marine fisheries; and
- Biodiversity.

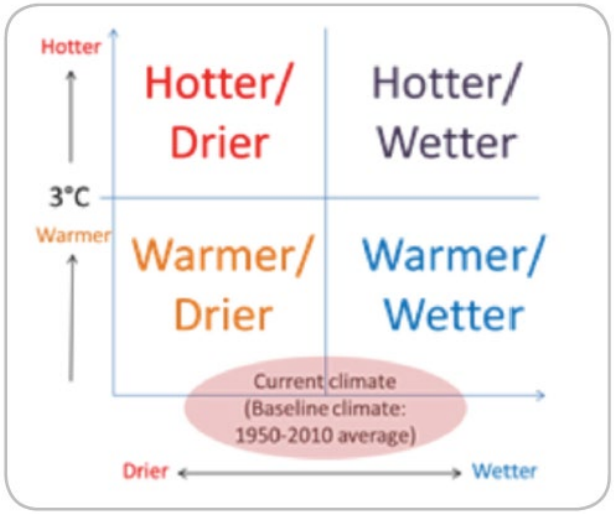
Upon conclusion of Phase 2 of the LTAS in 2014, DEA published a factsheet series which includes a volume on the economics of climate change adaptation, highlighting the three key economic impact areas:

- **Water availability for irrigation, municipal and industrial uses**: Climate change is expected to impact regional water supply under the drier climate scenarios (Hotter/Drier and Warmer/Drier as per Figure 6-4);
- **Yield impacts on dryland agriculture**: Agriculture employs a large number of people in South Africa and contributes directly contributes towards food security. It is the sector most negatively affected by climate change. There is a strong dependence on dry-land agriculture by rural populations with high poverty rates. This makes these rural populations even more susceptible to climate change impacts;
- **Road infrastructure**: Climate change is expected to result in increased disruptions to transport infrastructure due to extreme weather events.

The first stage of LTAS defines 4 (four) possible climate futures for the country (Figure 6-4):

1. Warmer (<2 °C above 1961-2000) and wetter with greater frequency of extreme rainfall events;
2. Warmer (<2 °C above 1961- 2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events;

3. Hotter (> 2°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events; and
4. Hotter (> 2°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.



srk consulting	NEWCASTLE GAS ENGINE POWER PLANT LTAS PHASE 1 CLIMATE FUTURES	Project No. 566508

Figure 6-4: LTAS Phase 1 climate futures (DEA, 2018)

The results from the LTAS Phase 2 incorporated vulnerability assessments to help understand the capacity to manage climate risk and highlighted the need to understand the physical, social and ecological aspects of climate change.

Climate risk = Vulnerability x exposure x severity / adaptive capacity

Where:

Exposure	The contact between the climate agent in question and the target (i.e. individual/community/ population) in which it will impact.
Vulnerability	The characteristics of the population and the extent to which social and biophysical elements are sensitive to changes in weather and climate.
Adaptive Capacity	Refers to those social and ecological elements that enable the system to re-spond to the risk.
Severity	A function of the consequence or impact of the scale of the asset loss due to the climate risk.

6.6 Mitigation Potential Analysis (MPA)

Mitigation Potential Analysis (DEA, 2014) built on the LTAS scenarios and analysed further mitigation options in key economic sectors: energy, industry, transport, waste and agriculture, forestry and other land use. The importance of the Mitigation Potential Analysis lies in its potential to guide climate change policies and subsequent measures.

The MPA is the most recent comprehensive study that outlines South Africa's future emission reduction potential and opportunities. The National GHG Inventory for the period of 2000-2010 and the Long Term Mitigation Scenarios (LTMS) have served as the departure point for the development of the Mitigation Potential Analysis.

The MPA has been used as the basis for the documentation of future emission projections and guides the technology and financial needs analyses of key future mitigation scenarios, which led to the development of marginal abatement cost curves and national abatement pathways.

The MPA applied a scenario development approach, for which the boundaries of the LTMS scenario framework are defined by the following:

- Growth without constraints' (GWC) emission scenario - based on an assumption of growth without any carbon constraint;
- Required by science' (RBS) emission scenario - which assumes that South Africa implements mitigation to the extent required by science to meets its fair contribution towards global emission reductions; and
- Peak-Plateau-Decline (PPD) emissions trajectory.

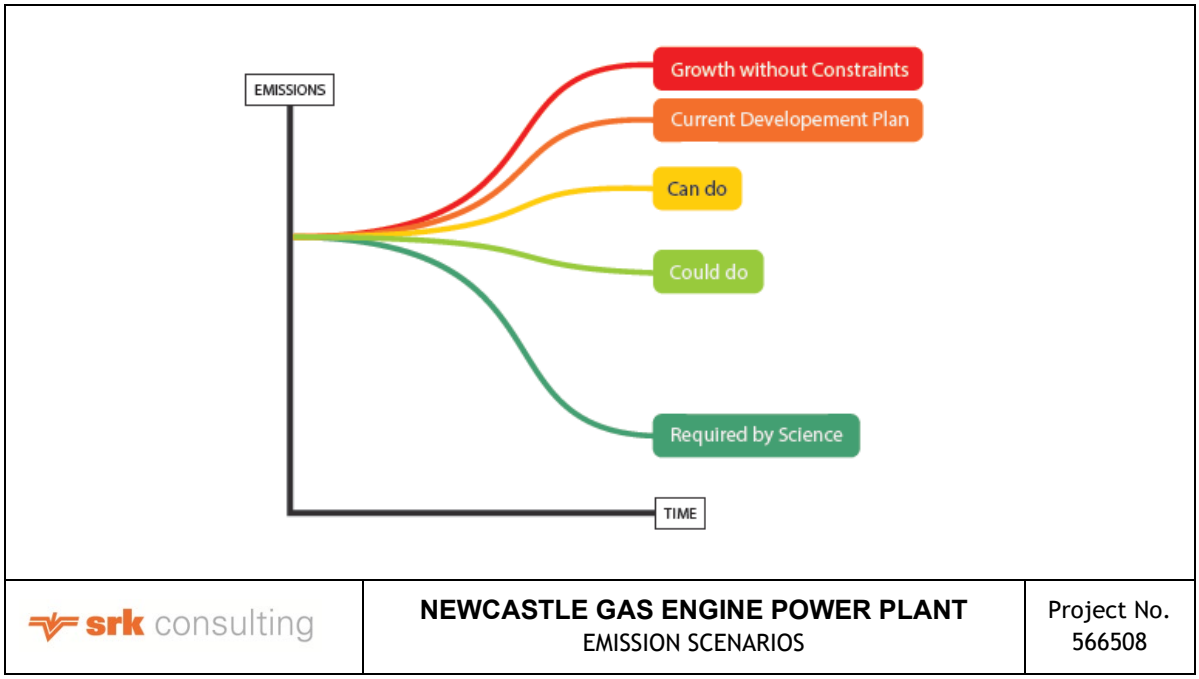


Figure 6-5: Main emission scenarios developed within the LTMS scenario framework (DEA, 2014)

The scenarios and mitigation actions developed in the LTMS study showed that the gap between GWC and RBS could not be fully closed if the identified mitigation actions were all implemented[3].

6.7 The National Climate Change Response Strategy for the Water Sector

The National Development Plan recognises that climate change will have a significant impact on the water sector. The National Climate Change Response White Paper states that the water sector is a critical component to climate change mitigation and adaptation. The National Climate Change Response Strategy for the Water Sector (DWS, 2014) is based on the format developed by the Southern African Development Community for climate change and water strategies. The water

[3] In discussing this result, the authors of the LTMS study noted that a rigorous quantitative analysis relies on current (known) technologies and cannot model future (as yet undeveloped) technologies that may reduce this gap (DEA, 2014)

strategy emphasises good water management which is a critical foundation for adaptation to water-related climate change impacts.

6.8 Nationally Determined Contributions

As a signatory of the Paris Agreement, South Africa is required to compile a set of Nationally Determined Contributions (NDCs) which outline contributions to the global goals to reduce GHG emissions and adapt to the impacts of climate change (UN, 2015). South Africa's goals outlined in its NDC document are:

- **Goal 1**: Develop a National Adaptation Plan, and begin operationalization as part of implementing the NCCRP for the period from 2020 to 2025 and for the period 2025 to 2030;
- **Goal 2**: Take into account climate considerations in national development, sub-national and sector policy frameworks for the period 2020 to 2030;
- **Goal 3**: Build the necessary institutional capacity for climate change response planning and implementation for the period 2020 to 2030;
- **Goal 4**: Develop an early warning, vulnerability and adaptation monitoring system for key climate vulnerable sectors and geographic areas for the period 2020 to 2030, and reporting in terms of the National Adaptation Plan with rolling five-year implementation periods;
- **Goal 5**: Development of a vulnerability assessment and adaptation needs framework by 2020 to support a continuous presentation of adaptation needs; and
- **Goal 6**: Communication of past investments in adaptation for education and awareness as well as for international recognition.

South Africa's overarching mitigation strategy is based on a peak, plateau and decline GHG emissions trajectory course. According to this course, South Africa's emissions will range between 398 and 614 Mt CO_2 equivalent (CO_2e)[4] by 2025 and 2030 respectively (Figure 6-6). The emissions are expected to plateau for about a decade and then decline in absolute terms thereafter (DEA, 2018).

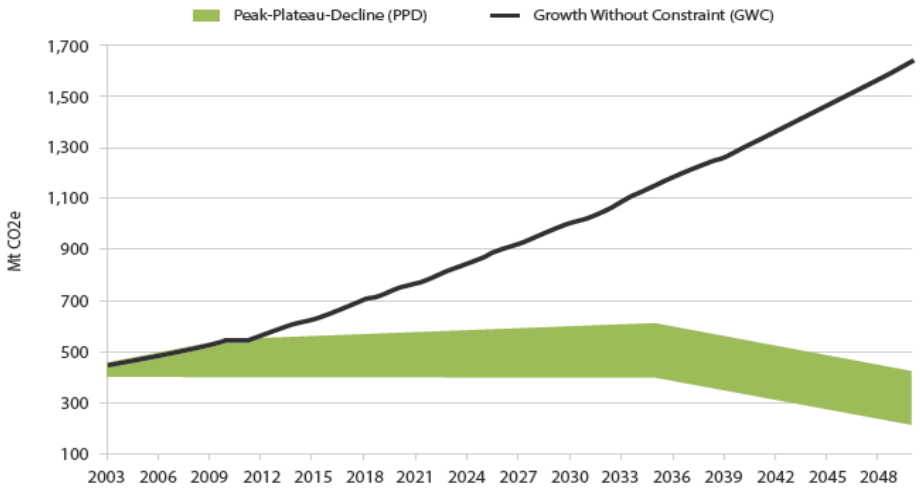


Figure 6-6: LTMS emission trajectories for 'growth without constraint' and 'peak, plateau and decline' scenarios (DEA, 2014)

[4] Carbon dioxide equivalent or CO_2 equivalent, abbreviated as CO2e is used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP). This is achieved by converting other GHGs to the equivalent amount of carbon dioxide with the same GWP.

6.9 National Greenhouse Gas Emission Reporting Regulations

The National Greenhouse Gas Emission Reporting Regulations, under section 53(A), (o) and (p) of NEM:AQA, were instituted in 2017 (General Notice Regulation (GNR) 275 of 2017) and later amended in September 2020. The regulations provide a list in Annexure 1 of activities and operations that are required to report their GHG emissions through a national system, the National Atmospheric Emission Inventory System (NAEIS). Submissions to NAEIS will further inform tax liabilities in terms of the Carbon Tax Act. To support the regulations Technical Guidelines for Monitoring, Reporting and Verification of Greenhouse Gas Emissions by Industry where published in 2017 with an amended guideline published in February 2021 for public comment.

6.10 Carbon tax

The Carbon Tax Act was formally introduced in parliament in November 2018 by the Minister of Finance. The National Assembly adopted the Bill on 19 February 2019. The Carbon Tax Act was promulgated on 22 May 2019 and Phase 1 (see Table 6-1) of the implementation thereof come into effect on 1 June 2019.

The carbon tax will play a role in achieving the objectives set out in the National Climate Change Response Policy of 2011 (NCCRP) and contribute towards meeting South Africa's commitments to reduce GHG emissions. This gradual approach takes cognisance of the developmental challenges facing South Africa and South Africa's National Determined Contribution (NDC) commitments made under the Paris Agreement to reduce GHG emissions. The first phase of the Bill will continue up until 31 December 2022, and the second phase will commence in 2023 and end in 2030. South Africa agreed at Conference of Parties COP15 in 2009 to cut its emissions by 34% by 2020 and 42% by 2025.

A carbon tax payer is classified as any person (including partnership, trust, municipal entity and public entity) that conducts an activity or activities in South Africa which results in greenhouse gas emissions (fuel combustion, industrial processes, and fugitive emissions) above the prescribed threshold will be liable to pay carbon tax. The carbon tax will be administered by the South African Revenue Service (SARS).

6.11 Climate Change Bill

The second draft of the Climate Change Bill was debated at the National Economic Development and Labour Council (Nedlac) in July 2019. The objective of the Climate Change Bill is for South Africa to provide a response to climate change and management of climate change related impacts as part of the global effort to stabilise greenhouse gas concentrations.

The National GHG Emission Reduction Trajectory includes Sectoral Emissions Targets (SETs) to be established for sectors and sub-sectors, which will require Sectoral Emission Reduction Plans (SERPs). Future regulations will determine how the SETs and SERPs are policed, and with what targets.

A carbon budget will operate in parallel to the SET and SERP's target reduction system and will be allocated to emitters above a certain threshold level, and will require GHG reduction plans.

The timing for establishing the SET, SERP's and carbon budgets is unclear, as the regulations have not been published yet. It is however known that the emission trajectory needs to be aligned with international obligations.

6.12 National Climate Change Adaptation Strategy (NCCAS)

The National Climate Change Adaptation Strategy (NCCAS) provides a common vision of climate change adaptation and climate resilience for the country, and outlines priority areas for achieving this vision. The NCCAS serves as South Africa's National Adaptation Plan and fulfils South Africa's commitment to its international obligations as outlined in the Paris Agreement under the UNFCCC.

The NCCAS will be used as the basis for meeting South Africa's obligations in terms of the adaptation commitments outlined in the NDC. The NCCAS is a ten-year plan that will be reviewed every five years. The NCCAS is divided into sets of strategic objectives, strategic interventions and strategic outcomes with associated actions.

NCCAS Action 1.1.10 states the following: *Create a more adaptive electricity system to reduce dependence on a centralized system and increase distributed generation, especially in rural areas."*

Action 1.1.10 will involve encouraging the development of an adaptive and decentralised electricity system so that the system is more resilient to climate disruptions.

South Africa's primary energy sources are mainly coal (65.7%) and crude oil (21.6%), whilst renewable energy sources and waste currently only accounts for 7.6% of the supply (DEA, 2014). Coal fired power stations account for around 90% of South Africa's electricity supply. The national utility, Eskom, generates approximately 95% of the electricity used in South Africa. If a more adaptive system is in place (assuming the use of renewable energy such as wind/solar), it will reduce South Africa's emissions significantly.

The Intergovernmental Panel on Climate Change (IPCC) has developed a set of Representative Concentration Pathways (RCPs) that explore alternative futures with different levels of global greenhouse gases (CO_2e concentrations) as presented in Table 6-2. High mitigation scenarios (RCP4.5) assumes a CO_2e concentration of approximately 650ppm, and low mitigation scenarios (RCP8.5) assumes a CO_2e concentration of 1350ppm.

Table 6-1: Representative Concentration Pathways in the year 2100 (O'Neill & Schweize, 2011)

Scenario	Radiative Forcing	CO2e concentration	Rate of change in radiative forcing
RCP 8.5 (low mitigation)	8.5 W/m^2	1350 ppm	Rising
RCP 6.0	6.0 W/m^2	850 ppm	Stabilising
RCP 4.5 (high mitigation)	4.5 W/m^2	650 ppm	Stabilising
RCP 2.6	2.6 W/m^2	450 ppm	Declining

A detailed assessment of various global climate models was investigated by the CSIR, which considered numerous high-resolution projections of future climate change over Africa, using a conformal-cubic atmospheric model (CCAM). The results represent both high (RCP4.5) and low (RCP8.5) mitigation scenarios. CCAM was applied at 50 km resolution globally and was downscaled to a resolution of 8 km over South Africa (Engelbrecht, 2019). This chapter will use the results of the model for the RCP 4.5 and RCP 8.5 scenarios for temperature (section 7) and rainfall (section 7.1.2).

According to the IPCC Fifth Assessment Report (AR5) climate change is likely to increase the frequency and magnitude of many extreme events and will certainly increase the risk of slow-onset events such as sea level rise and drought (IPCC 2013).

7 Climate Change Trends

7.1 South Africa

7.1.1 Temperature

The simulated baseline over South Africa for the period 1961-1990 based on CCAM is shown in Figure 7-1. The projected changes for the time period 2021-2050 relative to the baseline period 1961-2000 is shown in Figure 7-2, first for RCP8.5 (low mitigation) and then for RCP4.5 (high mitigation) using the 50th (median) percentiles of projected changes under the RCP.

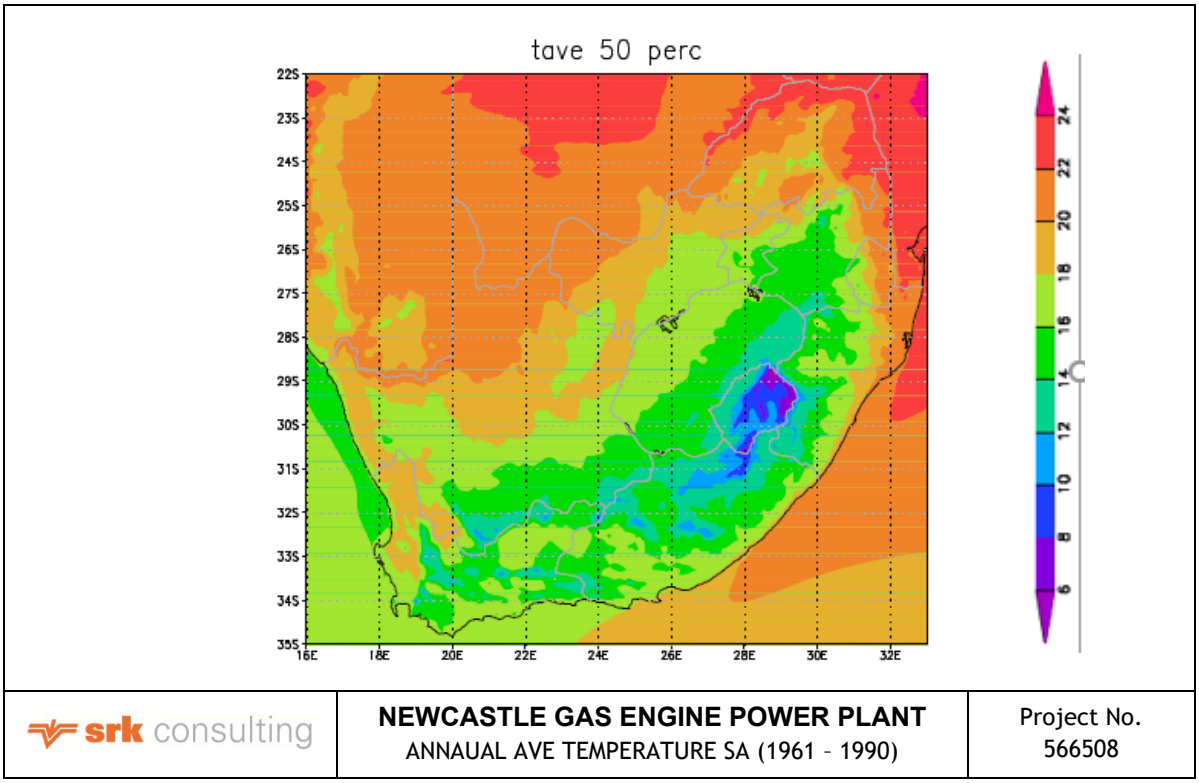


Figure 7-1: Annual average temperature (°C) over South Africa (1961 – 1990) (Engelbrecht, 2019)

CCAM projected change in the annual average temperature (°C) over South Africa for the period 2021-2050 relative to the period 1961-1990, under low mitigation, temperature increases of 1 to 2.5°C may plausibly occur over the southern coastal regions. Over the interior regions larger temperature increases are likely, which may well exceed 3°C over the northern parts as indicated in Figure 7-2.

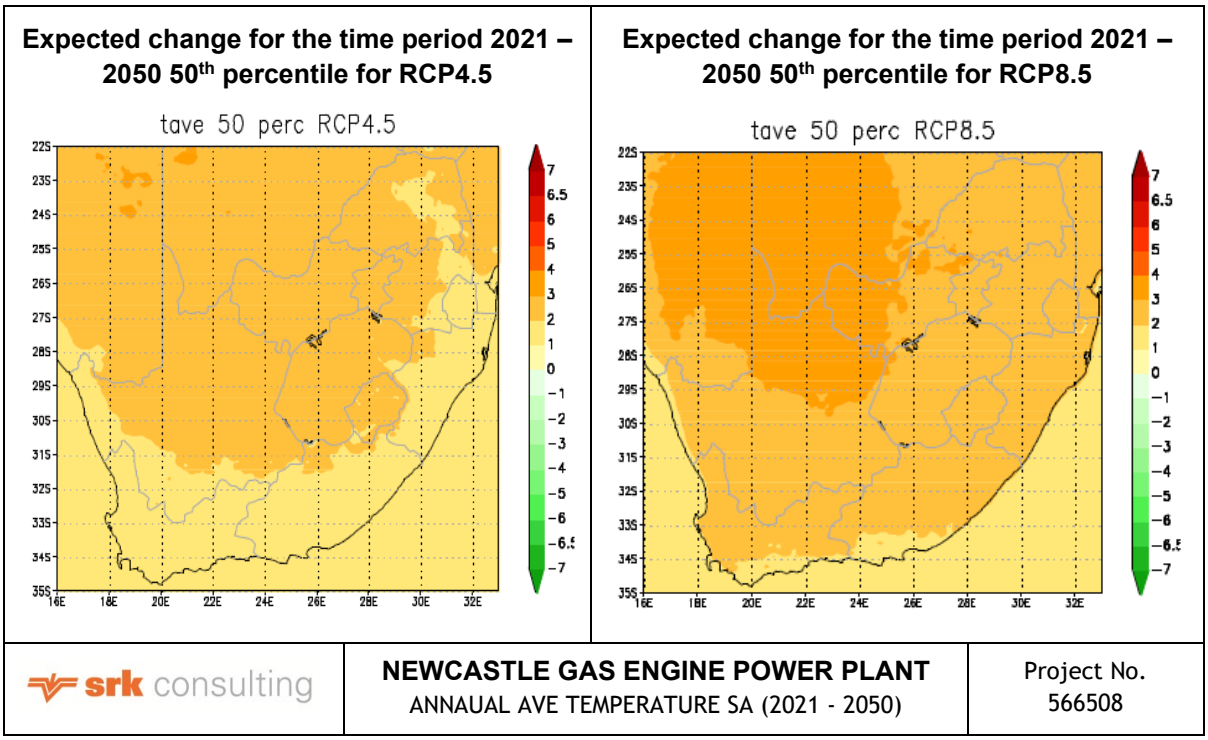


Figure 7-2: Annual average temperature (°C) over South Africa (2021 - 2050) (Engelbrecht, 2019)

For the period 2070-2099 relative to the period 1961-1990 under low mitigation, temperature increases of 2-3°C are plausible over the southern coastal regions. Over the interior, temperature increases of more than 4°C are likely and may well exceed 7°C over the northern interior as indicated in Figure 7-3. Such drastic temperature increases would have significant impacts on numerous sectors, including agriculture, water and energy.

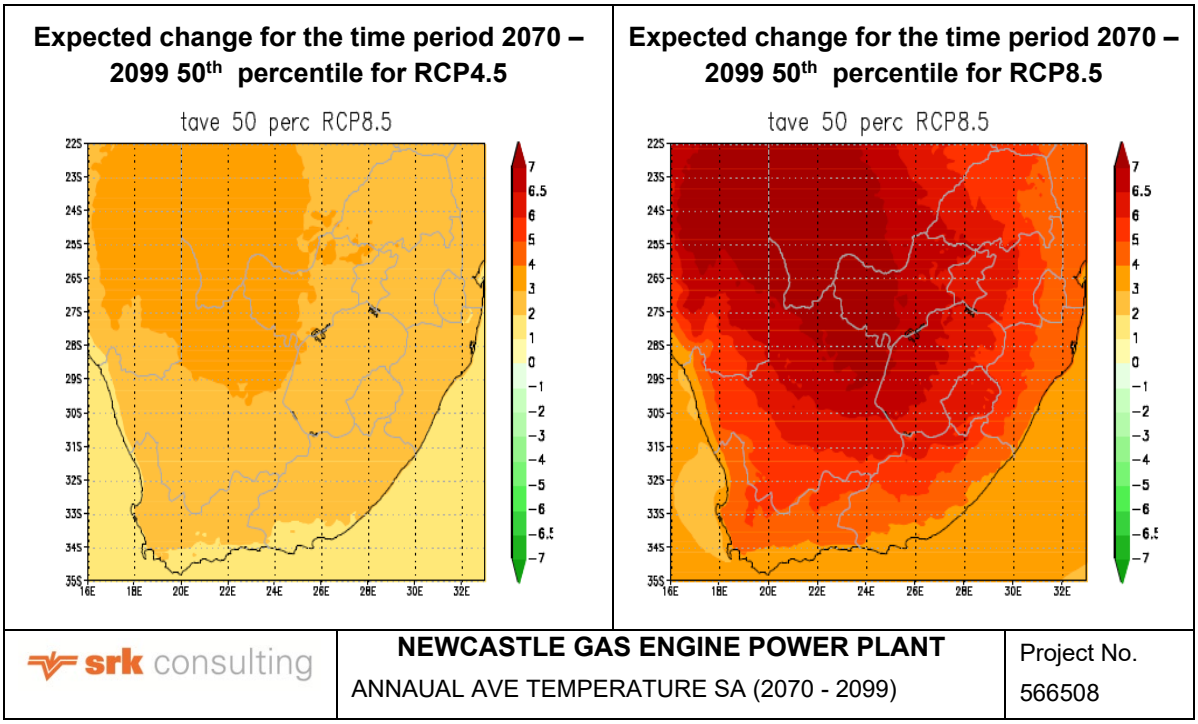


Figure 7-3: Annual average temperature (°C) over South Africa (2070 - 2099) (Engelbrecht, 2019)

CCAM projected change in the annual average temperature (°C) over South Africa at 8 km resolution, for the time-period 2070-2099 relative to 1961-1990. The 10th, 50th and 90th percentiles are shown for the ensemble of downscaling of six GCM projections.

7.1.2 Rainfall

The simulated baseline over South Africa for the period 1961-1990 is shown in Figure 7-4. The projected changes for the time period 2021-2050 relative to the baseline period 1961-2000 is shown in Figure 7-5, first for RCP8.5 (low mitigation) and then for RCP4.5 (high mitigation) using the 50th (median) percentiles [5]of projected changes under the RCP.

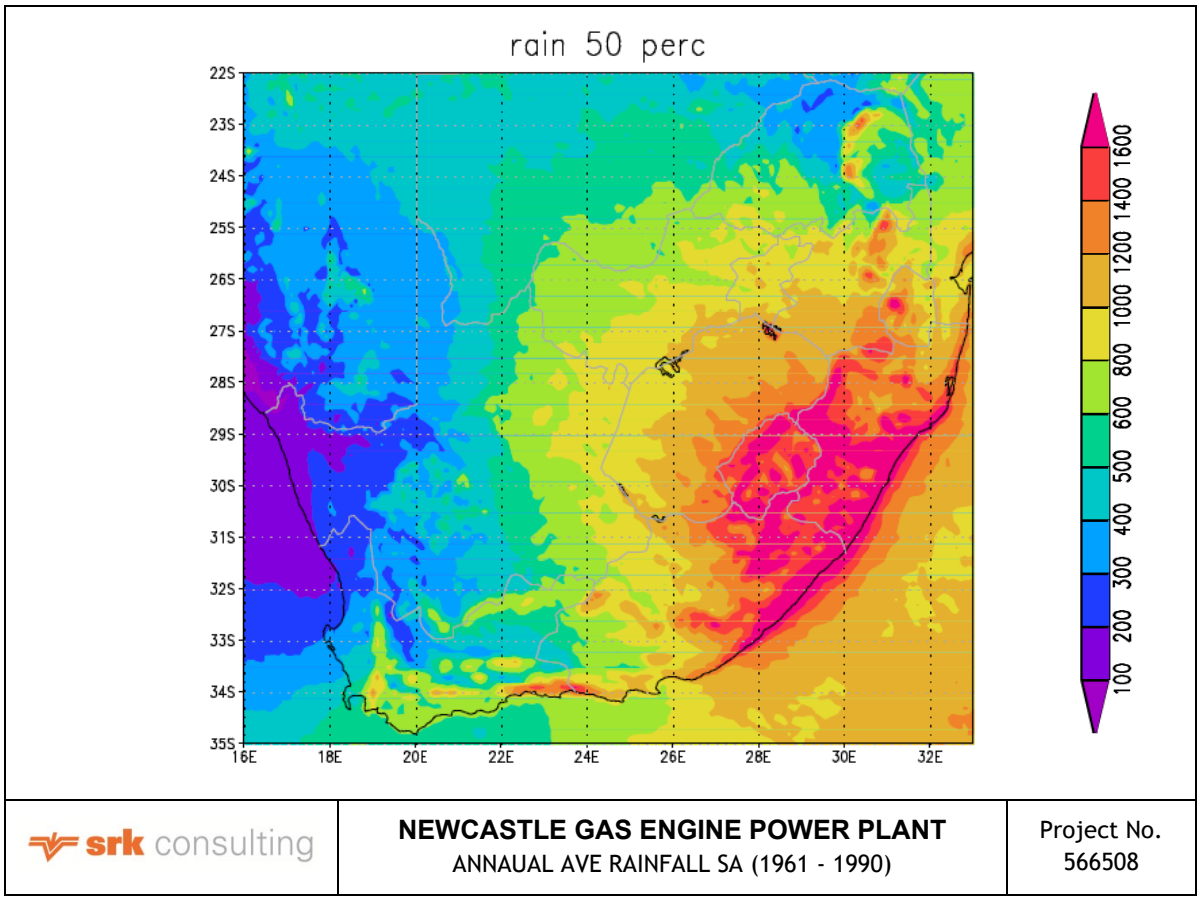


Figure 7-4: Annual average rainfall (mm) over South Africa (1961 – 1990) (Engelbrecht, 2019)

CCAM projected change in the annual rainfall (mm) over South Africa for the period 2021-2050 relative to the period 1961-1990, under low mitigation, rainfall is projected to increase over the central interior and the east coast.

[5] The 10th and 90th percentile was not considered in this CC assessment for MM

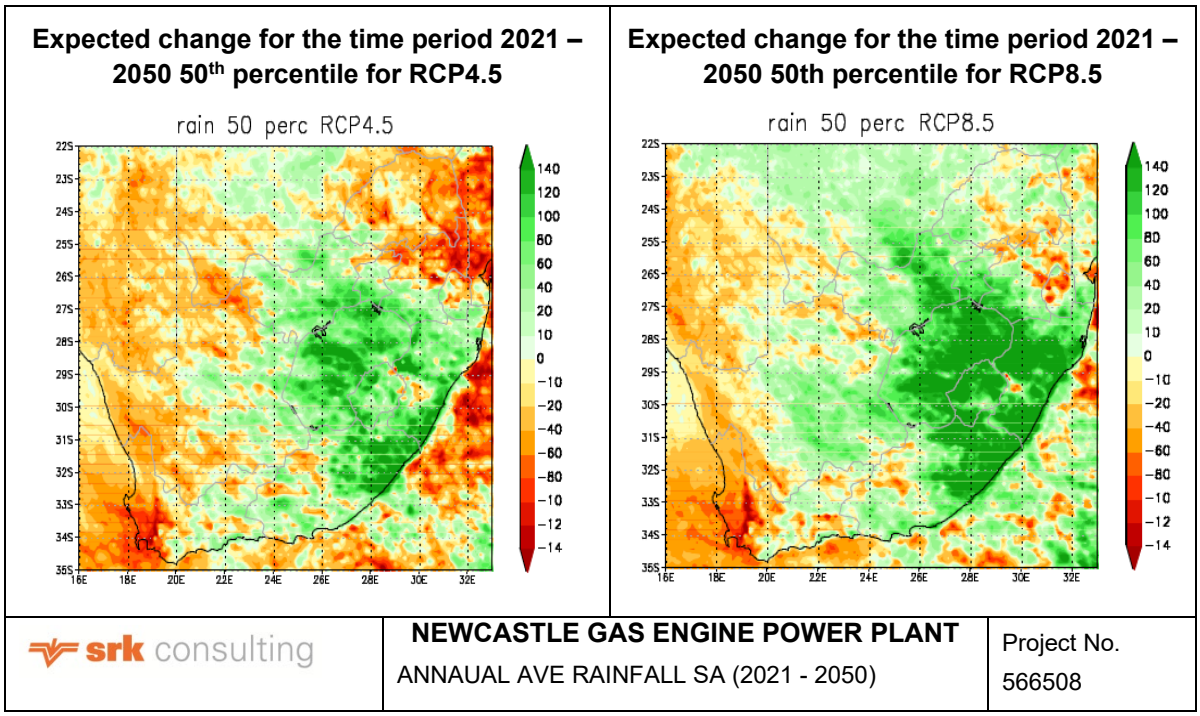


Figure 7-5: Annual average rainfall (mm) over South Africa (2021 - 2050) (Engelbrecht, 2019)

For the period 2070-2099 relative to the period 1961-1990 under low mitigation, rainfall is projected to decrease over the central interior and east coast of South Africa as indicated in Figure 7-6.

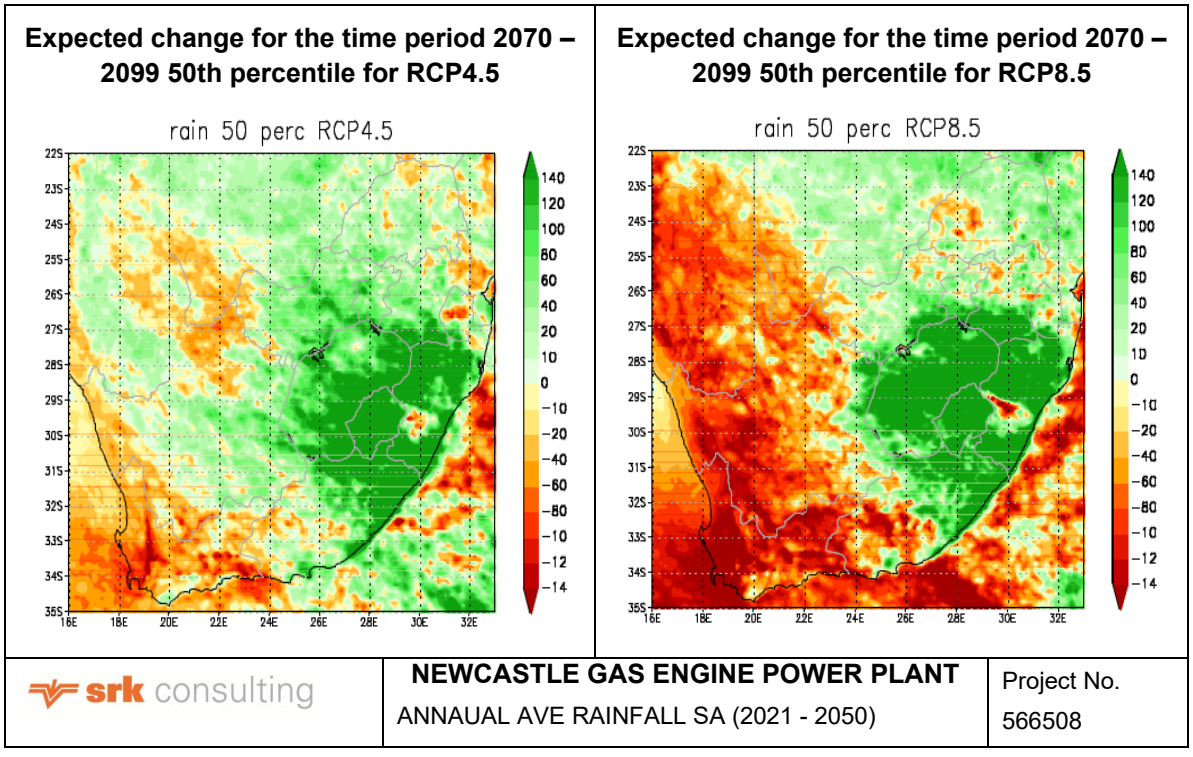


Figure 7-6: Annual average rainfall (mm) over South Africa (2070 - 2099) (Engelbrecht, 2019)

7.2 Regional

The site falls within KwaZulu-Natal and the South Africa's TNC under the UNFCCC notes that KwaZulu-Natal has experienced drastic warming over the 1931-2015 period. Stations along the coastline have reported temperature increases of more than 2 °C/century.

Hot days have been increasing at a rate of about 0.5 days per decade. There is, however, no clear evidence of statistically significant changes in annual precipitation totals or daily rainfall extremes.

While the site falls within KwaZulu-Natal, Newcastle is located in the interior of the province and the climate is more closely related to the neighbouring Free State province. The TNC indicates that there is a lack of weather station data but that there is evidence that warming is occurring. As for KwaZulu-Natal statistically significant changes in annual precipitation totals where not noted for the province but a spatially coherent pattern of extreme daily precipitation increases is noted.

8 Climate change risks

The TNC notes that KwaZulu-Natal, in which the site falls is the wettest province in South Africa, with high rainfall totals occurring along both the eastern escarpment and over the coastal areas. However while the site is located in KwaZulu-Natal, the climate aligns more closely with the Free State. That is relatively drier and cooler.

The TNC provides two possible narratives for Narrative 1 the TNC predicts a hotter and drier climate with temperature increases up to 3 °C potentially occurring by 2040-2060 with associated reduction in rainfall. The Free State has a similar prediction under Narrative 1 with temperature increases limited to 3 °C. Such a climate regime will be associated with an increase in heat-wave frequency and high fire-danger days. For KwaZulu-Natal El Niño-induced drought events are predicted to increase while for the inland regions increased and more intense sub-tropical highs are predicted to produce enhanced subsidence over the province, suppressing moisture transport into the region and convective activity. This is predicted to result in reduced frequency and magnitude of rainfall events but when they do occur, it is anticipated that they will be more intense resulting in localised flooding and related damage.

For Narrative 2, a warmer future with increased rainfall is predicted. Under this narrative an increase in intense thunderstorms and damaging flood events is predicted resulting in potential damage to infrastructure.

For both narratives human health may be increasingly affected by oppressive temperatures. For the warmer wetter narrative, however, the climate may result in an increase in pests due to the humid conditions.

9 Project Alternatives

Project alternatives are detailed in the Scoping Report as required by item 2.(1)(g) in Appendix 2 of GN 326. The following alternatives where considered in the assessment of the projects impact on climate change and the impact of climate change on the project and are discussed in the sub-sections below:

- Technology alternatives;
- Activity;
- Site location;
- Layout; and
- No-go.

9.1 Technology alternatives

For the NGEPP there are various technologies that are able to use natural gas and generate electricity. These are: Open Cycle Gas Turbines (OCGT), Combine Cycle Gas Turbines (CCGT), gas fired boiler/steam turbine systems (GFST), Open Cycle Reciprocating Engines (OCRE) and Combine Cycle Reciprocating Engines (CCRE).

Gas Turbines are proven efficient in applications:

- For large “base load, continuous duty” in a national grid. In this application a CCGT works out to be the best solution in terms of electric efficiency/OPEX, availability and space (kW installed/m^2). However, they consume large volumes of “good quality water”, do not accommodate many frequent stop/start well and seldom reach maximum efficiency under 60 minutes.
- For industrial power applications where “very large” volumes of heat/steam is required.
- Where “large capacity power in smallest footprint” is an important consideration (for instance pump drives/gensets on oil rig platforms and large capacity mobile/rental power for outdoor events, managing mining disasters or environmental disasters) and where electric efficiency is of lessor importance.

For everything else (mid-merit and peaking/stand-by power) the high speed (1 500 rpm) and medium speed (750 rpm) reciprocation engines are at “better” suited for use.

The DMRE’s RMIPPPP calls for (amongst others):

- Intermitted use with many stop/starts;
- Fast response; and
- Value for money (low tariff = max efficiency).

These stringent performance requirements led to **selecting OCRE as the preferred technology** for the following advantages as outlined in the subsections that follow:

9.1.1 ISO Performance Standards

ISO 3977-1 applies to Turbines: The standard environmental design point of any gas turbine system is 15°C, 60% Relative Humidity and sea level (i.e. 0 meters above mean seal level (mamsl)) elevation.

ISO 3046-1/ISO 8525-1 applies to Reciprocating Engines: The standard environmental design for a reciprocating engine is: 35°C, 60% Relative Humidity and 100m.a.s.l. elevation.

As the average South African environmental conditions exceed the ISO 3977 conditions, this makes reciprocating engines more stable performers and flexible technology as deration will only occur beyond 35°C and above 100 mamsl.

9.1.2 Water consumption

To boost turbine performance and stretch performance to equal reciprocating engine technology, additional Inlet Air/Spray Conditioning and Water Injection technology has to be applied, requiring large volumes (factors more than a reciprocating engine plant of the same capacity) of good quality water. This is not normal “tap” water and generally a large water source and water processing plant are additional requirements. The processing plant has extra CAPEX as well as OPEX cost, as certain chemicals are consumed in volume. There is also a risk of accidently operating the turbine with un-treated water. This can cause serious damage to the turbine.

A reciprocating engine power plant, such as that proposed for NGEPP, generally makes use of closed circuit radiator coolers. The only surface exposed to evaporation to atmosphere is the approximately 1 m^2 inside the header tank. With the coolant being around 96°C, ambient being average 30°C on a 1 m^2 surface, evaporation is minimal at less than 50 litre per engine per day.

9.1.3 Start-up cost

Air derivative turbine technology competes with the B35:40V20AG2 medium speed reciprocating gensets (OCRE) proposed for the NGEPP. The turbine efficiency (gross, single cycle) is 38% to 42% (below 10°C and at 0 m.a.s.l). Start-up time to 100% load is around 10 minutes.

Whereas the reciprocating technology efficiency (gross, single cycle) is 47% (up to 35°C and 100 m.a.s.l). Start-up time to 100% load is between 2 to 5 minutes.

The nett result is that reciprocating engines out-perform turbines as far as start-up cost is concerned. For this reason, reciprocating engines for use in mid-merit/peaking applications and stabilizing electricity grids with Renewable Energy capacities is much better suited.

9.1.4 Time Between Overhauls (TBO)

The reciprocating engines TBO is 120 000 hrs (13.7 years at 24 hrs a day, 365 days a year). It is just a very large spark plug engine. General Automotive Mechanics level are well skilled to appreciate and perform any maintenance/repair activities on the engine. The engine never leaves the site as all services are performed in suite. Major service is performed at 120 000 hrs when all the friction components are replaced and then the engine life starts over at “0”- hrs.

Air derivative turbines have a TBO 50 000 hrs to 60 000 hrs (5.7 to 6.5 years at 24 hrs a day, 365 days a year). It requires well skilled engineers to maintain and overhaul to the very high/fine tolerances required. If serious work is required on the heat module, this needs to be shipped to the factory for rework. Exporting such components and shipping is an additional cost. It is a major source of aggravation to power plant owners, where they most often have no direct control.

9.1.5 Oil consumption

The “specific oil consumption” for reciprocating engines is guaranteed at 0.4 gram/kWh as part of the combustion process. However, the true consumption is nearly half of this guaranteed value. However, the oil is never changed. As it burns off, new oil is topped up, and there is no mess or environmental issues to discard used oil.

By comparison, turbines do not use oil in the combustion process and very little oil is used in gearboxes/drives. However, this oil is drained at regular service intervals and needs to be stored on site and disposed of.

9.1.6 Smaller battery sizes

OCRE comes with smaller battery sizes. These power plants do not have an excessive risk (loss of capacity) when an engine fails, as is the case when a large capacity single turbine fails.

Smaller battery sizes give greater flexibility to closely follow the load demand. Operating at partial load (especially in the case of gas turbines) comes with reduction in electric efficiency. OCRE technology can be switched off in order to maximize operating load on remaining OCRE.

9.2 Activity Alternatives

No activity alternatives are considered as part of this EIA. The activity of the proposed project is specifically to respond to the dispatchable power requirement of the RMIPPPP, as per the ministerial determination for the procurement of 2 000 MW, gazetted on the 7 July 2020.

Furthermore, the site on which the NGEPP is proposed, houses an existing 18.5 MW gas fired cogeneration plant. As such, much of the gas, water and electrical grid tie in points are already established (although some minor reconfiguration / upgrades might be required).

9.3 Site Alternatives

Newcastle Energy bought the existing 18.5 MW cogeneration plant in 2019 from Newcastle Cogeneration. The purchase of the plant was accompanied by taking over the lease of the industrial property from the owner, Karbochem. Since the site was already secured, is of adequate size, and has established services and utility tie in points, alternative sites will not be considered in the S&EIR process.

9.4 Layout Alternatives

The layout of the power plant will be governed by safety and logistics considerations. It is expected that layout configurations on the site are limited due to these considerations, and in any event, layout options on the site are unlikely to have a material impact on impacts other than safety impacts.

Based on the above, layout alternatives will not be considered in the S&EIR process, although its recognised that the proposed layout will be determined by safety considerations, and that the Quantitative Risk Assessment proposed in this scoping report would evaluate these risks.

9.5 No-go

The no-go alternative implies the continuation of the status quo in terms of development potential, zoning and management. In the case of the NGEPP site, this would mean leaving the land as is i.e. with an 18.5 MW cogeneration plant on it.

In terms of greenhouse gas emissions, the no-go alternative assumes that this project would not be substituted by a similar project at a different location. Consequently, impacts associated with reducing greenhouse gas emissions, ensuring energy security, and promoting macro-economics at a national scale would not materialise.

In terms of air quality impacts, it is assumed that the no-go alternative would prevent other similar developments from occurring within the Newcastle airshed, and that the current air quality would be maintained.

The no-go alternative will be used as a baseline throughout the assessment process against which potential impacts will be compared and will be assessed in the EIR.

However, the site has been zoned for industrial use, is located within the industrial complex, is in line with the Newcastle Local Municipality Integrated Development Plan (IDP), Amajuba District Growth and Development Plan (DGDP) and the KZN Provincial Growth and Development Strategy (PGDS) and is extensively disturbed from the installation of services. As such, it seems likely that the no-go alternative would result in the existing cogeneration plant remaining or the site being redeveloped for another industrial use at some point in the future.

10 GHG Emissions Inventory

10.1 Emissions Calculation

To estimate the GHG emissions the following steps described further below where undertaken:

- Identification of GHG emissions sources;
- Selection of a GHG emissions calculation approach;
- Collection of activity data;
- Selection of emission factors; and
- Application of calculation tools to develop a GHG emission inventory.

10.1.1 GHG emissions source identification

Emissions can result from intentional release (which is through the direct operation of an organisation) or through unintentional released (fugitive emission) such as leaks. Both direct and fugitive emissions need to be accounted for based on the source categories identified from Annexure 1 of the NGERs. It is important to note that although Newcastle Energy's main activity is covered in category 1A1a (Electricity production), their operations include a wider scope of activities and therefore GHG emissions were identified from additional categories. The emission sources identified are expanded in Table 10-1 below.

Table 10-1: GHG Sources

Category	Code	Subcategory	Definition	Source from Proposed Project
Energy	1 A 1 a i	Electricity Generation	Comprises emissions from all fuel use for electricity generation from main activity producers except those from combined heat and power plants.	A pivotal component of the proposed NGEPP project is the installation of 13 Bergen B35:40V20AG2 natural gas engines for the purpose of generating approximately 100 MW of electricity. It is assumed that the power plant will have a minimum of 365 starts per year. Methane Rich Gas (MRG) supplied by Sasol is the primary fuel to be used whilst Liquefied Natural Gas (LNG) will be considered as a secondary fuel source in the future.
Fugitive Emissions from Fuels	1 B 2 b iii	All Other (Fugitive releases)	Fugitive emissions at natural gas facilities from equipment leaks, storage losses, pipeline breaks, well blowouts, gas migration to the surface around the outside of wellhead casing, surface casing vent bows and any other gas or vapour releases not specifically accounted for as venting or flaring.	Fugitive emissions associated with the proposed project may result from the gas connection to the Sasol Main Gas Station located at the Karbochem chemical complex. The related section of the gas pipeline which is approximately 1km long will be owned and maintained by Newcastle Energy. In addition to the pipeline fugitive emissions may arise from LNG fuel storage tanks. In order to meet the required 3 day's supply of fuel, 7 LNG storage tanks of 300m^3 will be located onsite.
Non-Energy Products from Fuels and Solvent Use	2 D 4	Other	For example, CH_4, CO and NMVOC emissions from asphalt production and use (including asphalt blowing), as well as NMVOC emissions from the use of other chemical products than solvents should be contained here, if relevant.	Although not inherently stipulated, it is assumed that oils and lubricant will be used on vehicles and machinery on the site, either during routine maintenance or repairs during the operation phase.
Other Product Manufacture and Use	2 G 1	Electrical Equipment	Electrical equipment is used in the transmission and distribution of electricity above 1 kV. SF6 is used in gas insulated switchgear (GIS), gas circuit breakers (GCB), gas-insulated transformers (GIT), gas-insulated lines (GIL), outdoor gas-insulated instrument transformers, reclosers, switches, ring main units and other equipment.	The onsite power plant substation will consist of a Gas Insulated Substation (GIS), including switchgear, synchronising breakers, uninterrupted power supply and direct current (DC) systems. The gas insulated substation generally uses sulfur hexafluoride gas as the insulating medium. As a result of normal operations gas leaks can occur leading to fugitive emissions.

10.1.2 Calculation approach

GHG emissions are calculated based on the formula of the data from the activity multiplied by the emissions factor. The result is a value of GHG emissions which is represented as a CO_2 equivalent (CO_2e). Based on the available activity data information, the relevant emissions factors were selected based on published and accepted sources.

10.1.3 Activity Data

Activity data is defined as data on the magnitude of human activity resulting in emissions or removals taking place during a given period. Presented in Table 10-2 is the activity data collected for the facility in relation to the emission sources identified in Figure 10-1.

Table 10-2: Activity data for NGEPP

Source	Fuel type	Quantity	Units
Bergen B3540V20 gas engines	Methane Rich Gas (MRG)	140,870,000	m^3
Pipeline	Methane Rich Gas (MRG)	1	km
Tanks	Liquified Natural Gas (LNG)	300	m^3
Oils, lubricants and solvents to be used for maintenance	ND	ND	ND
HV Substation and including switchgear	SF6 gas	30[6]	kg

10.1.4 Emission Factors

Emission factors are calculated ratios relating GHG emissions to proxy measure of activity at an emissions source, because GHG emissions are not directly monitored using equipment as this can be technically unfeasible or prohibitively expensive. Consequently, GHG emissions are calculated, as per best practice, through the use of activity data multiplied by an emissions factor. The emission factors used for this assessment are presented in Table 10-3.

Table 10-3: Emission Factors

Stationary Fuel Combustion Emission Factors and Net Calorific Value				
Fuel Source	CO_2 per litre (kg)	CH_4 per litre (kg)	N_2O per litre (kg)	Default Calorific Value in TJ/Tonne
Methane Rich Gas	56,100[7]	1	0.1	33.6[8]
Fugitive Releases				
Transmission				

[6] The total amount of SF6 was provided as 500 litres, which was converted to 30 kg. Based on the pressure, temperature and density relationship of the gas for the use as insulating medium. The information used was sourced from 2016 guidelines by Horizon Power.

7 There is not specific emissions factor for Methane rich gas in the technical guideline so the emissions factor for natural gas was used.

8 There is a country specific calorific value for methane rich gas in the technical guideline so this was used rather than the default calorific value for natural gas

Fuel Source	Gg of CO_2 per km	Gg of CH_4 per km	Gg of N_2O per km	
Methane Rich Gas	0.000016[9]	0.0025	NA	
Storage				
Fuel Source	Gg of CO_2 per year per a m^3	Gg of CH_4 per year per a m^3	Gg of N_2O per year per a m^3	
LNG		0.000000002	ND	

10.1.5 Global Warming Potential

The amount of greenhouse gas (GHG) emissions are expressed as carbon dioxide equivalent (CO_2e) which is the standard unit for measuring carbon footprints by expressing the impact of each different greenhouse gas in terms of the amount of CO_2. The CO_2e is a measure used to compare the emissions from various greenhouse gases based on their global warming potential (GWP). The GWP for each gas is used to convert the GHGs into equivalent amounts of CO_2e (Table 10-4)

Table 10-4: GWP for gas

GHG	Chemical Formula	Atmospheric Lifetime	Global Warming Potential (100 year)
Carbon dioxide	CO_2	100-300	1
Methane	CH_4	12.0	23
Nitrous oxide	N_2O	114	296
Sulfur hexafluoride	SF_6	Varies up to 100	22 200
Hydrofluorocarbons	HFCs	Varies up to 100	Varies
Perfluorocarbons	PFCs	Varies up to 100	Varies

10.2 Emission assessment

The GHG emissions estimations for the proposed NGEPP were considered for an annual period. GHG emissions are usually undertaken for a calendar year, this is known as the reporting year. SRK acquired information directly from client to undertake the assessment and while every effort was made to ensure the information was validated SRK has, has to assume that the values supplied are correct.

10.2.1 Estimated Emissions

The GHG emission in CO_2e emissions are presented in Table 4-1. The total emissions are 266666.04 t CO_2e. Stationary combustion for the generation of electricity is the highest contributor to the total with 265 783.28 t CO_2e (99.67%). Whilst the remaining sources contribute to 0.33% of the remaining emission. The total amount of CO_2e is presented in Figure 10-1.

[9] There is no specific emissions factor for methane rich gas in the technical guideline so the emissions factor for natural gas was used. The technical guideline however specifies a country specific calorific value for methane rich gas so this was used rather than the default value for natural gas.

Table 10-5: Cumulative Scope 1 annual emissions per zone

Source	Tonnes of CO2e	Percentage contribution (%)
Stationary Combustion	265783.28	99.67
Transmission	57.52	0.02
Storage	0.11	0.00
GIS and Switch Gear	666.00	0.25
Oil/ Lubricant use	159.14	0.06
Total	266666.04	100.00

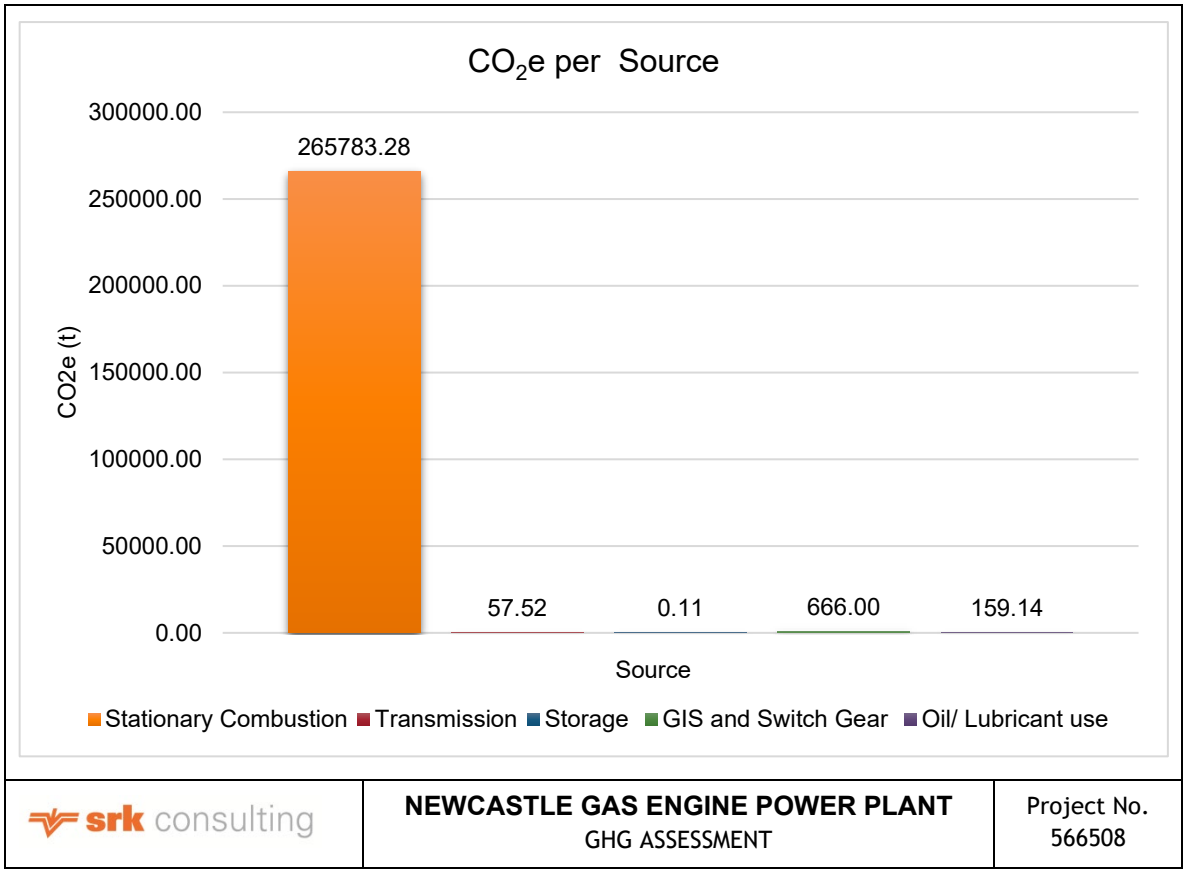


Figure 10-1: NGEPP GHG emission (CO_2e)

10.2.2 Comparative analysis

In South Africa the energy sector is the main contributor of GHG emissions and a key category in the national GHG inventory, therefore GHG emissions in this sector are important in terms if climate change and adaption. Coal is the most widely used fuel in the power sector and accounts for about 88% of energy generation. The proposed NGEPP project will provide the electricity generation capacity of approximately 100 MW which will feed into the external Eskom Grid system. This project will make use of MRG and LNG. The following comparative analysis was undertaken to compare and contrast the use of MRG against coal in the proposed NGEPP project to inform the impact assessment.

The t CO_2e for the use of coal was calculated based on the estimated operating kw/hr and the default emission factor of 0.98 kgCO_2/kWh for purchased electricity by Eskom. The results are presented in Figure 10-2. In comparison to the 266666.04 t CO_2e calculated for the use of Natural gas, emission from coal were calculated at 607 117.06 t CO_2e. The difference between coal and natural gas is 340451.01t CO_2e (which is a 128 % increase from natural gas).

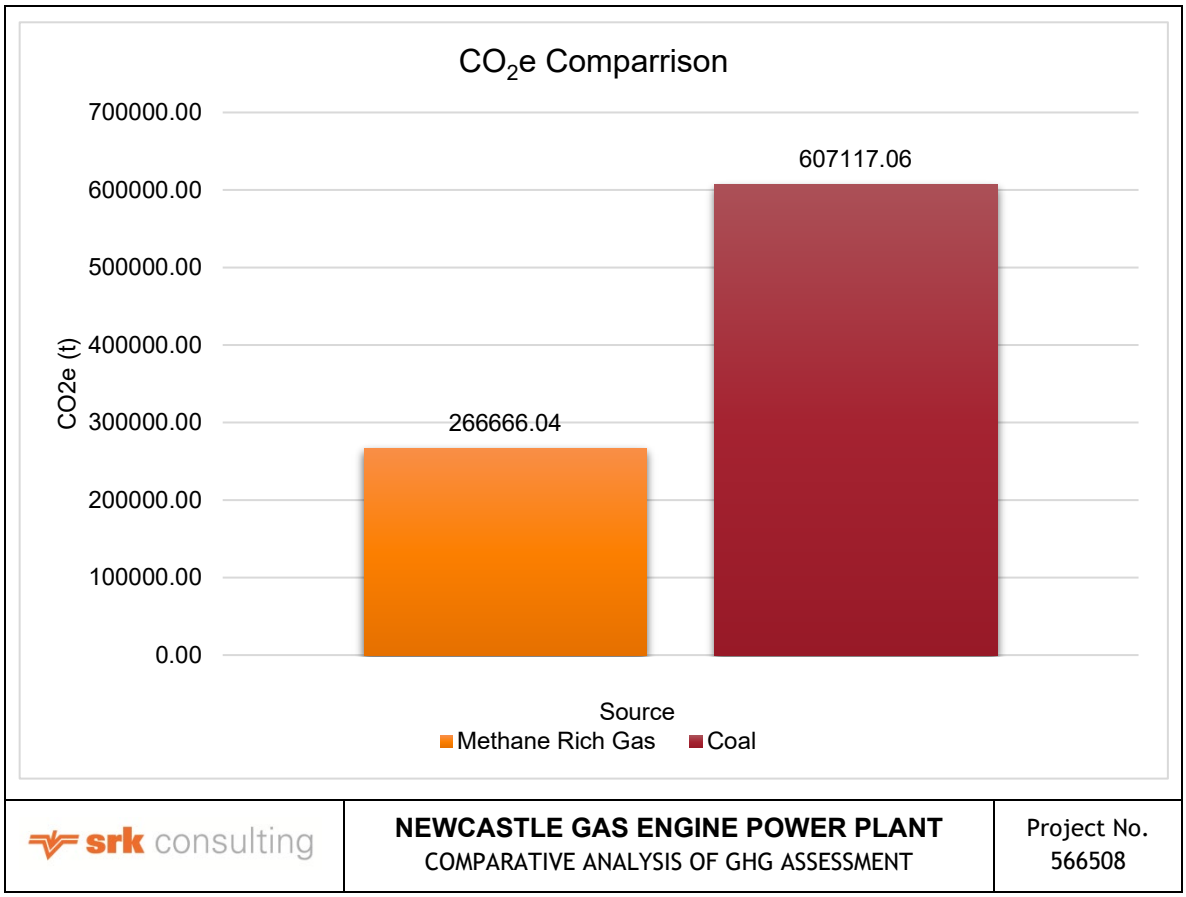


Figure 10-2: GHG emission (CO_2e) NGEPP vs Coal

11 Impact Assessment

11.1 Impact of the project on climate change

11.1.1 GHG emissions resulting from the Construction Phase

GHG emissions during the construction phase will result from machinery used to build the proposed project infrastructure and clearing activities undertaken during the construction phase. Should refrigeration or air conditional units need to be filled during construction this will also contribute to the carbon footprint of the construction phase. As above, however, as the construction related GHG emissions are not within the operational control of the NGEPP they could not be quantified for the purpose of this assessment but are qualitatively assessed in terms of its significance in Table 11-1 below.

Table 11-1: Impact Assessment for the contribution of construction related GHG emissions.

Impact CC1: GHG emissions during construction.								
Activity	Construction and installation of project infrastructure and equipment.							
Project Phase	Construction phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	Significance	Status of impact	Confidence
Before Management	(Inter) national (3)	Medium (2)	Short-term (1)	Low (5)	Definite (>90%)	Low	- ve	Medium
The significance of the impact is low and therefore mitigation measures are not strictly required. The construction phase will however result in GHG emissions albeit small and therefore there remains opportunities to further reduce GHG emissions through: • Ensuring regular maintenance of construction equipment to maximise energy efficiency. • As far as possible procure construction materials locally to reduce materials transport distances. • Plan procurement of materials, equipment and infrastructure to reduce the number of deliveries required. • Educate construction staff on energy efficiency and the need to reduce energy consumption for example, not to leave equipment idling, turn off any equipment not in use, and make note of any equipment that may not be operating normally or requiring more regular charging/ refuelling.								
After Management	(Inter) national (3)	Medium (2)	Short-term (1)	Low (5)	Definite (>90%)	Low	- ve	Medium

11.1.2 GHG emissions resulting from the Operational Phase

As per Section 10.2.1 above, the total GWP of the NGEPP is 266 506.91 t CO_2e. The most significant contributor (99.98%) as a result of stationary combustion of MRG for the generation of electricity.

According to South Africa's 3rd Biennial Update Report to the United Nations Framework Convention on Climate Change (UNFCCC) dated March 2019, South Africa's total net emissions for 2015 were approximately **512 million t CO_2e.** The project therefore would contribute approximately 0.05% to South Africa's total carbon footprint annually.

If we consider however that the project will effectively replace 100 MW of coal-based energy with a GWP of **607 117.06 t CO_2e** (0.11% of South Africa's total carbon footprint annually). An effective reduction of **340451.01 t CO_2e** (0.067% of South Africa's total carbon footprint annually) the project, while not renewable, has the potential to reduce, if not significantly, South Africa's total carbon footprint.

It is acknowledged that energy demand is likely to grow in the future therefore the project may not result in a decrease in the demand for traditional coal-based energy. It will however assist in reducing South Africa's annual carbon footprint.

The assessment of the significance of this impact is provided in Table 11-2below.

Table 11-2: Impact Assessment for the contribution of operational GHG emissions.

Impact CC2: GHG emissions during operation.								
Activity	Operation of the engines.							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	Significance	Status of impact	Confidence
Before Management	(Inter) national (3)	Medium (2)	Medium-term (2)	High (7)	Probable (70-90%)	High	+ ve	Medium
While the overall impact is positive, given that the project will reduce the GHG footprint associated with the energy output. The project however does have GHG emissions and therefore there remains opportunities to further reduce GHG emissions and therefore reduce tax liability through: • Ensure that the plant's thermal efficiency is maximised throughout the life of the plant in order to reduce the gas consumption and therefore the GHG emissions; • Manage changes in operating philosophy or offtake agreement to ensure that the engines only produce as much power as required and therefore reduce emissions. Any decrease in operating time or load factor will result in decreased total annual emissions from the plant; • Installation of solar/ photo voltaic power to provide backup power and for the projects own use to further reduce emissions intensity of the plant; • Invest in carbon offset projects through a certified institution to further offset carbon tax liability; • Create and implement GHG emission reduction projects within local communities as part of Corporate Social Responsibility (CSR) initiatives to further offset carbon tax liability; • Invest in South African clean energy research and associated projects; and • Develop a GHG management plan to effectively manage and monitor emissions over time. As part of monitoring the following information should be regularly collected: - Total MRG and other fuels consumed. - The amount of oil and lubricant used for maintenance or repair. - The amount of SF6 being refilled into the substation or switch gear. • Use this information to feed into NGEPP's carbon tax calculations so any reductions will contribute to reducing the carbon tax liability.								
After Management	(Inter) national (3)	Medium (2)	Medium-term (2)	High (7)	Probable (70-90%)	High	+ ve	Medium

11.2 Climate change risks to the project

11.2.1 Increased temperatures

As indicated in Section 9.1 it is noted that to boost turbine performance and stretch performance to equal reciprocating engine technology, additional Inlet Air/Spray Conditioning and Water Injection technology has to be applied. Newcastle Energy have indicated that the engines will output their rated capacity (~8.8MWe) up to 35°C (at 60% relative humidity (RH), 1200m altitude). They further note that should the temperature increase above 35°C, then the engines will derate i.e. reduce output. A review of the meteorological data indicates that during the summer months the 35°C threshold is not yet often exceeded but temperatures do exceed 30 - 34°C. The TNC predicts up to a 3°C increase in temperatures with an associated increase in heat-wave frequency. It is therefore likely that the operational threshold will be exceeded and could affect the output of the engines in the future.

For the hot and dry narrative the probability of fires increases. Fire events may cause damage and operational losses, as well as threaten the health and safety of employees on site. It is noted that disaster management infrastructure has been included in the design. While the proposed project isn't labour intensive, increasing temperatures are also likely to result in heat stress to any staff working outside. Additional cooling requirements may be required resulting in a greater GHG emission footprint.

Temperature increases could also result in the expansion to vector borne diseases. For the warmer wetter narrative in particular the climate may result in an increase in pests due to the hot humid conditions. The project site is currently in a low to no risk malaria area. Should temperature increase predictions be realized there is a strong possibility of the area becoming intermediate and possibly even high risk for malaria. Again, given that the project is not by nature labour intensive the impact of disease on the operation of the plant is likely to be limited.

The assessment of the significance of this impact is provided in Table 11-3 below.

Table 11-3: Impact Assessment for risks to the project as a result of increase temperatures.

Impact CC3: Impact of increased temperatures during operation.								
Activity	Operation of the engines.							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	Significance	Status of impact	Confidence
Before Management	Local (1)	Low (1)	Medium-term (2)	Very low (4)	Possible (40-70%)	Insignificant	- ve	Medium
While the impact to the project from temperature increases is insignificant. To address potential risks to the project the following mitigation measures are suggested: • Ongoing trend analysis should be undertaken to ensure that any increase in temperature or times where temperatures exceed the operational limits are identified in sufficient time to make technological improvements to ensure no interruption of supply that may compromise the offtake agreement. • Regular maintenance of the cooling system will be required to ensure limited disruption to supply due to derating at high temperatures.								
After Management	Local (1)	Low (1)	Medium-term (2)	Very low (4)	Possible (40-70%)	Insignificant	- ve	Medium

11.2.2 Decreased annual rainfall or increased drought periods

Estimated water consumption for the project is approximately 7.6 m^3 per day. This water is required for disaster (fire) management, domestic (drinking water, toilets, showers etc.) and engine cooling. The water will be sourced from Karbochem and it is acknowledged at this stage that a water resource

study has not been undertaken for this project specifically as Karbochem have indicated that they are able to supply the required water in terms of their existing offtake agreement.

For the hotter and drier narrative an increase in drought periods and a decrease in annual rainfall is predicted. With a reduction in water availability competition for limited water resources will rise. Water available for the project may therefore be threatened in the future. Further should the prevalence of fire increase the demand for fire water (disaster management) will also increase.

The assessment of the significance of this impact is provided in Table 11-4 below.

Table 11-4: Impact Assessment for risks to the project as a result of decreased annual rainfall or increased drought periods.

Impact CC4: Impact of decreased annual rainfall or increased drought periods during operation.								
Activity	Operation of the engines.							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	Significance	Status of impact	Confidence
Before Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Possible (40-70%)	Low	- ve	Medium
While the impact to the project as a result of decreased annual rainfall or increased drought periods during operation is low it still poses a significant risk to the sustainability and successful operation of the facility. To address potential risks to the project the following mitigation measures are suggested: • Alternatives for air cooling should be investigated to reduce dependence on water. As part of the investigation it is recommended that options to extend the temperature related operational limits also be investigated. This will ensure a greater buffer and an improved guarantee of supply even at expected elevated temperatures. • Should air cooling not be feasible consideration should be given to undertaking a water resource investigation to identify back up water supply should Karbochem be unable provide the required water. In Newcastle given the prediction of extended drought periods but a possibility of increased annual rainfall ground water may prove to be a feasible back up supply option. • It is strongly recommended that rather than just attenuation, rainwater harvesting be installed to provide additional water resources and address any limitations to the supply of water.								
After Management	Local (1)	Medium (2)	Medium-term (2)	Low (5)	Possible (40-70%)	Low	- ve	Medium

11.2.3 Increased fire days, intense thunderstorms and damaging flood events

For the warmer and wetter narrative an increase in intense thunderstorms and damaging flood events is predicted. This would include lightning strikes associated with the highveld thunderstorms. A lightning strike can induce an overvoltage on transmission lines and cause a flashover, which results in power failures, and damages power transmission equipment. There is also the potential for damage to infrastructure as a result of heavy rainfall and associated flooding. SRK Consulting has drafted a Hydrology and Flooding Assessment for NGEPP. This assessment modelled the floodline for the adjacent river and found that development is located outside of the 1:100-year floodlines. The study further determined that there would be an increase in the peak flow rates (14-15%) and flood volumes as a result of the NGEPP project and recommended that the surface water runoff be attenuated. The study further offers opportunities for rainwater harvesting that may address water availability issues. It is noted that the study has been conducted in terms of current best practice and using historical data. However, it is acknowledged that there remains a risk of the floodlines and peak flows changing as a result of climate change. Current models however are unable to determine to what extent. It would

therefore be prudent to revisit storm water management modelling with updated climate data regularly (every 5 years) and allow space in the design should additional attenuation become necessary.

For the warmer drier narrative an increase in fire risk days is noted. It is however acknowledged that as per email correspondence with Newcastle Energy fire risk has been included in the design in terms of the water requirements.

The assessment of the significance of this impact is provided in Table 11-5 below.

Table 11-5: Impact Assessment for risks to the project as a result of increased fire days, intense thunderstorms and damaging flood events.

Impact CC5: Impact of increased fire days, intense thunderstorms and damaging flood events during operation.								
Activity	Operation of the engines.							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	Significance	Status of impact	Confidence
Before Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Possible (40-70%)	Low	- ve	Medium
While the impact to the project as a result of increased fire days, intense thunderstorms and damaging flood events during operation is low it still poses a significant risk to the sustainability and successful operation of the facility. To address potential risks to the project the following mitigation measures are suggested: • To address risks of lightning strikes, design should include appropriate lightning protection for all infrastructure including the engines, substations and transmission lines. • Storm water management planning should be reviewed every 5 years to enable adaptation to changes in rainfall patterns. The design should allow sufficient space should additional attenuation to be constructed should it become necessary. • It is strongly recommended that rather than just attenuation, rainwater harvesting be installed to provide additional water resources and address any limitations to the supply of water. As above the design should allow for the expansion of storage capacity should it become necessary.								
After Management	Local (1)	Medium (2)	Medium-term (2)	Low (5)	Possible (40-70%)	Low	- ve	Medium

12 Mitigation, conditions or monitoring requirements

Based on the assessment of the impacts above it is noted that while the project is not renewable, the expected GHG emissions for the project are 2.2 times less than the production of the equivalent energy from coal. The project is therefore considered to have a positive impact on South Africa's carbon footprint. There remains, however, the opportunity to offset the GHG emissions from the proposed MRG. This may include any of the following:

- Ensure that the plant's thermal efficiency is maximised throughout the life of the plant in order to reduce the gas consumption and therefore the GHG emissions;
- Manage changes in operating philosophy or offtake agreement to ensure that the engines only produce as much power as required and therefore reduce emissions. Any decrease in operating time or load factor will result in decreased total annual emissions from the plant;
- Installation of solar/ photo voltaic power to provide backup power and for the projects own use to further reduce emissions intensity of the plant;
- Invest in carbon offset projects through a certified institution to further offset carbon tax liability;

- Create and implement GHG emission reduction projects within local communities as part of Corporate Social Responsibility (CSR) initiatives to further offset carbon tax liability;
- Invest in South African clean energy research and associated projects; and
- Develop a GHG management plan to effectively manage and monitor emissions over time. As part of monitoring the following information should be regularly collected:
  - Total MRG and other fuels consumed.
  - The amount of oil and lubricant used for maintenance or repair.
  - The amount of SF6 being refilled into the substation or switch gear.

  This information will then also feed into NGEPP's carbon tax calculations so any reductions will contribute to reducing the carbon tax liability.

In terms of adapting to the risk imposed on the project by climate change the three main risks identified included risks from increased temperatures, reduced water availability and extreme weather (flooding and lighting). The following recommendations are offered to address these risks to the project:

- Alternatives for air cooling should be investigated to reduce dependence on water. As part of the investigation it is recommended that options to extend the temperature related operational limits also be investigated. This will ensure a greater buffer and an improved guarantee of supply even at expected elevated temperatures.
- Should air cooling not be feasible consideration should be given to undertaking a water resource investigation to identify back up water supply should Karbochem be unable provide the required water. In Newcastle given the prediction of extended drought periods but a possibility of increased annual rainfall ground water may prove to be a feasible back up supply option.
- Similarly, should it not be feasible to extend the temperature related operational limits, it is recommended that ongoing trend analysis be undertaken to ensure that any increase in temperature or times where temperatures exceed the operational limits be undertaken regularly to ensure any such increases are identified in sufficient time to make technological improvements to ensure no interruption of supply that may compromise the offtake agreement.
- Furthermore, the regular maintenance of the cooling system will be required to ensure limited disruption to supply due to derating at high temperatures.
- To address risks of lightning strikes, design should include appropriate lightning protection for all infrastructure including the engines, substations and transmission lines.
- Storm water management planning should be reviewed every 5 years to enable adaptation to changes in rainfall patterns. The design should allow sufficient space should additional attenuation to be constructed should it become necessary.
- It is strongly recommended that rather than just attenuation, rainwater harvesting be installed to provide additional water resources and address any limitations to the supply of water. As above the design should allow for the expansion of storage capacity should it become necessary.

13 Consultation Process

The specialist report will form part of the Environmental Impact Report that will be made available to the public for comment for the legislated 30-day period as per Chapter 6 of the EIA Regulations (GN 326, 07 April 2017) and the Guideline on Public Participation in the EIA Process (GN 807, 10 October 2012). All comments received on the draft report will be incorporated into the revised/ final report, which will be submitted to DEFF and will be made available on the SRK website for review by commenting authorities and IAPs.

14 Specialist opinion

While the project is not renewable, the expected GHG emissions for the project are 2.2 times less than the production of the equivalent energy from coal. Further, while risks to the project as a result of potential climatic changes have been identified, they are not considered fatal flaws. Therefore, from a climate change assessment perspective SRK does not note any specific climate change conditions required as part of the authorisation. Recommendations are, however, offered to reduce GHG emissions and associated carbon tax liability and make the project more resilient to climate change risk.

Prepared by

Philippa Burmeister PrSciNat EAP

Principal Scientist (Air Quality and Climate Change)

Reviewed by

Marius van Huyssteen CEAPSA

Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

15 References

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Appendices

Appendix A: Specialist CV's

Philippa Burmeister (Emanuel)

Principal Scientist

Profession	Environmental Science (Air Quality and Climate Change)
Education	Driving Business towards the Sustainable Development Goals, University of Rotterdam, 2019
	Planning for Climate Change in African Cities, IHS and University of Rotterdam, 2019
	Climate Change Mitigation in Developing Countries, University of Cape Town, 2019
	Bonsucro Sustainability Auditor Training, 2017
	International Qualification, Environmental Auditing, Aspects International, 2010
	Dip, Project Management, Varsity College, 2008
	BSc (Hons), Environmental Science, Rhodes University, 2002
Registrations/ Affiliations	Pr.Sci.Nat, South Africa, 400195/08
	Registered EAP, 2020/896
	Member, NACA
	Member, IAIA
	Environmental Science (Air Quality and Climate Change)
Awards	None

Specialisation

Philippa partners with business to identify and execute innovative sustainability solutions to strategic resource challenges. Philippa specialises in sustainability assessment including the use of a range of integrated environmental management tools, listed below. The focus of her work is the identification of environmental opportunities and constraints leading to the sustainable use of natural resources to efficiently meet socio-economic needs. This includes auditing and the development of environmental management systems. Most recently she has focussed attention on a specialisation in Air Quality and Climate Change.

Expertise

Philippa aims to change the perception of sustainability from a requirement to an asset that business may realise through the implementation of strategic planning and alternatives. Philippa has been involved in integrated environmental management for the past 17 years. Her expertise includes:

- climate change strategy development
- greenhouse gas emission inventory development and verification
- environmental and air quality process management including environmental and air quality impact assessment;
- strategic environmental assessment at municipal or large scale and project specific level including development of environmental management plans;
- preparation of environmental management frameworks;
- development of sustainability frameworks and sustainability appraisal and auditing;
- preparation and auditing of environmental management systems (ISO 14001) and environmental management programmes.

Employment

2016 – present	SRK Consulting (Pty) Ltd, Principal Scientist, Environmental Department, Durban
2009 – 2016	SRK Consulting (Pty) Ltd, Senior Scientist, Environmental Department, Durban
2007 – 2009	SRK Consulting (Pty) Ltd, Scientist, Environmental Department, Pietermaritzburg
2003 – 2007	Udidi Environmental Planning & Development Consultants, Environmental Planner, Durban

Philippa Burmeister (Emanuel)

Principal Scientist

Publications	Several environmental scientist publications
Languages	English – read, write, speak (Excellent) Afrikaans – read, write, speak (Fair)

Philippa Burmeister (Emanuel)

Principal Scientist

Publications

1. Burmeister P, van Der Weg, D (2018) How to reduce infrastructure costs with sustainable design. Civil Engineering Vol 28 No 8 pg 18

2. Burmeister (Emanuel), P (2015): Consultant tackles tight EIA timeframes in Water, Sewerage and Effluent 1 October 2015 p9

3. Burmeister (Emanuel), P (2015): Pre-screening helps cut frustration in EIA processes in Mining Mirror 1 October 2015 p9

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8. Emanuel, P.L. 2002. The Knysna Seahorse Story. African Wildlife (Journal of the wildlife and environment society of South Africa), Vol. 56 (4) pg 9-11

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Air Quality Management

Location:	Johannesburg, South Africa
Project duration & year:	2020 - present
Client:	Airports Company South Africa
Name of Project:	OR Thambo Cargo complex Air Quality Impact Assessment
Project Description:	Assess the impact to air quality of the proposed construction of a fully functional Cargo complex and associated infrastructure
Job Title and Duties:	Project Manager and Principal Scientist – Review baseline and monitoring information, identify and assess potential impacts and offer potential mitigation measures.
Value of Project:	NA

Location:	East London, South Africa
Project duration & year:	2019 - present
Client:	East London Industrial Development Zone
Name of Project:	East London Industrial Development Zone ambient air quality monitoring
Project Description:	Ambient air quality monitoring study for the ELIDZ over a three-year period from January 2019 to December 2021 and quarterly reporting.
Job Title and Duties:	Project Manager
Value of Project:	NA

Location:	Alfred Nzo District Municipality
Project duration & year:	August 2018 – April 2019
Client:	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism
Name of Project:	Air Quality Management Plan for the Alfred Nzo District Municipality
Project Description:	Preparation of Emissions Inventory, Air Quality Monitoring Plan, Status Quo Assessment, Capacity Analysis and Air Quality Management Plan for the District Municipality
Job Title and Duties:	Policy Developer: Preparation of the Air Quality Management Plan, client liaison and coordination of public participation activities.
Value of Project:	N/A

Location:	South Africa
Project duration & year:	August 2017 – November 2018
Client:	Department of Environmental Affairs
Name of Project:	Review of the 2012 National Framework on Air Quality Management
Project Description:	Assist with the review of the 2012 Framework. Specifically, the facilitation of comments, recording thereof and providing independent review of how these comments are addressed, preparation of a review report highlighting proposed changes, finalisation of the Framework prior to gazetting.
Job Title and Duties:	Project manager: Duties included project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, management of the public participation process, reporting and product packaging
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Climate Change

Location:	Eastern Cape, South Africa
Project duration & year:	January 2020 – present
Client:	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT)
Name of Project:	Mainstreaming Climate Change in DEDTEA policies
Project Description:	Mainstream climate change considerations into the following provincial Policies / Plans: 1. The Provincial Sustainable Energy Strategy. 2. The Provincial Industrial Development Strategy. 3. The Eastern Cape Biodiversity Conservation Plan. 4. The Eastern Cape Tourism Master-Plan. 5. The Eastern Cape Coastal Management Programme.
Job Title and Duties:	Project manager: Duties included project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, management of the public participation process and product packaging
Value of Project:	N/A

Location:	Durban, South Africa
Project duration & year:	2017 - ongoing
Client:	Dube Tradeport Corporation
Name of Project:	DTPC GHG Assessment
Project Description:	A GHG Assessment, carbon monitoring procedure, management plan and training for Aerotropolis and tradeport
Job Title and Duties:	Project Manager
Value of Project:	N/A

Location:	Richards Bay, South Africa
Project duration & year:	2017 - ongoing
Client:	Mondi
Name of Project:	Mondi GHG emissions inventory verification
Project Description:	Verification of Mondi Craft's GHG emissions inventory
Job Title and Duties:	Project Manager
Value of Project:	N/A

Key Experience: Air Quality Compliance

Location:	Mpumalanga, South Africa
Project duration & year:	November 2019 – present
Client:	Sasol
Name of Project:	2020 Sasol MES postponement application
Project Description:	Preparation of motivation documents for postponement of compliance timeframes in terms of the MES promulgated in terms of the NEMAQA for Sasol's Synfuels and Infrachem operations
Job Title and Duties:	Project manager: Duties included project coordination and management of the project team and specialists, liaison with the client, project programming, budgeting, invoicing and progress reporting, management of the public participation process and product packaging
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Air Quality Compliance

Location:	Gauteng, South Africa
Project duration & year:	September 2019 - present
Client:	Hendok
Name of Project:	Legal Compliance Audit
Project Description:	Legal Compliance Audit in terms of environmental legislation with associated applications in terms of 22A of NEMAQA and 24G of NEMA.
Job Title and Duties:	Environmental Assessment Practitioner: Undertake site inspection, review process description and identify any legal compliance issues. Suggest rectification measures, discuss and obtain buy-in from authorities and then undertake processes to apply for rectification.
Value of Project:	N/A
Location:	Modderfontien South Africa
Project duration & year:	Annually December 2016 - present
Client:	AEL Mining Services (AECI)
Name of Project:	Atmospheric Emissions License Annual Compliance Auditing
Project Description:	Auditing compliance with the conditions of the AEL Mining Services Atmospheric Emissions License.
Job Title and Duties:	Project lead: Undertake site inspection, review monitoring data, identify non-compliances and rectification actions, client liaison and reporting
Value of Project:	N/A
Location:	Freestate and Mpumalanga, South Africa
Project duration & year:	February 2018 – April 2019
Client:	Sasol/ Natref
Name of Project:	2019 Sasol and Natref MES postponement application
Project Description:	Preparation of motivation documents for postponement of compliance timeframes in terms of the MES promulgated in terms of the NEMAQA for Sasol's and Natref's operations.
Job Title and Duties:	Project manager: Duties included project coordination and management of the project team and specialists, liaison with the client and providing procedural guidance, project programming, budgeting, invoicing and progress reporting, management of the public participation process and product packaging
Value of Project:	N/A
Location:	uMbogintwini
Project duration & year:	March 2017 – April 2019
Client:	Experse Surfactant Technologies
Name of Project:	Legal Compliance Audit
Project Description:	Legal Compliance Audit in terms of environmental legislation with associated applications in terms of 22A of NEMAQA.
Job Title and Duties:	Environmental Assessment Practitioner: Undertake site inspection, review process description and identify any legal compliance issues. Suggest rectification measures, discuss and obtain buy-in from authorities and then undertake processes to apply for rectification including a 22A and AEL application.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Air Quality Compliance

Location:	Freestate and Mpumalanga, South Africa
Project duration & year:	September 2016 – March 2017
Client:	Sasol/ Natref
Name of Project:	2017 Sasol and Natref MES postponement application
Project Description:	Preparation of motivation documents for postponement of compliance timeframes in terms of the MES promulgated in terms of the NEMAQA for Sasol's Synfuels and Infrachem operations
Job Title and Duties:	Project manager: Duties included project coordination and management of the project team and specialists, liaison with the client, project programming, budgeting, invoicing and progress reporting, management of the public participation process and product packaging
Value of Project:	N/A

Location:	Mpumalanga, South Africa
Project duration & year:	December 2015 – May 2016
Client:	Sasol
Name of Project:	2017 Sasol MES postponement application
Project Description:	Preparation of motivation documents for postponement of compliance timeframes in terms of the MES promulgated in terms of the NEMAQA for Sasol's Synfuels Tar Tanks
Job Title and Duties:	Project manager: Duties included project coordination and management of the project team and specialists, liaison with the client, project programming, budgeting, invoicing and progress reporting, management of the public participation process and product packaging
Value of Project:	N/A

Location:	Freestate and Mpumalanga, South Africa
Project duration & year:	October 2015 – February 2016
Client:	Sasol/ Natref
Name of Project:	Sasol and Natref Offset Public Participation
Project Description:	Public Participation for the Draft Offset Implementation Plan prepared in compliance with the decision regarding Sasol's MES postponement applications
Job Title and Duties:	Project manager: Duties included project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, management of the public participation process and product packaging
Value of Project:	N/A

Key Experience: National environmental management: air quality act 39 of 2004

Location:	Richards Bay, KwaZulu – Natal
Project duration & year:	September 2014 – April 2019
Client:	Foskor Richards Bay Division
Name of Project:	Foskor MEA postponement Application
Project Description:	Preparation of motivation documents and undertaking the stakeholder engagement process as part of an application for postponement of compliance timeframes in terms of the MES for t
Job Title and Duties:	Environmental Assessment Practitioner: Duties included project coordination and management of the project team and specialists, liaison with the client, project programming, budgeting, invoicing and progress reporting, management of the public participation process, preparation of the motivation report and presentation and product packaging
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience:	**National environmental management: air quality act 39 of 2004**
Location:	Modderfontien, South Africa
Project duration & year:	October 2014 – April 2015
Client:	AEL Mining Services
Name of Project:	AEL Mining Services Minimum Emission Standards (MES) postponement application
Project Description:	Preparation of motivation documents and undertaking the stakeholder engagement process as part of an application for postponement of compliance timeframes in terms of the MES promulgated in terms of the National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA) certain components of the AEL Mining Services' Modderfontien operations
Job Title and Duties:	Environmental Assessment Practitioner: Duties included preparation of the motivation report and presentation and product packaging.
Value of Project:	N/A
Location:	Milnerton, Cape Town, South Africa
Project duration & year:	May 2014 – March 2015
Client:	The Cape Town Refinery operated by Chevron
Name of Project:	Cape Town Refinery MES postponement application
Project Description:	Preparation of motivation documents and undertaking the stakeholder engagement process as part of an application for postponement of compliance timeframes in terms of the MES promulgated in terms of the NEMAQA for certain components of the Cape Town Refinery operated by Chevron
Job Title and Duties:	Environmental Assessment Practitioner: Duties included project coordination and management of the project team and specialists, liaison with the client, project programming, budgeting, invoicing and progress reporting, preparation of the motivation report and presentation and product packaging
Value of Project:	N/A
Location:	Freestate, Gauteng and Mpumalanga, South Africa
Project duration & year:	May 2013 – March 2015
Client:	Sasol/ Natref
Name of Project:	2015 Sasol and Natref MES postponement application
Project Description:	Preparation of motivation documents for postponement of compliance timeframes in terms of the MES promulgated in terms of the NEMAQA for Sasol's Synfuels, Infrachem and Nitro operations
Job Title and Duties:	Project coordinator: Duties included project coordination and management of the project team and specialists, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Strategic environmental assessment

Location:	South Africa
Project duration & year:	2012 – 2013
Client:	Transnet Capital Projects
Name of Project:	Strategic Environmental assessment of the Transnet 2012 Long Term Planning Framework
Project Description:	Undertake a Strategic Environmental Assessment Process for the 2012 Long Term Planning Framework to understand the environmental implications of the infrastructure expansion proposed in the Framework and understand the environmental opportunities and constraints to the Framework.
Job Title and Duties:	Project Leader: Duties included project coordination and management of the project team, development of the approach and liaison with the client, analysis and preparation of reports, project programming, budgeting, invoicing and progress reporting.
Value of Project:	N/A
Location:	Cato Ridge, KwaZulu-Natal
Project duration & year:	July 2010 - August 2012
Client:	Assmang Manganese Cato Ridge Works
Name of Project:	Assmang SEA
Project Description:	Undertake a Strategic Environmental Assessment Process for the Assmang Manganese Cato Ridge Works and prepare a Strategic Environmental Management Plan to inform EIA decision making and their Environmental Management System.
Job Title and Duties:	Environmental Assessment Practitioner: Duties included project coordination and management of monitoring team, development of training materials and liaison with the client, project programming, budgeting, invoicing and progress reporting.
Value of Project:	N/A
Location:	Msunduzi Municipality, KwaZulu-Natal
Project duration & year:	August 2008 - May 2010
Client:	Department of Environmental Affairs
Name of Project:	Msunduzi Environmental Management Framework
Project Description:	Undertake a Strategic Environmental Assessment of the Msunduzi Municipal Spatial Development Framework and develop a Strategic Environmental Management Plan for the Municipal Area.
Job Title and Duties:	Project Coordinator: Duties include project coordination and management of the EMF process to include management of the specialist team, liaison between the client and specialists, information gathering and reporting and product packaging
Value of Project:	N/A
Location:	Kokstad Municipality, KwaZulu-Natal
Project duration & year:	May 2005 - December 2005
Client:	Greater Kokstad Municipality
Name of Project:	Kokstad Integrated Environmental Program
Project Description:	Undertake a Strategic Environmental Assessment of the Greater Kokstad Municipality and develop a Strategic Environmental Management Plan for the Municipal Area to inform decision making within the Municipal Area.
Job Title and Duties:	Environmental Assessment Practitioner: Duties included preparation of a Strategic Environmental Assessment and Environmental Management Plan for the entire Municipal area to include public participation and the preparation of business plans for improved environmental management.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Strategic environmental assessment

Location:	Sisonke District Municipality, KwaZulu Natal
Project duration & year:	January 2004 - August 2004
Client:	Sisonke District Municipality
Name of Project:	Sisonke District Integrated Environmental Program
Project Description:	Undertake a Strategic Environmental Assessment of the Sisonke District Municipality and develop a Strategic Environmental Management Plan for the Municipal Area.
Job Title and Duties:	Environmental Assessment Practitioner: Duties included preparation of a Strategic Environmental Assessment and Environmental Management Plan for the entire district to include public participation and the preparation of business plans for improved environmental management.
Value of Project:	N/A

Location:	Amajuba Municipality, KwaZulu-Natal
Project duration & year:	March 2003 - August 2003
Client:	Amajuba District Municipality
Name of Project:	Amajuba District Integrated Environmental Program
Project Description:	Undertake a Strategic Environmental Assessment of the Amajuba District Municipality and develop a Strategic Environmental Management Plan for the Municipal Area.
Job Title and Duties:	Environmental Assessment Practitioner: Duties included preparation of a Strategic Environmental Assessment and Environmental Management Plan for the entire district to include public participation and the preparation of business plans for improved environmental management.
Value of Project:	N/A

Key Experience: Environmental management systems and auditing

Location:	Bloemfontein, Free State
Project duration & year:	October 2011 - August 2013
Client:	South African National Roads Agency
Name of Project:	N1 Environmental Auditing
Project Description:	Environmental Compliance Monitoring of N1 route rehabilitation activities in Section 14
Job Title and Duties:	Auditing of environmental compliance and Environmental Conservation Officer activities on the N1 Section 14.
Value of Project:	N/A

Location:	Durban, KwaZulu-Natal
Project duration & year:	May 2010 - August 2010
Client:	Black Pepper Events
Name of Project:	FIFA 2010 World Cup eThekwini Environmental Monitoring and Training
Project Description:	Implementation and monitoring of the Environmental Management Strategy for FIFA 2010 World Cup venues in eThekwini Municipality
Job Title and Duties:	Lead Auditor: Duties included project coordination and management of monitoring team, development of training materials and liaison with the client, project programming, budgeting, invoicing and progress reporting.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Environmental management systems and auditing

Project duration & year:	September 2009 - May 2010
Client:	eThekwini Municipality
Name of Project:	FIFA 2010 World Cup eThekwini Venues EMS
Project Description:	Development of Environmental Management Strategies for FIFA 2010 World Cup venues in eThekwini Municipality
Job Title and Duties:	Project Manager: Duties included project coordination and management of the EMS process to include, EMS development, management of the project team and specialists, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging
Value of Project:	N/A

Key Experience: Environmental impact assessment and environmental management plans

Location:	Richards Bay KwaZulu-Natal
Project duration & year:	May 2014 – August 2016
Client:	Richards Bay Mining
Name of Project:	Zulti South Mine Lease Area Environmental Impact Assessment
Project Description:	Application for amendment to the Environmental Management Programme (EMPr) in terms of the Mining and Petroleum Resources Act 28 of 2002 (MPRDA) and for authorisation in terms of the National Environmental Management Act (No. 107 of 1998) Environmental Impact Assessment Regulations for the construction for the Zulti South Mine Lease Area and associated infrastructure.
Job Title and Duties:	Environmental Assessment Practitioner: Duties included management of specialists and preparation of the assessment and EMPr components of the Environmental Impact Assessment (EIA) Report.
Value of Project:	N/A

Location:	Dassenhoek Outer west KwaZulu-Natal
Project duration & year:	2013 - 2014
Client:	Illiso
Name of Project:	Dassenhoek Sanitation Basic Assessment
Project Description:	Basic Assessment in terms of the NEMA EIA Regulations for the construction of bulk sanitation infrastructure and containerised ablution facilities.
Job Title and Duties:	Senior Environmental Scientist: Duties included development of the project budget and timing. Client liaison, management of the public participation process and reporting.
Value of Project:	N/A

Location:	uMbogintwini KwaZulu-Natal
Project duration & year:	2013 - 2014
Client:	Lake International, uMbogintwini Industrial Complex
Name of Project:	Lake International Basic Assessment
Project Description:	Basic Assessment in terms of the NEMA EIA Regulations for the expansion of Lake International's hazardous material storage capacity
Job Title and Duties:	Senior Environmental Scientist: Duties included development of the project budget and timing. Client liaison, management of the public participation process and reporting review.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Environmental impact assessment and environmental management plans

Location:	Mobeni Kwa-Zulu Natal
Project duration & year:	2013 - 2014
Client:	Kansai Plascon, Mobeni
Name of Project:	Kansai Plascon Basic Assessment
Project Description:	Basic Assessment in terms of the NEMA EIA Regulations for the decommissioning of their existing solvent storage tanks.
Job Title and Duties:	Senior Environmental Scientist: Duties included development of the project budget and timing. Client liaison, management of the public participation process and reporting review.
Value of Project:	N/A
Location:	Cato Ridge KwaZulu-Natal
Project duration & year:	September 2010 - 2012
Client:	Safal Steel, Cato Ridge
Name of Project:	Safal Operational Environmental Management Plan
Project Description:	Development and monitoring of the Operational Environmental Management Plan for Safal Steel.
Job Title and Duties:	Senior Environmental Scientist: Duties included development of the project budget and timing. Identification of potential environmental risks and legal requirements. Development of the Operational Environmental Management Plan
Value of Project:	N/A
Location:	Port St Johns, Eastern Cape
Project duration & year:	June 2011 - 2012
Client:	The Lily Lodge
Name of Project:	Lily Lodge 24G application
Project Description:	Application for rectification in terms of Section 24G of the National Environmental Management Act (No. 107 of 1998) (NEMA)
Job Title and Duties:	Environmental Assessment Practitioner: Duties include project coordination and management of the environmental assessment process to include public involvement and the preparation of the draft and final Assessment Report and draft Environmental Management Plan.
Value of Project:	N/A
Location:	Richards Bay, KwaZulu-Natal
Project duration & year:	March 2007 - October 2010
Client:	Alfluorco
Name of Project:	Alfluorco Environmental Impact Assessment
Project Description:	Environmental Impact Assessment for proposed Alfluorco Aluminum Fluoride Production Facility
Job Title and Duties:	Environmental Assessment Practitioner: Duties include project coordination and management of the EIA process to include public involvement and specialist input and the preparation of the Background Information Document, draft and final Scoping Report and draft Environmental Impact Report and Environmental Management Plan.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience:	**Environmental impact assessment and environmental management plans**
Location:	Kokstad, KwaZulu-Natal
Project duration & year:	April 2006 – August 2006
Client:	Singisi Forest Products
Name of Project:	Singisi Environmental Impact Assessment
Project Description:	Environmental Impact Assessment for the Singisi Wood Processing Facility in Kokstad
Job Title and Duties:	Environmental Assessment Practitioner: Duties include project coordination and management of the EIA process to include public involvement and specialist input and the preparation of the Background Information Document and draft and final Scoping Report.
Value of Project:	N/A
Location:	Richards Bay, KwaZulu-Natal
Project duration & year:	September 2005 - January 2007
Client:	uMhlathuze Municipality
Name of Project:	Hillview Environmental Impact Assessment
Project Description:	Environmental Impact Assessment for Medium Income Housing
Job Title and Duties:	Environmental Assessment Practitioner: Duties included project coordination and management of the EIA process in terms of the ECA. This included public involvement, identification and assessment of potential impacts and making recommendations for potential mitigation measures. Duties include the preparation of the following documents: Background Information Document and draft and final Scoping Reports.
Value of Project:	N/A
Location:	Dumbe, eDumbe Municipality, KwaZulu-Natal
Project duration & year:	October 2003 - February 2004
Client:	eDumbe Municipality
Name of Project:	Dumbe Housing Environmental Impact Assessment
Project Description:	Environmental Impact Assessment for Dumbe Housing Project
Job Title and Duties:	Environmental Assessment Practitioner: Duties included project coordination and management of the EIA process in terms of the ECA. This included public involvement, identification and assessment of potential impacts and making recommendations for potential mitigation measures. Duties include the preparation of the following documents: Background Information Document and draft and final Scoping Reports.
Value of Project:	N/A
Location:	Ncothane, uPhongolo Municipality
Project duration & year:	April 2003 - October 2003
Client:	uPhongolo Local Council
Name of Project:	Ncothane Environmental Impact Assessment
Project Description:	Environmental Impact Assessment for Ncothane Housing Project
Job Title and Duties:	Environmental Assessment Practitioner: Duties included project coordination and management of the EIA process in terms of the ECA. This included public involvement, identification and assessment of potential impacts and making recommendations for potential mitigation measures. Duties include the preparation of the following documents: Background Information Document and draft and final Scoping Reports.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Environmental impact assessment and environmental management plans

Location:	Shayamoya, Umdoni Municipality
Project duration & year:	March 2003 - July 2003
Client:	Umdoni Municipality
Name of Project:	Shayamoya Cemetery Environmental Impact Assessment
Project Description:	Environmental Impact Assessment for Shayamoya Cemetery
Job Title and Duties:	Environmental Assessment Practitioner: Duties included project coordination and management of the EIA process in terms of the ECA. This included public involvement, identification and assessment of potential impacts and making recommendations for potential mitigation measures. Duties include the preparation of the following documents: Background Information Document and draft and final Scoping Reports.
Value of Project:	N/A

Key Experience: Environmental policy development

Location:	KwaZulu-Natal, South Africa
Project duration & year:	2009 - 2012
Client:	KwaZulu-Natal Department of Environmental Affairs and Rural Development
Name of Project:	KwaZulu-Natal Hazardous Waste Management Plan
Project Description:	Development of a Hazardous Waste Management Plan for the Province
Job Title and Duties:	Project Manager: Collection and analysis of information, liaison with industry and waste management service providers to obtain information, policy writing and public involvement.
Value of Project:	N/A

Location:	Maloti Drakensberg, South Africa and Lesotho
Project duration & year:	November 2005 - December 2006
Client:	Maloti Drakensberg Transfrontier Project
Name of Project:	Maloti Drakensberg Transfrontier Project Security Strategy
Project Description:	Facilitation and Development of a Security Strategy for Maloti Drakensberg Transfrontier Project Area
Job Title and Duties:	Project Coordinator: Duties included project management, public consultation to identify issues, facilitation of policy formulation process and document compilation and editing.
Value of Project:	N/A

Location:	Royal Natal National Park
Project duration & year:	September 2005 - December 2005
Client:	Ezemvelo KZN Wildlife
Name of Project:	Redevelopment Concept for the Royal Natal National Park Hotel
Project Description:	Preparation of a Redevelopment Concept for the Royal Natal National Park Hotel
Job Title and Duties:	Project Coordinator: Duties included project management, and community liaison to include tourism concept development to include mapping and reporting.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Environmental policy development

Location:	Maloti Drakensberg, South Africa and Lesotho
Project duration & year:	January 2005 - February 2006
Client:	Maloti Drakensberg Transfrontier Project
Name of Project:	Amphitheatre/ Sentinel Node Tourism Concept Plan
Project Description:	Development of a Tourism Concept plan for the Amphitheatre/ Sentinel Node
Job Title and Duties:	Project Coordinator: Duties included project management, and community liaison to include tourism concept development to include mapping and reporting.
Value of Project:	N/A

Location:	Sisonke KwaZulu-Natal
Project duration & year:	November 2004 - January 2005
Client:	Sisonke District Municipality
Name of Project:	Mkomasi Wilderness Area Land Use Management Framework
Project Description:	Development of the Mkomasi Wilderness Area Land Use Management Framework
Job Title and Duties:	Environmental Planner: Duties included preparation of Zonation Mapping and associated Scheme Clauses
Value of Project:	N/A

Location:	Siyaya Coastal Park, KwaZulu-Natal
Project duration & year:	May 2004 - August 2004
Client:	uThungulu District Municipality
Name of Project:	Siyaya Coastal Park Integrated Management Plan
Project Description:	Development of Siyaya Coastal Park Integrated Management Plan
Job Title and Duties:	Environmental Planner: Duties included preparation of the conceptual zonation and reporting
Value of Project:	N/A

Location:	KwaZulu-Natal
Project duration & year:	April 2003 - July 2004
Client:	Planning & Development Commission
Name of Project:	KwaZulu-Natal Ecotourism Guidelines
Project Description:	Development of a set of guidelines to inform development authorisations for Ecotourism facilities in KwaZulu-Natal
Job Title and Duties:	Project Coordinator: Duties included administrative management, public consultation, document compilation and assistance with policy formulation.
Value of Project:	N/A

Key Experience: Environmental management frameworks

Location:	Msunduzi Municipality, KwaZulu-Natal
Project duration & year:	June 2017 - date
Client:	Msunduzi Municipality
Name of Project:	Review and update of the Msunduzi Environmental Management Framework
Project Description:	Development of an Environmental Management Framework
Job Title and Duties:	Project Coordinator: Duties include project coordination and management of the EMF process to include management of the specialist team, liaison between the client and specialists, information gathering and reporting.
Value of Project:	N/A

Philippa Burmeister (Emanuel)

Principal Scientist

Key Experience: Environmental management frameworks

Location:	Msunduzi Municipality, KwaZulu-Natal
Project duration & year:	August 2008 - May 2010
Client:	Department of Environmental Affairs
Name of Project:	Msunduzi Environmental Management Framework
Project Description:	Development of an Environmental Management Framework
Job Title and Duties:	Project Coordinator: Duties include project coordination and management of the EMF process to include management of the specialist team, liaison between the client and specialists, information gathering and reporting and product packaging
Value of Project:	N/A

Key Experience: Training and facilitation

Location:	Pietermaritzburg KwaZulu-Natal
Project duration & year:	April 2007
Client:	uMgungundlovu District Municipality
Name of Project:	Municipal Cemetery Management Training
Project Description:	Municipal Cemetery Management Facilitation
Job Title and Duties:	Facilitator: Duties included development of cemetery management training materials and facilitation of a Cemetery Management Workshop for district and local municipalities.
Value of Project:	N/A

Location:	KwaZulu-Natal
Project duration & year:	January 2004 - August 2004
Client:	Department of Environmental Affairs and Tourism
Name of Project:	Municipal Waste Management Training
Project Description:	Municipal Waste Management Facilitation
Job Title and Duties:	Facilitator: Duties included facilitation of Waste Management Workshops for district and local municipalities to include a hierarchical approach to waste management and waste management best practice.
Value of Project:	N/A

Ashleigh Maritz

Senior Scientist

Profession	Environmental Science and Management
Education	MSc (Biochemistry) Cum Laude, University of Johannesburg, 2007 BSc Honours (Biochemistry) Cum Laude, University of Johannesburg, 2005 BSc (Chemistry and Biochemistry), University of Johannesburg, 2004
Registrations/ Affiliations	Pr.Sci.Nat, SACNASP, 400331/11 Member, EAPASA, 2020/547 Member, IAIAsa Member, NACA
Awards	None

Specialisation

Environmental project management; environmental and social impact assessments, due diligence reviews, strategic environmental planning, environmental construction management.

Expertise

Ashleigh has 12 years' experience in the mining, agricultural, water, climate change, energy and infrastructure sectors specialising in environmental impact assessment and management, environmental and social safeguards, due diligence and environmental review. Her core expertise lies in project management of environmental and social impact assessments (within South African and Africa), auditing and due diligence/technical reviews. Ashleigh also has a keen interest in Climate Change and is focussed on developing her expertise in the mitigation and adaptation spheres of this field. Recently, Ashleigh has being involved in mega infrastructure and energy projects and her experience also spans into the mining and governmental sectors in South Africa, Zimbabwe, Malawi, Namibia, Democratic Republic of Congo, Botswana and Zambia.

Ashleigh has worked extensively in the Engineering, Procurement, Management and Construction (EPCM) environment and therefore as a thorough understanding of the project life cycle (from concept, pre-feasibility, feasibility and through to implementation) as well as how to provide an interface role between the technical engineering teams and environmental advisors on projects.

Employment

2018 – present	SRK Consulting, Senior Environmental Scientist, Illovo, Johannesburg
2011 – 2018	Hatch Africa (Pty) Ltd, Senior Environmental Advisor, Johannesburg
2008 – 2011	SRK Consulting, Environmental Scientist, Johannesburg

Publications

Various environmental and social publications and journal articles pertaining to climate change, environmental legislation, social transitioning to mine closure and other publications related to her Masters Dissertation.

Languages

English – read, write, speak (excellent)

Afrikaans – read, write, speak (good)

Ashleigh Maritz

Senior Scientist

Key Experience: Environmental permitting

Location:	Limpopo Province, South Africa
Project duration & year:	Current
Client:	Anglo American Platinum – Mogalakwena Mine
Name of Project:	Mogalakwena Mine DAF Plants Basic Assessment
Project Description:	Basic Assessment process for the proposed Dissolved Air Floatation Plants Project at Mogalakwena Mine.
Job Title and Duties:	Project Manager responsible for team coordination and report compilation
Value of Project:	R 300 000 in fees
Location:	Limpopo Province, South Africa
Project duration & year:	Current
Client:	Anglo American Platinum – Mogalakwena Mine
Name of Project:	Integrated Basic Assessment Project at Mogalakwena Mine
Project Description:	An Integrated Basic Assessment process for several proposed projects at Mogalakwena Mine including projects requiring various environmental authorisations such as Regulation 29 Part 1, Regulation 31 and basic assessment processes.
Job Title and Duties:	Project Manager responsible for internal team and specialist's coordination and report compilation
Value of Project:	R 1.7 million in fees
Location:	Limpopo Province, South Africa
Project duration & year:	2018 – 2020
Client:	Anglo American Platinum – Mogalakwena Mine
Name of Project:	Mogalakwena Mine Expansion Project
Project Description:	Environmental assessment process for the proposed Expansion Project at Mogalakwena Mine. The project includes a full Scoping/EIA process together with an extensive public participation exercise, Water Use Licence Applications and Regulation 29 Part 1 amendments for new technologies proposed at the Mogalakwena Mine
Job Title and Duties:	Environmental Coordinator
Value of Project:	R 5 million in environmental fees
Location:	KZN, South Africa
Project duration & year:	Two years, 2017-2018
Client:	The KwaZulu-Natal Department of Transport
Name of Project:	Basic Assessment for Borrow Pit Applications within the iLembe District Municipality on Ingonyama Trust Land
Project Description:	Basic Assessments for the permitting of
Job Title and Duties:	Environmental Advisor and project manager of the Basic Assessment Process
Value of Project:	R250 000
Location:	Jericho Dam, Amsterdam, Mpumalanga Province, South Africa
Project duration & year:	One year, 2017-2018
Client:	Department of Water and Sanitation
Name of Project:	Jericho Dam Pump Station Refurbishment
Project Description:	Environmental permitting for the construction of a new pump station to replace the existing pump station at the Jericho Dam which is a National Key Point.
Job Title and Duties:	Environmental Advisor and project manager responsible for conducting the Basic Assessment Process.
Value of Project:	R 216 000 in environmental fees

Ashleigh Maritz

Senior Scientist

Key Experience: Environmental permitting

Location:	Western Cape, South Africa
Project duration & year:	Two years, 2017-2018
Client:	Western Cape Government Roads
Name of Project:	Basic Assessment for the flood damage repairs to structures on the MR309 in Seweweekspoort Pass, Western Cape
Project Description:	Basic Assessment and Water Use Licence process for the upgrade and repair of 30 storm water management structures along the MR309 road within the Seweweekspoort in the Western Cape.
Job Title and Duties:	Environmental Advisor and project manager of the Basic Assessment Process
Value of Project:	R250 000
Location:	Welkom and Virginia, Free State Province, South Africa
Project duration & year:	Two years, 2016-2018
Client:	Matjhabeng Local Municipality
Name of Project:	Wastewater Treatment Works upgrades to the Virginia, Nyakallong and Theronia Works.
Project Description:	Environmental authorisation processes and three Water Use Licence Applications for required upgrades and repairs to the Virginia, Nyakallong and Theronia Wastewater Treatment Works.
Job Title and Duties:	Environmental Advisor and project manager responsible for conducting the permitting processes.
Value of Project:	R 2.5 million in environmental fees
Location:	Eastern Cape, South Africa
Project duration & year:	Eight months, 2016
Client:	Amathole District Municipality
Name of Project:	Xora Rural Water Supply Scheme
Project Description:	The environmental scope included the compilation and submission of several General Authorisations in terms of the National Water Act of South Africa for stream crossings required by the project.
Job Title and Duties:	Environmental Assessment Practitioner and Project Manager
Value of Project:	R 250 000
Location:	Limpopo, South Africa
Project duration & year:	Two months, 2011
Client:	De Beers
Name of Project:	Venetia
Project Description:	Undertaking of the necessary environmental authorizations for the amendment to the existing EMP in accordance with the MPRDA and NEMA
Job Title and Duties:	Environmental Scientist assisting with the compilation of the Scoping and EIA reports.
Value of Project:	R 1 million
Project duration & year:	Six months, 2011
Client:	Anglo American Inyosi Coal
Name of Project:	Kriel Colliery EMPR Amendment for Block F
Project Description:	Environmental Impact Assessment and Environmental Management Programme for the proposed mining activities to take place within Block F on Kriel Colliery in Mpumalanga.
Job Title and Duties:	Environmental Scientist responsible for the coordination of the public participation component of the EIA/EMP; coordination of specialists; discussions with stakeholders and authorities; Compilation of the NEMA and NEMWA application forms; Compilation of the scoping and EIA/EMP report according to the MPRDA and NEMA requirements.
Value of Project:	R 1 million

Ashleigh Maritz
Senior Scientist

Key Experience: Environmental permitting

Location:	Mpumalanga, South Africa
Project duration & year:	Six months, 2011
Client:	Anglo American Inyosi Coal
Name of Project:	Kriel Colliery EMPR Amendment for the Open Cast Operations
Project Description:	Environmental Impact Assessment and Environmental Management Programme for the proposed Open Cast mining activities to take place on Kriel Colliery in Mpumalanga.
Job Title and Duties:	Environmental Scientist Responsible for the coordination of the public participation component of the EIA/EMP; coordination of specialists; discussions with stakeholders and authorities; Compilation of the NEMA and NEMWA application forms; Compilation of the scoping and EIA/EMP report according to the MPRDA and NEMA requirements.
Value of Project:	R 1 million

Location:	Mpumalanga, South Africa
Project duration & year:	Six months, 2011
Client:	Anglo Coal
Name of Project:	Kleinkopje EMPR Alignments
Project Description:	Alignment of the existing approved EMPR documents according to a mine-specific directive sent to the Colliery by Mpumalanga DMR.
Job Title and Duties:	Environmental Scientist responsible for proposal preparation, client liaison, compilation of the Consolidation report.
Value of Project:	R 100 000

Location:	Mpumalanga, South Africa
Project duration & year:	1 year, 2009-2010
Client:	Anglo Inyosi Coal
Name of Project:	Kriel Colliery EMPR Amendment
Project Description:	Consolidation of existing approved EMPRs and additional EMPR amendments.
Job Title and Duties:	Environmental Scientist assisting with project Coordination. Assistance with the compilation of the consolidated document
Value of Project:	R 150 000

Location:	Limpopo, South Africa
Project duration & year:	1 year, 2009-2010
Client:	Messina Platinum Mines Limited
Name of Project:	Baobab Mining Operation
Project Description:	Environmental Impact Assessment and Environmental Management Programme for the proposed mining activities to take place on Baobab mine near Lebowakgomo in Limpopo
Job Title and Duties:	Responsible for the coordination of the public participation component of the EIA/EMP; coordination of specialists; discussions with stakeholders and authorities; compilation of the scoping and EIA/EMP report according to the MPRDA and NEMA requirements.
Value of Project:	R 1.5 million

Ashleigh Maritz

Senior Scientist

Key Experience: Environmental permitting

Location:	Limpopo, South Africa
Project duration & year:	1 year, 2009-2010
Client:	Messina Platinum Mines Limited
Name of Project:	Doornvlei Mining Operation
Project Description:	Environmental Impact Assessment and Environmental Management Programme for the proposed mining activities to take place on Doornvlei mine near Lebowakgomo in Limpopo
Job Title and Duties:	Responsible for the coordination of the public participation component of the EIA/EMP; coordination of specialists; discussions with stakeholders and authorities; compilation of the scoping and EIA/EMP report according to the MPRDA and NEMA requirements.
Value of Project:	R 1.5 million

Location:	Mpumalanga, South Africa
Project duration & year:	Three months, 2009
Client:	BHP Billiton Energy Coal South Africa
Name of Project:	Klipspruit
Project Description:	Consolidation of the three existing EMPRs for the Klipspruit Colliery into a single document as per the directive issued by the DMR.
Job Title and Duties:	Environmental Scientist
Value of Project:	R 200 000

Location:	Mpumalanga, South Africa
Project duration & year:	Four months, 2009
Client:	Samancor Chrome
Name of Project:	Samancor Chrome energy recovery project, Witbank, Middelburg and Steelpoort
Project Description:	Preparation of three separate Environmental Impact Assessments for the installation of two new furnaces at Ferrometals in Witbank, Middelburg Ferrochrome and at Tubatse Ferrochrome.
Job Title and Duties:	Environmental Scientist assisting the environmental project manager
Value of Project:	R 200 000

Location:	Limpopo, South Africa
Project duration & year:	Five months, 2008
Client:	Messina Platinum Mines Limited
Name of Project:	Dwaalkop Mining Operation
Project Description:	Environmental Impact Assessment and Environmental Management Programme for the proposed mining activities to take place on Dwaalkop mine near Lebowakgomo in Limpopo
Job Title and Duties:	Responsible for the coordination of the public participation component of the EIA/EMP; coordination of specialists; discussions with stakeholders and authorities; compilation of the EIA/EMP report according to the MPRDA requirements.
Value of Project:	R 900 000

Ashleigh Maritz

Senior Scientist

Key Experience: Environmental permitting

Location:	DRC
Project duration & year:	Eight months, 2008
Client:	International Barytex Resources
Name of Project:	Shituru Copper Project Environmental and Social Impact Assessment
Project Description:	Compilation of the Environmental and Social Impacts Assessment and the Environmental and Social Management Plan for Shituru Copper mine in the DRC.
Job Title and Duties:	Environmental Scientist: responsible for client liaison, reporting to the project team in Canada, coordination of specialist studies and reports, compilation of the ESIA, ESMP and Annex IV Report (according to the DRC regulations)
Value of Project:	R 2 million
Location:	Mpumalanga, South Africa
Project duration & year:	Six months, 2008
Client:	Petroline Holdings (Pty) Ltd
Name of Project:	Petroline Petroleum Pipeline Project
Project Description:	Environmental Impact Assessment of the South African component to construct and operate a petroleum pipeline between Matola in Mozambique and Kendal in Mpumalanga, South Africa
Job Title and Duties:	Environmental Scientist: assisted with the report compilation for the Pipeline EIA/EMP report
Value of Project:	R 2 million
Project duration & year:	Eight months, 2008
Client:	Sasol Oil (Pty) Ltd
Name of Project:	Sasol Alrode Basic Assessment
Project Description:	Basic Assessment for the installation of a new Keropur storage tank at the Sasol Alrode Depot.
Job Title and Duties:	Project coordinator responsible for data collection, public participation (including liaison with the relevant authorities), client liaison and the basic assessment report compilation
Value of Project:	R 100 000
Location:	North West Province, South Africa
Project duration & year:	Current
Client:	Anglo American Platinum - Rustenburg Platinum Mine Retained Operations
Name of Project:	Environmental Audit and Performance Assessment for the RPM Retained Operations
Project Description:	Audit of the consolidated Environmental Management Programme Report for submission to the authorities
Job Title and Duties:	Project Manager responsible for team coordination and report compilation
Value of Project:	R 70 000 in fees
Location:	Gauteng, South Africa
Project duration & year:	2020
Client:	Nampak
Name of Project:	Phase 1 Environmental Audit conducted for an industrial property located in the Germiston area of Johannesburg
Project Description:	Project manager
Value of Project:	R 50 000
Job Title and Duties:	Project manager and auditor

Ashleigh Maritz

Senior Scientist

Key Experience: Environmental permitting

Location:	Gauteng, South Africa
Project duration & year:	2019
Client:	Blend Property Group
Name of Project:	Phase 1 Environmental Audit conducted for an industrial property located in the Germiston area of Johannesburg
Project Description:	Project manager
Value of Project:	R 27 000
Job Title and Duties:	Project manager and auditor

Location:	Gauteng, South Africa
Project duration & year:	1 month, 2018
Client:	Shaw Almex
Name of Project:	Phase 1 Environmental Audit
Project Description:	Phase 1 Environmental Audit conducted for an industrial property located in the Lea Glen area of Johannesburg
Job Title and Duties:	Project manager
Value of Project:	R 26 000

Project duration & year:	1 month, 2018
Client:	Valbruna Steel
Name of Project:	Phase 1 Environmental Audit
Project Description:	Phase 1 Environmental Audit conducted for an industrial property located in the Modderfontein area of Johannesburg
Job Title and Duties:	Project manager
Value of Project:	R 17 000

Key Experience: Environmental due diligence/competent persons reporting

Location:	Mpumalanga, South Africa
Project duration & year:	2019-current
Client:	Webber Wentzel
Name of Project:	Project Armstrong Competent Persons Reporting of various coal assets situated in Mpumalanga Province
Project Description:	Technical advisory services, including environmental advisory. Due to the confidential nature of the work, the details cannot be disclosed.
Job Title and Duties:	Environmental Specialist/advisor responsible for the environmental compliance review and inputs to the Competent Persons Report for each asset
Value of Project:	Confidential

Location:	Mpumalanga and Limpopo, South Africa
Project duration & year:	2018-2019
Client:	Confidential
Name of Project:	Environmental and Social Competent Persons review
Project Description:	Review of environmental and social issues, risks and liabilities associated with one platinum asset and two gold assets for a stock exchange.
Job Title and Duties:	Environmental reviewer responsible for the environmental compliance review and inputs to the Competent Persons Report
Value of Project:	Confidential

Ashleigh Maritz

Senior Scientist

Key Experience: Environmental due diligence/competent persons reporting

Location:	Mpumalanga, South Africa
Project duration & year:	Six weeks, 2018
Client:	Goldman Sachs
Name of Project:	Goldman Sachs Due Diligence three coal assets in Mpumalanga Province
Project Description:	Technical advisory services, including environmental advisory. Due to the confidential nature of the work, the details cannot be disclosed.
Job Title and Duties:	Environmental Advisor responsible for the environmental compliance review, closure cost review and input to the due diligence report
Value of Project:	Confidential
Project duration & year:	Six weeks, 2018
Client:	Industrial Development Corporation
Name of Project:	Due Diligence of a Phosphate mine and plant.
Project Description:	Technical advisory services, including environmental advisory. Due to the confidential nature of the work, the details cannot be disclosed.
Job Title and Duties:	Environmental Advisor responsible for the environmental compliance review, closure cost review and inputs to the due diligence report
Value of Project:	Confidential
Location:	Mpumalanga, South Africa
Project duration & year:	Six weeks, 2017
Client:	Standard Bank
Name of Project:	Project Libra Due Diligence of three coal mines situated in Mpumalanga Province
Project Description:	Technical advisory services, including environmental advisory. Due to the confidential nature of the work, the details cannot be disclosed.
Job Title and Duties:	Environmental Advisor responsible for the environmental compliance review, closure cost review and input to the due diligence report
Value of Project:	Confidential

Key Experience: Strategic environmental reporting and Advisory

Location:	DRC and South Africa
Project duration & year:	2019 - current
Client:	Ivanhoe Mines Ltd
Name of Project:	Scoping and Implementation Support for Ivanhoe Group's Environmental System
Project Description:	To provide environmental system scoping and implementation support to the site-based environmental and technical teams at Platreef, Kamoa-Kakula and Kipushi (otherwise known as 'the Group'). The objective of this project is to assist Ivanhoe with Group-wide standardisation and alignment of environmental reporting methodology and documents; in preparation for the implementation of the IsoMetrix 4 integrated risk management software
Job Title and Duties:	Project Manager responsible to team coordination, report compilation and client engagement
Value of Project:	R 600 000 in fees

Ashleigh Maritz

Senior Scientist

Key Experience: Strategic environmental reporting and Advisory

Location:	DRC and South Africa
Project duration & year:	2018 and 2019
Client:	Ivanhoe Mines Ltd
Name of Project:	Environmental Management Gap Analysis Group Level 2019
Project Description:	Gap analysis assessment of the current environmental management and monitoring processes taking place at three of Ivanhoe's project sites. The overall aim of the exercise was to identify what environmental management gaps exist in each project in terms of environmental monitoring and management, water stewardship reporting and greenhouse gas emissions reporting. The findings of the gap analysis were used to make practical recommendations on how to effectivity fill the identified gaps. In addition, environmental management and monitoring were compared between the three projects to determine where alignment was needed across the operations to prepare for full audit verification of the environmental data in Ivanhoe's 2020 sustainability report.
Job Title and Duties:	Project Manager responsible to team coordination, report compilation and client engagement
Value of Project:	R 400 000 in fees

Location:	Uganda
Project duration & year:	2019
Client:	United Nations Development Programme
Name of Project:	Uganda Department of Environmental Sector Support Services Strategic Plan
Project Description:	Uganda has enjoyed an exponential socio-economic transformation over the past two decades due to political stability and support from developing partners and the Ugandan people. Rapid economic growth has, however, had a negative impact on the environment to such an extent that environmental degradation has resulted in a recent decline of this economic growth. The environmental degradation and pollution can be attributed to inadequate environmental governance. While Uganda does have strong environmental institutions in place, as well as good policies, plans and environmental legislation, a lack of funding and resources (including staff) to implement these policies and laws has compromised environmental governance. Therefore, more comprehensive interventions with long-term objectives are required which will guide coordination of the efforts in the environmental sector. To assist in meeting this requirement, SRK and a local Ugandan partner were appointed by the United Nations Development Programme in 2018 to compile a strategic environmental plan for the Ugandan government to guide environment and natural resource management for the next ten years.
Job Title and Duties:	Project Manager
Value of Project:	R 400 000 m in environmental fees

Ashleigh Maritz

Senior Scientist

Key Experience: Strategic environmental reporting and Advisory

Location:	SADC Member States
Project duration & year:	2020
Client:	SADC-GMI
Name of Project:	Southern African Development Community – Lessons Learnt Project
Project Description:	The Southern African Development Community Groundwater Institute (SADC-GMI) has embarked on a process to capture lessons learned from the World Bank Funded "Sustainable Groundwater Management in SADC Member States project", which is scheduled to end on the 31st of December 2020 and to develop a new regional groundwater programme. The objectives of the SADC-GMI Lessons Learned Project (LLP) are to firstly develop a background document on the emerging issues and lessons learned from implementation of the Sustainable Groundwater Management (SGM) in SADC Member States Project; and secondly, develop a ten-year (split into two five-year periods) bankable project proposal document for the implementation of a new SADC groundwater programme from 2021.
Value of Project:	R 1 500 000 in environmental fees
Location:	Malawi, Lesotho, Mozambique, Tanzania, Zambia, Eswatini, Angola, DRC, Zimbabwe and South Africa
Project duration & year:	2018 – ongoing
Client:	SADC-GMI
Name of Project:	SADC-GMI Environmental and Social Safeguard Support Project
Project Description:	Environmental and Social safeguards review of projects submitted by several SADC member states as part of the SADC Sustainable Groundwater Management Project.
Job Title and Duties:	Environmental Safeguards specialist
Value of Project:	R 2 million in environmental fees

Key Experience Environmental Management and Advisory

Location:	Polokwane, Limpopo Province, South Africa
Project duration & year:	2017 – 2018
Client:	Anglo American Platinum
Name of Project:	SO_2 Abatement Plant at Polokwane Smelter
Project Description:	Management of an external environmental consultant of behalf of Hatch Africa and management of the Environmental Control Officer for the construction phase. The SO_2 Abatement Plant was required for the Polokwane Smelter in order to assist the smelter in meeting the 2020 minimum emissions standards in terms of the National Air Quality Management Act.
Job Title and Duties:	Environmental Manager responsible for managing an external Environmental Assessment Practitioner, managing the ECO during construction, tender evaluation of contractor's and assistance to the Hatch engineering team during the feasibility and construction phases.
Value of Project:	R 2 million in environmental fees
Location:	Norway
Project duration & year:	6 months, 2018
Client:	Nordic Mining
Name of Project:	Engebø Rutile and Garnet Project
Project Description:	Pre-feasibility and feasibility studies for the proposal rutile and garnet mine in Norway.
Job Title and Duties:	Environmental advisor responsible for compiling the environmental design criteria to inform the engineering design for the feasibility phase.
Value of Project:	R 280 000 in environmental fees

Ashleigh Maritz

Senior Scientist

Key Experience	Environmental Management and Advisory
Project duration & year:	Three years, 2015-2018
Client:	Zimbabwe Power Company
Name of Project:	Hwange Transmission Work Expansion Project
Project Description:	The Project entails the proposed expansion of the generating capacity of the Hwange thermal power and Kariba hydropower stations to meet the country's energy demand. A network study undertaken by Hatch Africa (Project Owner's engineers) identified a number of transmission routes in the national grid that would require upgrading for greater capacity or the installation of new transmission lines. In addition to this, there will also be extensive substation work. The main components of the project included the Hwange-Insukamini (Bulawayo) new 400 kV transmission line, new Hwange sub-station and Insukamini sub-station upgrade; Insukamini-Marvel new 330 kV transmission line and Marvel sub-station upgrade and new Sherwood sub-station, near Kwekwe.
Job Title and Duties:	Environmental Advisor – management of the local environmental consultant and review of the Environmental and Social Impact Assessment process and reports to IFC/World Bank standards.
Value of Project:	Confidential
Location:	Gauteng Province, South Africa
Project duration & year:	Two years, 2016-2017
Client:	Gauteng Department of Economic Development
Name of Project:	Gauteng Industrialisation Project – Furniture Manufacturing Hub
Project Description:	Development of a business case to detail the development of a furniture manufacturing hub in the Roodepoort Industrial area of Johannesburg. The aim of the project was to determine what would be required in order to revitalise the furniture manufacturing industry in Gauteng.
Job Title and Duties:	Project Manager and study coordinator
Value of Project:	R225 000
Location:	Mpumalanga, South Africa
Project duration & year:	Two years, 2016-2017
Client:	Eskom
Name of Project:	Eskom Majuba Rail Project
Project Description:	Environmental compliance for the duration of the construction of the railway line. The contract included but was not limited to ensuring that contractors complied with all relevant health and safety and environmental legislation, EMP requirements, Eskom procedures and protocols and the project schedule. Responsibilities also included application for borrow pit closures, developing and implementing the water sampling requirements for the project, ongoing awareness training and reporting incidents.
Job Title and Duties:	Environmental Manager responsible for managing the environmental control officer and contractors ECOs on site
Value of Project:	R 2 million

Ashleigh Maritz

Senior Scientist

Key Experience — Environmental Management and Advisory

Project duration & year:	Two years, 2015-2017
Client:	Eramet South Africa
Name of Project:	Mukulu Manganese Mine
Project Description:	Pre-feasibility and feasibility study for the development of a proposed manganese mine, associated rail siding and relocation of Eskom transmission lines near Hotazel in the Northern Cape. The exact details cannot be disclosed due to the project being confidential in nature. The project involved extensive stakeholder engagement, a rail route options analysis (including environmental sensitivity analysis of the various scenarios) as a component of several environmental authorisation processes which were conducted
Job Title and Duties:	Environmental Advisor responsible for managing the Environmental Assessment Practitioner (GCS) and providing an interface role between the EAP and the engineering team
Value of Project:	R1.3 million
Location:	Northern Cape, South Africa
Project duration & year:	One year, 2014-2015
Client:	Assmang
Name of Project:	King TFR Mainline Deviation Project
Project Description:	Review, auditing and signoff of external contractor's audits and management of the Environmental Officer on site for the rail deviation.
Job Title and Duties:	Environmental Manager responsible for managing the environmental control officer and contractors ECOs on site
Value of Project:	R 250 000
Location:	Eastern Cape, South Africa
Project duration & year:	Six months, 2015
Client:	Municipal Infrastructure Support Agent
Name of Project:	Nxuba waste management project
Project Description:	The environmental scope included reviewing and updating the Nxuba Municipality's Integrated Waste Management Plan (IWMP), developing a Status Quo report for the Bedford and Adelaide Waste management sites and compiling a 10-year waste master plan for the Nxuba Municipality.
Job Title and Duties:	Environmental Advisor responsible for the IWMP update
Value of Project:	R 200 000
Location:	Mpumalanga, South Africa
Project duration & year:	Six months, 2013
Client:	Eskom Holdings SOC Limited
Name of Project:	Kendal Power Station Integrated Access Control Project
Project Description:	The project involved the design of an integrated access control system at the main gate of Kendal Power Station. The environmental tasks were limited to the Concept phase of the project and included Environmental sensitivity screening, a preliminary environmental risk assessment as well as a preliminary permitting strategy and Environmental Design Criteria.
Job Title and Duties:	Environmental Advisor
Value of Project:	R 100 000

Ashleigh Maritz

Senior Scientist

Key Experience	Environmental Management and Advisory
Project duration & year:	Two years, 2011-2013
Client:	Transnet
Name of Project:	16Mtpa Manganese Line expansion project
Project Description:	Assistance with management of the Environmental Assessment Practitioners conducting the Authorisation Processes for the Rail upgrade, construction of the compilation yard and the development of a manganese export facility within the Coega IDZ. Also carried out the permitting process for numerous borrow pits required along the line in both the Northern Cape and Eastern Cape.
Job Title and Duties:	Environmental Advisor and project coordinator
Value of Project:	R1.3 million
Location:	South Africa and Mozambique
Project duration & year:	Six months, 2012
Client:	Industrial Development Corporation
Name of Project:	Masorini Advanced Work for Feasibility
Project Description:	Project involved environmental input at three locations - two locations being South African based and the other based in Mozambique for the Advanced Work for Feasibility Phase (equated to a phase between Concept and Pre-feasibility). The exact details cannot be disclosed due to the project being confidential in nature.
Job Title and Duties:	Environmental Advisor
Value of Project:	R 300 000
Location:	Inhambane, Mozambique
Project duration & year:	Two years, 2011-2012
Client:	Rio Tinto Iron and Titanium
Name of Project:	Mutamba
Project Description:	This project entails environmental input for three export options and two mining site options within the province of Inhambane in Mozambique. Duties included managing the environmental baseline studies for the pre-feasibility stage together with the Environmental Impact Assessment for the feasibility stage. In addition to this, duties included consultation with the Mozambican authorities as well as the management of the in-country registered consultant (Impacto) who will be carrying out most of the Social related studies.
Job Title and Duties:	Environmental Advisor
Value of Project:	R1.3 million
Project duration & year:	16 months, 2009
Client:	Chapudi Coal (Pty) Ltd and Kwezi Mining Exploration (Pty) Ltd
Name of Project:	Chapudi Coal Environmental Baseline Assessment
Project Description:	Baseline assessment for the proposed Chapudi Coal mine situated at the foot of the Soutpansberg Mountains near Waterpoort in Limpopo.
Job Title and Duties:	Environmental Scientist responsible for client liaison, proposal preparation, project progress presentations and reporting to the project team, coordination of specialist studies and reports, compilation of the baseline assessment reports.
Value of Project:	R 1 million

Ashleigh Maritz

Senior Scientist

Key Experience	Climate assessment and management
Location:	Eastern Cape, South Africa
Project duration & year:	Current
Client:	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT)
Name of Project:	Mainstreaming Climate Change aspects into Five Department of Economic Development, Environmental Affairs and Tourism Policies
Project Description:	Reviewing and mainstreaming climate change aspects into selected DEDEAT Policies / Plans.
Job Title and Duties:	Specialist responsible for the research and compilation of the various reporting deliverables together with other members of the SRK research team
Value of Project:	R 200 000 in fees
Location:	Mpumalanga, South Africa
Project duration & year:	Current
Client:	Anglo American Coal
Name of Project:	SACE Lifex
Project Description:	Climate assessment for the SACE Lifex Project in support of the pre-feasibility studies and in compliance to the IDM
Job Title and Duties:	Specialist responsible for the research and compilation of the climate assessment together with other SRK team members
Value of Project:	R 50 000 in fees
Location:	DRC and South Africa
Project duration & year:	2018-2019
Client:	Ivanhoe Mines Ltd
Name of Project:	Environmental Management Gap Analysis Group Level 2019
Project Description:	A review of the greenhouse gas (GHG) reporting across the three projects using information obtained from publicly availability documentation, information supplied by Ivanhoe and from the interviews conducted on site
Job Title and Duties:	Specialist responsible for the research and compilation of the report together with other team members
Value of Project:	R 400 000 in fees (entire reporting component)

Yurgen Nigel Govender

Environmental Scientist

Profession	Environmental Scientist
Education	BSc, Hons (Environmental Monitoring and Modelling), University of South Africa, 2017 BSc (Environmental Science), University of KwaZulu-Natal, 2014
Registrations/ Affiliations	Candidate Natural Scientist (*Cand.Sci.Nat*), SACNASP, 120209
Awards	None

Specialisation

Air quality management, carbon foot printing and geographical information systems

Expertise

Yurgen Govender has been involved with various aspects of geographical information systems (GIS) and air quality management over the past 3 years. His recent exposure to carbon foot printing has also gained him experience in greenhouse gas reporting. His expertise is a following:

- air dispersion modelling;
- air quality impact assessments; ·
- greenhouse gas assessments;
- conducting passive sampling surveys; ·
- establishment and running of air monitoring networks;
- groundwater and surface water sampling;
- data collection and manipulation using geographical information systems; and
- map production and site layouts.

Employment

2018 – present	SRK Consulting (Pty) Ltd, Environmental Scientist, Durban
2017 – 2018	SRK Consulting (Pty) Ltd, Technician, Durban
2017 – 2017	Department of Physical Sciences at UKZN, Technical Research Assistant, Durban
2016 – 2017	The KZN Science Centre, Facilitator, Durban
2015 – 2016	The Occupational and Environmental Faculty at UKZN, Research Assistant, Durban

Publications

None

Languages

English – read, write, speak

Yurgen Nigel Govender

Environmental Scientist

Key Experience: Air quality management

Location:	Durban, South Africa
Project duration & year:	2020
Client:	Isegen (South Africa) (Pty) Ltd
Name of Project:	Atmospheric Impact Report for proposed relocation of the esterification plant
Project Description:	Dispersion modelling study as a specialist study
Job Title and Duties:	Identify sources of atmospheric emissions for the project and undertake a dispersion model to assessment air quality impacts using a dispersion model
Value of Project:	N/A

Location:	Durban, South Africa
Project duration & year:	2020
Client:	Mondi South Africa (Pty) Ltd
Name of Project:	Atmospheric Impact Report for the Proposed Replacement Fluidised Bed Boiler at Mondi Richards Bay Mill
Project Description:	Dispersion modelling study as a specialist study to inform the Basic Assessment (BA) process
Job Title and Duties:	Identify sources of atmospheric emissions for the project and undertake a dispersion model to assessment air quality impacts using a dispersion model
Value of Project:	N/A

Location:	Durban, South Africa
Project duration & year:	2020
Client:	Wireforce (Pty) Ltd.
Name of Project:	Atmospheric Impact Report for the Wireforce Facility
Project Description:	Dispersion modelling study for the Wireforece facility to inform a Section 22A rectification application and Section 24G application
Job Title and Duties:	Identify sources of atmospheric emissions for the project and undertake a dispersion model to assessment air quality impacts using a dispersion model
Value of Project:	N/A

Location:	Durban, South Africa
Project duration & year:	2019 – 2020
Client:	Dube Tradeport Corporation
Name of Project:	DTPC GHG Assessment
Project Description:	A GHG Assessment, carbon monitoring procedure, management and plan
Job Title and Duties:	Emission inventory calculation and carbon footprint reporting
Value of Project:	N/A

Location:	Gauteng, South Africa
Project duration & year:	2020-2021
Client:	Transnet Pipelines
Name of Project:	Transnet Pipeline Air quality Management
Project Description:	Air quality management for various Transnet Pipeline depots across. (NAEIS submission, Greenhouse gas reporting, ambient VOC monitoring and reporting, air quality training and maintenance of sampling network)
Job Title and Duties:	Scheduling monthly of monitoring, reporting and achieving of deliverables
Value of Project:	NA

Yurgen Nigel Govender

Environmental Scientist

Key Experience: Air quality management

Location:	Ladysmith, South Africa
Project duration & year:	2019
Client:	Transnet Pipelines
Name of Project:	Transnet Pipeline emergency air quality monitoring
Project Description:	Monitoring of VOCs after and energy situation
Job Title and Duties:	Onsite monitoring and reporting
Value of Project:	NA
Location:	Guinea, Siguiri
Project duration & year:	2019
Client:	Siguiri Anglo Gold mine (SAG)
Name of Project:	SAG Dispersion modeling
Project Description:	Modeling of proposed mining operation and infrastructure of determine impact on air quality
Job Title and Duties:	Identify sources of atmospheric emissions for the project and undertake a dispersion model to assessment air quality impacts using a dispersion model
Value of Project:	N/A
Location:	Sierra Leone,
Project duration & year:	2019
Client:	Sierra Rutile Limited
Name of Project:	Sierra Rutile Limited Air Dispersion Model
Project Description:	Modeling of proposed mining operation and infrastructure of determine impact on air quality
Job Title and Duties:	Identify sources of atmospheric emissions for the project and undertake a dispersion model to assessment air quality impacts using a dispersion model
Value of Project:	NA
Location:	East London, South Africa
Project duration & year:	2019-2021
Client:	East London Industrial Development Zone
Name of Project:	East London Industrial Development Zone ambient air quality monitoring
Project Description:	Ambient air quality monitoring study for the ELIDZ over a three-year period from January 2019 to December 2021 and quarterly reporting.
Job Title and Duties:	Scheduling monthly monitoring and reporting on results obtained
Value of Project:	NA
Project duration & year:	2019
Client:	Mamadi
Name of Project:	Mamadi Dispersion Model
Project Description:	Dispersion modelling assessment for eight petroleum storage sites in South Africa
Job Title and Duties:	Determining the impact of the of the relevant tank farms on air quality in respect to sensitive receptors identified around the study sites through the use of an air dispersion model.
Value of Project:	NA

Yurgen Nigel Govender

Environmental Scientist

Key Experience: Air quality management

Location:	Tzaneen, Limpopo
Project duration & year:	2019
Client:	PetroSA
Name of Project:	PetroSA ambient air quality monitoring
Project Description:	Undertake ambient air quality monitoring at the PetroSA Tzaneen Depot
Job Title and Duties:	Scheduling monthly monitoring and reporting on results obtained
Value of Project:	NA

Location:	Secunda, Mpumalanga
Project duration & year:	2019
Client:	Sasol Secunda Synfuels and Chemicals Operations
Name of Project:	Sasol Secunda Synfuels and Chemicals Operations Atmospheric Impact
Project Description:	Atmospheric impact assessment of new tank to be added to existing tank farms
Job Title and Duties:	Determining the impact of the new tanks on air quality in respect to sensitive receptors identified around the study site.
Value of Project:	N/A

Location:	Limpopo, South Africa
Project duration & year:	2018-2019
Client:	Universal Coal Development V
Name of Project:	Universal Coal Cygnus air quality impact assessment
Project Description:	Air Quality Impact Assessment (AQIA) as part of the EIA process
Job Title and Duties:	Identify sources of atmospheric emissions for the project and undertake a dispersion model to assessment air quality impacts using a dispersion model
Value of Project:	NA

Location:	Sunnyridge, East London
Project duration & year:	2018-2019
Client:	East London Industrial Development Zone
Name of Project:	EL IDZ AQ monitoring
Project Description:	Assess the ambient air quality within the EL IDZ facility.
Job Title and Duties:	Establish and set up ambient air quality network. Process air quality data and meteorological data.
Value of Project:	N/A

Yurgen Nigel Govender

Environmental Scientist

Key Experience: Air quality management

Project duration & year:	2018
Client:	Nyumba Ya Akiba S.A.R.L
Name of Project:	NYA Air dispersion modelling study
Project Description:	Assess the impacts that the NYA operational activities have on the air quality.
Job Title and Duties:	Processing and reporting of air quality and meteorological data to be used in dispersion modelling report.
Value of Project:	N/A
Location:	Guinea, Siguiri
Project duration & year:	2018
Client:	Siguiri Anglo Gold mine (SAG)
Name of Project:	SAG AQ monitoring
Project Description:	Establishing an ambient air quality monitoring network and training of SAG staff to undertake the monitoring for a year before the development of the new mining pits near the town of Saraya.
Job Title and Duties:	Air quality Specialist. Establishment of an ambient air quality network (Dust fallout, passive gas samplers and particulate matter samplers). Training of SAGs own environmental team to maintain the established network.
Value of Project:	N/A
Location:	Johannesburg, City Deep
Project duration & year:	January 2018
Client:	Transnet Freight Rail (TFR)
Name of Project:	Transnet AQ monitoring
Project Description:	To determine the constituents of dust that are related to the activities which occur in the TFR property
Job Title and Duties:	Air quality Technician. Establish a dust fallout monitoring network.
Value of Project:	N/A
Location:	Durban, Prospecton
Project duration & year:	December 2017
Client:	Toyota
Name of Project:	TSAM Air Mon.
Project Description:	To determine the constituents of dust that have been causing the rusting of vehicles at the TSAM facility which is located in an industrial area.
Job Title and Duties:	Air quality Technician. Set up of dust fallout units around the Toyota suspension plant in order to monitor the amount and the composition of dust in the atmosphere
Value of Project:	N/A
Location:	Limpopo
Project duration & year:	November 2017
Client:	Modikwa Platinum Mine (MPM)
Name of Project:	Fuel Audit JNB
Project Description:	To monitor the amount of atmospheric VOCs near MPM fuel storages units as per the regulatory requirements of their environmental audit.
Job Title and Duties:	Air quality Technician. Deployment of VOC passive sampler at fuel storage locations across active portions of the mine. Training of the MPMs our in-house environmental team to conduct the sampling required.
Value of Project:	N/A

Yurgen Nigel Govender

Environmental Scientist

Key Experience: Air quality management

Project duration & year:	October 2017
Client:	Vale
Name of Project:	Moatize Mine
Project Description:	Evaluation of the impact of new mining infrastructure on the current air quality levels
Job Title and Duties:	Dispersion Modelling Study
Value of Project:	N/A

Key Experience: GIS

Location:	Kipushi, DRC
Project duration & year:	2018-2019
Client:	Kipushi Mine
Name of Project:	Kipushi Mine Survey
Project Description:	Geological assessment on mining facility
Job Title and Duties:	Developing maps for reports
Value of Project:	N/A

Location:	La Mercy, KwaZulu-Natal
Project duration & year:	2018
Client:	Dube TradePort Corporation
Name of Project:	DTPC Hlawe Sewer line
Project Description:	WULA for Hlawe trunk sewer line project
Job Title and Duties:	All GIS and mapping requirements for the project.
Value of Project:	N/A

Location:	Umbogintwini, KwaZulu-Natal
Project duration & year:	2018
Client:	Experse Surfactant technologies
Name of Project:	Experse Environmental Legal Compliance Audit
Project Description:	Compliance audit of the site to determine the extent to which the processes on site are required to comply with the requirements of National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA)
Job Title and Duties:	All GIS and mapping requirements for the project, report and meeting.
Value of Project:	N/A

Location:	KwaZulu-Natal, Amanzimtoti
Project duration & year:	2017-2019
Client:	AECI (Pty) Ltd
Name of Project:	Umbogintwini Industrial Complex
Project Description:	Enhanced In-Situ Bioremediation of Contaminated Land
Job Title and Duties:	Developing maps for multiple reports. Database management of surveys and spatial. data
Value of Project:	N/A

Yurgen Nigel Govender

Environmental Scientist

Key Experience: GIS

Project duration & year:	October 2017
Client:	Chevron
Name of Project:	Chevron
Project Description:	Soil and groundwater assessments for underground storage tank removals, installation of monitoring wells and groundwater monitoring, remediation alternatives
Job Title and Duties:	GIS Technician. Developing maps for specialist reports.
Value of Project:	N/A
Location:	Dannhauser Local Municipality
Project duration & year:	October 2017
Client:	Amajuba District Municipality
Name of Project:	Dannhauser Ground Water
Project Description:	Rehabilitation of existing groundwater schemes drilling of new boreholes to supply a sustainable potable water source.
Job Title and Duties:	Maintaining database of field surveys conducted GIS Technician. Developing maps for reports. Database management of surveys and spatial data
Value of Project:	N/A

Appendix B: Specialists Declaration of Independence

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Climate Change Impact Assessment for the Newcastle Gas Engine Power Plant, KwaZulu-Natal

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	SRK Consulting (South Africa) (Pty) Ltd.			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	2	Percentage Procurement recognition	125%
Specialist name:	Philippa Burmeister			
Specialist Qualifications:	BSc Hons			
Professional affiliation/registration:	PrSciNat (400195/08)			
Physical address:	Suite 201 Norfolk House, 54 Norfolk Terrace, Westville			
Postal address:				
Postal code:	3630	Cell:	083 651 3462	
Telephone:	031 279 1233	Fax:	031 279 1204	
E-mail:	pburmeister@srk.co.za			

2. DECLARATION BY THE SPECIALIST

I, _Philippa Burmeister _, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

SRK Consulting (South Africa) (Pty) Ltd.

Name of Company:

28 April 2021

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, __ Philippa Burmeister ___, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

SRK Consulting (South Africa) (Pty) Ltd.

Name of Company

28 April 2021

Date

Signature of the Commissioner of Oaths

28/04/2021

Date

I certify that the deponent has acknowledged that he/she knows and understands the contents of this declaration Sworn to/affirmed and Signed before me at Westville *on* 28/04/2021

Reesha Bissesar (Administrator)
REF No: 9/1/8/2 (R/O) KZN (Pinetown)
Commissioner of Oaths

Addendum to Climate Change Impact Assessment Report:
External Peer Review

umweltsolutions

SRK Consulting (South Africa) (Pty) Ltd.

Section A Second Floor, Suite 02/B1

Norfolk House

54 Norfolk Terrace, off Blair Atholl Drive

Westville 3630

South Africa

Date: 19 May 2021

Peer review of Newcastle Energy Greenhouse Gas and Climate Change Assessment Report

Attention: Ms Philippa Burmeister

1 INTRODUCTION

Umwelt Solutions (Pty) Ltd (Umwelt) was appointed by Ms Philippa Burmeister from SRK Consulting South Africa (Pty) Ltd (SRK), to undertake a peer review on a Climate Change Impact Assessment (CCIA) for Newcastle Energy's proposed Newcastle Gas Engine Power Plant (NGEPP), situated in the Karbochem Industrial Complex in Newcastle, KwaZulu-Natal.

Newcastle Energy proposes to increase its electricity generation capacity to approximately 100 Mega Watt (MW). A power generation project of this magnitude requires an application for Environmental Authorisation via a Scoping and Environmental Impact Reporting (S&EIR) process in terms of the 2014 Environmental Impact Assessment (EIA) Regulations, to be submitted to the Competent Authority (CA), the National Department of Environment, Forestry and Fisheries (DEFF).

It is understood that the DEFF required assistance in assessing the scope and adequacy of the CCIA report. Therefore, the objective of Umwelt's engagement is to advise DEFF whether the climate change component of the CCIA:

- Meets acceptable standards with respect to assessing climate change risks at a project level;
- Considers relevant sources in the project's emissions inventory; and
- Provides recommendations concerning the mitigation of material risks.

2 APPROACH

The appointed scope of work required a detailed review of the CCIA and associated emission inventory (referred to hereafter as the MS Excel GHG spreadsheet). In addition, to the CCIA report, the project Draft Environmental Scoping Report was used for additional context and background.

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info@umweltsolutions.co.za

3 RESULTS OF REVIEW

The NGEPP CCIA report is comprehensive and is aligned with national legislation as well as international guidelines and best practice concerning the assessment of greenhouse gas (GHG) emissions at a project level. Some specific observations on the CCIA are provided for in this chapter.

3.1 Methodology

Section 3.3.1 (Greenhouse Gas (GHG) emissions quantification) lists the National Greenhouse Gas Emission Reporting Regulations (NGER), Technical Guidelines for Monitoring, Reporting and Verification of Greenhouse Gas Emissions by Industry, 2017 (Technical Guidelines), the GHG protocol and ISO14064 as sources that informed the NGEPP CCIA methodology.

The DEFF published updated NGER in September 2020, including new activities required to report emissions and changes to emissions reporting thresholds. In addition, DEFF published the Draft Methodological Guidelines for Quantification of Greenhouse Gas Emissions (Draft Methodological Guidelines), which will ultimately replace the Technical Guidelines, once promulgated. As such, the legal summary merits a more in-depth discussion to take into consideration the amendments from the 2020 updates to NGER.

3.2 Project Description

The project description is very thorough and provides a detailed background on the project.

3.3 Climate baseline

The report provides a description of the baseline climate scenarios (rainfall, temperature, wind) associated with climate change that may pose a risk to the project, although a rather short-term period of 3 years was utilized for this baseline information. Since modelling of the climatic data was excluded from the project scope, the climate baseline time period is adequate for the CCIA.

3.4 South Africa's Climate Change Response

The CCIA report details the South African context with regards to climate change response. The following comments and suggestions are applicable to Section 6 of the CCIA:

- The abbreviation "IDC" is provided in the heading for Section 6.8 for the Nationally Determined Contributions. Clarify and update if the heading and associated abbreviation should be read as either Intended Nationally Determined Contributions (INDC) or Nationally Determined Contributions (NDC);
- Carbon Tax:
    - Table 6-1 states that only mobile combustion was included in the tax liability assessment during Phase 2. There was not description of project phases nor was the proposed tax liability assessment included in the CCIA;
    - The carbon tax rate is stated to be R120.00, however it is currently R134.00;

- The information required to calculate the potential carbon tax is readily available, and as such could have been included in the CCIA, however it may not be required in terms of SRK's project scope and appointment.

3.5 Climate Change trends and risk

The report has sourced information from credible sources and provides an appropriate list of key climate related risks that could impact on the proposed NGEPP including:

- The contribution of construction and operation related GHG emissions;
- Risks to the project because of increase temperatures;
- Risks to the project as a result of decreased annual rainfall or increased drought periods; and
- Risks to the project due to increased fire days, intense thunderstorms, and damaging flood events.

3.6 GHG inventory

The following observations and recommendations concerning the GHG inventory and calculations were made:

- Section 3.4 details the assumptions and limitations applicable to the CCIA. The following statements are made:
  - "All data received from the client is deemed correct and has been verified by the client at the time of the assessment". To this effect, confirm if the start-up and shutdown fuel consumption was considered in the information provided;
  - "The quantification of GHG emission from the substation and switch gear is based on an assumed leakage rate of 100 % as a conservation means to estimate a worst-case scenario". After review of the GHG assessment MS Excel GHG spreadsheet, it was noted that a leakage rate of 3% was used in the calculation. It is recommended that the assumption and/or the calculations are updated and aligned accordingly.
  - "Emissions could only be calculated for the use of oils, lubricants and solvents to be used for maintenance. As the project is proposed, it is difficult to reasonably estimate the quantity of oils, lubricants and solvents that will be used". In section 9.1.5 however oil consumption is detailed as 0.4 gram/kWh (worst case scenario) and an implied 0.2 gram/kWh actual consumption. Since this information is available, it can be included in the emission inventory.
- Section 4.1.2 details the NGEPP and associated infrastructure:
  - Infrastructure associated with the engine house includes inter alia air compressors, oil cooling system, water cooling radiators and an air ventilation system. From the information provided it is unclear if the energy associated with these infrastructure components will be met from the NGEPP itself, or if other sources of energy (mobile combustion and/or electricity) will be utilised, and if refrigerants will be required. It is recommended that the report provides clarification on the matter and update the emission inventory accordingly (if so required).
- Table 10-3 details the emission factors considered in the assessment.
  - The default calorific value in TJ/Tonne for natural gas is provided for as 33.6, however the Technical Guidelines (Table A.1) specifies a value of 0.048 TJ/Tonne

for natural gas. Table D1 however specifies net calorific value for methane rich gas (MRG) as 33.6 MJ/Nm^3. It is recommended that Table 10-3 be updated to specify the calorific values either in an additional row in the table or footnotes, as natural gas and MRG's calorific values are not comparable.

- The MS Excel GHG spreadsheet details two scenarios for calculation of the emissions associated with the stationary combustion (natural gas), however no detail is provided on why one set of calculations were chosen, and the other disregarded. It is recommended that the assumption and/or the calculations are updated and aligned accordingly;
- Overall, the emission calculations appear to have been appropriately considered (with exception of comments noted in this section of the review), however, the MS Excel sheet did not specify the steps followed nor referenced the source for all the inputs utilised, with specific focus on information pertaining to stationary combustion (natural gas). It is recommended that references for values utilised be specified to ensure future calculations consider the same methodology and that the results are comparable year on year.
- References to the Global Warming Potential (GWP) source information should also be included.

3.7 Impact Assessment

The following observations and recommendations concerning the impact assessment were made:

- The comparison of the proposed NGEPP GHG emissions intensity in relation to coal fired power generation is informative and applicable to the CCIA;
- Tax liability is mentioned repeatedly in Table 11-2, however the tax liability was not assessed in Section 6.10 of the report. Refer to comments made under Section 3.4 of this report for further consideration; and
- The impact assessment and proposed management measures are suitable to the proposed NGEPP.

4 CONCLUSION

The NGEPP CCIA report is of a high standard and reflect the application of South African legal requirements and international standards. Overall, the assessment of the risks and impacts associated with the GHG emissions and climate change vulnerabilities is realistic and based on credible sources. No fatal flaws were identified in the peer review, only items requiring clarification, confirmation and further discussion. Once the recommendations as indicated in this peer review report is addressed, it will ensure that potential shortcomings are averted.

Report compiled by:

Author:

Estie Retief
Pr.Sci.Nat & Registered EAP
Director & Environmental Lead
Umwelt Solutions (Pty) Ltd

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31 May 2021
566508

Principal Environmental Scientist
SRK Consulting (South Africa) (Pty) Ltd
MVanHuyssteen@srk.co.za

Attention: Marius van Huyssteen

Dear Mr. Van Huyssteen

Response to Peer Review of the Newcastle Energy Greenhouse Gas and Climate Change Assessment Report

SRK Consulting (South Africa) (Pty) Ltd. (SRK) has been appointed as the Environmental Assessment Practitioner (EAP) to undertake the required environmental applications on behalf of Newcastle Energy for the proposed project. As part of the EIA, the need for a Climate Change Impact Assessment (CCIA) has been identified and SRK has also been appointed to undertake the CCIA. As the CCIA was undertaken by an in-house specialist Umwelt Solutions (Pty) Ltd (Umwelt) was appointed by SRK to undertake a peer review.

This letter details the comments received from the peer reviewer on the 19 May 2021 and the associated responses by SRK in Table 1 below.

Table 1: Comments and Responses

Peer Review Comment	SRK Response
The NGEPP CCIA report is comprehensive and is aligned with national legislation as well as international guidelines and best practice concerning the assessment of greenhouse gas (GHG) emissions at a project level.	Noted with thanks
Section 3.3.1 (Greenhouse Gas (GHG) emissions quantification) lists the National Greenhouse Gas Emission Reporting Regulations (NGER), Technical Guidelines for Monitoring, Reporting and Verification of Greenhouse Gas Emissions by Industry, 2017 (Technical Guidelines), the GHG protocol and ISO14064 as sources that informed the NGEPP CCIA methodology. The DEFF published updated NGER in September 2020, including new activities required to report emissions and changes to emissions reporting thresholds. In addition, DEFF	The report has been updated to include the recent updates in legislation.

Peer Review Comment	SRK Response
published the Draft Methodological Guidelines for Quantification of Greenhouse Gas Emissions (Draft Methodological Guidelines), which will ultimately replace the Technical Guidelines, once promulgated. As such, the legal summary merits a more in-depth discussion to take into consideration the amendments from the 2020 updates to NGER.	
The project description is very thorough and provides a detailed background on the project.	Noted with thanks
The report provides a description of the baseline climate scenarios (rainfall, temperature, wind) associated with climate change that may pose a risk to the project, although a rather short-term period of 3 years was utilized for this baseline information. Since modelling of the climatic data was excluded from the project scope, the climate baseline time period is adequate for the CCIA.	Agreed as the risk identification was undertaken on the basis of the South Africa's Third National Communication (TNC) under the United Nations Framework Convention on Climate Change (UNFCCC) the need for long term climatic baseline information was not deemed necessary.
The abbreviation "IDC" is provided in the heading for Section 6.8 for the Nationally Determined Contributions. Clarify and update if the heading and associated abbreviation should be read as either Intended Nationally Determined Contributions (INDC) or Nationally Determined Contributions (NDC)	The report has been updated to correctly refer to Nationally Determined Contributions (NDC).
Carbon Tax: • Table 6-1 states that only mobile combustion was included in the tax liability assessment during Phase There was no[t] description of project phases nor was the proposed tax liability assessment included in the CCIA; • The carbon tax rate is stated to be R120.00, however it is currently R134.00; • The information required to calculate the potential carbon tax Is readily available and as such could have been included in the CCIA, however it may not be required in terms of SRK's project scope and appointment.	A tax liability assessment was not included in the SRK scope of work. While SRK can calculate the worst case tax liability by applying the tax rate to the GHG emissions calculation there are a number of tax free allowances and other measures that NGEPP could employ to reduce their tax liability. SRK would advise that after detailed design the GHG inventory be updated and that at that point a carbon tax expert advise on the liability and measures to be implemented to reduce the liability. Table 6.1 has therefore been removed as it provided only an overview of the legislation as it applied to NGEPP and not an assessment of the projects liability.
The report has sourced information from credible sources and provides an appropriate list of key climate related risks that could impact on the proposed NGEPP including: • The contribution of construction and operation related GHG emissions; • Risks to the project because of increase temperatures; • Risks to the project as a result of decreased annual rainfall or increased drought periods; and • Risks to the project due to increased fire days, intense thunderstorms, and damaging flood events.	Noted with thanks
Section 3.4 details the assumptions and limitations applicable to the CCIA. The following statements are made: • "All data received from the client is deemed correct and has been verified by the client at the time of the assessment". To this effect, confirm if the start-up and shutdown fuel consumption was considered in the information provided; • "The quantification of GHG emission from the substation and switch gear is based on an assumed leakage rate of 100 % as a conservation means to estimate a worst-case scenario". After review of the GHG assessment MS Excel GHG spreadsheet, it was noted that a leakage rate of 3% was used in the calculation. It is recommended that the	• Start-up and shutdown fuel consumption was not available at the time of developing the GHG emissions inventory and is therefore excluded from the quantification. Should the information be available during detailed design the inventory can be updated accordingly. • The leakage rate was originally assumed at 3% as per the USEPA but was inconsistent with other literature and no values where

Peer Review Comment	SRK Response
assumption and/or the calculations are updated and aligned accordingly. • "Emissions could only be calculated for the use of oils, lubricants and solvents to be used for maintenance. As the project is proposed, it is difficult to reasonably estimate the quantity of oils, lubricants and solvents that will be used". In section 9.1.5 however oil consumption is detailed as 0.4 gram/kWh (worst case scenario) and an implied 0.2 gram/kWh actual consumption. Since this information is available, it can be included in the emission inventory.	available for South Africa. Therefore 100% was assumed as a worst case but the excel sheet was not updated accordingly. The assumption in the report however is correct and represents a worst case scenarios for the purposes of the impact assessment. In reality the leakage rate is likely to be less. • Emissions for the use of oils, lubricants and solvents have been added to the inventory and the report has been updated to include these emissions.
Infrastructure associated with the engine house includes inter alia air compressors, oil cooling system, water cooling radiators and an air ventilation system. From the information provided it is unclear if the energy associated with these infrastructure components will be met from the NGEPP itself, or if other sources of energy (mobile combustion and/or electricity) will be utilised, and if refrigerants will be required. It is recommended that the report provides clarification on the matter and update the emission inventory accordingly (if so required).	NGEPP in an email dated 25 May 2021 confirmed that energy for equipment such as the compressed air system and ventilation system will be sourced from the power plant and not other sources of energy will be required.
The default calorific value in TJ/Tonne for natural gas is provided for as 33.6, however the Technical Guidelines (Table A.1) specifies a value of 0.048 TJ/Tonne for natural gas. Table D1 however specifies net calorific value for methane rich gas (MRG) as 33.6 MJ/Nm3. It is recommended that Table 10-3 be updated to specify the calorific values either in an additional row in the table or footnotes, as natural gas and MRG's calorific values are not comparable.	As detailed in Section 3.4 of the report, for stationary combustion, the default emission factors for natural gas where used in the absence of emissions factors for Methane Rich Gas (MRG). They do however specify a default calorific value Sasol MRG which was used instead of for natural gas. This explanation has however been added as a footnote in Section 10.1.4 and the fuel source amended to specify MRG.
The MS Excel GHG spreadsheet details two scenarios for calculation of the emissions associated with the stationary combustion (natural gas), however no detail is provided on why one set of calculations were chosen, and the other disregarded. It is recommended that the assumption and/or the calculations are updated and aligned accordingly.	Due to the lack of default emission factors for MRG initially calculations where made using guidance from the USEPA and IPCC. This was later abandoned in favour of the approach as above informed by the Technical guidelines. The excel sheet has been updated with comments to capture this.
Overall, the emission calculations appear to have been appropriately considered (with exception of comments noted in this section of the review), however, the MS Excel sheet did not specify the steps followed nor referenced the source for all the inputs utilised, with specific focus on information pertaining to stationary combustion (natural gas). It is recommended that references for values utilised be specified to ensure future calculations consider the same methodology and that the results are comparable year on year. References to the Global Warming Potential (GWP) source information should also be included	Data sources have been updated in the reporting and the Excel spreadsheet to ensure that comparative calculations can be made in future.
The following observations and recommendations concerning the impact assessment were made: • The comparison of the proposed NGEPP GHG emissions intensity in relation to coal fired power generation is informative and applicable to the CCIA; • Tax liability is mentioned repeatedly in Table 11-2, however the tax liability was not assessed in Section 6.10	Noted with thanks, as above the tax liability assessment has been excluded from the scope and it is recommended that after detailed design the GHG inventory be updated and that at that point a carbon tax expert advise on the

Peer Review Comment	SRK Response
of the report. Refer to comments made under Section 3.4 of this report for further consideration; and • The impact assessment and proposed management measures are suitable to the proposed NGEPP.	liability and measures to be implemented to reduce the liability.
The NGEPP CCIA report is of a high standard and reflect the application of South African legal requirements and international standards. Overall, the assessment of the risks and impacts associated with the GHG emissions and climate change vulnerabilities is realistic and based on credible sources. No fatal flaws were identified in the peer review, only items requiring clarification, confirmation and further discussion. Once the recommendations as indicated in this peer review report is addressed, it will ensure that potential shortcomings are averted.	Noted with thanks

Yours faithfully,

SRK Consulting (South Africa) (Pty) Ltd

Philippa Burmeister *PrSciNat/ EAP*
Principal Scientist (Air Quality and Climate Change)