Final Environmental Impact Report for the Proposed Newcastle Gas Engine Power Plant, KwaZulu-Natal

[EIA Ref: 14/12/16/3/3/2/2031]

Report Prepared for

Newcastle Energy (Pty) Ltd.

Report Number 566508/FEIR

Report Prepared by

srk consulting

June 2021

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[EIA Ref: 14/12/16/3/3/2/2031]

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SRK Project Number 566508/FEIR

June 2021

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List of Abbreviations

ADM	Amajuba District Municipality
AEL	Atmospheric Emissions Licence
AIR	Atmospheric Impact Report
BA	Basic Assessment
BBBEE	Broad Based Black Economic Empowerment
CAPEX	Capital Expenditure
CCGT	Combine Cycle Gas Turbines
CCRE	Combine Cycle Reciprocating Engines
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DEFF	National Department of Environment, Forestry and Fisheries (changed to DFFE)
DFFE	Department of Forestry, Fisheries and Environment (formerly DEFF)
DEIR	Draft Environmental Impact Report
DGDP	District Growth and Development Plan (Amajuba District)
DMRE	Department of Mineral Resources and Energy
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
dBA	A-weighted decibels
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
FEIR	Final Environmental Impact Report
FSR	Final Scoping Report
GFST	Gas fired boiler/steam turbine systems
GHG	Greenhouse gas
GN	Government Notice
Ha	Hectare
HV	High voltage
IAP	Interested and Affected Party
IBL	Inside battery limits
ICT	Information Communication Technology
IDA	Infrastructure Development Act (No. 23 of 2014)
IDP	Integrated Development Plan
IPP	Independent Power Producer
IR	Infrared radiation
IRP	Integrated Resource Plan
ISO	International Standards Organisation
kV	Kilovolt
LNG	Liquefied Natural Gas
m.a.s.l.	Metres above mean sea level
MW	Megawatt

MWe	Megawatts electric
MHI	Major Hazard Installation
NDP	National Development Plan
NEMA	National Environmental Management Act 107 of 1998
NEM:AQA	National Environmental Management: Air Quality Act 39 of 2004
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NEM:WA	National Environmental Management: Waste Act 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Areas
NGEPP	Newcastle Gas Engine Power Plant
NHRA	National Heritage Resources Act 25 of 1999
NLM	Newcastle Local Municipality
NWA	National Water Act 36 of 1998
OBL	Outside battery limits
OCGT	Open Cycle Gas Turbines
OCRE	Open Cycle Reciprocating Engines
OHSA	Occupational Health and Safety Act 85 of 1993
PES	Present Ecological State
PGDS	Provincial Growth and Development Strategy (KZN)
PICC	Presidential Infrastructure Coordinating Commission
PPA	Power Purchase Agreement
PPP	Public participation process
QRA	Quantitative Risk Assessment
QSE	Qualifying Small Enterprise
RM IPP	Risk Mitigation Independent Power Producer
RMIPPPP	Risk Mitigation Independent Power Producer Procurement Programme
S&EIR	Scoping and Environmental Impact Report
SDF	Spatial Development Framework
SG	Surveyor General
SIP	Strategic Integrated Projects
SMME	Small, Medium and Micro-sized Enterprise
SRK	SRK Consulting (South Africa) (Pty) Ltd
TBO	Time Between Overhauls
WUL	Water Use Licence

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.

1 Introduction

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 to the Karbochem Industrial Complex in Newcastle, KwaZulu-Natal.

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. Figure 1-1 provides a locality map of the project site within the Karbochem Industrial Complex in Newcastle.

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.

The S&EIR process consists of two phases, a Scoping Phase and an EIA Phase (Figure 1-2). The Scoping Phase commenced in October 2020 with notification of potential interested and affected parties (I&APs) and distribution of the Draft Scoping Report and Plan of Study for EIA for review and comment. The Final Scoping Report (SRK, December 2020) was accepted by the National Department of Forestry, Fisheries and Environment (DFFE) (formerly known as the Department of Environment, Forestry and Fisheries or “DEFF”) on 18 February 2021.

The Draft Environmental Impact Report (DEIR) was released for public comment on 28 April 2021 and all registered I&APs were notified of its availability for review. All comments received, along with the responses, have been incorporated into the Final Environmental Impact Report (FEIR) (i.e. this document) to be submitted to the DFFE for a decision on the application.

For the remainder of this document, all additions and amendments to the Draft EIR have been incorporated into this Final EIR in underlined italics text for ease of reference.

This report includes the following:

- Introduction, the objectives of the EIA process and the legislated requirements for the content of a EIR (Chapters 1 -3).
- Details regarding the EAP (Chapter 4).
- Project location and description (Chapters 5 -6).
- The legislative context (Chapter 7).
- Project need and desirability (Chapter 8).
- Alternatives (Chapter 9).
- The public participation process and identified issues (Chapter 10).
- The identification of impacts (Chapter 11).
- The impact assessment methodology (Chapter 12).
- Environmental impact assessment (Chapter 13).
- Environmental Management Programme (Appendix H).
- Assumptions, limitations and deviations (Chapter 15).
- Environmental impact statement (Chapter 16).

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

- EAP affirmation (Chapter 17).
- Authorisation opinion (Chapter 18).

91000 96000 101000

-3070000 -3075000 -3080000

Memel Road
Allen Street
Allen Street
Newcastle CBD
N11
Albert Wessels Drive
Asiphephe Drive
Madadeni
Madadeni Road
Ladysmith Drive
Karbochem Road
Karbochem Spruit
Project site
Propose area for LNG Facilities

N

Location of the site in South Africa

N3
Site Location
N1
N2

Legend

- Place
- Non-Perennial River
- Perennial River
- Proposed area for LNG Facilities

OSM Roads

- National Freeway
- Main Road
- Arterial Route
- Secondary Road
- Street
- Newcastle Energy project site

0 0.5 1 2 Kilometers

Data Source: ESRI Basemap Imagery	
Scale: 1:50 000	
Projection: TM	Datum: HH94
Central Meridian/Zone: Lo 29	
Date: 09/10/2020	Compiled by: INBRO
Project No: 566508	Fig No: 1-1

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NEWCASTLE GAS ENGINE POWER PLANT

LOCALITY MAP

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\Groundwater\566508_F2_1_NGEPP_Locality_A3CL_20201012.mxd

Revision: A Date: 28 01 2020

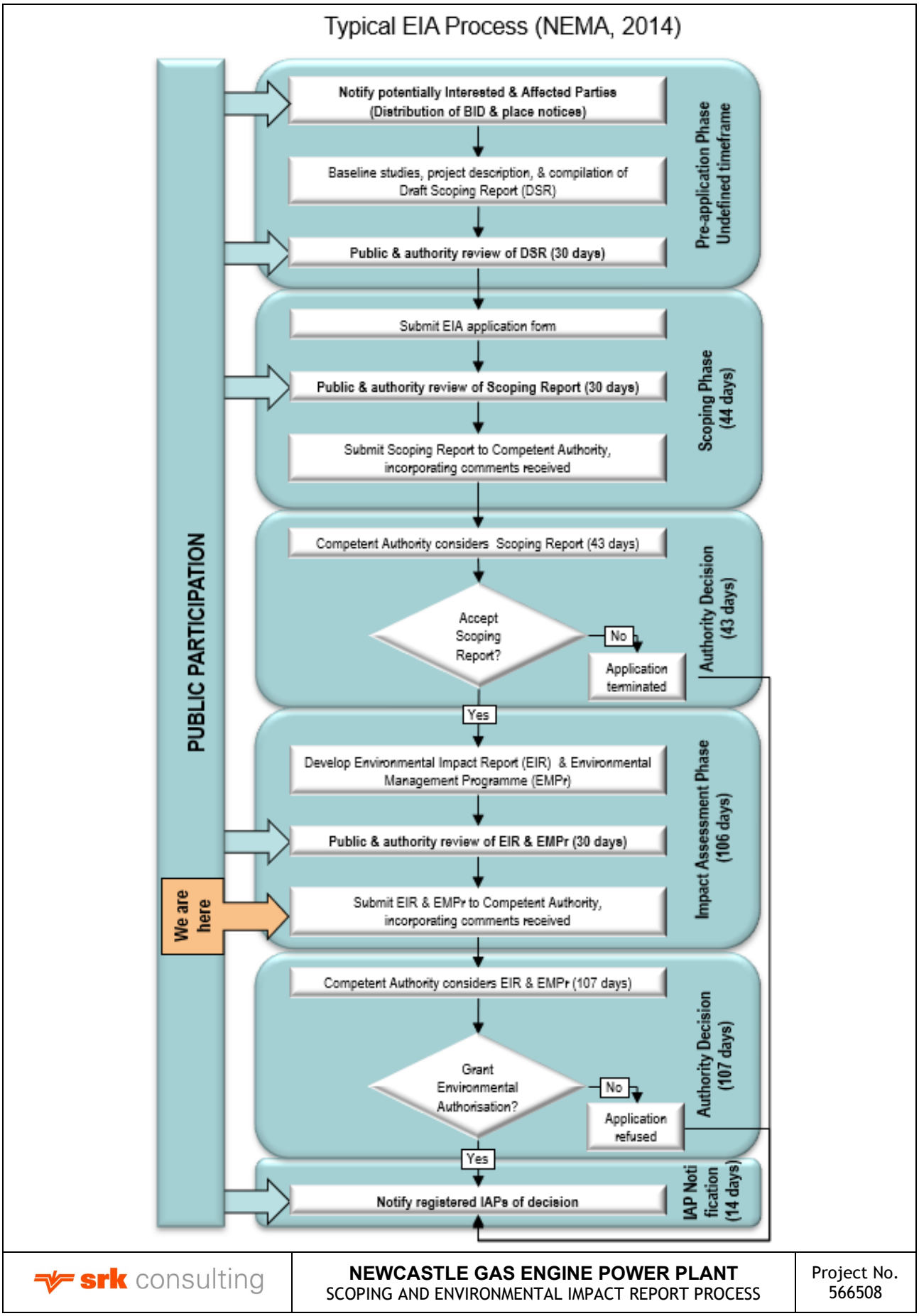

Figure 1-2: Scoping and Environmental Impact Report Process

2 Objectives

The objectives of the EIA process are specified in Appendix 3 of the Amendments to the 2014 EIA Regulations, as published by the Department of Environmental Affairs (DEA) in Government Notice (GN) 326 on 07 April 2017.

Table 2-1 lists the EIA objectives from GN 326 and provides a reference to the applicable chapter of this document where each objective is addressed.

Table 2-1: Objectives of the EIA Process

EIA Objectives (Appendix 3 of GN 326, 07 April 2017)	Reference in this Document
1. The objective of the EIA process is to, through a consultative process-	Chapter 2: Objectives Chapter 10: Public Participation Process
(a) Identify the relevant policies and legislation relevant to the activity.	Chapter 7: Legislative Context
(b) Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location.	Chapter 8: Project Need and Desirability
(c) Identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment.	Chapter 5: Project Location Chapter 6: Project Description Chapter 9: Alternatives Chapter 13: Environmental Impact Assessment
(d) Determine the— (i) Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives. (ii) Degree to which these impacts— (aa) Can be reversed. (bb) May cause irreplaceable loss of resources. (cc) Can be avoided, managed or mitigated.	Chapter 13: Environmental Impact Assessment
(e) Identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment.	Chapter 5: Project Location Chapter 6: Project Description Chapter 9: Alternatives Chapter 13: Environmental Impact Assessment
(f) Identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity.	Chapter 11: Identification of Potential Impacts Chapter 13: Environmental Impact Assessment
(g) Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	Chapter 13: Environmental Impact Assessment Chapter 14: Environmental Management Programme

3 Report Content

The legislated requirements for the content of an EIA Report are specified in Appendix 3 of the Amendments to the 2014 EIA Regulations (GN 326, 07 April 2017).

Table 3-1 lists the content requirements from GN 326 and provides a reference to the applicable chapter of this document where the specified information is provided.

Table 3-1: Legislated Requirements for the Content of an EIA Report

Content Requirements (Appendix 3 of GN 326, 07 April 2017)	Reference in this Document
3.(1) An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—	Chapter 3: Report Content
(a) details of — (i) the EAP who prepared the report. (ii) the expertise of the EAP, including a curriculum vitae.	Chapter 4: The Environmental Assessment Practitioner
(b) the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including— (i) the 21 digit Surveyor General code of each cadastral land parcel. (ii) where available, the physical address and farm name. (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	Chapter 5: Project Location
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is— (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Figure 1-1: Locality Map Figure 5-1: Aerial View of NGEPP Site. Figure 6-3: Plant general arrangement layout *Figure 6-6: Preliminary layout for LNG storage and regassification facility*
(d) a description of the scope of the proposed activity, including— (i) all listed and specified activities triggered and being applied for. (ii) a description of the activities to be undertaken, including associated structures and infrastructure.	Chapter 6: Project Description Table 7-1: Applicable NEMA Listed Activities
(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Chapter 7: Legislative Context
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report	Chapter 8: Project Need and Desirability
(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report.	Chapter 9: Alternatives
(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including— (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Chapter 9: Alternatives Chapter 10: Public Participation Process *Appendix E: Comments and Responses Trail Report* Chapter 13: Environmental Impact Assessment

Content Requirements (Appendix 3 of GN 326, 07 April 2017)	Reference in this Document
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts— (aa) can be reversed. (bb) may cause irreplaceable loss of resources. (cc) can be avoided, managed or mitigated. (vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives. (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects. (viii) the possible mitigation measures that could be applied and level of residual risk. (ix) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such. (x) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	Chapter 11: Identification of Potential Impacts Chapter 13: Environmental Impact Assessment Chapter 12: Impact Rating Methodology Chapter 13: Environmental Impact Assessment Chapter 13: Environmental Impact Assessment Chapter 9: Alternatives *Chapter 9: Alternatives (Section 9.6: Concluding statement)* *Chapter 18: Authorisation Opinion*
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process. (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Chapter 11: Identification of Potential Impacts Chapter 13: Environmental Impact Assessment
(j) an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts. (ii) the nature, significance and consequences of the impact and risk. (iii) the extent and duration of the impact and risk. (iv) the probability of the impact and risk occurring. (v) the degree to which the impact and risk can be reversed. (vi) the degree to which the impact and risk may cause irreplaceable loss of resources. (vii) the degree to which the impact and risk can be mitigated.	Chapter 13: Environmental Impact Assessment
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Chapter 13: Environmental Impact Assessment
(l) an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment. (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping	Chapter 16: Environmental Impact Statement Figure 16.1: Sensitive environmental features in the vicinity of the site

Content Requirements (Appendix 3 of GN 326, 07 April 2017)	Reference in this Document
report indicating any areas that should be avoided, including buffers. (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.	Chapter 14: Environmental Management Programme
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	*Chapter 9: Alternatives (Section 9.6: Concluding statement)* *Chapter 16: Environmental Impact Statement (Section 16.1: Summary of key findings)*
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	Chapter 18: Authorisation Opinion
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Chapter 15: Assumptions, Limitations and Deviations
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Chapter 16: Environmental Impact Statement
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.	N/A
(s) an undertaking under oath or affirmation by the EAP in relation to— (i) the correctness of the information provided in the reports. (ii) the inclusion of comments and inputs from stakeholders and I&APs. (iii) the inclusion of inputs and recommendations from the specialist reports where relevant. (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.	Chapter 17: EAP Affirmation
(t) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	N/A
(u) an indication of any deviation from the approved scoping report, including the plan of study, including— (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks. (ii) a motivation for the deviation.	Chapter 15: Assumptions, Limitations and Deviations
(v) any specific information that may be required by the competent authority; and	Chapter 17: EAP Affirmation
(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.	
3.(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report, the requirements as indicated in such notice will apply.	

4 The Environmental Assessment Practitioner

In accordance with Item 3(1)(a) in Appendix 3 of GN 326, this chapter provides details of:

(i) The Environmental Assessment Practitioner (EAP) who prepared this report.
(ii) The expertise of the EAP.

4.1 Details of the EAP

The EAP for this application is Mr. Marius van Huyssteen, Principal Environmental Scientist at SRK.

Pertinent information relating to the expertise of the EAP is summarised below:

- BSc Honours Degree in Geography and Environmental Management (2003) from the University of Natal.
- 17 years of experience in the field of environmental management.
- Specialises in environmental assessment, environmental auditing and integrated environmental licencing for the industrial, waste management and mining sectors.
- A certified EAP with the Interim Certification Board for EAPs in South Africa (CEAPSA).

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

Contact details for the EAP are provided below:

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4.2 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 EIA process 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 Report(s) or the EIA process.

5 Project Location

In accordance with Items 31)(b) and 31)(c) in Appendix 3 of GN 326, this chapter provides details of the location of the proposed project, including:

(i) The 21-digit Surveyor General (SG) code of each cadastral land parcel (Table 5-1).
(ii) The physical address and property name (refer to the box below).
(iii) Geographical coordinates for the site (Table 5-2).
(iv) A plan which locates the proposed activities applied for at an appropriate scale (Figure 1-1, Figure 5-1).

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 *(NGEPP site)*
	Remainder of Erf 13744 Newcastle (LNG facility)
Address:	3 Karbochem Road, Newcastle

The extent and SG codes for the single erf comprising the project site is provided in Table 5-1.

Table 5-1: Project Site Erf, Extent and SG Code

Site Erven	Erf Extent	SG Code
Erf 15618 Newcastle *(NGEPP site)*	1.78 ha	N0HS02210001561800000
Rem of Erf 13744 Newcastle (LNG facility)	*50.12 ha (total Erf)* *LNG facility footprint is 0.361 ha of the total Erf area:* - *LNG dispensing Station: 0.052 ha.* - *LNG Tank Farm: 0.157 ha.* - *Regassification facility: 0.152 ha.*	*N0HS02210001374400000*

The coordinates of the boundary of the *NGEPP site* are provided in Table 5-2.

Table 5-2: Geographical Coordinates for corners of the NGEPP Site

Point (Fig. 5-1)	Longitude	Latitude
A	29° 58.170' E	27° 47.078' S
B	29° 58.112' E	27° 47.107' S
C	29° 58.218' E	27° 47.181' S
D	29° 58.245' E	27° 47.168' S

The coordinates of the approximate boundaries of the components of the LNG facility are provided in Table 5-3.

Table 5-3: Geographical Coordinates for the LNG site

Point (Fig. 5-1)	***Longitude***	***Latitude***
LNG Dispensing Station		
1	*29° 58.216′ E*	*27° 47.069′ S*
2	*29° 58.218′ E*	*27° 47.075′ S*
3	*29° 58.192′ E*	*27° 47.086′ S*
4	*29° 58.189′ E*	*27° 47.080′ S*
LNG Tank Farm		
5	*29° 58.245′ E*	*27° 47.091′ S*
6	*29° 58.255′ E*	*27° 47.111′ S*
7	*29° 58.233′ E*	*27° 47.121′ S*
8	*29° 58.224′ E*	*27° 47.102′ S*
Regassification facility		
9	*29° 58.268′ E*	*27° 47.129′ S*
10	*29° 58.277′ E*	*27° 47.146′ S*
11	*29° 58.255′ E*	*27° 47.155′ S*
12	*29° 58.248′ E*	*27° 47.139′ S*
LNG pipeline		
13	*29°58.202′ E*	*27°47.082′ S*
14	*29°58.245′ E*	*27°47.151′ S*

Refer to Figure 5-1 for a map showing an aerial view of the NGEPP project site *and associated LNG facility.*

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)

A
B
C
D

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Legend

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

0 125 250 500 Meters

29°58.0001'E
29°58.5'E
29°59.0001'E
29°59.5'E

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NEWCASTLE GAS ENGINE POWER PLANT (NGEPP)

AERIAL VIEW OF NGEPP SITE

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: 5-1

Revision: A Date: 12 04 2021

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6 Project Description

In accordance with Item 3(1)(d)(ii) in Appendix 3 of GN 326, this chapter provides a description of the proposed activities, including associated structures and infrastructure.

This chapter has been updated from the Final Scoping Report with an alternative (preferred) location and layout for the Liquefied Natural Gas (LNG) backup fuel storage facility (Section 6.3.6). There has however been no substantial change to the project description from the Scoping Report.

The sub-sections below provide further information in terms of:

- Newcastle Energy – the Applicant.
- Context and alignment.
- Project detail.
- Construction and commissioning timeframes.
- Assumptions and limitations.

6.1 Newcastle Energy – the Applicant

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.

Newcastle Energy, as a subsidiary of Vutomi Energy's objectives of the NGEPP project are to:

- Get a favourable interest rates from financiers (locally or abroad) based on the strong project technical solution, a solid operating model, and competitive capital expenditure (CAPEX) estimate.
- Provide Eskom with a long-term Power Purchase Agreement (PPA), with a competitive electricity tariff or levelized cost of energy, that will suite their business requirements, but still make a fair profit for Vutomi Energy.
- To build and operate a power plant with flexibility and potential future increased capacity for energy export to the grid.
- To establish a long-term gas supply agreement to lower the overall operation cost.

6.2 Context and Alignment

A number of national policy documents present the case for natural gas as a significant contributor to South Africa's energy mix (also see Section 7.11 and Section 8). Within this context, the Department of Mineral Resources and Energy (DMRE) subsequently, on 24 August 2020, launched a Risk Mitigation IPP Procurement Programme (RMIPPPP) with the objective to address the current short-term supply gap of approximately 2 000 MW between 2019 and 2022. It is envisaged that this will alleviate the current electricity supply constraints and reduce the extensive utilisation of diesel-based peaking electrical generators. The determination for procurement of 2 000 MW through the RMIPPPP was gazetted on the 7 July 2020.

Although the applicant withdrew as a bidder for the RMIPPPP tender process, Vutomi's business strategies in terms of its operations, financial model, partnerships, and market presence align with the Government's objectives. The need for stable, firm power makes the NGEPP project desirable on the network and Vutomi / Newcastle Energy intends to bid on future such DMRE tender processes.

6.3 Project Detail

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

6.3.1 Decommissioning and demolition of existing 18.5 MW Cogeneration Plant

The existing 18.5 MW cogeneration plant (Figure 6-1 (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 6-1 (b)).
- Two Janbacher (2 MW each) engines in acoustic hoods and inside a powerhouse, with external radiator cooling towers (Figure 6-1 (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.
  - 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 deenergised, disconnected and cut back to designated location 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 (including capital plant/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 removed 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 on-site power lines, above ground pipelines, will be removed or demolished and the areas rehabilitated.

- 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.

Following the decommissioning and demolition of the existing cogeneration plant, the site will require clearing and levelling.

Figure 6-1 (a): View of cogeneration plant

Figure 6-1 (b): Deutz containerised engine

Figure 6-1 (c): Powerhouse containing Jenbacher engines

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Figure 6-1: Photographs of the existing cogeneration plant

6.3.2 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) reciprocating gas engines of 8.8 MW each. These engines will be four-stroke medium-speed (750 rpm) gas fuelled engines that will dive 11 kV electrical generators. Radiators will be used for the engines' cooling systems.

[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 MW.]

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 capacity of using the existing electrical infrastructure to export electricity produced from the NGEPP is still to be confirmed. Should any additional infrastructure need to be constructed, and should such infrastructure development trigger any EIA Listed Activities not included in this process (Table 7-1 below), Environmental Authorisation will be applied for via a separate EIA Application and Basic Assessment or Scoping and EIA process as applicable.]

Water and effluent systems will be supplied by Karbochem and all these 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) Potable 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 11 kV/50 Hz 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. There will be 13 such exhaust stacks (i.e. one for each engine).
    - 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.
    - Offloading bay.
7) High voltage (HV) yard to step up from 11 kV to 132 kV, including interconnecting transformers, line feeders and grid 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.
- Board room.
- Control room including layout plan.
- Library/documentation centre.
- Storeroom.
- Kitchen.
- Toilets.
- Staff parking.
- Visitors parking.

14) Maintenance workshop, including:
- Working and tool areas.
- Offices.
- Spares storeroom.
- Kitchen.
- Toilets.

A conceptual block diagram showing what infrastructure will be within the site boundary (i.e. inside battery limits (IBL)) and what infrastructure will be outside of the site boundary (i.e. outside battery limits (OBL)) is shown in Figure 6-2.

A provisional general arrangement layout for the above is shown in Figure 6-3 below.

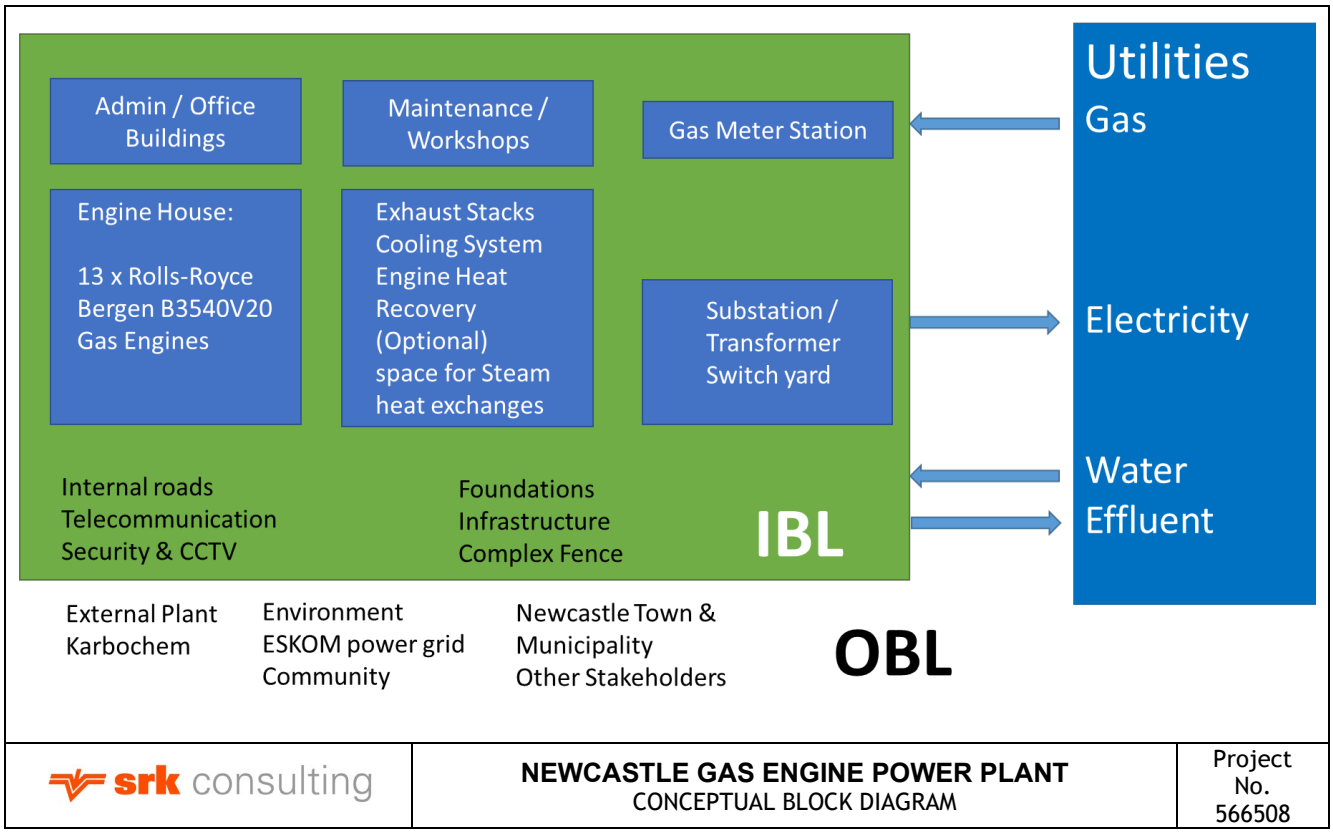
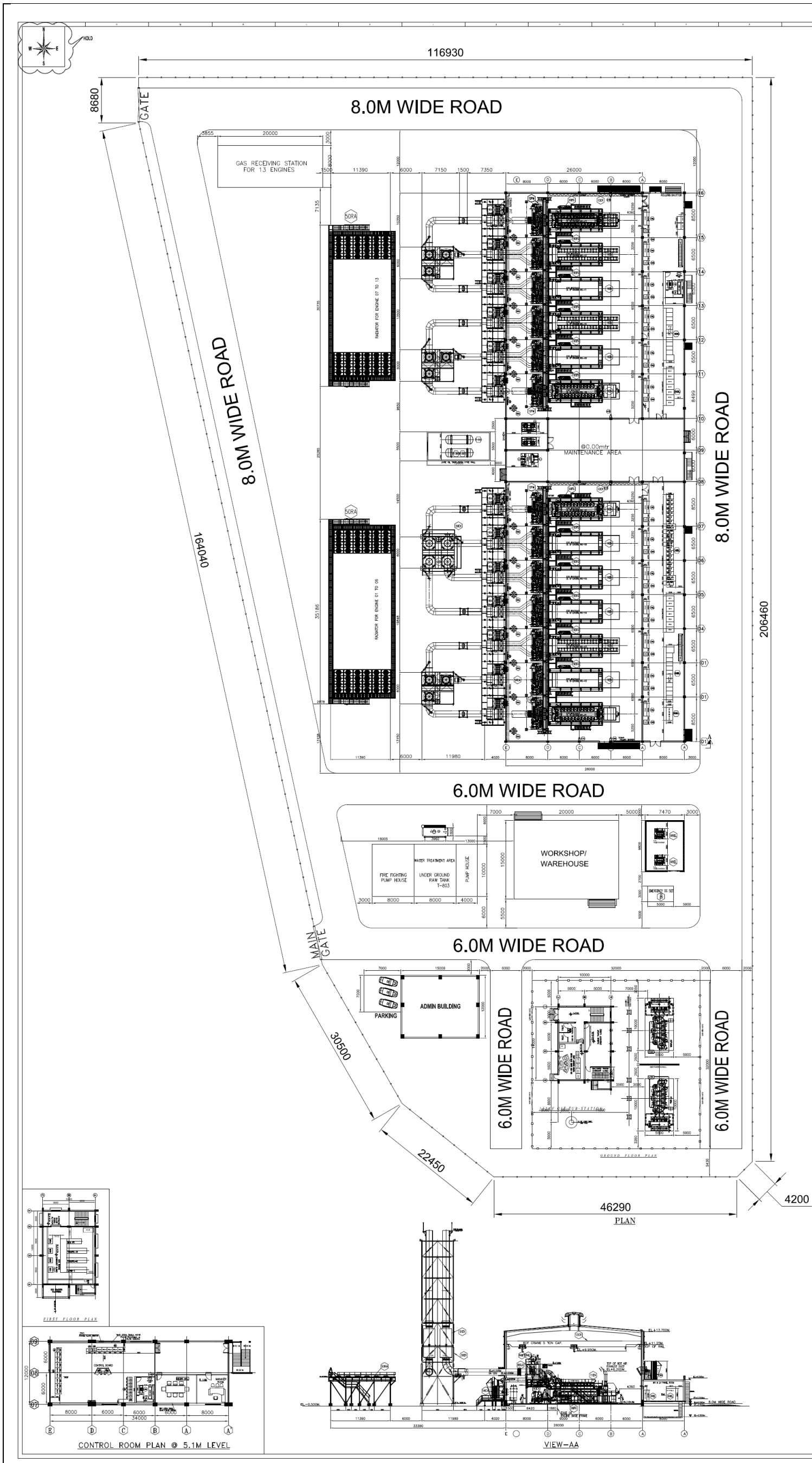


Figure 6-2: Conceptual block diagram



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 (-) 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 6-3: Plant general arrangement layout (Source: Rolls Royce)

6.3.3 Gas Engine Overview

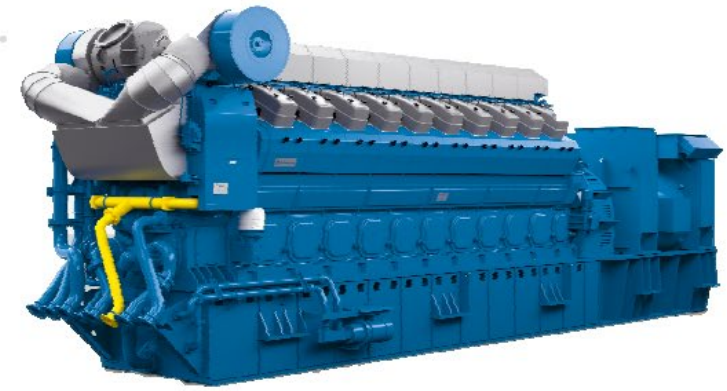
Bergen Engines supplies medium-speed engines for marine and power generation applications, and for the oil and gas industry. Marine engines are marketed through the Rolls-Royce Marine sales organization while engines for the power and for the oil and gas industry via the Rolls-Royce Power Systems sales 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 (NOx), 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.

Newcastle Energy and Rolls Royce have selected the Bergen B35:40V20 natural gas engine as the engine of choice for the project (i.e. an Open Cycle Reciprocating Engine (OCRE)). The performance data for selected engine is shown in Figure 6-4 below.

Performance data

Bergen B35:40V20AG2



Engine Type	Length [mm]	Width [mm]	Height [mm]	Weight dry [kg]	Bore / Stroke [mm]	Engine Speed [rpm]		Exhaust gas emissions 5%O2 [mg/nm³]		
B35:40V20AG2	11650	3490	4690	105500	350 / 400	750	NOx	CO	NMHC	
							500	750	225	
Engine Load						**Unit**	**100 %**	**75 %**	**50 %**	**25 %**
Mechanical output						kW	9050	6790	4525	2265
Alternator efficiency, cos ϕ = 0,9						%	97,70	97,60	96,80	95,00
Frequency						Hz	50	50	50	50
Electrical output						kW	8840	6625	4380	2150
Nom. el. Efficiency						%	47,1	46,1	43,1	36,5
Fuel gas and LO consumption						**Unit**	**100 %**	**75 %**	**50 %**	**25 %**
Specific fuel gas consumption (guidance only)						kJ/kWh	7465	7615	8090	9375
Fuel gas consumption						kW	18765	14360	10165	5895
Lub.oil consumption						g/kWh	0,4	0,4	0,3	0,3
Heat dissipation						**Unit**	**100 %**	**75 %**	**50 %**	**25 %**
Charge air cooler LT						kW	605	445	310	180
Charge air cooler HT						kW	1730	950	370	-60
Lub.oil cooler						kW	1065	950	845	665
Jacket water cooler						kW	1320	1015	765	425
Exhaust mass						kg/h	49900	37600	26600	15400
Exhaust gas temperature						°C	375	405	435	470
Cooling water data						**Unit**				
LT Inlet temp to charge air cooler (max)						45	°C			
Normal cooling water LT flow to charge air cooler						120	m³/h			
Reference site conditions							**Unit**			
Altitude above sea level (max)						1200	m			
Turbocharger air intake temp (max)						35	°C			
Turbocharger air intake temp (min)						5	°C			
Relative Humidity (max)						60	% (at 35 °C)			
Exhaust back pressure (max)						400	mmWG			
Reference fuel specification							**Unit**			
Minimum fuel gas pressure to fuel gas module						4,5	bar(g)			
Lower heating value						32,5	MJ/m³n			
Methane number						80	MN			

- All technical data are valid at 100% load, incl. two engine driven pumps (lub. oil and jacket water).
- Engine power definitions and fuel gas consumption are acc. to ISO 3046-1 (ICFN).
- Generator rating and performance in accordance with IEC 60034-1.
- Electrical efficiency may vary dependent upon alternator.
- Data for heat dissipation and exhaust gas are based on a tolerance of ± 5%, turbocharger air suction temp. 25°C.
- Due to continuous development, some data may change.

Rolls-Royce Group
bergen.rolls-royce.com

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Figure 6-4: Engine performance data (source: Rolls-Royce)

6.3.4 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.
  - 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.
  - Growing concerns over global and local gas supply.

6.3.5 Primary Fuel Supply

The primary fuel Newcastle Energy are proposing to supply the power plant with is Methane Rich Gas (MRG) via the existing gas pipeline.

A preliminary MRG specification from Spring Lights Gas has been provided by Vutomi Energy as detailed in Figure 6-5. The pressure is 20 bar downstream of the Sasol pressure reducing station at Karbochem site.

The power plant will include a new high-pressure gas receiving and metering station within the site. This gas receiving station will reduce the pressure of the gas from the pipeline to the approximately 4.5 bar required by the gas engines.

1. TYPICAL COMPOSITION

Component	Volume %
• Methane (CH_4)	88,6
• Hydrogen (H_2)	2,6
• Carbon Monoxide (CO)	2,1
• Nitrogen & Argon (N_2 & Ar)	6,4
• Ethane & Ethylene (C_2H_6 & C_2H_4)	0,3
• Water (H_2O)	Nil

2. PHYISICAL CHARACTERISTICS

Property		Units	Average Value
• Gross Energy Content	(EC_s)	MJ/ m^3_s (101,3 kPa &15°C)	33,89 Standardized
	(EC_n)	MJ/ m^3_n (101,3 kPa & 0°C)	35,73 Normalized
	(EC_s)	*MJ/kg (101.3kpa&15°C)*	*46.81 Standardized*
• Relative Density (RD)		-	0,59
• Wobbe Index (WI_n)		$\frac{EC_n}{(RD)^{0,5}}$	46,5
• Density		kg/m^3_s	0,724 standardized
		kg/m^3_n	0,763 normalized
• Dew Point		°C	< -100
• Sulphur (S)		mg/ m^3_n	9
• Lower Explosive Limit (LEL)		gas in air v/v	5%
• Higher Explosive Limit (HEL)		gas in air v/v	17%
• Stoichiometric Conditions		air/gas ratio	8,6
• Molecular Weight		g/mol	17,3
• Viscosity (dynamic)		cP	$1,2 \times 10^{-2}$
• Viscosity (kinematic)		cSt	$1,7 \times 10^{-2}$
• Auto Ignition Temperature		°C	600 – 650
• Theoretical Flame Temperature		°C	1 950
• Cracking Temperature		°C	>1000
• Flame Speed		m/s	0,41
• Flame Speed Factor		-	14 (H_2 = 100)
• Emmisivity = 1)		-	0,35 – 0,45 (black body e
• Volume of products of combustion		m^3/m^3 of gas	9,5 (wet basis) 7,7 (dry basis)
– $C0_2$ produced		kg/GJ	49,7 (HFO = 75)
– H_20 produced		kg/GJ	22,5 (HFO = 13)
• Max. theoretical $C0_2$ in flue		v/v %	12 (dry basis)

3. NOTES

- Net Energy Content is approximate 10% lower than the Gross Energy Content dependant on the application.
- Relative Density is equal to Specific Gravity (air = 1,0) or ratio of the average molecular weight of gas to that of air, where molecular weight of air is taken as 28,97g/mol.
- Sulphur is a component of an organic odorant (THT = Tetrohydrothiopheen), which is added to pipeline gas for safety considerations.
- The separation process of gasses at the Secunda factories occurs at -155°C to ensure that the gas is free from moisture.

Disclaimer: This datasheet is presented for informational purposes only and is subject to change without notice. SASOL GAS accepts NO LIABILITY which may arise from the use of this datasheet.

Source: Vutomi Energy 21/10/2020

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Figure 6-5: Preliminary Methane Rich Gas specification (source: Vutomi, 2020)

6.3.6 Backup Fuel Storage

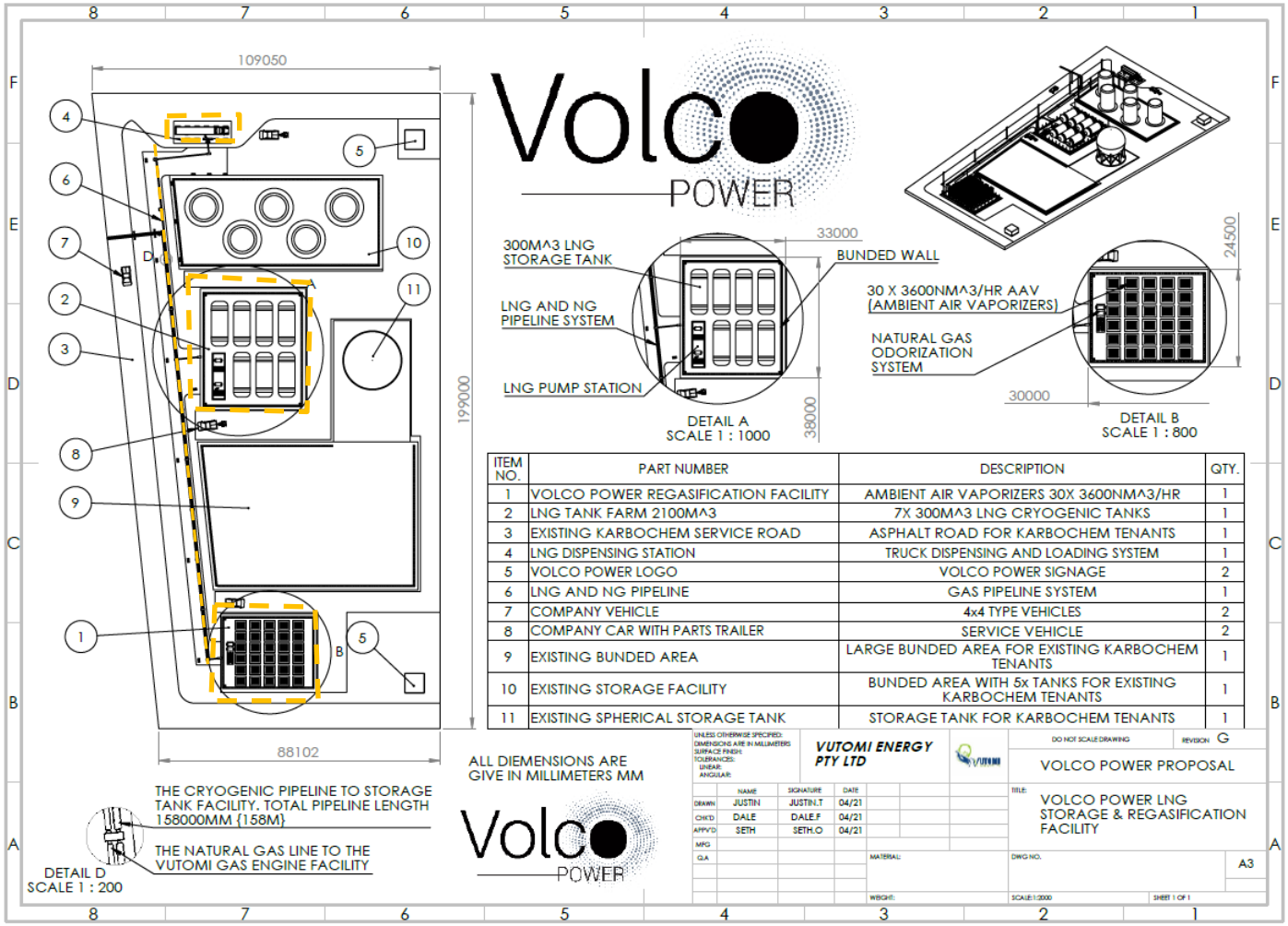
The storage of backup fuel, to the volume equivalent of a three-day supply reserve, is required for the NGEPP.

As noted in Section 6.3.5 above, 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.
- Pressure reduction station.

The above is proposed to be located within the Karbochem Industrial Complex, on the site immediately to the east of the NGEPP site (as indicated in Figure 5-1) [Note: A previously considered alternative location was to the north of the NGEPP, however, Karbochem were in favour locating the LNG facilities to the east]. The proposed LNG facility will allow for three days of LNG storage and to utilize the natural boil off gas to feed into the existing piped gas supply at a point after the piped gas pressure reduction station and before entering the gas engines. The boil off gas replenishment would be supplied by LNG ISO containers and offloaded into the cryogenic storage facility. A preliminary layout from Volco Power (Pty) Ltd. (Volco), an LNG supply company, is provided in Figure 6-6.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	VOLCO POWER REGASIFICATION FACILITY	AMBIENT AIR VAPORIZERS 30X 3600NM^3/HR	1
2	LNG TANK FARM 2100M^3	7X 300M^3 LNG CRYOGENIC TANKS	1
3	EXISTING KARBOCHEM SERVICE ROAD	ASPHALT ROAD FOR KARBOCHEM TENANTS	1
4	LNG DISPENSING STATION	TRUCK DISPENSING AND LOADING SYSTEM	1
5	VOLCO POWER LOGO	VOLCO POWER SIGNAGE	2
6	LNG AND NG PIPELINE	GAS PIPELINE SYSTEM	1
7	COMPANY VEHICLE	4x4 TYPE VEHICLES	2
8	COMPANY CAR WITH PARTS TRAILER	SERVICE VEHICLE	2
9	EXISTING BUNDED AREA	LARGE BUNDED AREA FOR EXISTING KARBOCHEM TENANTS	1
10	EXISTING STORAGE FACILITY	BUNDED AREA WITH 5x TANKS FOR EXISTING KARBOCHEM TENANTS	1
11	EXISTING SPHERICAL STORAGE TANK	STORAGE TANK FOR KARBOCHEM TENANTS	1

Notes:
1) The facilities indicated in dashed orange outlines are the proposed main LNG components.
2) Existing Karbochem infrastructure is also indicated in the layout (for orientation) but is not included in the scope of this EIR.

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NEWCASTLE GAS ENGINE POWER PLANT
PRELIMINARY LAYOUT FOR LNG STORAGE AND REGASSIFICATION FACILITY

Project No. 566508

Figure 6-6: Preliminary layout for LNG storage and regassification facility (source: Volco Power, 2021)

Figure 6-7 (a): View of proposed LNG Dispensing Station (area to the right of photograph)

Figure 6-7 (b): View of proposed Regassification Facility area

Figure 6-7 (c): View of proposed LNG Tank Farm area

Figure 6-7 (d): View of proposed LNG Pipeline route (from Dispensing Station towards Regassification Facility)

srk consulting	**NEWCASTLE GAS ENGINE POWER PLANT** PHOTOGRAPHS OF THE LNG FACILITY AREA	Project No. 566508

Figure 6-7: Photographs of the proposed LNG Facility area

6.3.7 Water Requirements and Supply

Raw and potable water for the NGEPP is envisaged to be supplied by the adjacent Karbochem Industrial Complex, subject to confirmation of water availability. The Karbochem plant supplies the existing 18.5 MW cogeneration plant under a Services and Utilities Agreement.

A complete water balance showing water consumption and rejection rates has yet to be finalised. However, water demand is not expected to be significant as there is no large requirement for cooling (i.e. it is proposed to be a closed loop cooling system and only a small amount of make-up water should be required). In this regard, the Newcastle Energy technical team has estimated a water consumption of approximately 7.6 m^3 per day.

The main water requirements will be for:

- Fire water system (especially for the first fill).
- Drinking water, toilets, showers, etc.
- Engine cooling system (especially make-up water for air cooled radiators).

Water will be needed during the construction process as normal. It is anticipated that construction water will be supplied via Karbochem too.

6.3.8 Waste Treatment

Wastewater and effluent from the NGEPP is envisaged to be discharged to the adjacent Karbochem Industrial Complex, as per the Services and Utilities Agreement for the existing 18.5 MW cogeneration plant.

7 Legislative Context

In accordance with Items 3(1)(d)(i) and 3(1)(e) in Appendix 3 of GN 326, this chapter provides:

- A description of listed and specified activities triggered and being applied for.
- A description of the policy and legislative context within which the development is proposed and an explanation of how the proposed development complies with and responds to the legislation and policy context.

The proposed NGEPP plant requires certain authorisations, licences and permits prior to the commencement of construction and operation. The identification of the relevant environmental authorisations, licences, and permits required was based on meetings and correspondence with the Applicant's Project Team (including design engineers and legal counsel), as well as SRK's understanding of site conditions.

Relevant legislation, policy, programmes and plans relating to the following aspects were consulted:

1) The South African Constitution.
2) Environmental management.
3) Waste management.
4) Air quality.
5) Water.
6) Biodiversity.
7) Heritage.
8) Health and safety risk.
9) Planning and policy framework.

The environmental legislation which is applicable to the authorisation of the proposed project is outlined in Sections 7.1 to 7.11 below.

7.1 South African Constitution

The Constitution of the Republic of South Africa Act (No. 108 of 1996) is the supreme law of the land. In terms of environmental management, the Constitution provides the overarching framework for sustainable development, including the protection of natural resources while promoting economic and social development.

The environmental clause in Section 24 of the Constitution provides that:

"Everyone has the right –

a) To an environment which is not harmful to their health or wellbeing.

b) To have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:

i. Prevent pollution and ecological degradation;
ii. Promotes conservation;
iii. Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development."

7.2 National Environmental Management Act

The National Environmental Management Act (No. 107 of 1998) (NEMA) provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of the State, as well as to provide for matters connected therewith. Section 2 of NEMA establishes a set of principles that apply to the activities of all organs of state that may significantly affect the environment. These include the following:

- Development must be sustainable.
- Pollution must be avoided or minimised and remedied.
- Waste must be avoided or minimised, reused or recycled.
- Negative impacts must be minimised.
- Responsibility for the environmental health and safety consequences of a policy, project, product or service exists throughout its life cycle.

Section 28(1) states that:

"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring."

If such degradation/pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution. These measures may include:

- Assessing the impact on the environment.
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks.
- Ceasing, modifying or controlling actions which cause pollution/degradation.
- Containing pollutants or preventing movement of pollutants.
- Eliminating the source of pollution.
- Remedying the effects of the pollution.

The enforcing authority for NEMA is the DFFE and provincial environmental authorities (for this application, DFFE is the competent authority).

Legal requirements for this project

Newcastle Energy has a responsibility to ensure that the proposed development and the EIA process conform to the principles of NEMA. The proponent is obliged to take action to prevent pollution or degradation of the environment in terms of Section 28 of NEMA.

7.3 NEMA EIA Regulations

7.3.1 Background

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities that may not commence without an Environmental Authorisation issued by the competent authority (DFFE). In this context, the 2014 EIA Regulations, as amended in April 2017 in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIA's in support of Environmental Authorisation applications. The EIA Regulations consists of the following Government Notices (GN):

- GN R326 specifies the EIA procedures to be followed.
- GN R327 provides Listing Notice 1 – activities that require a Basic Assessment (BA) process.
- GN R325 provides Listing Notice 2 – activities that require a Scoping and Environmental Impact Report (S&EIR) process.
- GN R324 provides Listing Notice 3 – activities in identified geographical areas that require a BA process.

The regulations for both processes stipulate that:

- Public participation must be undertaken as part of the assessment process.
- The assessment must be conducted by an independent EAP.
- The relevant authorities respond to applications and submissions within stipulated time frames.
- Decisions taken by the authorities can be appealed by the proponent or any other Interested and Affected Party (IAP).
- A draft EMPr must be compiled and released for public comment.

GN R326 sets out the procedures to be followed and content of reports compiled during the Basic Assessment and S&EIR processes.

The NEMA National Appeal Regulations (GN R993 of 2014, as amended by GN R205 of 2015) make provision for appeal against any decision issued by the relevant authorities. In terms of the Regulations, an appeal must be lodged with the relevant authority in writing within 20 days of the date on which notification of the decision (Environmental Authorisation) was sent to the applicant or IAP (as applicable). The applicant, the decision-maker, interested and affected parties and organ of state must submit their responding statement, if any, to the appeal authority and the appellant within 20 days from the date of receipt of the appeal submission.

7.3.2 Historical Environmental Authorisation – existing 18.5MW Cogeneration Plant

The KwaZulu-Natal Department of Agriculture and Environmental Affairs, as they were known at the time[2], issued Newcastle Cogeneration (Pty) Ltd. (the previously owners of the existing facility) Environmental Authorisation (Ref: EIA/6399, 27 July 2006) for the construction a cogeneration heat

[2] The KwaZulu-Natal Provisional Authority is currently named the Department of Economic Development, Tourism and Environmental Affairs (EDTEA).

and power plant with gas turbines and associated infrastructure. The Environmental Authorisation was subsequently amended (Ref: EIA 6399/AMND/08, 29 September 2008).

7.3.3 Application for Environmental Authorisation for the 100 MW NGEPP

The site on which the NGEPP project is proposed is within an industrial complex and currently contains the above described 18.5 MW cogeneration plant. Despite the existing land use and transformed nature of the site, the NEMA listed activities as described in Table 7-1 will be triggered by the development and operation of the proposed GNEPP and therefore require Environmental Authorisation. Since activities from Listing Notice 2 are triggered, a S&EIR process is being undertaken.

[**Note**: The site for the project is within an industrial complex. As such, there are existing water supply, gas supply, and electricity grid tie in points. Where upgrades or expansions to the existing infrastructure/ tie in points may be required, these will be considered in terms of any additional potential listed activities that may be triggered for inclusion in the EIA Application. Such possible expansion related listed activities in the context of the project, where applicable, will be discussed and confirmed with the DFFE Assessing Officer assigned to this project (e.g. during the Pre-Application Meeting).]

Table 7-1: Applicable NEMA Listed Activities

No.	Activity Description	Applicability to the Project
NEMA EIA Listing Notice 1 (GN 327) – BA process required		
31	The decommissioning of existing facilities, structures or infrastructure for— (i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; …….	There is an existing 18.5 MW gas fired cogeneration plant on the site, which is owned by Newcastle Energy. This existing plant will be decommissioned and removed from site to provide space for the proposed 100 MW NGEPP.
NEMA EIA Listing Notice 2 (GN 325) – S&EIR process required		
2	The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more.	The NGEPP is proposed to have 100 MW capacity, to be achieved via installation of 13 gas engines and associated infrastructure.
4	The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres. Where "dangerous goods" means goods containing any of the substances as contemplated in South African National Standard No. 10234, supplement 2008 1.00: designated "List of classification and labelling of chemicals in accordance with the Globally Harmonized Systems (GHS)" published by Standards South Africa, and where the presence of such goods, regardless of quantity, in a blend or mixture, causes such blend or mixture to have one or more of the characteristics listed in the Hazard Statements in	The storage of backup fuel (LNG), to the volume equivalent of a three-day supply reserve, is required for the NGEPP (see Section 6.3.6). The proposed combined capacity of containers for the storage and handling of dangerous goods on site will be 2 100 m^3.

No.	Activity Description	Applicability to the Project
	section 4.2.3, namely physical hazards, health hazards or environmental hazards.	
6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding- (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (iii) the development of facilities and infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.	The proposed project will require an Atmospheric Emission License (AEL) in terms of National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM: AQA). In this regard, Government Notice No. 893 (November 2014) (as amended June 2015, October 2018 and March 2020), as promulgated under NEM: AQA, includes the following listed activity: • Category 1 "Combustion Installations", which includes Subcategory 1.4 "Gas combustion installations". Refer to Section 7.4 for further details regarding the AEL application.

Legal requirements for this project

The proposed development includes activities listed in terms of GN R325. As such, the proponent is obliged to conduct an Environmental Impact Assessment (via a S&EIR process) for the proposed activity in accordance with the procedure stipulated in GN R326.

7.4 National Environmental Management: Air Quality Act

The National Environmental Management: Air Quality Act No. 39, 2004 (NEM: AQA) stipulates that activities listed as having a potential negative impact on air quality require authorisation in the form of an Atmospheric Emission Licence (AEL). A S&EIR process, as described in the EIA Regulations made under section 24(5) of the NEMA, is required. The following listed activity is relevant to the proposed activities:

Sub-category 1.4: Gas Combustion Installations.

Gas combustion (including gas turbines burning natural gas) used primarily for steam raising or electricity generation.

All installations with design capacity equal to or greater than 50 MW heat input per unit, based on the lower calorific value of the fuel used.

Legal requirements for this project

The power plant will have a generation capacity of approximately 100 MW, from the combustion of gas, as such an AEL will be required.

7.5 National Environmental Management: Waste Act

The National Environmental Management: Waste Act (No. 59 of 2008) (NEM: WA) was implemented on 1 July 2009 and Section 20 of the Environment Conservation Act (No. 73 of 1989), under which waste management was previously governed, was repealed. The main objectives of the NEM: WA are to:

> *Reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; and to provide for:*
> - *National norms and standards for regulating the management of waste by all spheres of government;*
> - *Specific waste management measures;*
> - *The licensing and control of waste management activities;*
> - *The remediation of contaminated land; to provide for the national waste information system; and*
> - *Compliance and enforcement.*

The objectives of NEM:WA involve the protection of health, wellbeing and the environment by providing reasonable measures for the minimisation of natural resource consumption, avoiding and minimising the generation of waste, reducing, recycling and recovering waste, and treating and safely disposal of waste as a last resort.

In terms of the NEM: WA, all waste management activities must be licensed. According to Section 44 of the Act, the licensing procedure must be integrated with an EIA process in accordance with the Regulations GN R982 (as amended). Government Notice 719, which was implemented on 3 July 2009, removed all waste management activities from the EIA Regulations GN R386 and GN R387, resulting in new NEMA listed activities namely GN R544 and GN R545 which were further amended to form GN R983, 984 and 985. In 2017, GN R983, 984 and 985 were amended through GN R324, 325 and 327.

GN R921, of 29 November 2013, lists the waste management activities that require licensing. A distinction is made between Category A waste management activities, which require a Basic Assessment, and Category B activities, which require a S&EIR process, and Category C waste management activities which do not require a waste management licence but compliance with relevant requirements or standards.

Legal requirements for this project

Waste handling, storage and disposal during decommissioning and demolition of the existing 18.5 MW cogeneration plant is required to be undertaken in accordance with the requirements of this act.

With regards to the proposed 100 MW power plant, it will not receive waste for processing or recycling and there are no solid waste streams directly associated with the energy generation process (e.g. coal ash as would occur in a coal fired power plant). Solid wastes generated from ancillary processes are expected to be minor in quantity and if a waste management storage area is required, it is anticipated that the scale of such a storage area would fall below the thresholds specified in Category C.

7.6 National Greenhouse Gas Emission Reporting Regulations

The National Greenhouse Gas Emission Reporting Regulations (GN R275 of 2017) have been promulgated in terms of NEM: AQA for the purpose of introducing a single national reporting system for the transparent reporting of greenhouse gas emissions. The Regulations apply to the categories of emission sources listed in Annexure 1 to the Regulations and include fugitive emissions from fuels from the leakage of natural gas. Installations with a combined stationary combustion installation design

capacity equal to or above 10 MW(th)[3] are required to report on Greenhouse Gas emissions. Tier 1 reporting is required as a minimum, with a five year grace period applicable before reporting of the lower tiers.

Legal requirements for this project

It is expected that, in order for the competent authority to make a decision regarding the project, the quantity of greenhouse gases emitted from the proposed development are reported on in the Environmental Impact Report (see Section 13.2). Reporting of actual GHG emissions would be required during the operational phase.

7.7 National Environmental Management: Biodiversity Act

The National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of the NEM: BA, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA Regulations).
- Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

The objectives of this Act are to provide, within the framework of the NEMA, for:

- The management and conservation of biological diversity within the Republic.
- The use of indigenous biological resources in a sustainable manner.

The Act's permit system is further regulated in the Act's Threatened or Protected Species Regulations (GN R255) of March 2015, the National List of Threatened Ecosystems (GN R1002) of December 2011 and the Alien Invasive Species Regulations (GN R598) of August 2014.

Legal requirements for this project

The site on which is the NGEPP is proposed is within an industrial complex, on land zoned for industry and houses an existing 18.5 MW gas fired cogeneration plant (i.e. it is transformed from its natural state). The site on which the LNG facility is proposed is similarly within the Karbochem Industrial Complex, on undeveloped land but also transformed from its natural state (i.e. terraces, platforms, embankments, mowed lawn grass). Although much of the NGEPP site is hard surfaced, the central and south eastern portions are of the site are vegetated. The ecological quality and integrity of these areas, including the possible presence of protected species and associated permitting requirements (if applicable), are reported on in the Environmental Impact Report (see Section 13.4).

7.8 National Heritage Resources Act

The protection and management of South Africa's heritage resources is controlled by the National Heritage Resources Act (No. 25 of 1999) (NHRA). The enforcing authority for this act is the South African Heritage Resources Agency (SAHRA).

[3] MW(th) refers to Megawatt thermal. Megawatt thermal is the amount of energy required to generate the energy output of the power plant / boiler. For example, a powerplant with a generating capacity of 1 000 MW(e) might require 3 000 MW(th) to generate this output energy.

In terms of the Act, historically important features such as graves, trees, archaeological artefacts/sites and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection. In terms of Section 38 of the NHRA, SAHRA can call for a Heritage Impact Assessment where certain categories of development are proposed. The Act also makes provision for the assessment of heritage impacts as part of an S&EIR process and indicates that if such an assessment is deemed adequate, a separate Heritage Impact Assessment is not required.

The Act requires that:

> *"…any person who intends to undertake a development categorised as the ... or any development or other activity which will change the character of a site exceeding 5 000 m² in extent or involving three or more existing erven or subdivisions thereof must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development..."*

Legal requirements for this project

The NGEPP site (including LNG facility) is a brownfields site within an industrial complex. When it was developed for the cogeneration plant, no historical features were uncovered. As such, no heritage studies are proposed. However, a chance finds procedure will be included in the Environmental Management Programme for the development.

7.9 National Water Act

The National Water Act (No. 36 of 1998) (NWA) provides for:

- The promotion of efficient, sustainable and beneficial use of water in the public interest.
- The facilitation of social and economic development.
- The protection of aquatic and associated ecosystems and their biological diversity.
- The reduction and prevention of pollution and degradation of water resources.

The Act also provides for emergency situations where pollution of water resources occurs. Section 21 of the Act describes activities that will require prior permitting before these activities may be implemented, including any changes to the river course and banks, changes to water flows and the discharge of water containing waste.

Legal requirements for this project

The development may include activities that are listed under Section 21 in which case Water Use Authorisations will be required. The Aquatic Ecological Impact and Compliance Statement specialist study (SAS, 2021a), indicates that the stie falls outside of any wetland and riparian zones of regulation in terms of NEMA and GN 509 as it relates to the NWA (see Section 13.3.2). Furthermore, the Hydrogeological Assessment (Appendix G-7) undertaken for the feasibility study, has concluded that the need for significant dewatering of groundwater during construction is not anticipated for this project (Section 13.7.5). Based on the project description and the specialist input referred to above, application for a Section 21 Water Use Authorisation may not be triggered. This will be confirmed with the Department of Water and Sanitation.

7.10 Health and Safety Risk: NEMA and Occupational Health and Safety Act

In South Africa, risk assessments are carried out under the legislation of two separate acts, each with different requirements. These are discussed in the subsections that follow.

7.10.1 EIA Risk Assessment

Risk assessments regarding public health and safety from major incidents under NEMA are associated with EIAs and must be performed in accordance with NEMA. In this instance, impacts on the environment must be evaluated and mitigation proposed by the specialist conducting the investigation.

Section 30 of NEMA deals with the control of emergency incidents where an incident is defined as an "*unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed*." NEMA goes further by giving instructions with regard to reporting such an incident and limiting the effects of such an incident regarding risks to public health and the environment. The identification and mitigation of potential Section 30 incidents is thus crucial in the risk assessment of the project.

Generally, at the EIA phase there is insufficient detailed information to complete a Major Hazard Installation (MHI) risk assessment in full accordance with the MHI Regulations (refer to Section 7.10.2). For example, emergency plans have not been developed and final designs have not been completed. Under these circumstances, a risk assessment would be conducted generally in accordance with the prescribed topics of the MHI Regulations. The MHI risk assessment is not a requirement for EIA approval.

The EIA phase determines if there are any fatal flaws that will prevent the project proceeding and the EIA risk assessment should have a statement from a professional person covering:

- The identification of potential NEMA Section 30 incidents.
- The determination of whether the proposed project is likely to be considered an MHI.
- If found to be an MHI, the determination of whether the proposed project would meet the requirements of the MHI Regulations and whether the risks could be engineered or managed to an acceptable level.
- The determination of whether there are any factors that will prevent the project from proceeding to the next phase of construction or alternatively whether the project could continue under certain conditions or with mitigation.
- The determination of whether there are any special requirements that the local authorities should be aware of when evaluating the proposal.

7.10.2 MHI Risk Assessment

The Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the MHI Regulations (GN R692 of 30 July 2001) require that a MHI risk assessment be undertaken for installations which have on their premises a quantity of a substance which can pose a significant risk to the health and safety of employees and the public.

Should the EIA risk assessment confirm that the facility is a MHI and no fatal flaws are identified, the Department of Labour requires that a MHI risk assessment be undertaken prior to construction to determine if the project can be constructed and operated with all risks to employees and the public at an acceptable level.

The MHI report must be prepared by a registered Department of Labour Approved Inspection Authority. The risk assessment undertaken during the EIA would be updated to include recalculations for the changes indicated by the Environmental Authorisation and would include all the required elements of the MHI Regulations not completed in the EIA risk assessment, such as evaluation of emergency planning.

The MHI risk assessment (if required) would need to be submitted to the Department of Labour and the Newcastle Municipality: Disaster Management / Fire and Rescue.

Legal requirements for this project

An EIA risk assessment (Section 7.10.1) has been undertaken as part of the EIA phase for the NGEPP project. This included a determination of whether the proposed project is likely to be considered a MHI and the specific requirement of the OSHA and MHI Regulations have been reported on in the Environmental Impact Report (refer to Section 13.6 and Appendix G-6).

7.11 Planning Policy Framework

7.11.1 Integrated Energy Plan 2019

South Africa's National Development Plan (NDP) envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution. The is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment (DMRE, 18 October 2019).

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

The IRP spells out the DMREs vision of a diversified energy mix that reduces reliance on one or a few energy sources. Decommissioning of existing coal power generation plants due to end of design life provides an opportunity for other energy sources in the energy mix.

Electricity generation from natural gas is identified as a potential energy source. Gas to power technologies can provide the flexibility required to complement renewable energy. In the short term gas to power would require the importing of gas but an established gas sector would provide an opportunity in the longer term to explore local gas sources. Co-operation with neighbouring countries is envisaged for joint exploitation and beneficiation of natural gas within the SADC region.

The IRP indicates a requirement for 1 000 MW in 2023 and 2 000 MW in 2027, at a 12% average load factor. This takes into account locational issues such as ports, environment, transmission etc. The IRP notes that this represents low gas utilisation and makes the assumption that this is unlikely to justify the development of new gas infrastructure and power plants. Consideration is therefore also given to the conversion of the existing diesel-powered peaking power plants on the east coast of South Africa, as infrastructure for the importation of gas is expected to be developed at these locations first.

7.11.2 Risk Mitigation IPP Procurement Programme

The Department of Mineral Resources and Energy (DMRE) has issued a determination aimed at ensuring energy security for the generation of approximately 2 000 MW from a range of energy source technologies in accordance with the short-term risk mitigation capacity allocated under the heading 'Others', for the years 2019 to 2022 of the Integrated Resource Plan for Electricity 2019 to 2030 (published as GN 1360 of 18 October 2019 in Government Gazette No. 42784 ('IRP 2019'). The procurement programme aims to haver new generation capacity linked to the grid by no later than 30 June 2022 (DMRE, 2020).

The Risk Mitigation IPP Procurement Programme notes the following:

- The Risk Mitigation IPP Procurement Programme has been designed to procure the target of 2 000 MW of new generation capacity to be derived from different types of dispatchable power generation Projects.

- The dispatchable power generation projects may utilise fuel to produce the energy output.
- The capacity and energy output will be procured from a range of energy source technologies.
- The selected projects will contribute towards socio-economic development and sustainable economic growth, while enabling and stimulating the participation of independent power producers in the electricity supply industry in South Africa.

The NGEPP described and assessed in this EIR did not bid in this 2 000 MW bidding round. It is however expected that there would be further similar bidding rounds, which have yet to be announced, and that the project will be put forward in response to those.

7.11.3 Infrastructure Development Act and Strategic Integrated Projects

The Infrastructure Development Act (No. 23 of 2014) (IDA) aims to:

- Provide for the facilitation and co-ordination of public infrastructure development which is of significant economic or social importance to the Republic.
- Ensure that infrastructure development in the Republic is given priority in planning, approval and implementation.
- Ensure that the development goals of the state are promoted through infrastructure development.
- Improve the management of such infrastructure during all life-cycle phases, including planning, approval, implementation and operations.
- Provide for matters incidental thereto.

Section 7 of the IDA outlines the requirements for Strategic Integrated Projects (SIPs), and Section 8 allows for the designation and implementation of SIPs.

In terms of Section 8(1)(a) read with Section 7(1) of the IDA, the Presidential Infrastructure Coordinating Commission (PICC) has designated an updated list of SIPs (published under GN 812 of 24 July 2020), which includes:

"Emergency/Risk Mitigation Power Purchase Procurement Programme (2000MW): National".

As referred to in Section 6.2 of this document, the applicant withdrew as a bidder for the 2020 RMIPPPP tender process but intends to bid on future such DMRE tender processes. It is SRK's understanding that should the NGEPP project receive preferred bidder status from the DMRE (at some point in the future), then the project could qualify to be classified as a SIP, and be prioritised as such.

Planning policy relevance for this project

The proposed NGEPP project aligns with purpose and objectives of the IEP, IRP and IDA in terms of Government's vision for the future energy landscape in South Africa.

8 Project Need and Desirability

In accordance with Item 3.(1)(f) in Appendix 3 of GN 326, this chapter provides a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site, as contemplated in the accepted Scoping Report.

The DEA has published a "Guideline on Need and Desirability" (DEA, 2017) which contains best practice guidelines for the consideration of the need and desirability of a development involving NEMA listed activities.

Need and desirability is based on the principle of sustainability, set out in the Constitution and in NEMA, and provided for in various policies and plans, including the National Development Plan 2030. Addressing the need and desirability of a development is a way of ensuring sustainable development – in other words, that a development is ecologically sustainable and socially and economically justifiable – and ensuring the simultaneous achievement of the triple bottom-line.

The guideline sets out a list of questions which should be addressed when considering need and desirability of a proposed development based on Section 24 of the Constitution which calls for the securing of "ecological sustainable development and use of natural resources" and the promotion of "justifiable economic and social development".

8.1 Analysis of Need and Desirability

There are various proxies for assessing the need and desirability of a project, notably national and regional planning documents which enunciate the strategic needs and desires of broader society and communities. Project alignment with these documents must therefore be considered and reported on in the EIA process. With the use of these documents – or using best judgment where these planning documents are not available – the EAP (and specialists) must consider the project's strategic context, or justification, in terms of the needs and interests of the broader community (DEA&DP, 2013).

The consideration of need and desirability in EIA decision-making therefore requires the consideration of the strategic context of the project along with broader societal needs and the public interest (DEA, 2014). However, it is important to note that projects which deviate from strategic plans are not necessarily undesirable. The DEA notes that more important are the social, economic and ecological impacts of the deviation, and "the burden of proof falls on the applicant (and the EAP) to show why the impacts might be justifiable" (DEA, 2017).

The social component of need and desirability can be assessed using regional planning documents such as Spatial development Frameworks, Integrated Development Plans and EMFs to assess the project's social compatibility with plans. These documents incorporate specific social objectives and emphasise the need to promote the social well-being, health, safety and security of communities, especially underprivileged and/or vulnerable communities.

The proposed NGEPP project will create employment opportunities during the construction and operational phases and provide power to the national energy grid during the operational phase, improving energy security at a national level and indirectly facilitating further development opportunities in the area. The project would therefore constitute a strategic investment that will generate benefits in support of the provision of power in a more environmentally favourable manner than coal fired power generation.

The economic need and desirability of a project can be assessed using national, provincial, district and local municipal planning documents to assess the project's economic compatibility with plans. These documents describe specific economic objectives and emphasise the need to:

- Improve job creation opportunities.
- Ensure appropriate economic growth.
- Concentrate on sustainable job creation, using existing economic strategies as a basis, particularly business and infrastructure development.
- Encourage trade and investment through improved energy availability and security.
- Provide adequate and appropriate infrastructure to stimulate economic growth.

The proposed project is aligned with the above objectives, which effectively support the development of the gas to power plant as a means to ensure economic growth and energy provision.

It is essential that the implementation of social and economic policies takes cognisance of strategic ecological concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of our ecosystem services. Sustainable development is the process that is followed to achieve the goal of sustainability (DEA, 2014).

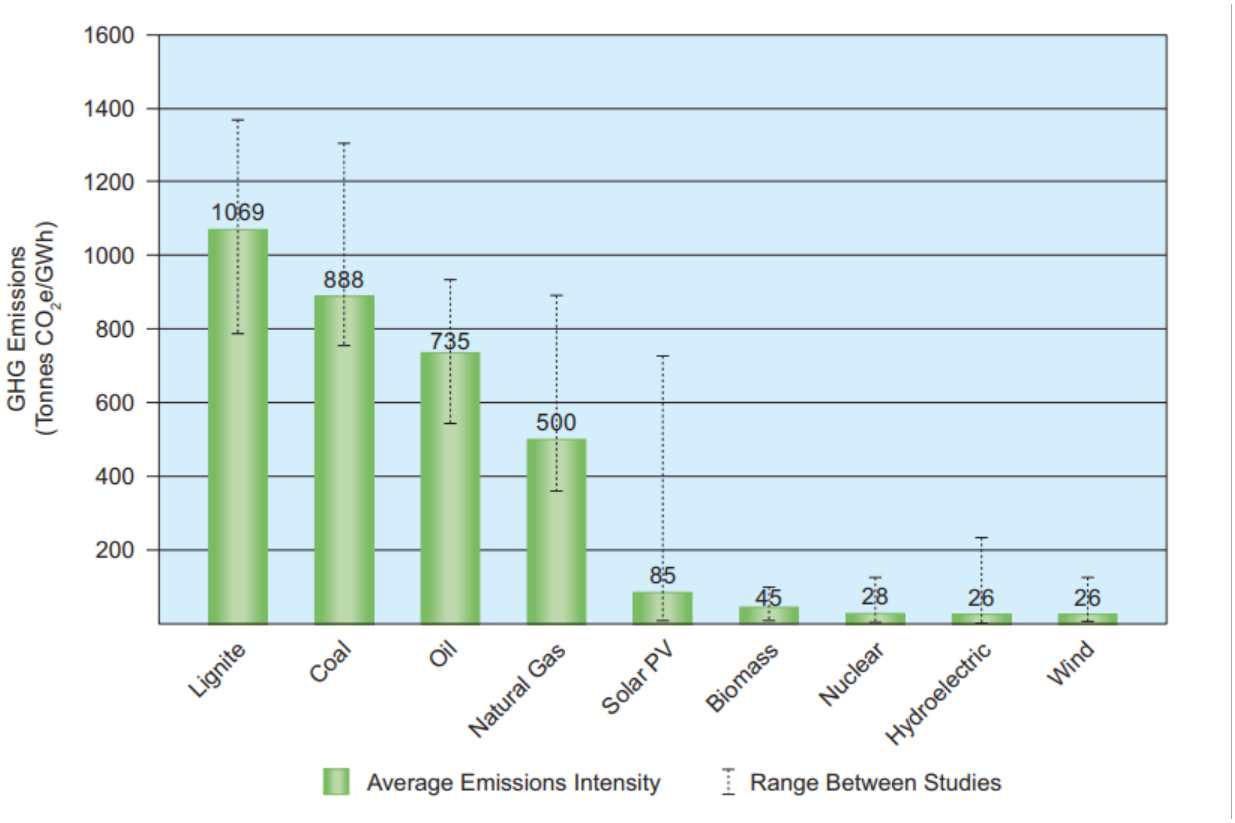
Sustainable development implies that a project should not compromise natural systems. In this regard, the Best Practicable Environmental Option is that which provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

NEMA and the EIA Regulations, 2014 call for a hierarchical approach to the selection of development options, as well as impact management which includes the investigation of alternatives to avoid, reduce (mitigate and manage) and/or remediate (rehabilitate and restore) negative (ecological) impacts (DEA, 2014).

Gas fired power generation is among the current alternative sources of energy which has been shown to be an efficient and, in comparison with coal fired power plants, a relatively clean method of thermal power generation. The primary fuel type being considered is natural gas, although provision is also made for the storage and use of LNG, as a backup fuel, and possibly for initial periods, should gas supply be delayed for any reason. The EIA process will assess the impact of the fuel being used, including the estimated quantities of alternative fuels that can reasonably be expected to be used. Significant deviations from the changes in the assessed fuel mix would require further assessment and licensing.

A compilation study of secondary resources, which looked at 83 sources compared the life cycle emissions of different methods of generating electricity, including natural gas and coal (WNA, July 2011)[4]. This study revealed that, using existing power generation technology, electricity generation from natural gas on average emits less greenhouse gases (GHG) than from coal (see Figure 8-1).

[4] WNA. (July 2011). *Comparison of Lifecycle Greenhouse Gas Emissions of Various Electrivity Generation Sources.*



srk consulting	NEWCASTLE GAS ENGINE POWER PLANT LIFECYCLE GHG EMISSIONS INTENSITY OF ELECTRICITY GENERATION METHODS	Project No. 566508

Figure 8-1: Lifecycle GHG Emissions Intensity of Electricity Generation Methods (WNA, July 2011)

8.2 Alignment with Energy Initiatives

Newcastle Energy's proposed 100 MW Gas to Power project is in direct response to the DMRE's Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) which was launched in August 2020. The objective of the RMIPPPP is to fill the current short-term supply gap, of approximately 2 000 MW between 2019 and 2022, to alleviate the current electricity supply constraints and reduce the extensive utilisation of diesel-based peaking electrical generators.

As referred to in Section 6.2 of this document, the applicant withdrew as a bidder for the 2020 RMIPPPP tender process but intends to bid on future such DMRE tender processes.

8.3 Land Use Planning Policy Framework

The proposed development is situated within the Karbochem Industrial Complex in Newcastle and is consistent with land use planning objectives that the Newcastle Local Municipality has defined for that area.

8.4 Employment Opportunities

Although the number of employment opportunities is still to be confirmed by Newcastle Energy, it is projected that the NGEPP project will create permanent skilled employment opportunities in addition to contract employment positions. There will also be direct employment opportunities during the construction phase of the project. Opportunities would be created for skilled and trained workers.

Newcastle Energy plans to award goods and services contracts for the NGEPP to small, medium and micro-sized enterprises (SMMEs) in the KwaZulu-Natal area. These contracts will include security, fuel supply, cleaning, transport, mobile equipment maintenance, gardening, sales officer and Information Communication Technology (ICT). Based on an average of each worker supporting six other persons, the project could potentially provide significant indirect economic benefits.

9 Alternatives

This chapter meets the requirements of Items 3(1)(g), 3(1)(h)(i), 3(1)(h)(ix) and 3(1)(n) of Appendix 3 of GN 326, by providing details of all the alternatives considered and the final proposed alternatives which respond to the impact management measures, avoidance and mitigation measures identified through the assessment.

The following alternatives are discussed in the sub-sections below:

- Technology.
- Activity.
- Site location.
- Layout.
- 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/ operational expenditure (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 “better” suited for use.

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

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

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

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 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 100 m.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 m.a.s.l.

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 is extra CAPEX as well as OPEX cost, as certain chemicals are consumed in volume.

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.

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 are better suited for use in mid-merit/peaking applications and for stabilizing electricity grids with Renewable Energy capacities.

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 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 uniquely 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.

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 used oil to discard.

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.

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 *was initially* to respond to the dispatchable power requirement of the DMRE's RMIPPPP *which has the objective to address the current short-term supply gap of approximately 2 000 MW by 2022 (refer Section 6.2).*

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.

The proposed back up fuel supply LNG facility was initially proposed to be located in the Karbochem parking area to the north of the NGEPP site as presented in the FSR. This location was subsequently revisited. The currently preferred LNG facility location is to the east of the NGEPP (on undeveloped parcels of land), also within the Karbochem Industrial Complex (Figure 5-1).

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 for the powerplant 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 has evaluated these risks (Section 13.6 and Appendix G-6).

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 on greenhouse gas emissions, energy security, and 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 have been compared and assessed in this 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.

9.6 Concluding statement regarding alternatives considered

The project alternatives as described in this chapter, including technology, activity, site location, layout and no-go alternatives, were considered by Newcastle Energy and its technical team during project conceptualisation and prefeasibility phase. The preferred or final alternatives have therefore been built into the project description as presented in Chapter 6 of this report and have subsequently been assessed in Chapter 13 (Environmental Impact Assessment). As such, all resulting impact management measures, avoidance and mitigation measures identified and recommended through the assessment, are in response to the preferred proposed alternatives.

10 Public Participation Process

This chapter meets the requirements of Item 3(1)(h)(ii) in Appendix 3 of GN 326, by providing details of the public participation process (PPP) to be undertaken in terms of Regulation 41 of the Amendments to the 2014 EIA Regulations (GN 326, 07 April 2017) and includes copies of the supporting documents and inputs.

The purpose of the public participation process is to ensure that the issues, inputs and concerns of interested and affected parties (IAPs) are taken into account during the decision-making process. This requires the identification of IAPs (including authorities, technical specialists and the public), communication of the process and findings to these IAPs and the facilitation of their input and comment on the process and environmental impacts, including issues and alternatives that are to be investigated.

A successful public participation process is one that is inclusive, actively engages the public and provides ample opportunity for the public to participate in the application process.

SRK has taken cognisance of the requirements for public participation in terms of 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) and will strived to ensure that the public participation principles are upheld.

Activities undertaken as part of the public participation process are described in the sub-sections below.

10.1 COVID-19 Public Participation

SRK has taken cognisance of the requirements for public participation in terms of the Directions Regarding Measures to Address, Prevent and Combat the Spread of COVID-19 Relating to National Environmental Management Permits and Licences (Government Notice Regulation 650, dated 5 June 2020) (GN R. 650).

The purpose of the GN R. 650 Directions is to curtail the threat posed by the COVID-19 pandemic and to alleviate, contain and minimise the effects of the national state of disaster, and in particular to provide directions to ensure fair licensing processes and public participation processes as required by environmental legislation, including the EIA Regulations, as applicable to this application.

At all times it must be ensured that reasonable opportunity is provided for public participation and that all administrative actions are reasonable. While the COVID-19 pandemic is a unique circumstance, the specific circumstances in each case must be considered in order to determine what will be reasonable. If in the circumstances of a particular case alternative reasonable methods to give notice to potential IAPs are available, then the relevant competent authority can be approached for an agreement in this regard as provided for in Regulation 41(2)(e) of the EIA Regulations.

As such, a public participation plan in accordance with the GN R. 650 Directions was submitted to approved by the DFFE on 30 October 2020. Refer to Appendix C for the plan and subsequent DFFE approval of it.

10.2 National Authority Pre-Application Meeting

A pre-application meeting was held virtually via Microsoft Teams with the DFFE on 30 October 2020, where the proposed development was presented and discussed with the competent authority. The listed activities in terms of the NEMA EIA Regulations, 2014 and proposed way forward were discussed with DFFE.

10.3 Identification of Interested and Affected Parties

The public participation for the project was initiated with the development of an IAP database. The IAP database includes the following:

- Competent Authority – DFFE.
- Commenting Authorities:
  - Department of Water and Sanitation (DWS).
  - KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA) (Amajuba District Municipality Office)
  - Amajuba District Municipality.
  - Newcastle Local Municipality.
- Civil Aviation Authority.
- Adjacent industries, including:
  - Karbochem.
  - African Amines.
  - Brother CISA.
- Nearby accommodation facilities (500m to 800m to the west of the site):
  - Snips B&B.
  - Sipholesizwe Guest Lodge.

The IAP database is included in Appendix D.

10.4 Project Announcement

10.4.1 Public Notices

Five (5) A2 size laminated posters informing IAPs of the proposed application and inviting registration, were placed around the project site on 14 October 2020. The purpose of the site notices was to inform passers-by of the proposed development and how to register and comment. A copy of the content of the site notice, the GPS co-ordinates of the locations and photographic proof of placement has been included in Appendix D.

10.4.2 Newspaper Advertisement

An English advertisement was placed in the Newcastle Advertiser Newspaper on 16 October 2020. The aim of the advertisements was to inform the public in the area of the proposed development in order to canvass the issues and concerns of the broader public. This was done to ensure that all potential IAP's were invited to register for the project and afforded the opportunity to comment on the proposed development.

A copy of the advertisement, as published, is included in Appendix D.

10.4.3 Letters to Key Stakeholders and Authorities

A notification letter was compiled and distributed electronically to the IAPs on the database on 20 October 2020. The letters provided a brief overview of the proposed development and an explanation of the EIA process being followed. The purpose of the letters was to inform IAPs of the project and afford them an opportunity to register as an IAP and provide comment. Also see Section 10.5 below. Where emails were not delivered, phone calls were made to confirm contact details.

10.5 Draft Scoping Report

IAPs on the database were notified via email on 20 October 2020 of the availability of the Draft Scoping Report for review and comment. The link to a digital copy was provided (https://docs.srk.co.za/en/za-newcastle-gas-engine-power-plant-100-mw-ipp-project-scoping-eia) together with the forms of communication available to submit comments. A further email was sent to notify IAPs on 4 November 2020 to notify them of the extension of the commenting period to 30 November 2020.

The Draft Scoping Report and Environmental Authorisation (EA) application was submitted to DFFE on 30 October 2020 via the Departments online submission platform via the link: https://sfiler.environment.gov.za:8443/

10.6 Final Scoping Report

All comments received on the Draft Scoping Report were incorporated into the Final Scoping Report, which was submitted to DFFE and made available on the SRK website for review by commenting authorities and IAPs. Refer to Appendix E for the Comments and Response Trail Report. DFFE approved the FSR and Plan of Study for the EIA dated 18 February 2021 (see Appendix F).

10.7 Distribution of Draft EIR

The Draft EIR *was* made available to registered I&APs and relevant authorities for review and comment *via the SRK website on 28 April 2021. Hard copies of the Draft EIR were provided to the following authorities that requested it:*

- *DWS.*
- *KZN EDTEA (Amajuba District Municipality Office).*
- *Amafa aKwaZulu Natali (Heritage Authority).*

All registered I&APs and relevant authorities were notified via written correspondence of the availability of the Draft EIR for review and comment and provided with a period of 30 days to submit comments (Appendix D). Telephonic and written communications were undertaken with I&APs as and when the need arose.

10.8 Final EIR

All comments received on the Draft EIR have been incorporated into this Final EIR which will be submitted to DFFE and made available on the SRK website for review by commenting authorities and I&APs.

All relevant authorities and registered I&APs will be notified of the availability of the Final EIR for review and comment. Any comments received after closure of the comment period will be forwarded to DFFE for consideration during decision-making on the application.

10.9 Decision Notification

In accordance with section 4(2) of the EIA Regulations, all registered I&APs will be notified in writing within 14 days of the decision date and the appeal process.

10.10 I&AP Issues Raised

Comments received during the stakeholder engagement processes and responses to those comments are summarised in the Comments and Responses Trail Report attached as Appendix E. Also included in Appendix E are copies of written comments received and minutes of meetings.

11 Identification of Potential Impacts

In accordance with Items 3(1)(h) and (i) in Appendix 3 of GN 326, this chapter provides a description of the process followed to identify potential impacts and risks of the proposed activities and associated structures and infrastructure on the receiving environment.

The consecutive steps of the process undertaken to identify and characterise potential impacts are described below and illustrated in Figure 11-1:

Step 1: Identify activities

Identification of the main activities during the construction, operational and decommissioning phases of the proposed development.

Step 2: Identify aspects

For each identified activity, the associated environmental and social aspects are identified and verified during stakeholder engagement and specialist input.

Step 3: Characterise the receiving environment

The likely sensitivities or vulnerabilities of the receiving environment, as they pertain to the proposed activities and associated infrastructure, are characterised.

Step 4: Identify potential impacts

Within the context of the proposed activities and the nature of the receiving environment, impacts and risks identified with implementation of the project are considered in terms of potential significance.

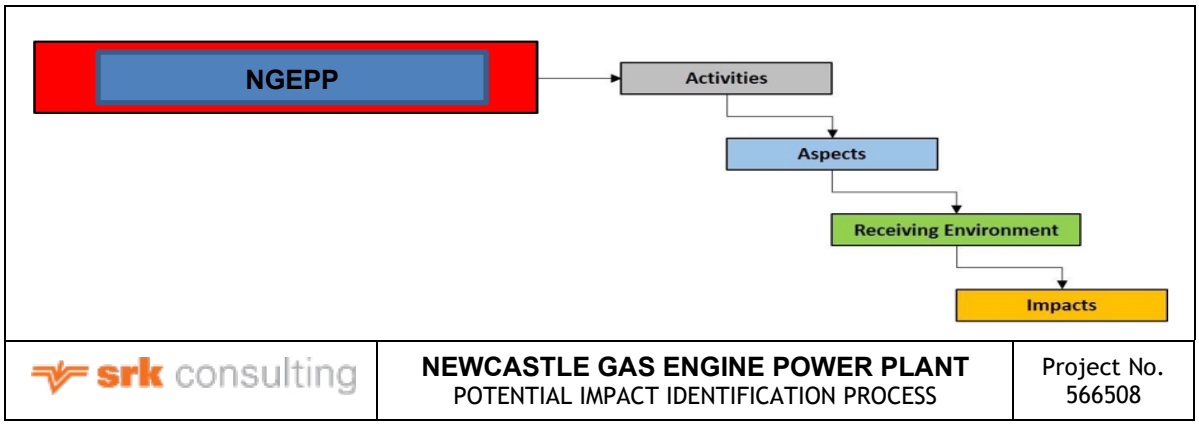


Figure 11-1: Potential Impact Identification Process

The potential impacts of the project are mostly linked to the sensitivity of the biophysical environment, expected emissions and discharges, climate change and stakeholders' perceptions.

Based on the professional experience of the EIA team, legal requirements, the nature of the proposed activity, the nature of the receiving environment and issues raised in the stakeholder engagement process, the following key environmental aspects of the proposed development have been investigated in the impact assessment phase of the EIA:

- Emissions to air (air quality and climate change impacts).
- Noise generation (noise impacts).
- Spill, fire and explosion risks (safety impacts).
- Decommissioning of existing plant and construction of new plant (terrestrial and aquatic ecology, surface and ground water, and heritage resource impacts).
- Waste generation (waste management impacts).
- Electricity generation (socio-economic impacts).

- Job creation (socio-economic impacts).
- Altering sense of place (visual impacts).

The above listed aspects, their associated impacts and their relevance to the proposed project area are described in more detail in Table 11-1 below, including where where/how they are addressed in this report.

Table 11-1: Process to Identify Potentially Significant Impacts

Aspect	Potential Impact	Description and approach	EIR Sections
Emissions to air	Air quality impacts	Air quality impacts would occur through the following: • Combustion of fossil fuels, resulting in emissions of oxides of carbon, nitrogen and sulphur, and particulate matter. • Fugitive emissions of natural gas during the storage and handling of LNG. • Particulate matter during construction. The probability of emissions occurring is definite for all of these emission sources, and emissions are considered irreversible and unavoidable. With the exception of dust emissions during construction, the extent, duration, consequence and significance of these emissions requires further study by means of an Atmospheric Impact Assessment. In addition to the impacts on ambient air quality and climate change (see row below) , the cumulative impacts of the proposed NGEPP project, the existing industrial activities at the Karbochem Complex, and other existing developments or emission sources within the Newcastle airshed, will need to be assessed to determine compliance with the national ambient air quality standards. Dust emissions during the construction phase are temporary in nature and the extent, probability, consequence, and significance can readily be managed through standard construction techniques. Therefore, it was proposed in the FSR that a qualitative assessment of significance of dust impacts during construction be provided in the EIR and that these impacts are addressed by means of standard conditions in the Environmental Management Programme.	Section 13.1 Appendix G-1
	Climate change	The emission of the greenhouse gases carbon dioxide and methane, as highlighted in the previous section, are an inevitable consequence of the proposed project. The use of carbon capture technology is not proposed, and while fugitive emissions of methane can be managed, some emissions are bound to occur. On the other hand, the need for the project is to provide an alternative to diesel peaking power plants and make up short term energy shortfalls from renewable energy project (thereby displacing the use of diesel and supporting the renewable energy industry). An assessment of the impact of the project on climate change targets is required to determine extent, significance and consequence of the project during the operational phase of the development.	Section 13.2 Appendix G-2
Noise generation	Noise impacts	During construction, noise will be generated by the operation of earth moving and construction equipment, such as bulldozers, front end loaders, scrapers, excavators, concrete mixers as well as haulage and other kinds of trucks. It is likely that piling will be required. These are characterised by impulsive noise events of high amplitude that can have a startling effect (see Section 10.8 regarding proximity to residential areas). It is proposed that noise impacts during the construction phase be assessed by the EAP and addressed through standard practices in the EMPr. For most gas-fired power plants, the major noise sources during operation are the Air Cooled Condensers, steam turbine generator, combustion inlet filter house, and the exhaust stack. The combustion turbine and generator may be housed in acoustical enclosures, thereby dropping their respective noise source ranking (Saussus, 2012). A Noise Impact Assessment is proposed to assess the extent, consequence, and significance of noise impacts during the operational phase of the development.	Section 13.5 Appendix G-5

Aspect	Potential Impact	Description and approach	EIR Sections
Spill, fire and explosion risks	Safety impacts	The storage and handling of LNG poses a safety risk and is a Major Hazard Installation (MHI) in terms of the Occupational Health & Safety Act (No. 85 of 1993) (OHSA). Quantitative Risk Assessments are carried out under two separate Acts, each with different requirements. Section 30 of NEMA deals with the control of emergency incidents. This differs from an MHI risk assessment done under the OHSA. Generally, at the EIA phase there is insufficient detailed information to complete an MHI risk assessment in full compliance with the OHSA MHI regulations. An MHI Risk Assessment will however need to be conducted prior to construction. The EIA phase risk assessment determines if there are any fatal flaws that will prevent the project proceeding, while the MHI risk assessment will determine if the project can be constructed and operated with all risks to employees and public at an acceptable level. It is therefore proposed that for the purposes of the EIA, specialist Quantitative Risk Assessment be conducted.	Section 13. 6 Appendix G-6
Decommissioning of existing plant and construction of new plant	Aquatic ecology impacts	The National Freshwater Ecosystem Priority Areas (NFEPA) identifies a wetland 201 m to the south east of the NGEPP site (Figure 1-1). There is a stormwater drain along the eastern site boundary, which drains towards culvert in south eastern corner of the site. Vegetation clearing and disturbance of soils during construction will leave them vulnerable to erosion by water and wind. This could lead to increased sediment load in stormwater runoff, which has the potential to impact the identified wetland, or alternatively the existing stormwater infrastructure. Similarly, the increase in hardened surfaces associated with the operation of development will result in less infiltration of stormwater into the soil and increased runoff, potentially exacerbating stormwater impacts. It is anticipated that the stormwater infrastructure within the industrial complex has anticipated the increased runoff and is suitable sized. The proximity to a wetland will require an assessment of the impacts on that wetland for the purposes of a Water Use Authorisation. It is therefore proposed that an Aquatic Impact Assessment be conducted to inform the Water Use Authorisation process. This assessment will consider impacts during both construction and operation.	Section 13.3 Appendix G-3
	Groundwater impacts		Section 13.7 Appendix G-7
	Surface water impacts		Section 13.7 and 13.8 Appendix G-7
	Terrestrial ecology impacts	Vegetation will need to be cleared in order to prepare the site for construction. Clearing and disturbance of the soil and vegetation during construction also has the potential to promote the growth and spread of invasive alien vegetation on the site. Faunal species could be lost and fragmented through vegetation clearing for the development, displacing these animals to adjacent areas. The transformation of land was previously approved for the development of the 18.5 MW cogeneration plant. Notwithstanding this, there may be protected species on the site that require permits for relocation or removal. No terrestrial ecological assessment is therefore proposed in this EIA process. However, a biodiversity compliance statement will be prepared by a biodiversity specialist (i.e. supported by a desktop assessment and field verification study with associated maps). Following which, it is proposed that terrestrial ecological impacts be managed through standard procedures in the EMPr, and application for the relevant permits for removal or relocation of protected species post-authorisation.	Section 13.4 Appendix G-4

Aspect	Potential Impact	Description and approach	EIR Sections
	Heritage resource impacts	It is possible that excavation and earth-moving activities during construction could expose, and potentially damage or destroy, concentrations of palaeontological and/or archaeological material. Since the site is transformed (disturbed) and no sensitive areas/material were identified within the proposed development area during the construction of the existing plant, a heritage study is not deemed to be required. Standard management measures will be included in the EMPr aimed at managing the significance and consequence of any chance finds that may be uncovered during construction.	Section 13.10
	General construction related impacts	A number of construction and demolition related impacts that might occur, and which are not captured in the discussion above, include: • Sanitation and water supply. • Safety and security. • Veld fires and fire management. • Interruption to services supply. It is proposed that these potential impacts are addressed through standard management procedures in the EMPr, without specialist investigations.	EMP, Appendix H
Waste generation	Waste management impacts	With the exception of effluent and air emissions, no large-scale systematic by-products (i.e. wastes) would be generated as part of the process. Relatively minor quantities of general and industrial waste, typical of industrial process, are would be generated. No specific waste study is therefore proposed for either construction or operation. Standard waste management practices would apply, and the EMPr will include an item for the preparation and implementation of a waste management plan for the construction, operational, and decommissioning/demolition phases (i.e. for both the existing cogeneration plant and proposed NGEPP).	Section 13.12 EMP, Appendix H
Electricity generation	Socio-economic impacts	It is expected that the social and economic benefits associated with the project would be self-evident to the environmental authorities and the general public, particularly given that this project is in response to the government led RMIPPPP. The proposed development would result in positive investment in the Newcastle Municipal Area and would result in the creation of a number of employment opportunities. Additional socio-economic benefits resulting from indirect employment (provision of services and goods), stimulation of the local economy, and government levies and taxes paid would also result from the development. As such it is proposed that the positive social and economic benefits be described qualitatively by the EAP during the impact assessment phase, and without specialist input.	Section 13.9
Job creation	Socio-economic impacts		Section 13.9
Altering sense of place	Visual impacts	The project is located in an industrial complex on a site that already houses an 18.5 MW cogeneration plant. The nature of the NGEPP project will therefore be consistent with the surrounding land use and the visual expectations for the area. To manage impacts during construction, activities will need to be managed so that negative visual impacts (including those resulting from dust) are minimised. No assessment of visual impacts is therefore proposed in in the EIA phase. It is proposed that visual impacts during the construction phase are managed through standard management measures in the EMPr.	Section 13.11 EMP, Appendix H

12 Impact Rating Methodology

The assessment of impacts will be based on the professional judgement of specialists and the EAP according to the SRK impact assessment methodology presented below. The impact ratings will be informed by the findings of specialist assessments conducted, fieldwork, and desk-top analysis. The significance of potential impacts that may result from the proposed development will be determined in order to assist DFFE in making a decision.

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 12-1 below.

Table 12-1: 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 12-2.

Table 12-2: 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 12-3.

Table 12-3: 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 12-4 below.

Table 12-4: 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 12-5 below.

Table 12-5: 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

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant:** the potential impact is negligible and will not have an influence on the decision regarding the proposed activity/development.
- **Very Low:** the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity/development.
- **Low:** the potential impact may not have any meaningful influence on the decision regarding the proposed activity/development.
- **Medium:** the potential impact should influence the decision regarding the proposed activity/development.
- **High:** the potential impact will affect the decision regarding the proposed activity/development.
- **Very High:** The proposed activity should only be approved under special circumstances.

Practicable mitigation measures will be recommended and impacts will be rated in the prescribed way both with and without the assumed effective implementation of mitigation measures.

13 Environmental Impact Assessment

This chapter meets various requirements in Items 3(1)(h) to (k) in Appendix 3 of GN 326 relating to a description of the environmental attributes and assessment of each identified potentially significant impact and risk.

As part of the initial desktop review of available information, regional and baseline information presented in the Final Scoping Report (SRK, December 2020) was informed by the following sources (references as applicable):

- *Final Integrated Development Plan (IDP) Review (2020/21) - Development Planning and Human Settlements*, Newcastle Local Municipality, June 2020 (IDP Review, 2020).
- *Assessment of Groundwater Quality at the African Amines Plant within the Karbochem Newcastle Factory Site*, by Jones & Wagner Consulting Civil Engineers, Report No. JW69/07/B057, May 2007 (Jones & Wagner, 2007).
- *Environmental Impact Assessment Report for proposed Chrome Chemicals Plant Expansion at Newcastle*, KwaZulu-Natal, prepared by Environmental Science Associates (ESA) for Lanxess (Pty) Ltd., July 2009 (ESA, 2009).
- *Record of Decision (RoD): Proposed Construction of a New Co-generation Heat and Power Plant with Gas Turbines and Associated Infrastructure on Sentrachem Plant, Lot 13660/1, Newcastle (Ref: EIA/6399)*, issued by the KZN Department Agriculture and Environmental Affairs, July 2006 (Cogeneration RoD, 2006).
- *Amajuba District Municipality: Biodiversity Sector Plan*, by Ezemvelo KZN Wildlife, Version 1.0, March 2014 (Amajuba DM, 2014).

In the subsections that follow, baseline information presented in the FSR has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed project. In this regard, the specialist studies undertaken for the EIA process, as well as those commissioned to inform the project feasibility and preliminary design, are listed in Table 13-1. Specialist impact assessment reports specifically undertaken to inform this EIR, which include more detailed descriptions of the various elements of the baseline environment, are attached as Appendices G-1 to G-7.

Table 13-1: Project specific specialist studies

No.	Study	Undertaken by
A	**EIA Specialist Studies (i.e. attached as Appendices G-1 to G-7)**	
1	Atmospheric Impact Report for Proposed Gas-to-Power Plant in Newcastle, South Africa (Appendix G-1)	SRK Consulting
2	Climate Change Impact Assessment for the Newcastle Gas Engine Power Plant, KwaZulu-Natal (Appendix G-2)	SRK Consulting
3	Aquatic Ecological Impact and Compliance Statement Considering Development of the Proposed 100 MW Newcastle Gas Engine Power Plant (NGEPP) Independent Power Producer (IPP) Project in Kwazulu-Natal Province (Appendix G-3)	Scientific Aquatic Services (SAS)
4	Terrestrial (Biodiversity) Compliance Statement Considering Development of the Proposed 100 MW Newcastle Gas Engine Power Plant (NGEPP) Independent Power Producer (IPP) Project in Kwazulu-Natal Province (Appendix G-4)	Scientific Aquatic Services (SAS)
5	Acoustic Impact Assessment for Proposed Newcastle Gas Engine Power Plant, KwaZulu-Natal (Appendix G-5)	SRK Consulting
6	Quantitative Risk Assessment for the Proposed Newcastle Gas Engine Power Plant at Newcastle in the KwaZulu-Natal Province (Appendix G-6)	RISCOM (Pty) Ltd.
B	**Feasibility / design related studies (i.e. those referenced in this document)**	
1	Feasibility Geotechnical Report for the Proposed 100MW IPP Power Plant in Newcastle, Kwazulu-Natal (December 2020)	Gevorkyan Geophysics [Ref: Gevorkyan, 2020]
2	Hydrogeological Assessment for the proposed Newcastle Gas Energy Power Plant (Appendix G-7)	SRK Consulting

No.	Study	Undertaken by
3	Hydrology and Flooding Assessment for the Proposed Newcastle Gas Engine Power Plant, KwaZulu-Natal (December 2020)	SRK Consulting [Ref: SRK, 2020e]

The specialist studies are summarised, as applicable, in the sub-sections below to provide:

- A description of the relevant environmental attributes.
- Identified potentially significant impacts and risks.
- An assessment of the pre- and post-mitigation significance using the methodology described in Chapter 13.
- A description of the cumulative nature of the environmental aspects and impacts identified for the project within the context of the receiving environment in the broader Newcastle area is provided in Section 13.13.

The following impacts have been be addressed by SRK without specialist input:

- Socio-Economic Impacts.
- Archaeological and cultural heritage.
- Visual Impacts.

External Peer Review of SRK Specialist Studies

Of the specialist studies listed Table 13.1 above, four of them were undertaken SRK's inhouse specialist consultants. In order to verify independence, the following external specialist peer reviews were undertaken:

- *Atmospheric Impact Report Peer Review:*
  - ***IMA Trader 20 CC**: Mr. A. Simpson (Pr.Sci.Nat.) and Ms. M. McNamara.*
- *Acoustic Impact Assessment Peer Review:*
  - ***IMA Trader 20 CC**: Mr. A. Simpson (Pr.Sci.Nat.) and Ms. M. McNamara.*
- *Climate Change Impact Assessment Peer Review:*
  - ***Umwelt Solutions (Pty) Ltd.**: Ms. E. Retief (Pr.Sci.Nat.; Reg EAP).*
- *Hydrogeological Assessment Peer Review:*
  - ***The WaterWorx Group (Pty) Ltd.**: Mr. S. Kisten (Pr.Sci.Nat.).*

For each external peer review undertaken, the reviewer has produced a peer review report, which has been appended to the back of the relevant specialist report, accompanied by a response letter from the SRK specialist.

Integration of Studies into the EIR and Review

The completed specialist studies and their findings have been integrated into the EIA Report. The key findings of each specialist were evaluated in relation to each other to provide an overall and integrated assessment of the project impacts.

SRK has considered the suite of potential impacts in a holistic manner and in certain instances, based on independent professional judgment and this integrated approach, may have altered impact significance ratings provided by the specialist. Where this has been done it is indicated in the relevant section of the report.

Specialists have made recommendations for the management of impacts, and the EIA team has assessed these recommendations. For the sake of brevity, only key (i.e. non-standard essential) mitigation measures are presented in impact rating tables (later in this section).

13.1 Air Quality

The section is informed by the Atmospheric Impact Report (AIR) which is attached as Appendix G-1.

13.1.1 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.

13.1.2 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.

13.1.3 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).

Rainfall

Rainfall acts as a removal mechanism whereby atmospheric gases are absorbed, and particulate matter is trapped into raindrops falling to the ground. As such, during periods of high rainfall, the air quality of an area can be improved.

During 2017, rainfall ranged from 0.5 mm (July) to 76.8 mm (February). Whilst in 2018, rainfall ranged from 0.3mm (June) to 45.0 mm (March), and 0.0 mm (July) to 148.7 mm (December). Total rainfall for 2017, 2018 and 2019 was 218.7 mm, 159.3 mm and 627.3 mm respectively. 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 13-1.

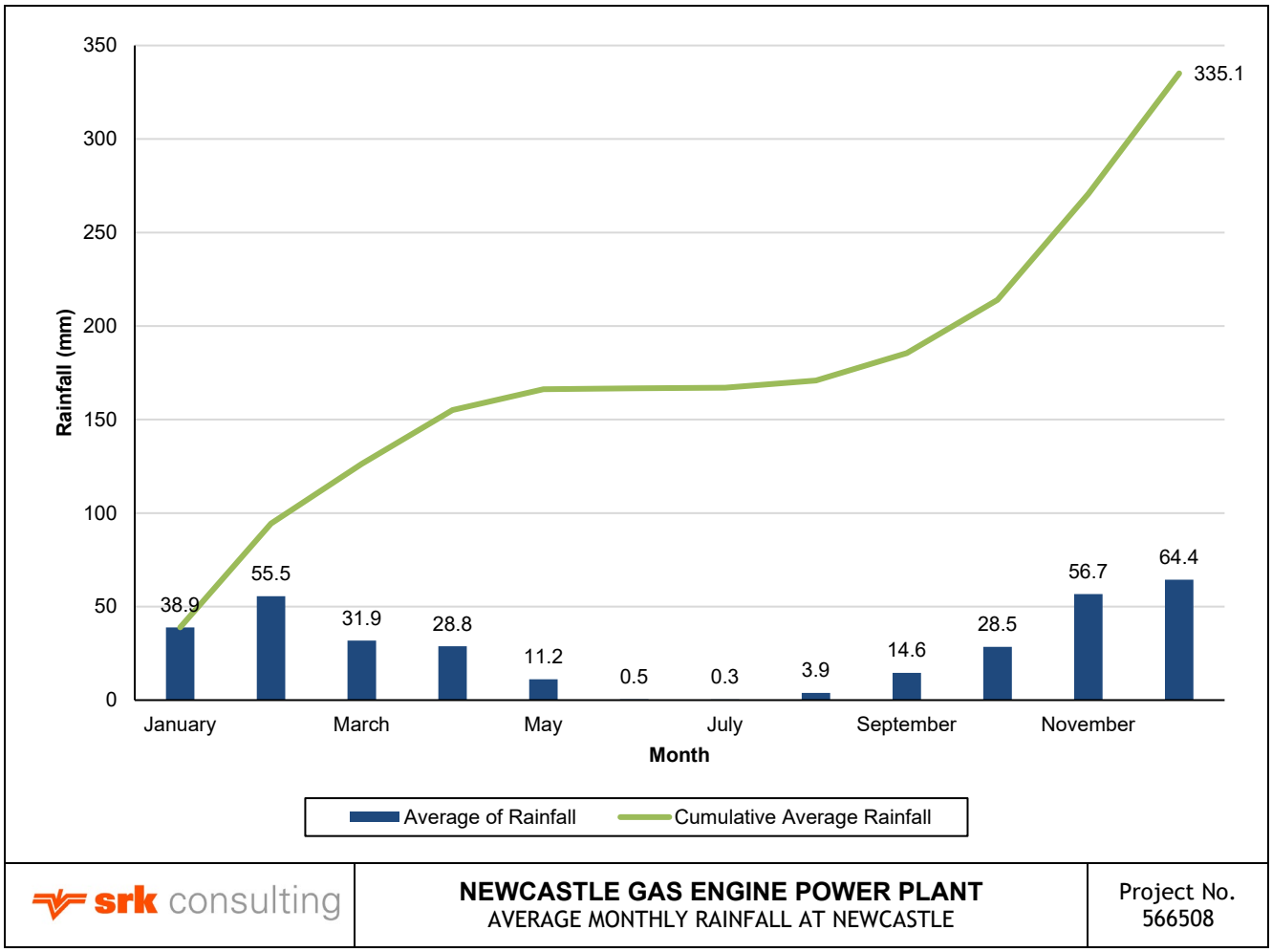


Figure 13-1: Average monthly rainfall for Newcastle for the period January 2017 to December 2019

Temperature

Higher temperatures are experienced during the months of September to March and lower temperatures are experienced between the months of April to August. A seasonal variation is evident in the temperature dataset where higher average temperatures are recorded during summer and lower average temperatures are recorded during winter. The monthly average, maximum and minimum temperatures for the period January 2017 and December 2019 is presented in Figure 13-2 below.

The average monthly temperature during 2017 ranges between 11°C to 19°C. The maximum temperature of 27°C occurred in December and a minimum of 6°C occurred in June and July. In 2018 average temperatures ranged from 10°C to 22°C. The minimum and maximum temperatures were 5°C (July) and 30°C (December), respectively. Average monthly temperatures range from 17°C to 27°C in 2019, with the maximum temperature measured at 31°C (January) and the minimum monthly temperature measured at 5°C (July).

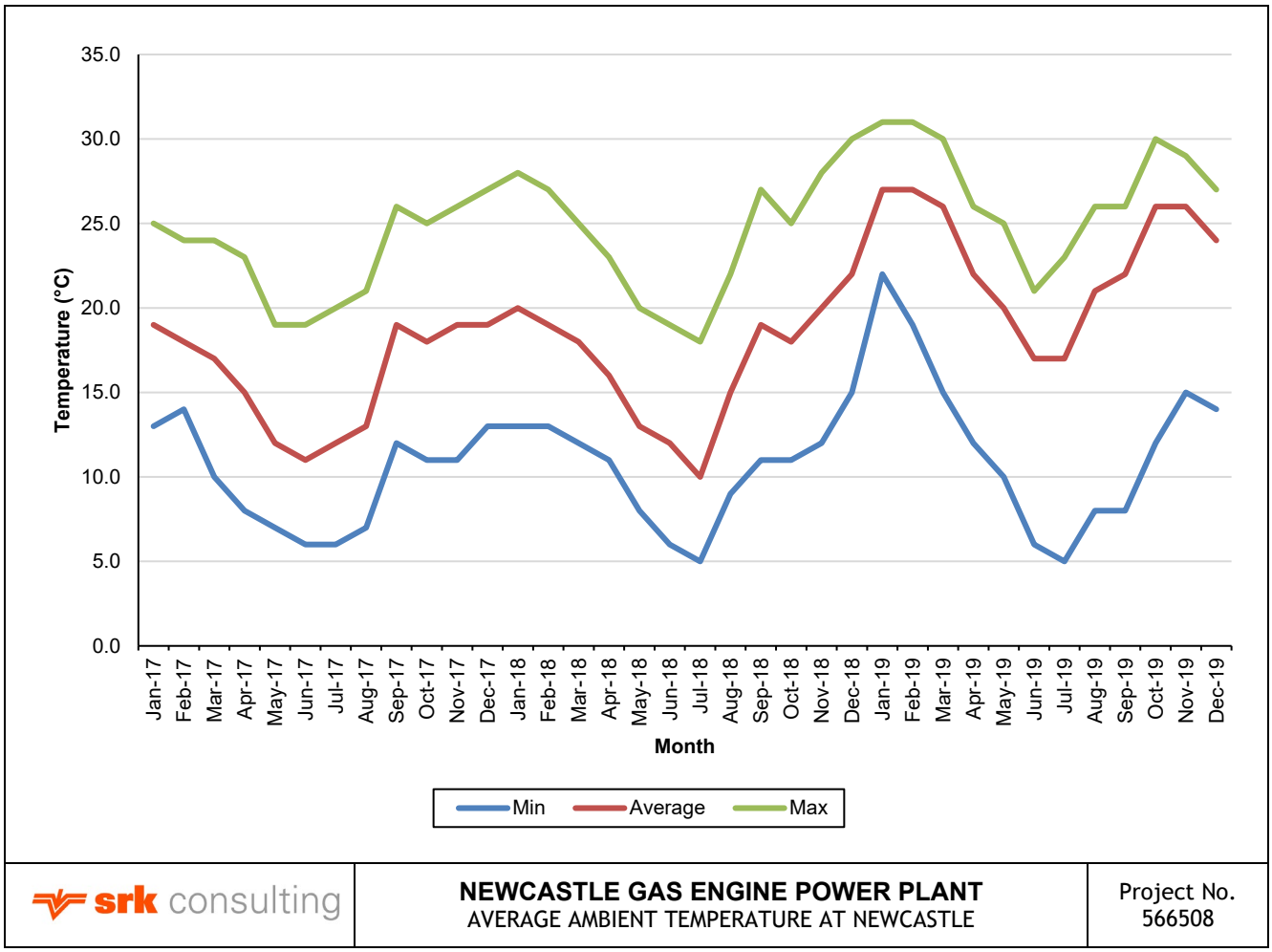


Figure 13-2: Average ambient temperatures for Newcastle for the period January 2017 to December 2019

Wind Field

For the study area, winds are predominately from the north-northwest, northwest and west-northwest with lower occurrences of winds from the directions between the northeast and southwest.

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.

[Note: For further detail, refer to the Atmospheric Impact Report (Appendix G-1) where annual, day and night wind roses using wind field data have been generated in WRPLOT View V8.0.2 for 2017 to 2019.]

To identify any potential risks associated with wind, the wind class (wind speed) frequency distribution is provided in Figure 13-3 below. Based on the current windspeed frequency distribution, risks to infrastructure as a result of high winds is not anticipated.

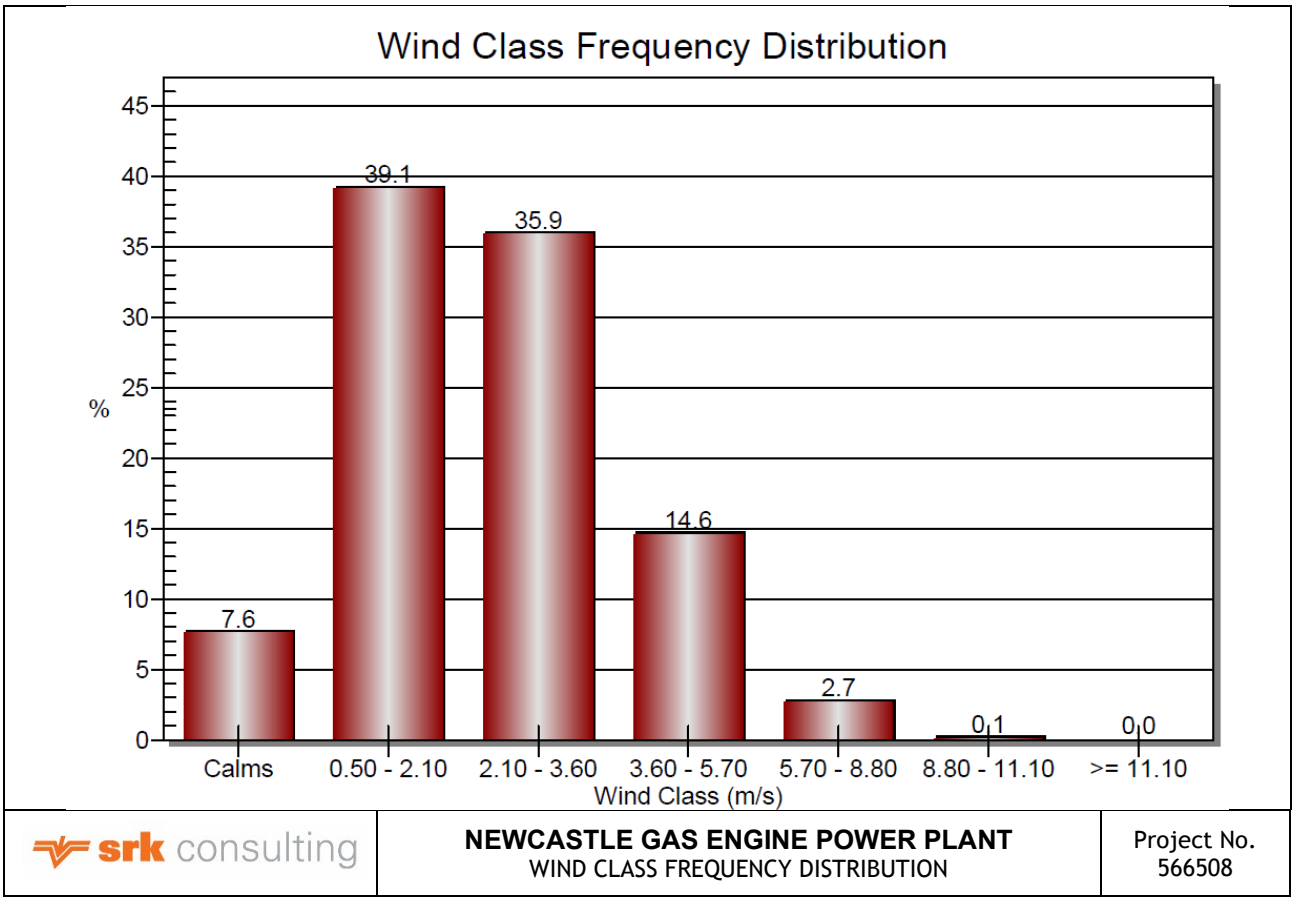


Figure 13-3: Wind class frequency distribution

13.1.4 Potential Emissions

From a review of the project description and specifications of the proposed gas engines, the AIR's assessment accounts for all significant air pollution releases associated with operation of the new 100 MW NGEPP i.e. Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Particulate Matter (PM_{10}) and Non-methane hydrocarbons (NMHC)[5] as described further below:

A) Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a natural gas with a strong odour. Small quantities can be produced by plants, soil and water, but human activities such as the combustion of fossil fuels and biomass are the major source of NO_2 in the air. Human respiratory tract irritation could be a direct effect of NO_2 exposure. Due to it being relatively insoluble (relative to SO_2), NO_2 can penetrate deep into the lungs, causing potential tissue damage. Effects of NO_2 exposure include alveolar tissue disruption and obstruction of the respiratory bronchioles. Long term effects of exposure include increased potential for lung infections. The relevant South African Standards for ambient NO_2 levels are presented in Table 13-2.

5 NMHCs is a subcategory of Volatile Organic Compounds (VOCs) and commonly refers to compounds such as ethane, ethene, acetylene, propane, propene, n-butane and isoprene. South Africa does not have a direct NAAQS to compare NMHC predicted concentrations to. The predicted NMHC are therefore compared to the benzene NAAQS.

Table 13-2: Ambient air quality standards for NO_2

Standard	Maximum 1-hour Concentration	Annual Average Concentration
Units	µg/m^3	µg/m^3
South African Standard[1]	200	40
Frequency of exceedance	88	0
1) As listed in the NEM: AQA. Government Gazette No. 32816 of 24 December 2009		

B) Particulate Matter

Particulate matter (PM) consists of airborne particles that include dust, smoke and soot. PM can either be emitted naturally (e.g. windblown dust from stockpiles) or through human activity (e.g. stack emissions). It is defined by size, with coarse particles being between 2.5-10 microns, fine particles less than 2.5 microns, and ultrafine particles less than 0.1 microns in diameter.

PM can have adverse effects on humans such as respiratory illnesses (asthma and bronchitis) or cardiovascular diseases. It can also affect vegetation in two ways, namely, by inhibiting the plant's photosynthetic properties by coating the leaves thereby blocking the penetration of natural light. Furthermore, deposition onto soils of various metals that could be in the PM can be absorbed by vegetation thereby hindering plant growth. The uptake of metals by plants also has the potential to contaminate vegetables and fruit that may be consumed by humans and animals.

Ambient air quality guidelines and standards for inhalable particles or PM_{10} (i.e. particulates with an aerodynamic diameter of less than 10 µm) are presented in Table 13-3. PM_{10} is important as it provides a measure of respirable dust, which has the potential to affect human health.

Table 13-3: Ambient air quality standards for PM_{10}

Standard	24-hour	Annual Average
Units	µg/m^3	µg/m^3
South African Standard (Effective from 1 January 2015)[1]	75	40
Frequency of exceedance	4	0
1) As listed in the NEM: AQA. Government Gazette No. 32816. 24 December 2009		

C) Carbon Monoxide

Carbon monoxide (CO) is an odourless and colourless gas that is highly toxic if exposed to in high levels. CO is produced by burning fuels and poor ventilation may cause the accumulation of CO to dangerous levels. Inhalation of CO fumes in high amounts causes CO poisoning where CO builds up in the bloodstream, replacing oxygen, and can lead to severe tissue damage. The NAAQS for ambient CO is presented in Table 13-4.

Table 13-4: Ambient air quality standards for CO

Standard	Maximum 1-hour Concentration	8-hour Average Concentration
Units	µg/m^3	µg/m^3
South African Standard[1]	30 000	10 000
Frequency of exceedance	88	11
1) As listed in the NEM: AQA. Government Gazette No. 32816 of 24 December 2009		

D) Benzene[6]

Benzene is part of the group of compounds known as Volatile Organic Compounds (VOCs). It evaporates easily and is highly flammable. The NAAQS for ambient benzene is presented in Table 13-5 and is provided in this study for reference in the absence of a total VOC standard.

Table 13-5: Ambient air quality standards for benzene

Standard	Annual Average Concentration
Units	µg/m^3
South African Standard[1]	5
Frequency of exceedance	0
1) As listed in the NEM: AQA. Government Gazette No. 32816 of 24 December 2009	

An emissions inventory was developed for the proposed NGEPP project. The emission inventory outlines type of pollutants and emission rates for each of the relevant sources at the proposed thermal power generating plant. Stacked physical parameters and estimated stack emission rates (based on performance data sourced for 13 Rolls-Royce (Bergen B3540V20) gas engines, each with 33m stack) are presented in the AIR (Appendix G-1).

13.1.5 Model Outputs

The AIR assessment makes use of the Level 3 California Puff (CALPUFF) atmospheric dispersion model to assess the potential impacts that the proposed project may have on air quality on the Newcastle airshed. The following input parameters where used to inform the model and are discussed in greater detail in the AIR (Appendix G-1):

- Meteorological data.
- Receptor grid.
- Specified sensitive receptors.
- Terrain data.
- Emission rates.
- Emission source parameters.

Predicted long-term (period average) and short term 99th percentile (P99) 24-hour and 1-hour average concentrations are compared with National Ambient Air Quality Standards (NAAQS).

The model outputs which were used for the figures that follow, show concentrations that would be experienced at ground level. The following statistical outputs were calculated:

- Long-term (period average) is calculated by averaging all hourly concentrations over the modelled period (2017 to 2019). The calculation is conducted for each grid point within the modelling domain and at each discrete receptor for every line of meteorological data.
- P99 is the 99th percentile concentration from short term (1 hour or 24-hour) average concentrations for one year or for the entire meteorological period (three years in this study). The P99 concentrations are a normal statistical method to exclude anomalous predicted concentrations. This in turn identifies emission concentrations in a range that is most likely to be observed during the proposed project's operational phase and excludes outliers. For example, the 24-hour PM_{10} NAAQS allows for four 24-hour exceedances of the standard value per annum at any location. Thus, if the P99 24-hour value is lower than the standard value, the location can be considered compliant. Although the P99 results are graphically presented in the maps that follow as concentration isopleths, in reality these values do not occur simultaneously across the model domain. Hence the P99 PM_{10} isopleths, for example, do not depict a continuous average plume

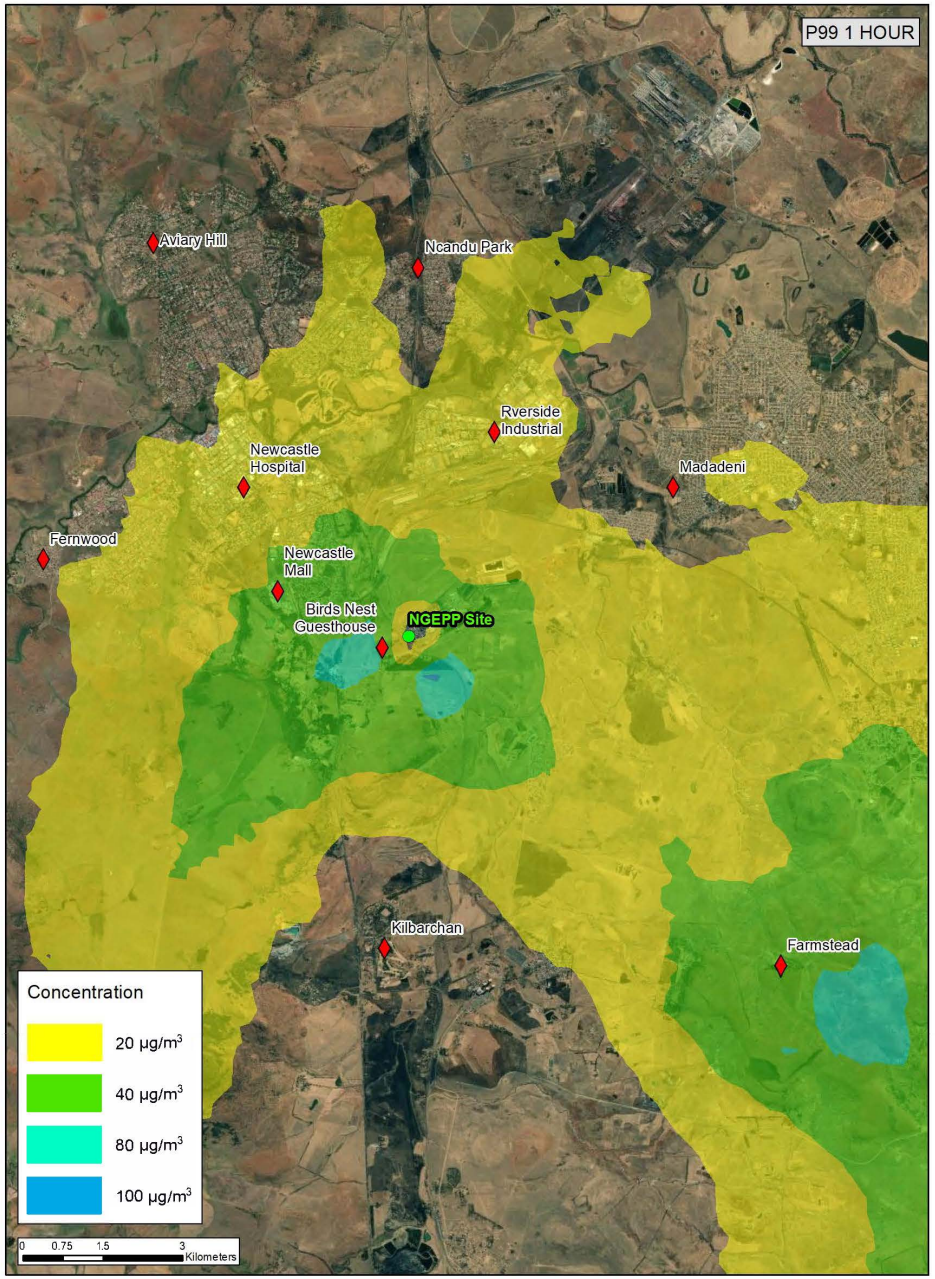
6 NMHCs is a subcategory of Volatile Organic Compounds (VOCs) and commonly refers to compounds such as ethane, ethene, acetylene, propane, propene, n-butane and isoprene. South Africa does not have a direct NAAQS to compare NMHC predicted concentrations to. The predicted NMHC are therefore compared to the benzene NAAQS.

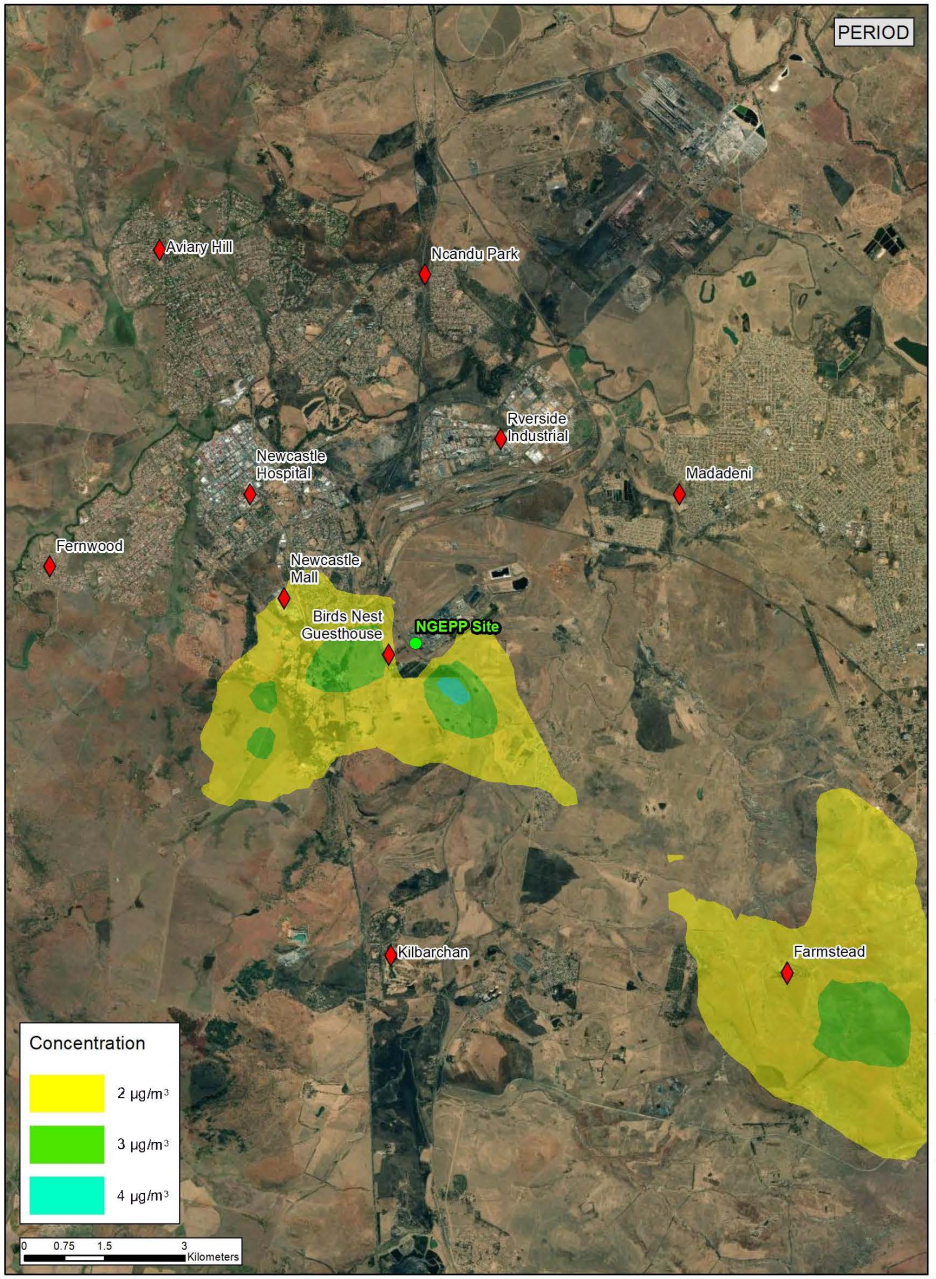
but rather a statistical distribution of the fifth highest 24-hour average PM_{10} concentrations over the modelling period.

Concentration results at specified sensitive receptors are presented in tabular format in the AIR, while concentration isopleths are presented graphically (see Figures 13-4 to 13-7 below) to indicate the spatial dispersion of air pollutants from proposed NGEPP operations. Modelled ambient ground level concentration isopleths represent interpolated values from the concentrations predicted by the CALPUFF model for each of the receptor grid points.

Key findings from the AIR are as follows:

- All maximum period average and short term (P99 1-hour and 24-hour) average concentrations for NO_2, PM_{10}, CO and NMHC (modelled as benzene) demonstrate full compliance with the respective National Ambient Air Quality Standards (NAAQS) at all receptors.
- The predicted plume isopleths for NO_2, PM_{10}, CO and NMHC primarily extend in a south easterly direction due to prevailing wind direction from the northwest.
- While elevated air pollutant concentrations are predicted in the nearfield to Newcastle Energy, complex terrain in the study area has resulted in elevated ground level air pollutant concentrations also being predicted along a ridge located approximately 9km south east from the proposed facility. Predicted period and P99 average air pollutant concentrations along this ridge demonstrate full compliance with the respective NAAQS.
- An ambient air quality monitoring station at Armscor Dam operated by DFFE was identified on the SAAQIS. Due to poor data recovery from this station, a cumulative assessment for the proposed project could not be undertaken.
- Based on the contribution of the predicted air pollutant concentrations to the respective NAAQS, the overall impact of the project on the surrounding environment is likely to be low.





N

Legend
- Sensitive Receptors
- NGEPP Site

Data Source: ESRI Basemap Imagery	
Scale: 1:100 000	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: Zone 35S	
Date: 17/11/2020	Compiled by: INBRO
Project No: 566508	Fig No: 13-4

srk consulting

NEWCASTLE GAS ENGINE POWER PLANT

PREDICED NO_2 EMISSIONS

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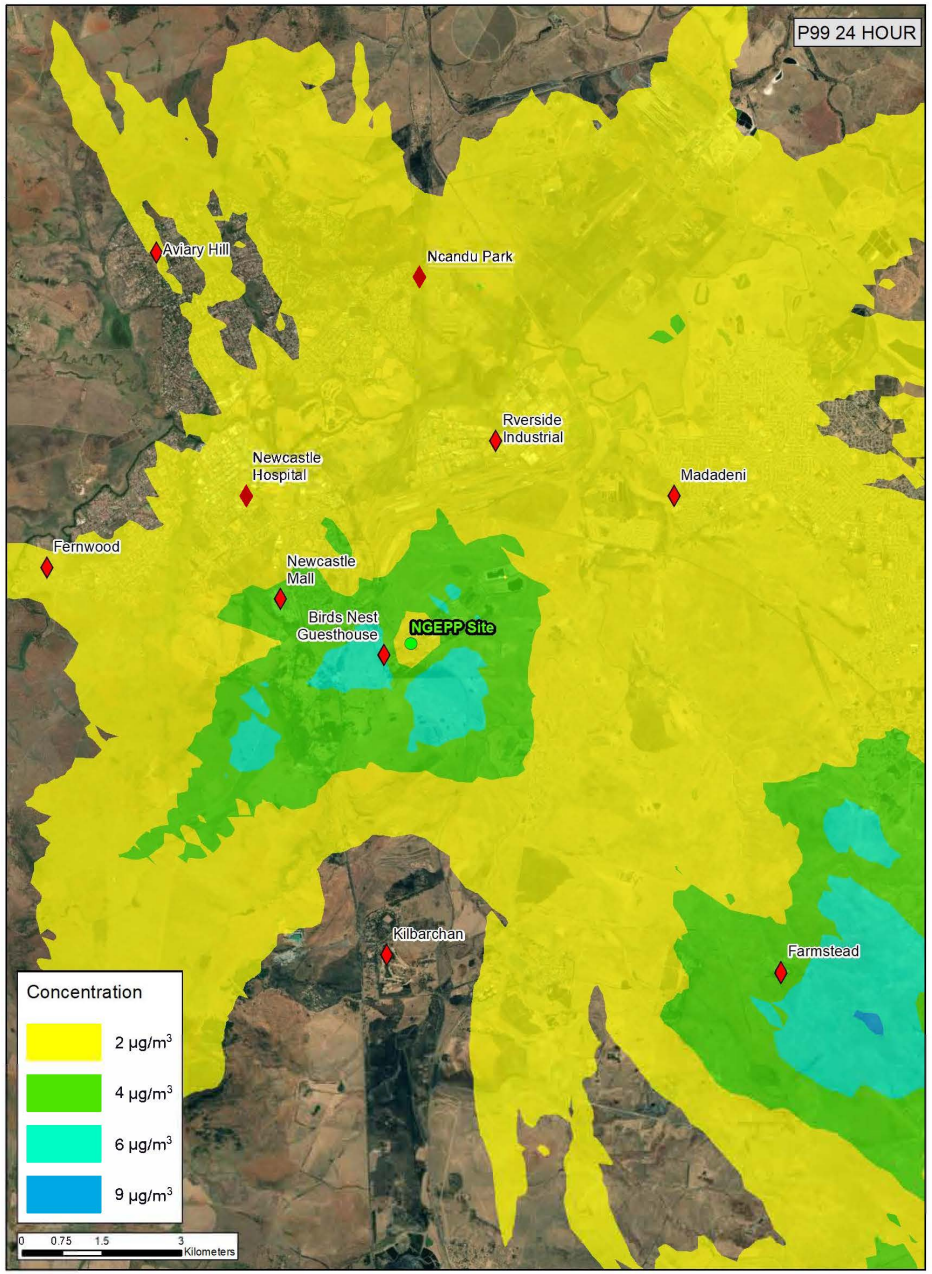
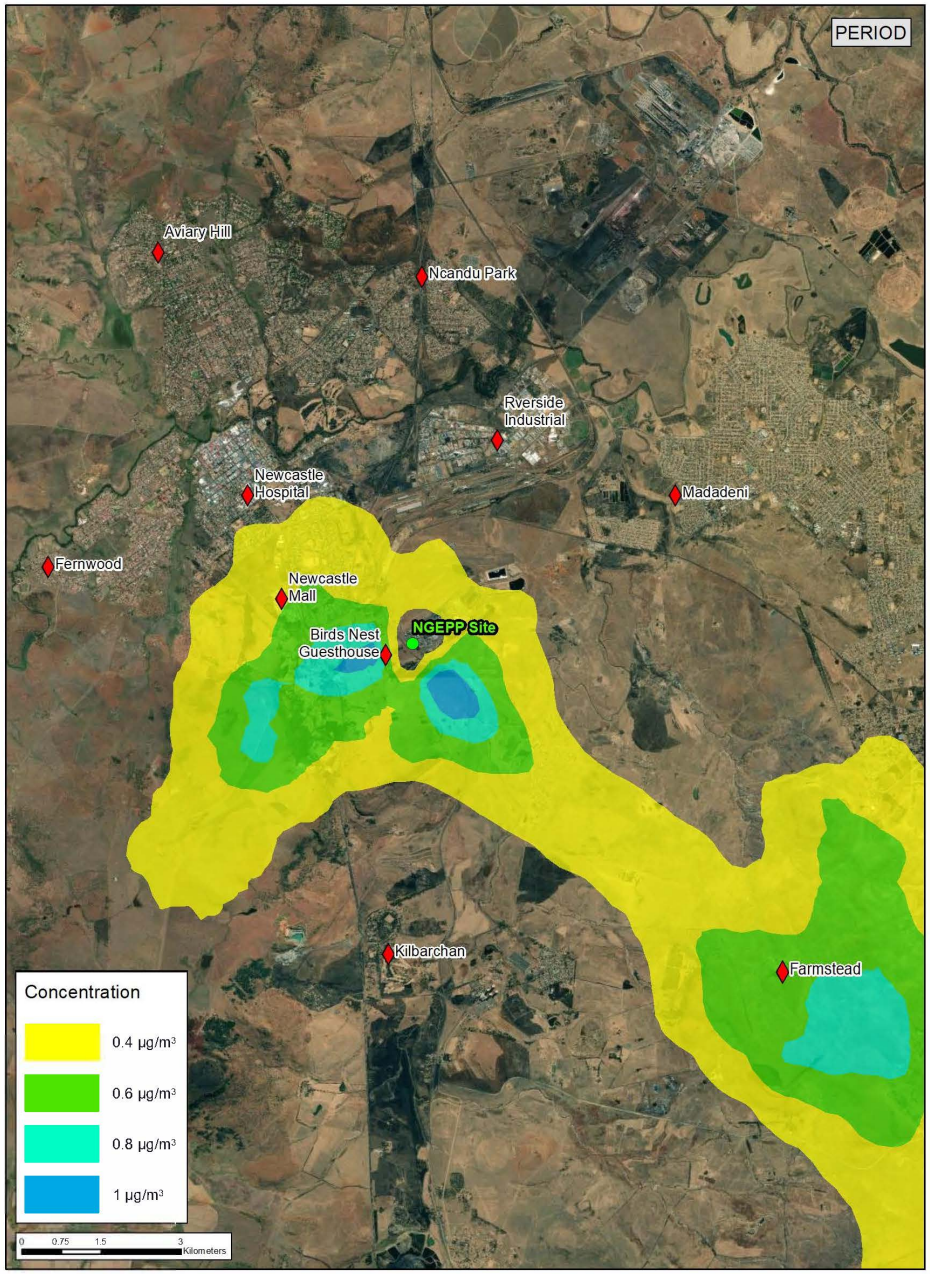
Revision: A Date: 02 12 2020





N

Legend
- Sensitive Receptors
- NGEPP Site

Data Source: ESRI Basemap Imagery	
Scale: 1:100 000	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: Zone 35S	
Date: 17/11/2020	Compiled by: INBRO
Project No: 566508	Fig No: 13-5

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NEWCASTLE GAS ENGINE POWER PLANT

PREDICTED PM_{10} EMISSIONS

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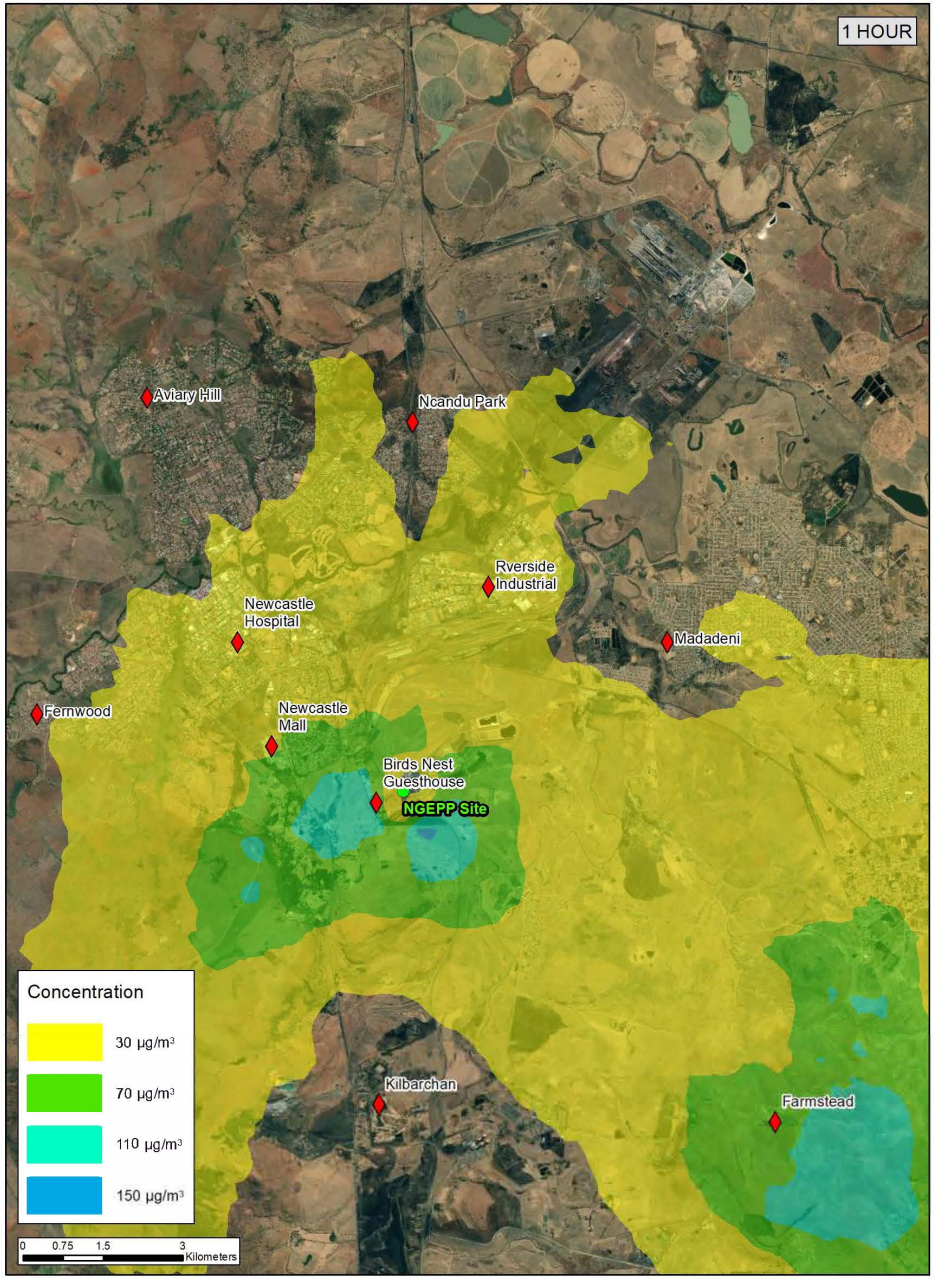
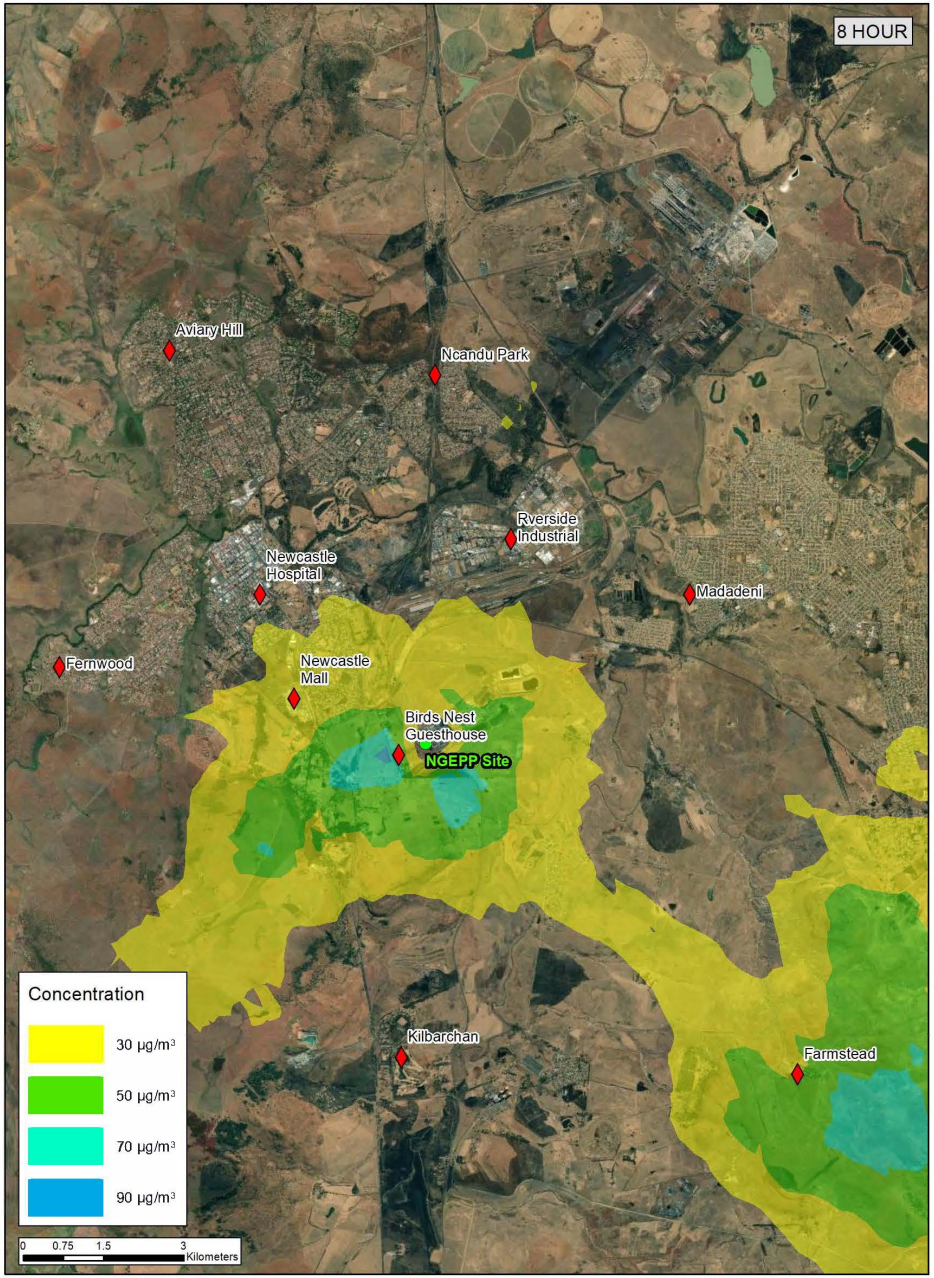
Revision: A Date: 02 12 2020





N

Legend
- Sensitive Receptors
- NGEPP Site

Data Source: ESRI Basemap Imagery
Scale: 1:100 000
Projection: TM
Datum: HH94
Central Meridian/Zone: Lo 29
Date: 17/11/2020
Compiled by: INBRO
Project No: 566508
Fig No: 13-6

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NEWCASTLE GAS ENGINE POWER PLANT
PREDICTED CO EMISSIONS

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\AQ\566508_F8-3_NGEPP_AQ_CO_A3CL_20201218.mxd

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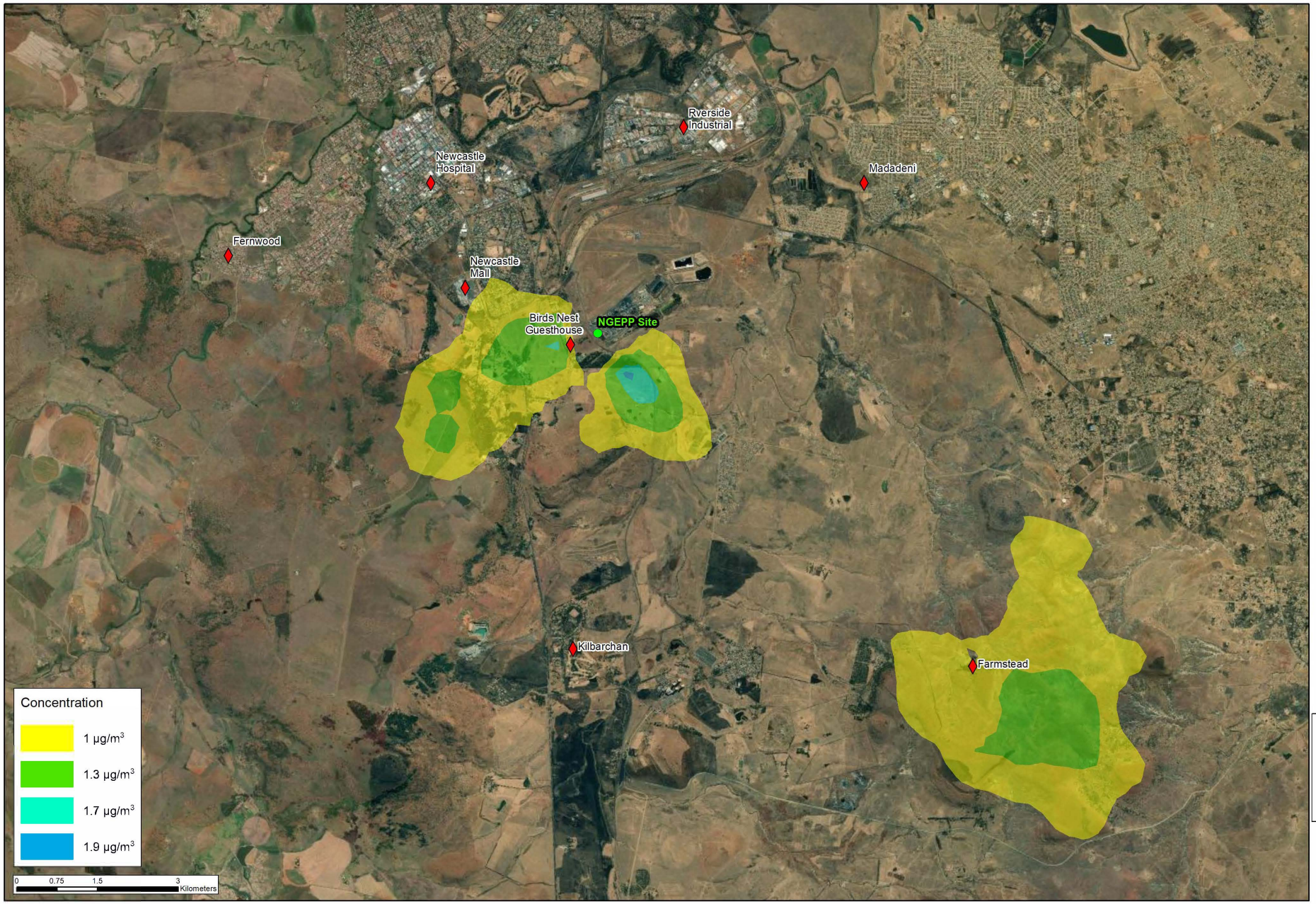

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NEWCASTLE GAS ENGINE POWER PLANT

PREDICTED PERIOD AVERAGE NMHC EMISSIONS

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Projection: UTM	Datum: WGS84
Central Meridian/Zone: Zone 35S	
Date: 17/11/2020	Compiled by: INBRO
Project No: 566508	Fig No: 13-7

Revision: A Date: 02 12 2020

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13.1.6 Impact Assessment

The following impacts relating to air quality were assessed and are further described in the subsections that follow:

- Impact AQ1: Dust emissions due to the demolition of the existing cogeneration plant and site clearance (Table 13-6).
- Impact AQ2: Dust emissions during the construction phase (Table 13-7).
- Impact AQ3: Dust and gas emissions during the operational phase (Table 13-8).

Impact AQ1: Dust emissions due to the demolition of the existing cogeneration plant and site clearance

The first phase of the proposed project will be the decommissioning of the current 18.5 MW plant. 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. Dust emissions are expected to occur during the demolition phase and will be temporary in nature and the extent. The probability, consequence, and significance of the expected dust emission can readily be managed through standard mitigation techniques.

Table 13-6: Impact Assessment for dust emissions due to the demolition of the existing cogeneration plant and site clearance

Impact AQ1: Dust emissions during the demolition phase								
Activity	Demolition of the existing cogeneration plant and site clearance							
Project Phase	Demolition phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Short-term (1)	Very Low (4)	Definite (>90%)	**Very Low**	- ve	High
Management measures: • Demolished equipment and/or materials which are stockpiled on site prior to their removal should be covered with a tarpaulin to reduce fugitive dust emissions • Transportation of dust raising materials in closed body vehicles or covering material with a tarpaulin will reduce fugitive dust emissions. • Additional application of water during Site clearing activities will reduce fugitive dust. • On windy days, or when fugitive dust can be observed leaving the Site of Works, additional application of water to the affected areas should be applied. • Material which cannot be watered should be covered until utilized. • Site clearance activities should be stopped during period of high wind speeds.								
After Management	Local (1)	Low (1)	Short-term (1)	Very low (3)	Definite (>90%)	**Very Low**	- ve	High

Impact AQ2: Dust emissions during the construction phase

The construction phase will include construction of a gas fired open cycle thermal power generating plant and axillary infrastructure. Dust emissions during the construction phase are temporary in nature and the extent, probability, consequence, and significance can readily be managed through standard construction techniques.

Table 13-7: Impact Assessment for dust emissions during the construction phase

Impact AQ2: Dust emissions during the construction phase								
Activity	Construction of a gas fired open cycle thermal power generating plant and axillary infrastructure							
Project Phase	Construction phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Short-term (1)	Very Low (4)	Definite (>90%)	**Very Low**	- ve	High
Management measures: • Regular irrigation by water of the site, access roads and construction material to increase moisture to reduce dust without creating runoff. • Transportation of dust raising materials in closed body vehicles or covering material with a tarpaulin will reduce fugitive dust emissions. • On windy days, or when fugitive dust can be observed leaving the Site of Works, additional application of water to the affected areas should be applied. • Material which cannot be watered should be covered until utilized. • Soil disturbance activities should be stopped during period of high wind speeds.								
After Management	Local (1)	Low (1)	Short-term (1)	Very low (3)	Definite (>90%)	**Very Low**	- ve	High

Impact AQ3: Dust and gas emissions during the operational phase

The probability of emissions from the combustion of fossil fuels, resulting in emissions of NO_2, CO, PM_{10} and NMHC occurring is definite, and emissions are considered irreversible and unavoidable. The model predicted long term (period average) and short term (1-hour, 8-hour or 24-hour) average concentrations of dust and gaseous emissions indicate that concentrations at the all sensitive receptors comply with the relevant NAAQS. The significance of the impact before and after management measures will therefore be low.

Table 13-8: Impact Assessment for dust and gas emissions during the operational phase

Impact AQ3: Dust and gas emissions during the operational phase								
Activity	Operation for the gas fired open cycle thermal power generating plant							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	Low (1)	Long-term (3)	Medium (6)	Possible	**Low**	- ve	High
Management measures: • Require employees to wear Personal Protective Equipment (PPE) in areas of exposure to gaseous emissions. • Regular maintenance will ensure equipment will continue to meet Original Equipment Manufacturer (OEM) specifications and acceptable international emissions standards. • Isokinetic stack monitoring should take place on an annual basis unless otherwise prescribed in the AEL to determine compliance against the minimum emission standards (MES). • Consideration should be taken towards the development and implementation of routine emissions and ambient air quality monitoring program to determine whether there are any significant increases in emissions and impacts at sensitive receptors.								
After Management	Regional (2)	Low (1)	Long-term (3)	Medium (6)	Possible	**Low**	- ve	High

[Note: Since the dispersion modelling indicates the facility will be complaint with the NAAQS (max. predicted concentration are low) the impact significance is considered low for both pre- and post-implementation of management measures. Furthermore, abatement technology was not included into the management measure as they would be compliant under normal operations. The management measures prescribed will not reduce emission but maintain compliance.]

13.1.7 Conclusions and Recommendations

Based on the findings of the assessment undertaken by SRK, the following recommendations are provided:

- An Atmospheric Emission License (AEL) application must be undertaken should the project be granted environmental authorisation.
- *Development and implementation of a routine ambient air quality monitoring program to determine whether there are any significant increases in emissions and impacts at sensitive receptors as a result of the proposed project. Ambient monitoring for SO_2, NO_2, PM and CO is to be included as a condition for authorisation to the project.*
- Regular maintenance will ensure equipment will continue to meet Original Equipment Manufacturer (OEM) specifications and acceptable international emissions standards.
- Consideration should be given towards the development and implementation of routine emissions *monitoring* and ambient air quality monitoring program to determine whether there are any significant increases in emissions and impacts at sensitive receptors.
- Employees must wear Personal Protective Equipment (PPE) in areas of exposure to gaseous emissions.
- A high standard of housekeeping should be maintained onsite to ensure proposed operations occur in a manner in which it does not impact the ambient environment.
- Isokinetic stack monitoring must be undertaken annually to determine exact emission rates for point source emissions as well as determine compliance with regulated standards.
- Complaints and any actions arising from a complaint must be recorded in a complaints register maintained by site management.
- Training the workforce in awareness of air emissions can be carried out at all levels (workers, foremen, managers) and can be included in induction courses. Training should focus on promoting understanding as to why mitigation measures are in place.

13.2 Climate Change

The section is informed by the Climate Change Impact Assessment (CCIA) which is attached as Appendix G-2.

13.2.1 Introduction

The following entails different climate change definitions with the common factor between the various definitions relating to ‘changes in the temperature of the earth’s surface’ (IDP Review, 2020):

- National Climate Change Response White Paper: “Ongoing trends of changes in the earth’s general weather conditions as a result of an average rise in temperature of the earth’s surface often referred to as global warming.”
- IPCC Working Group II Assessment Report V: “A change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.”
- United Nations Framework Convention on Climate Change: “A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.”

Climate change is caused by both natural and human activities even though human activities are regarded as the biggest perpetrators of the phenomenon. Climate change variability due to natural

causes entails changes in solar radiation, earth's orbit around the sun, changes in volcanic activity, regional patterns of climate variability, cyclical changes in the solar radiation, natural carbon cycle processes, greenhouse effect, and volcanic eruptions (short-term effect on climate change). Climate change variability due to human activities entails burning of fossil fuels (domestic and commercial) which results in increases in the amount of greenhouse gases within the atmosphere i.e. water vapour, carbon dioxide (CO_2 – 50%), Methane (CH_4 – 18%), Nitrous Oxide (N_20 – 6%), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF_6). Furthermore, aerosols, land use changes and development thereof (deforestation), and agricultural activity (overgrazing) also contribute to climate change.

The increased concentration of greenhouse gases within the atmosphere enhances the greenhouse gas effect and the process of climate change is described below:

- Step 1: Sunlight passes through the atmosphere and warms the earth's surface.
- Step 2: Infrared radiation (IR) is given off by the earth.
- Step 3: Most of the IR escapes to outer space allowing the earth to cool.
- Step 4: Some of the IR is trapped by gases in the air (including CO_2) thus keeping earth warm enough to sustain life.
- Step 5: An increased concentration of IR trapped by gases offsets the 'enhanced greenhouse effect' causing the surface to heat up even more.

Assessment of climate change related impacts associated with the proposed NGEPP project is therefore of key importance and has been further reported on this EIR.

13.2.2 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).
- 2017 South Africa's Third National Communication under the United Nations Framework Convention on Climate Change.

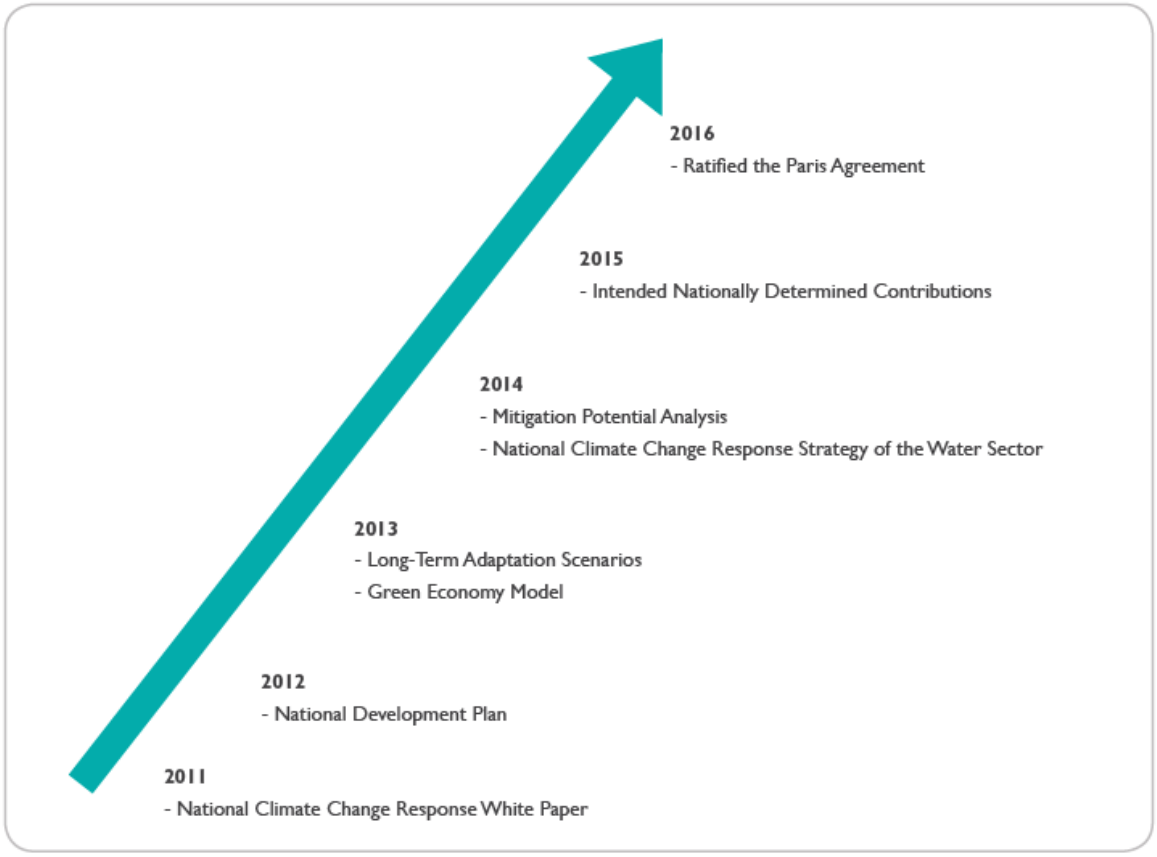
The transition of South Africa's climate change response through national development programmes, plans and strategies from 2011-2015 is highlighted in Figure 13-8 and is further discussed in this chapter, to give context to the regulatory framework associated with greenhouse gas (GHG) emissions and 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.

Further detail regarding the following is included in the Climate Change Impact Assessment report (Appendix G-2):

- National Climate Change Response Policy (NCCRP) White Paper.
- National Development Plan (NDP, 2013).
- United Nations Millennium Development Goals (MDG).
- Sustainable Development Goals (SDG).
- Long Term Adaptation Scenarios (LTAS).
- Mitigation Potential Analysis (DEA, 2014).
- The National Climate Change Response Strategy for the Water Sector (DWS, 2014).
- Nationally Determined Contributions.
- The National Greenhouse Gas Emission Reporting Regulations, under NEM:AQA (General Notice Regulation (GNR) 275 of 2017).
- Carbon Tax Act.
- Climate Change Bill.
- National Climate Change Adaptation Strategy (NCCAS).



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

Figure 13-8: Transition of South Africa's climate change response (DEA, 2018)

13.2.3 Climate Change Trends - South Africa

Temperature

The simulated baseline over South Africa for the period 1961-1990 based on the Conformal-cubic atmospheric model (CCAM) is shown in Figure 13-9. The projected changes for the time period 2021-2050 relative to the baseline period 1961-2000 is shown in Figure 13-10, first for Representative Concentration Pathways (RCPs) RCP8.5 (low mitigation) and then for RCP4.5 (high mitigation) using the 50th (median) percentiles of projected changes under the RCP.

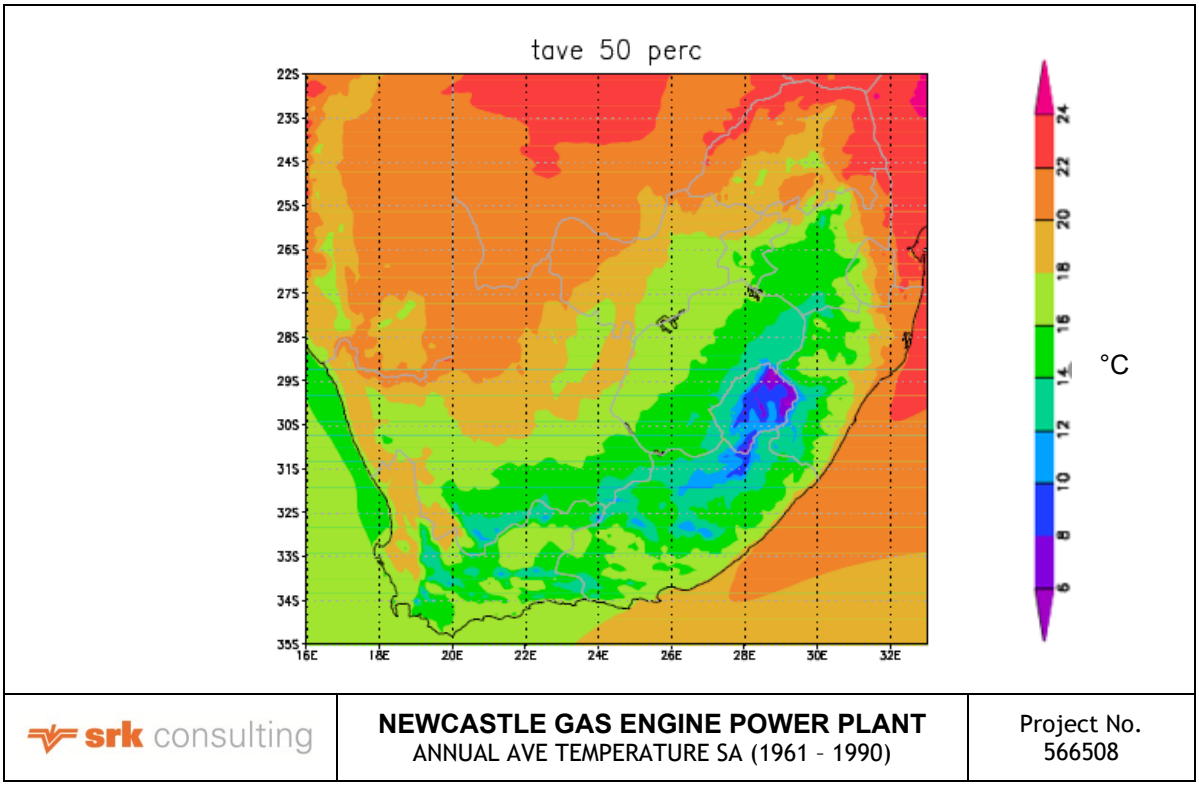


Figure 13-9: Annual average temperature (°C) over South Africa (1961 – 1990) (Engelbrecht, 2019)

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 13-10.

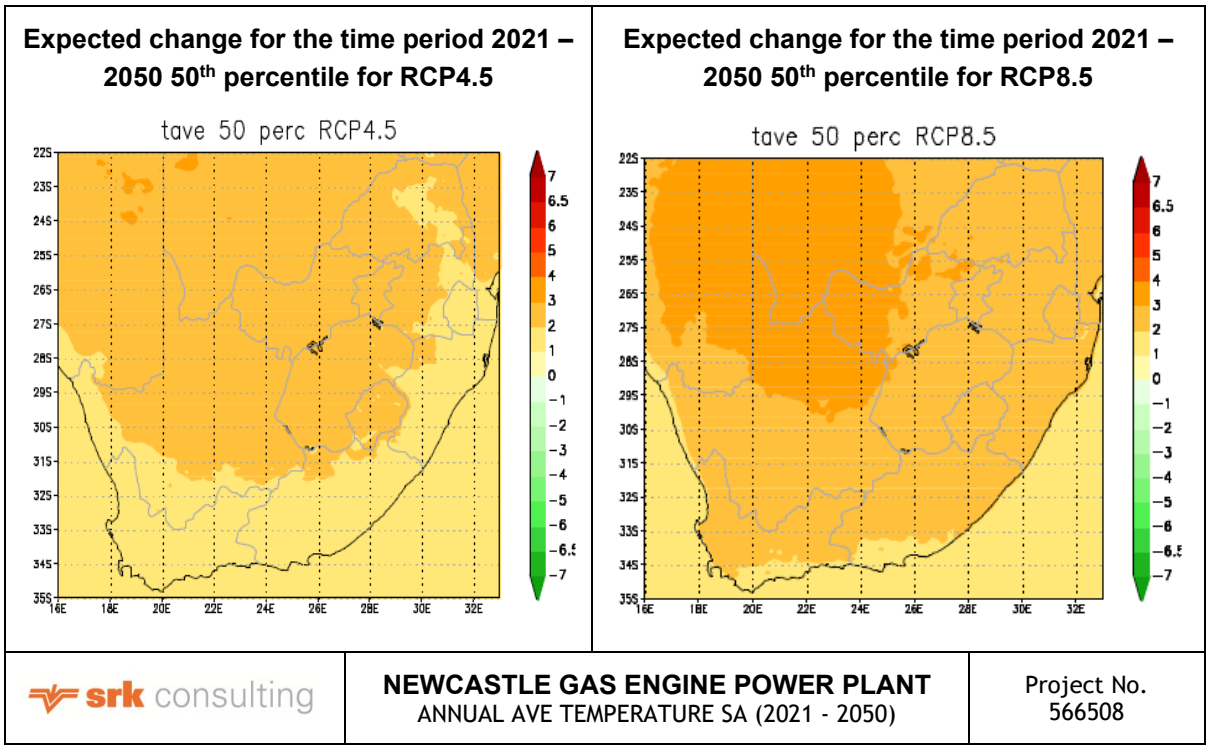


Figure 13-10: Annual average temperature (°C) over South Africa (2021 - 2050) (Engelbrecht, 2019)

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 13-11. Such drastic temperature increases would have significant impacts on numerous sectors, including agriculture, water and energy.

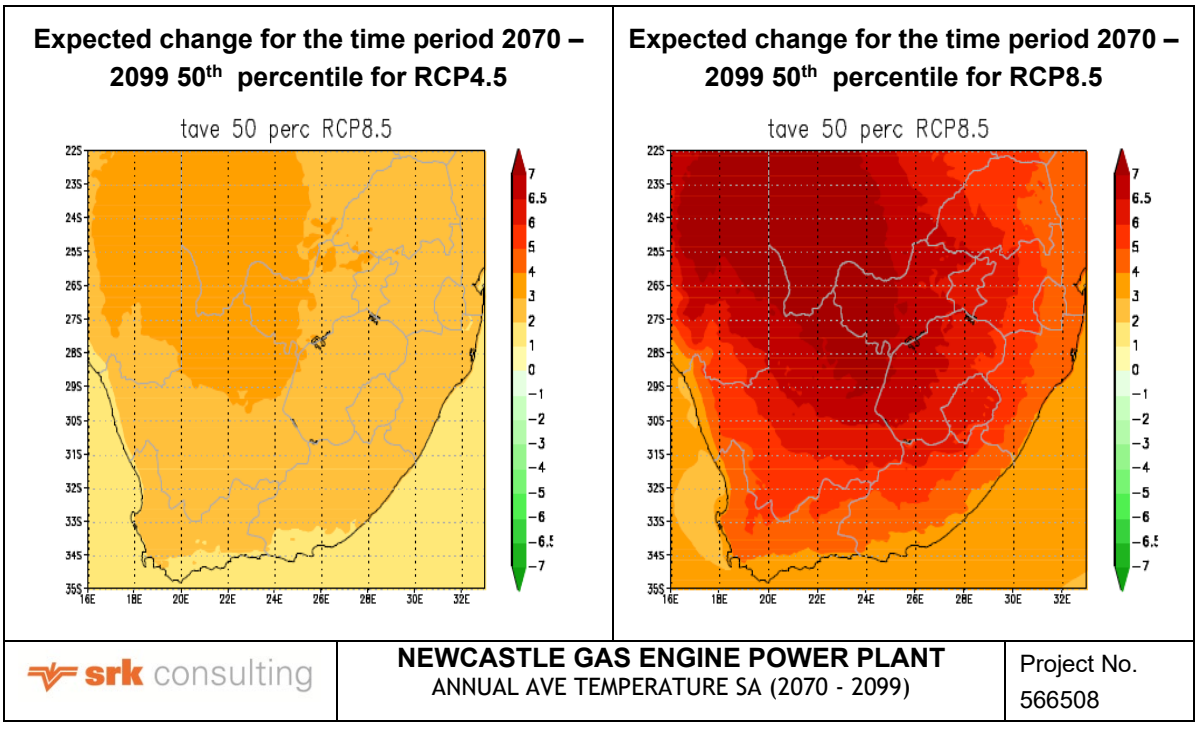


Figure 13-11: Annual average temperature (°C) over South Africa (2070 - 2099) (Engelbrecht, 2019)

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.

Rainfall

The simulated baseline over South Africa for the period 1961-1990 is shown in Figure 13-12. The projected changes for the time period 2021-2050 relative to the baseline period 1961-2000 is shown in Figure 13-13, first for RCP8.5 (low mitigation) and then for RCP4.5 (high mitigation) using the 50th (median) percentiles [7]of projected changes under the RCP.

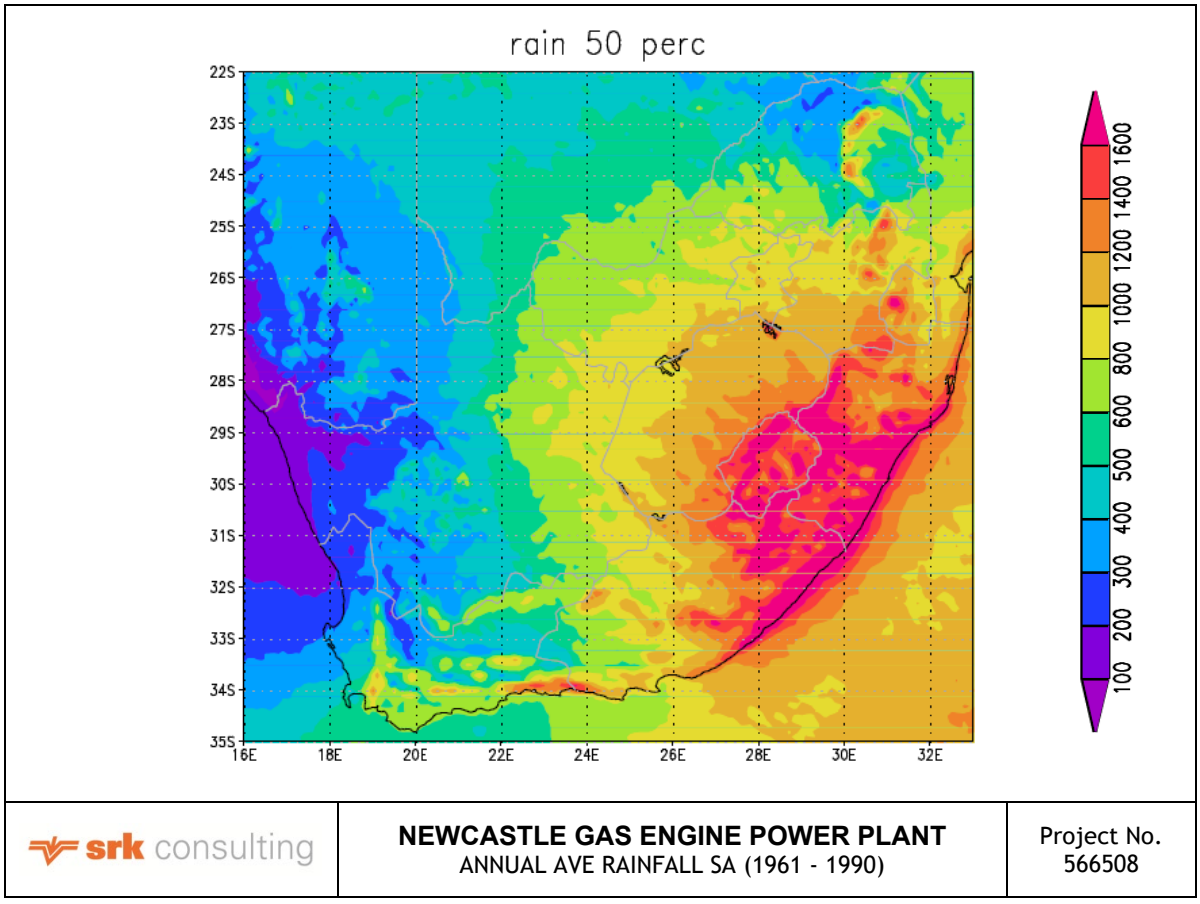


Figure 13-12: Annual average rainfall (mm) over South Africa (1961 – 1990) (Engelbrecht, 2019)

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.

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

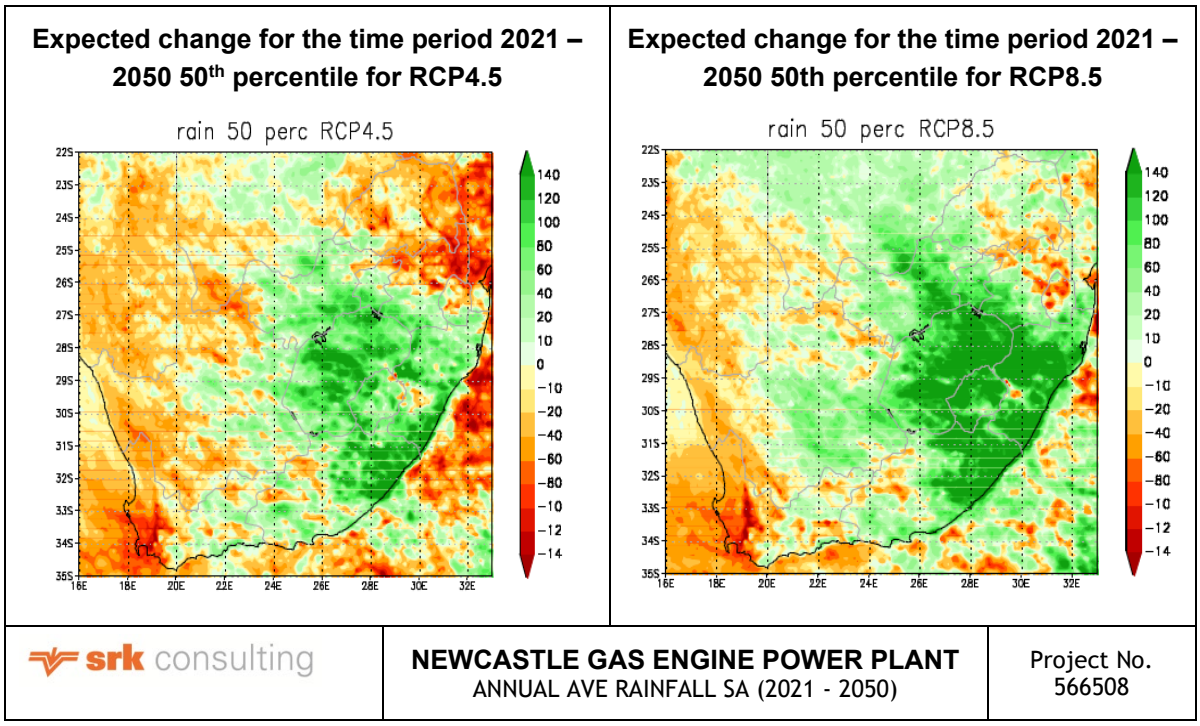


Figure 13-13: Annual average rainfall (mm) over South Africa (2021 - 2050) (Engelbrecht, 2019)

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 13-14.

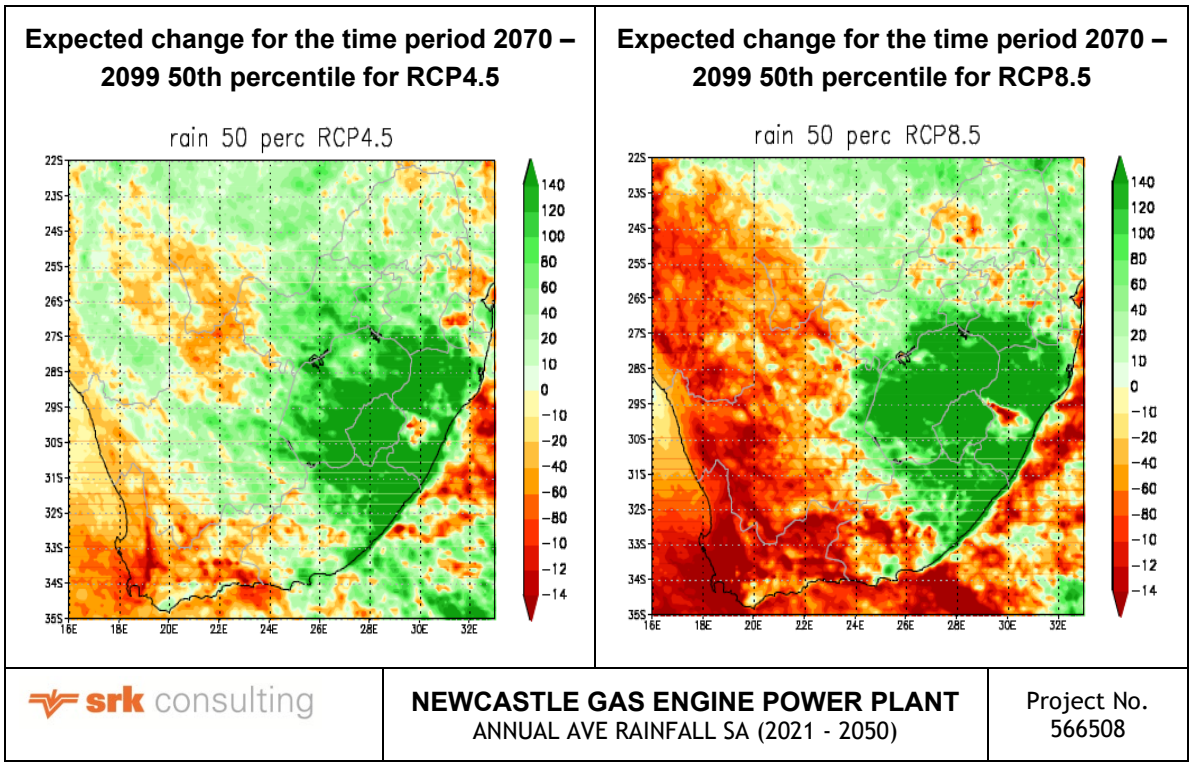


Figure 13-14: Annual average rainfall (mm) over South Africa (2070 - 2099) (Engelbrecht, 2019)

13.2.4 Climate Change Trends - Regional

The NGEPP site falls within KwaZulu-Natal and the South Africa's Third National Communication (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.

13.2.5 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.

13.2.6 GHG Emissions Inventory

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.
- Application of calculation tools to develop a GHG emission inventory.

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 13-9 below.

Table 13-9: GHG Sources

Category	Code	Sub-category	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.

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.

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 13-10 is the activity data collected for the facility in relation to the emission sources identified Figure 13-15.

Table 13-10: 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[8]	kg

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 13-11.

[8] 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.

Table 13-11: 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[9]	1	0.1	33.6[10]
Fugitive Releases				
Transmission				
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[11]	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	

Global Warming Potential

The amount of greenhouse gas (GHG) emissions is 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 13-12).

Table 13-12: 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

[9] *There is not specific emissions factor for Methane rich gas in the technical guideline so the emissions factor for natural gas was used.*

[10] *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*

[11] 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.

13.2.7 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.

Estimated Emissions

The GHG emission in CO_2e emissions are presented in Table 13-13. The total emissions are *266 666.04* 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 13-15.

Table 13-13: Cumulative Scope 1 annual emissions per zone

Zone	Tonnes of CO_2e	Percentage contribution (%)
Stationary Combustion	265 783.28	*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	*266 666.04*	100.00

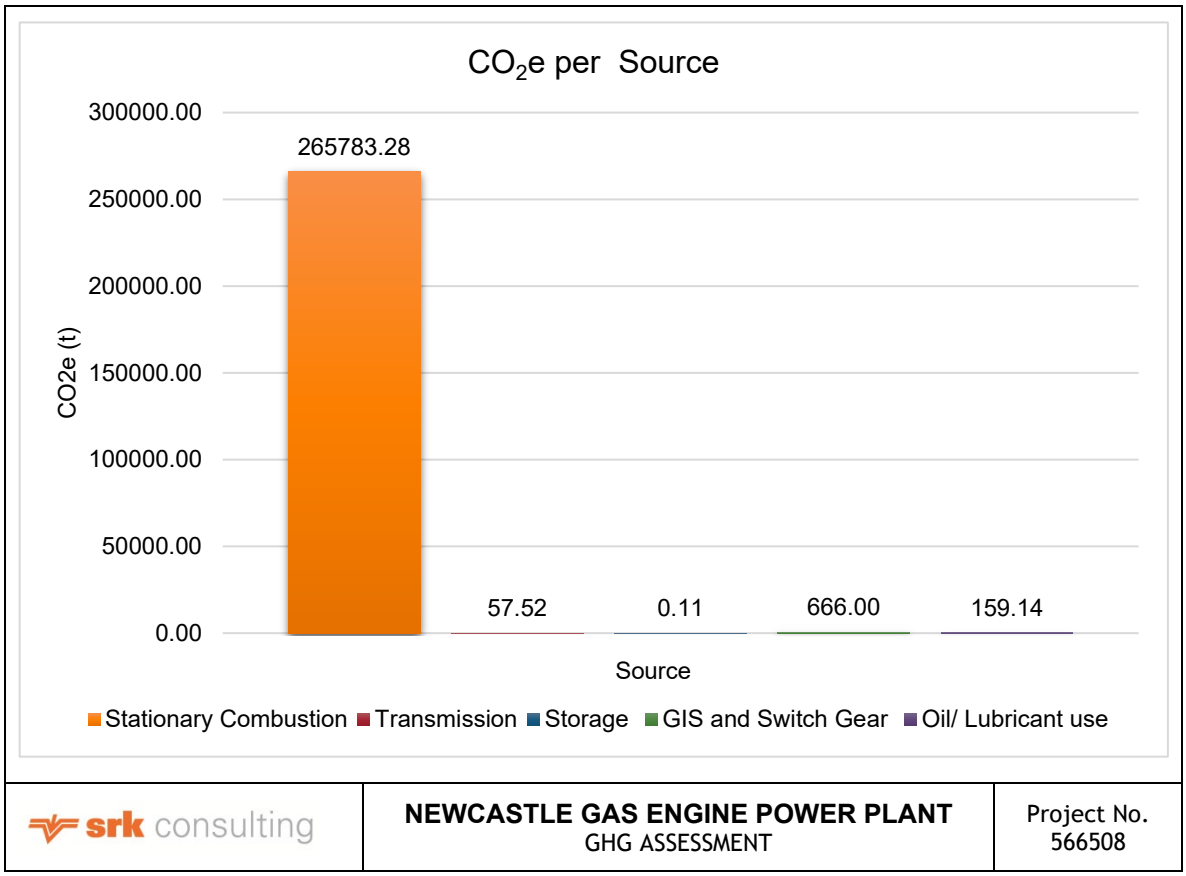


Figure 13-15: NGEPP GHG emission (CO_2e)

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 13-16. In comparison to the *266 666.04* 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 *340 451.01* t CO_2e (which is a 128 % increase from natural gas).

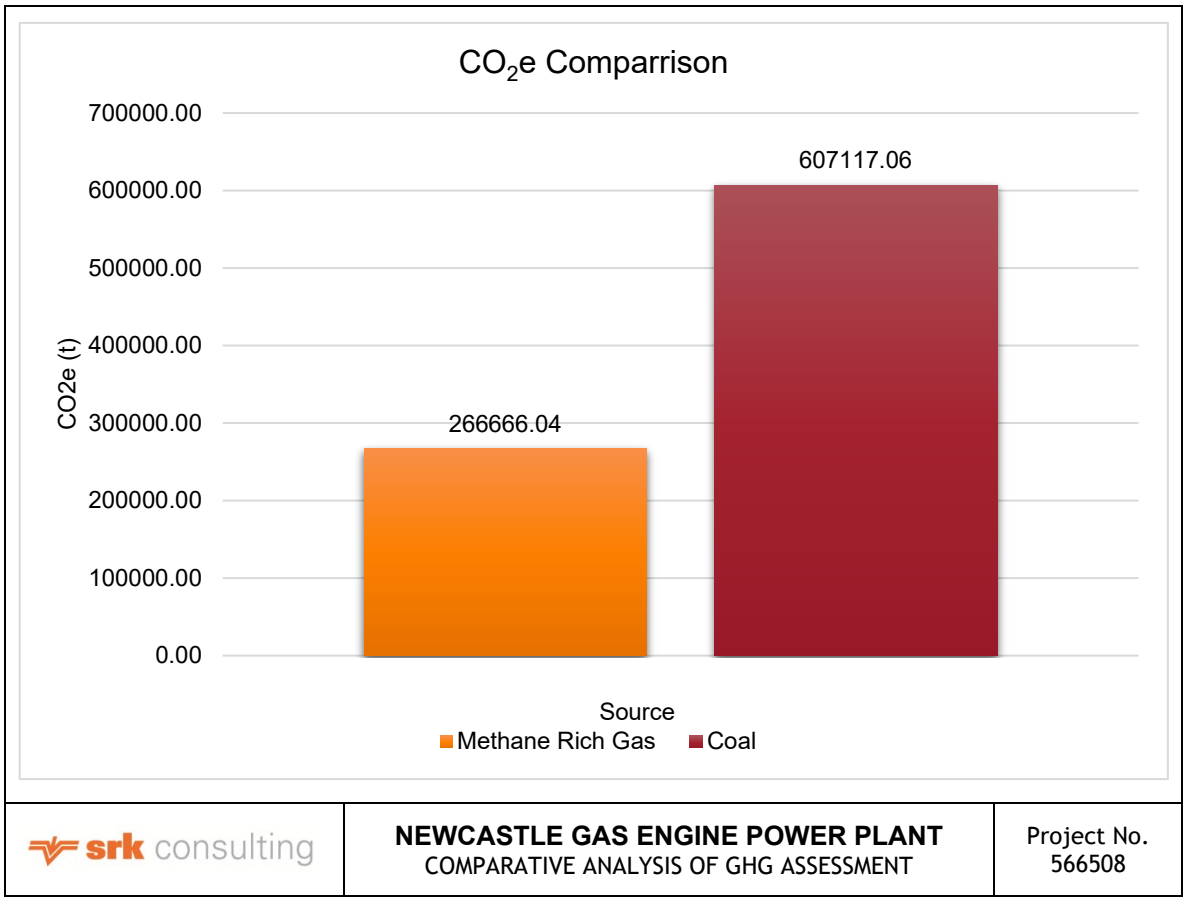


Figure 13-16: GHG emission (CO_2e) NGEPP vs Coal

13.2.8 Impact Assessment - of the project on climate change

The following impacts relating to climate change were assessed and are further described in the subsections that follow:

- Impact CC1: GHG emissions resulting from the Construction Phase (Table 13-14).
- Impact CC2: GHG emissions resulting from the Operational Phase (Table 13-15).

Impact CC1: 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 13-14 below.

Table 13-14: 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
Management measures: 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

Impact CC2: GHG emissions resulting from the Operational Phase

As per the previous section, 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 ***340 451.01*** **t CO_2e** (0.067% of South Africa's total carbon footprint annually) the project, while not renewable, has the potential to reduce 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 13-15 below.

Table 13-15: 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 potentially 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

13.2.9 Climate change risks to the project

The following climate change related risks to the project were assessed and are further described in the subsections that follow:

- Impact CC3: Impact of increased temperatures during operation (Table 13-16).
- Impact CC4: Impact of decreased annual rainfall or increased drought periods during operation (Table 13-17).
- Impact CC5: Impact of increased fire days, intense thunderstorms and damaging flood events during operation (Table 13-18).

Impact CC3: Impact of increased temperatures during operation

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 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 13-16 below.

Table 13-16: 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 as a result of 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

Impact CC4: 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 13-17 below.

Table 13-17: 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

Impact CC5: 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 13-18 below.

Table 13-18: 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

13.2.10 Conclusions and Recommendations

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.
- 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 for 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.

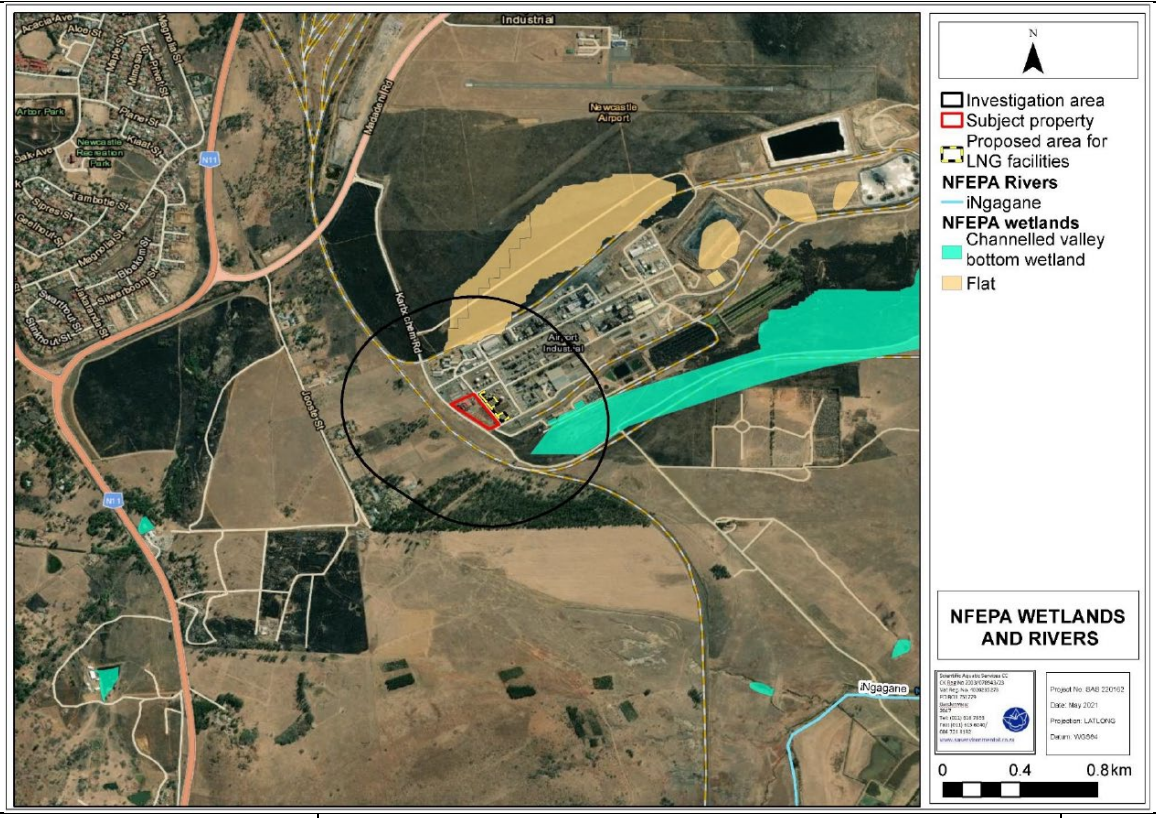
13.3 Aquatic Ecological Impact Assessment

The section is informed by the Aquatic Ecological Impact and Compliance Statement which is attached as Appendix G-3. The aquatic biodiversity of the study area is described in the subsections below and is based on desktop investigation and site surveys undertaken by the specialist.

13.3.1 Desktop Investigation Findings

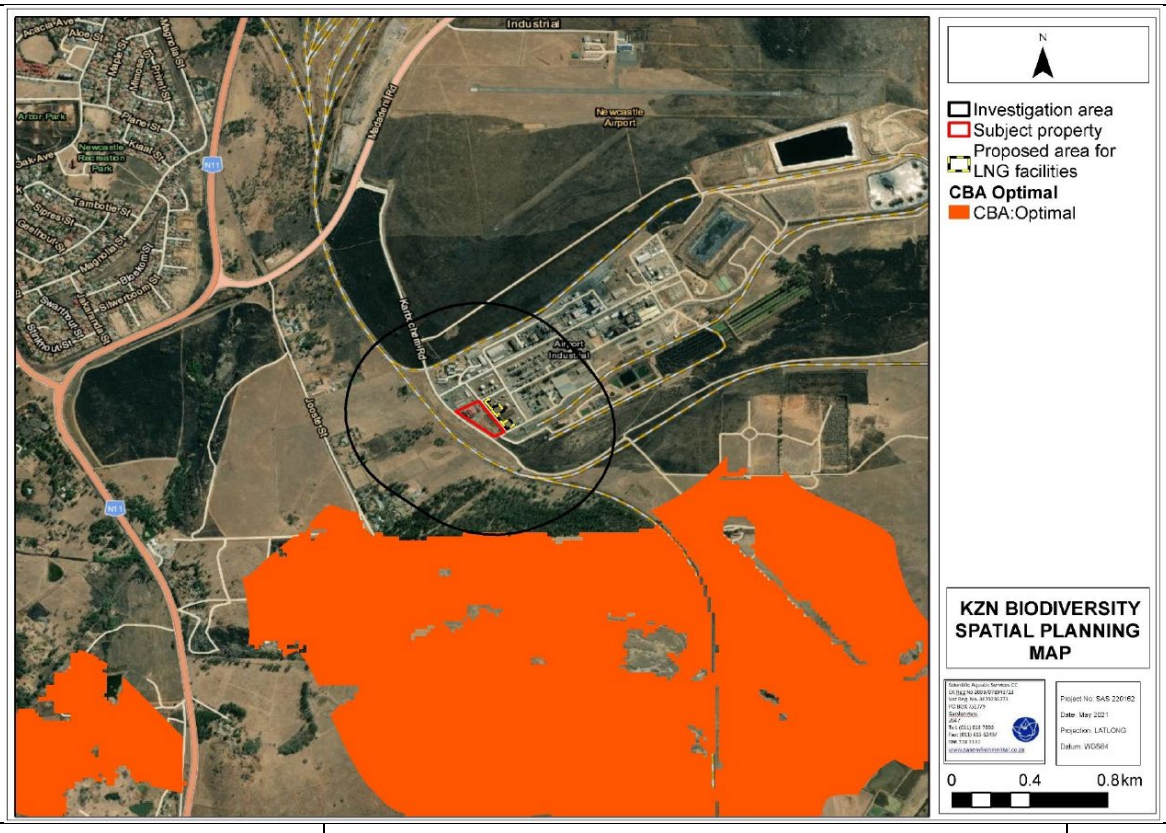
A database review and desktop analysis was undertaken prior to the site survey of the NGEPP study site. The results are summarised in the points below:

- According to the National Freshwater Ecosystem Priority Area (NFEPA, 2011) dataset (Figure 13-17), there are two natural wetland flats within the northern portion of the investigation area, as well as one natural channelled valley bottom and two artificial channelled valley bottom wetland features within the south eastern portion of the investigation area. The NFEPA database indicates these wetlands are in a moderately modified condition. Upon the site survey, the wetland flats identified by the database were noted to be stormwater drainage features and associated excavation within the landscape, whilst the artificial channelled valley bottom wetland features were determined to be process water dams associated with the Karbochem Industrial Complex. These features thus, cannot be classified as watercourses. The natural channelled valley bottom wetland identified by the NFEPA database was identified to be a true watercourse classified as a non-perennial river rather than a wetland as defined by NFEPA (2011). This non-perennial river is an unnamed tributary of the iNgagane River and is known locally as the Karbochem Spruit.
- The National Biodiversity Assessment (NBA) (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) largely correlates with the NFEPA (2011) database which indicates there are two seep wetland features associated with the investigation area of the NGEPP study site. As discussed above, the seep feature towards the north of the investigation area was identified to be a stormwater drainage feature and associated excavation, whilst the drainage feature to the south of the subject property was identified as the Karbochem Spruit.
- The iNgagane River is situated approximately 2.11 km south of the NGEPP study site and was classified as Moderately modified (Category C) according to the DWS Resource Quality Information Services (RQIS) present ecological state (PES) and ecological importance and sensitivity (EIS) database (2014).
- According to the KZN Biodiversity Spatial Planning (2016), (Figure 13-18) a CBA optimal area is located within the southern portion of the investigation area of the NGEPP study site.



srk consulting | **NEWCASTLE GAS ENGINE POWER PLANT** NFEPA RIVERS AND WETLANDS MAP | Project No. 566508

Figure 13-17: NFEPA Rivers and Wetlands Map (Source: SAS, 2021a)



srk consulting | **NEWCASTLE GAS ENGINE POWER PLANT** KZN BIODIVERSITY SPATIAL PLANNING MAP | Project No. 566508

Figure 13-18: KZN Biodiversity Spatial Planning Map (Source: SAS, 2021a)

13.3.2 Site survey results

A survey of the NGEPP study site and 500 m investigation area was undertaken by SAS on 29 October 2020, using visual assessment methods and use of digital satellite imagery. In addition, the use of a bucket soil auger was used to verify the presence, or lack thereof, of any potential wetland features on the NGEPP study site and investigation area. The study site comprises of the existing 18.5 MW gas fired cogeneration steam and power plant with a small portion of vacant land. The vacant land on the study site has been transformed and contains debris and building material used to facilitate maintenance on the power plant. As a result of the transformation, majority of the NGEPP study site is infested with alien invasive plant species such as *Tagetes minuta*, *Datura ferox*, *Solanum mauritianum*, and *Verbena bonariensis*.

In addition, an artificial man-made pond was constructed towards the south eastern boundary of the NGEPP study site. It was ascertained that the pond was driven by means of a leak in the municipal water supply and was artificial in nature (Shannet Anoop, pers comms, 29 October 2020). Upon rectification of the leaking infrastructure, the pond began drying out and presently has been deconstructed (Plate 10-2).

Plate 13-1: Remains of man-made pond in stormwater drainage channel

The flow path of stormwater has since been formalised into a stormwater channel which conveys runoff from the greater Karbochem Industrial Complex (Plate 10-1 in Section 10-4 above). The stormwater channel discharges into a non-perennial river situated approximately 140 m south of the NGEPP study site which is an unnamed tributary of the iNgagane River known locally as the Karbochem Spruit. The Karbochem Spruit was surveyed for indicators of wetland and riparian habitat as per the "*Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas*" (DWAF, 2008). The findings of the site survey indicated that no wetland characteristics occur along the Karbochem Spruit. The system displayed alluvial soils with a weakly defined riparian zone further downstream and was classified as a river with associated weakly developed riparian habitat. The Karbochem Spruit is in a largely modified condition due to point and diffuse sources of pollution, including runoff from the Karbochem Industrial Complex and surrounding industry (ESA, 2009). This has resulted in incipient bankside erosion along the river reach, with some portions channelised due to the effects of culverts constricting flow. The Karbochem Spruit drains into the iNgagane River situated approximately 2.11 km downgradient of the NGEPP study site which is classified as largely modified.

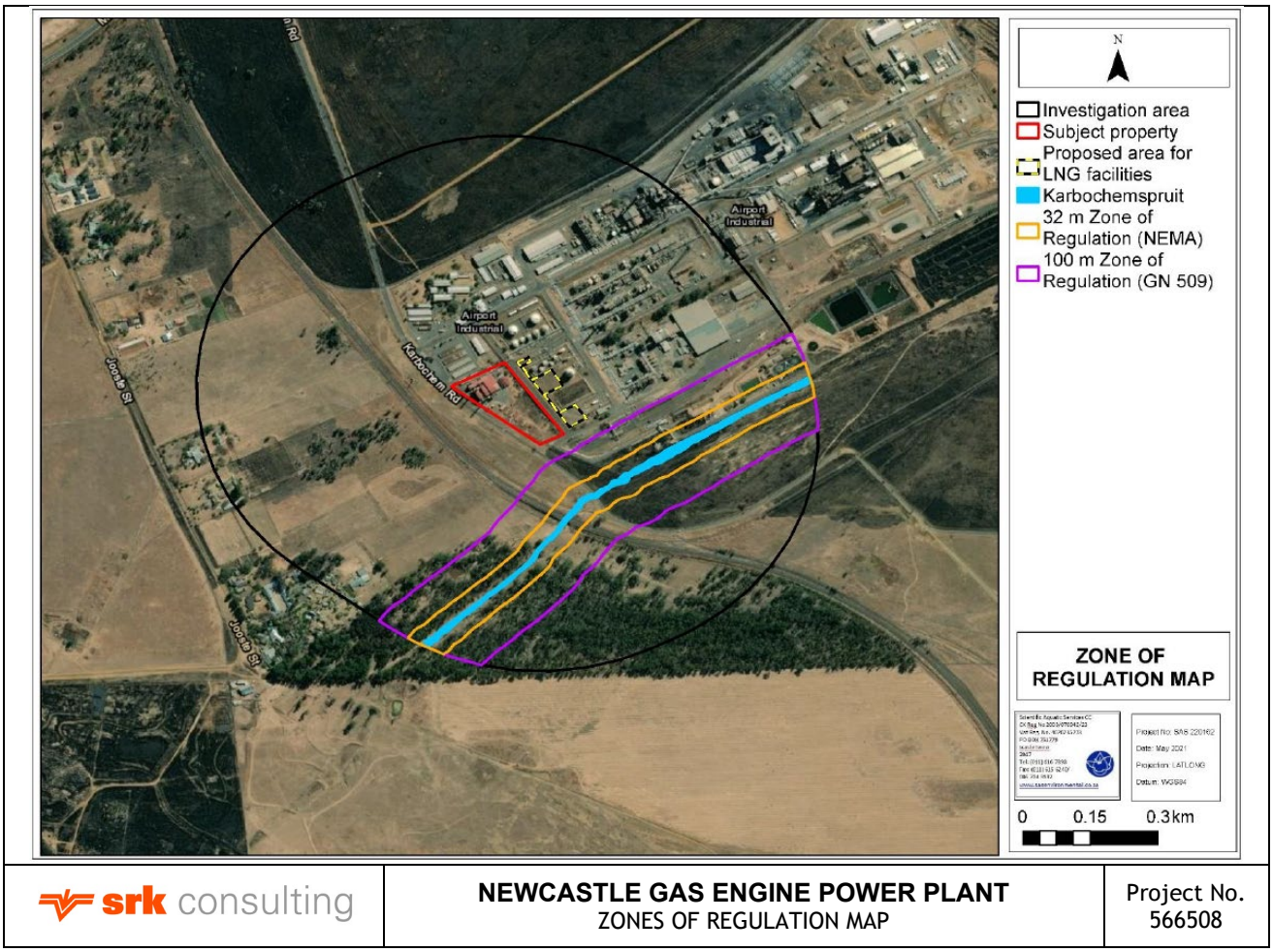


Figure 13-19: Conceptual presentation of the zones of regulation in terms of NEMA and GN 509 as it relates to the NWA (SAS, 2021a)

13.3.3 Impact Assessment

The following impact relating to aquatic ecology was assessed and is further described in the subsection that follows:

- Impact AE1: Disturbance to wetlands or other freshwater habitat (demolition of existing plant construction of new one) (Table 13-19).
- Impact AE2: Disturbance to wetlands or other freshwater habitat (operational phase) (Table 13-20).

Impact AE1: Disturbance to wetlands or other freshwater habitat (demolition and construction)

The specialist study (SAS, 2021a) concluded that **no wetlands or other sensitive freshwater habitat occur in positions which are likely to be directly affected by the proposed NGEPP project**. Due to the nature of the NGEPP project on the study site and relative locality to the Karbochem Spruit, the proposed project is considered to pose a very low risk of further impact to the already largely impacted river system. In addition, the NGEPP study site is not subject to any zones of regulation as per the National Water Act (No. 36 of 1998), as the study site does not fall within the 100 m zone of regulation (as applicable to rivers) of the Karbochem Spruit (Figure 13-19). As such, no development constraints are applicable from a watercourse management perspective.

Whilst no direct impacts as a result of the NGEPP project on the study site are anticipated, the potential for indirect impacts such as sediment laden runoff and ingress of contaminants such as cement into

the Karbochem Spruit may have the potential to occur. As a result, should the NGEPP project receive approval, responsible construction techniques and general good housekeeping is considered essential to ensure that potential impacts are adequately mitigated and minimised as much as possible.

The significance of the impact before and after management measures will therefore be low.

Table 13-19: Impact Assessment for wetlands and freshwater habitat (demolition and construction)

Impact AE1: Disturbance to wetlands or other freshwater habitat (demolition and construction)								
Activity	Demolition of the existing plant and construction of proposed new 100MW plant.							
Project Phase	Demolition and construction phases							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Short-term (1)	Very low (4)	Probable	**Very low**	- ve	High
Management measures: • Any clearing of vegetation and associated soil disturbance during construction should be limited to essential areas only and exposed soil and soil stockpiles should be protected by covering with a suitable geotextile such as hessian sheeting. It must also be ensured that stockpiles do not exceed 2 m in height. This will ensure prevention of excessive sedimentation and runoff into the Karbochem Spruit. • All construction activities and site clearing should ideally take place during the dry season to limit potential impacts and runoff into the Karbochem Spruit. • Concrete and cement-related mortars associated with construction activities can be toxic to aquatic life and other biota. Proper handling and disposal of cement on the NGEPP study site is considered imperative to minimise or eliminate discharge into the Karbochem Spruit situated downgradient. Measures to minimise contamination include ensuring that mixing of cement should only be undertaken within the construction camp and may not be mixed on bare soil. In addition, it is advised that the mixing of concrete is to be strictly undertaken within a lined, bound or bunded portable mixer. • Of particular importance, no waste disposal is to be permitted within the Karbochem Spruit or the stormwater channel within that traverses the eastern boundary of the study site and discharges into the Karbochem Spruit. All waste is to be removed from the study site and disposed of at a registered waste disposal facility. It is further recommended that waste such as wash water should be treated on-site or discharged to a suitable sanitation system to prevent contamination and runoff into the Karbochem Spruit. • Any concrete spillage outside of the demarcated area on the NGEPP study site must be promptly removed and taken to a suitably licensed waste disposal facility. • During the operational phase of the NGEPP project, general good housekeeping must be ensured at all times in order to prevent spills, potential leakage and runoff of hazardous chemicals associated with the NGEPP into the Karbochem Spruit. No waste must be disposed into the stormwater channel and appropriate waste disposal facilities should be allocated as part of the NGEPP project.								
After Management	Local (1)	Low (1)	Short-term (1)	Very low (3)	Improbable	**Insignificant**	- ve	High

Impact AE2: Disturbance to wetlands or other freshwater habitat (operational phase)

As noted for Impact AE1 above, **no wetlands or other sensitive freshwater habitat occur in positions which are likely to be directly affected by the proposed NGEPP project**. However, the potential for indirect impacts such as sediment laden runoff and ingress of contaminants into the Karbochem Spruit may have the potential to occur. As a result, should the NGEPP project receive approval, general good housekeeping is considered essential to ensure that potential impacts are adequately mitigated and minimised as much as possible.

The significance of the impact before and after management measures will therefore be low.

Table 13-20: Impact Assessment for wetlands and freshwater habitat (operation)

Impact AE2: Disturbance to wetlands or other freshwater habitat (operation)								
Activity	Operation of the NGEPP.							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Long-term (3)	Medium (6)	Possible	**Low**	- ve	High
Management measures: • No waste disposal is to be permitted within the Karbochem Spruit or the stormwater channel within that traverses the eastern boundary of the study site and discharges into the Karbochem Spruit. All waste is to be removed from the study site and disposed of at a registered waste disposal facility. It is further recommended that waste such as wash water should be treated on-site or discharged to a suitable sanitation system to prevent contamination and runoff into the Karbochem Spruit. • During the operational phase of the NGEPP project, general good housekeeping must be ensured at all times in order to prevent spills, potential leakage and runoff of hazardous chemicals associated with the NGEPP into the Karbochem Spruit. No waste must be disposed into the stormwater channel and appropriate waste disposal facilities should be allocated as part of the NGEPP project.								
After Management	Local (1)	Medium (2)	Long-term (3)	Medium (6)	Improbable	**Low**	- ve	High

13.3.4 Conclusions and Recommendations

Based on the findings of the assessment undertaken by SAS, it is recommended that the proposed management measures presented Tables 13-19 to 13-20 be carried into the EMPr for this project and, once approved (assuming such), implemented as far as practical.

13.4 Terrestrial Biodiversity Compliance Statement

As part of the process of initiating the Environmental Authorisation process, SRK applied the Department of Environmental Affairs (DEA) screening tool to the NGEPP study site. According to the screening tool, the study site is located within an area of very high terrestrial significance, medium animal significance and low plant significance. As a result, an applicant, intending to undertake an activity on a site identified as being of “very high sensitivity” for biodiversity theme based on the national web-based environmental screening tool, must submit a Terrestrial Compliance Statement to the competent authority unless the site survey, or findings by the specialist determine that a high risk to the regional terrestrial ecology in the area is likely.

The section is informed by the Terrestrial Biodiversity Compliance Statement which is attached as Appendix G-4.

The terrestrial biodiversity of the study area is described in the subsections below and is based on desktop investigation and site surveys undertaken by the specialist.

13.4.1 Desktop Investigation Findings

A database review and a desktop analysis was undertaken prior to the site survey of the NGEPP *and LNG facility* study site. The results are summarised in the points below:

- The study site fall within the **Least Concerned KwaZulu Natal Highland Thornveld** which is currently **Not Protected**.
- According to the National Threatened Ecosystems (2011) database, the NGEPP study site falls within a **Least Threatened** ecosystem.

- The Terrestrial Sensitivity for the study area has a **very high sensitivity**. The high sensitivity regions are a result of **Critical Biodiversity Areas (CBA)**.
- For the Plant Species theme, the entire NGEPP study site is within a **low sensitivity** area.
- For the animal species theme, a **medium sensitivity** was reported for the NGEPP study site. Sensitive species identified by the EIA screening tool included: **Invertebrate - *Clonia lalandei*, Mammalia - *Ourebia ourebi***.
- According to the KZN Biodiversity Spatial Plan (2016), there are no CBA or Ecological Support Areas (ESAs) associated with study site.

13.4.2 Site survey results

A survey of the NGEPP study site was undertaken on 29 October 2020 (early summer season), using visual assessment methods and use of digital satellite imagery. The study area and surrounding have received sufficient rainfall for good vegetation growth to be present during the site assessment.

The study site comprises of the existing *Newcastle* Energy 18.5 MW gas-fired cogeneration steam and power plant with a small portion of vacant land. The vacant land on the study site has been transformed and contains debris and building material used to facilitate maintenance on the power plant. The habitat unit (transformed habitat) has been notably degraded from a floral species perspective. As a result of the transformation, the majority of the NGEPP study site is infested with alien invasive plant species such as *Tagetes minuta*, *Datura ferox*, *Solanum mauritianum*, and *Verbena bonariensis*. The DEA screening tool indicated a low sensitivity for Species of Conservation Concern (SCC) for plant themes. This was also verified and confirmed during the site assessment as no suitable habitat for SCC was found.

An area situated within the greater Karbochem Industrial Complex, directly east of the study site is proposed for the LNG facilities. The proposed area for the LNG facilities was concreted along some portions and surrounded by existing infrastructure of the greater Karbochem Industrial Complex.

Animal sensitive species for the invertebrate *Clonia lalandei* (Lalande's Black-winged Clonia) and the Mammalia *Ourebia ourebi ourebi* (oribi) were listed to occur within the surrounding area of the study site (screening tool, 2020). Although the distribution of Clonia is within the Newcastle area, no suitable habitat is present within the study site and surrounds, neither for the Oribi species. The study site is located within an industrial area and surrounding agricultural lands, providing no suitable habitat for faunal SCC. Only commonly occurring faunal species associated with urban settings are expected to occur within the study site and immediate surrounds.

As the floral diversity (faunal habitat) has degraded over the years, so has the ability of the study site to support a diversity of faunal species degraded. This has been further compounded through the loss of habitat connectivity to larger natural habitats in the surrounding areas. The vegetation associated with the *NGEPP and LNG* study sites are also not representative of the KwaZulu Natal Highland Thornveld Vegetation Type due to the habitat transformation from anthropogenic activities and alien proliferation. Development within the transformed habitat unit is unlikely to impact significantly on a local and regional scale. Development is also unlikely to contribute towards provincial biodiversity targets relating to the CBA.

The DEA screening tool indicated the site as medium sensitivity for Animal themes due to the possible presence of SCC (the invertebrate *Clonia lalandei* (Lalande's Black-winged Clonia) and the mamalia *Ourebia ourebi ourebi* (Oribi)). As on-site characteristics do not support these species the sensitivity is considered to be an overestimate of the study site based on QDS results as appose to site specific characters. The Screening tool also indicated a Very High Sensitivity for terrestrial biodiversity theme as it is considered a CBA. As the site is badly degraded as a result of high Alien Invasive Plant (AIP) abundance, fragmentation, fencing, dumping and historic gravel roads which transverse it the study site it is no longer representative of the unit. Its fragmented nature does not promote re-establishment

of native fauna and flora and thus has no conservation value. *Therefore, the sensitivity associated with the NGEPP and LNG study sites are considered low.*

13.4.3 Impact Assessment

The following impact relating to terrestrial biodiversity was assessed and is further described in the subsection that follows:

- Impact TD1: Disturbance to terrestrial biodiversity (Table 13-21).

Impact TB1: Disturbance to terrestrial biodiversity

The specialist study (SAS, 2021b) concluded that the site is badly degraded as a result of high AIP abundance, fragmentation, fencing, dumping and historic gravel roads which transverse the study site. Its fragmented nature does not promote re-establishment of native fauna and flora and thus has no conservation value.

Whilst no direct impacts as a result of the NGEPP project on the study are area anticipated, the potential for indirect impacts such edge effects resulting alien plant species proliferation in surrounding more natural areas may have the possibility to occur. As a result, should the NGEPP project receive approval, responsible construction techniques and general good housekeeping is considered essential to ensure that potential impacts are adequately mitigated and minimised as much as possible.

The significance of the impact before and after management measures will therefore be low.

Table 13-21: Impact Assessment for terrestrial biodiversity

Impact TB1: Disturbance to terrestrial biodiversity								
Activity	Demolition of the existing plant, construction and operation of proposed new 100MW plant.							
Project Phase	Demolition, construction and operational phases.							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Low (1)	Long-term (3)	Very low (4)	Probable	**Very low**	- ve	High

Management measures (construction and operation):

- No collection of floral or faunal species may be allowed by construction personnel.
- No hunting or trapping of faunal species is to be allowed by construction personnel.
- Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed.
- Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by:
  - Demarcating of all footprint areas during construction activities.
  - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas and should be taken to a registered waste disposal facility.
  - All soils compacted as a result of construction activities should be ripped and profiled and reseeded, where required.
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made to Category 1b species identified within the development footprint areas.
- No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed as a result of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dumpsites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility.
- Upon completion of construction activities, it must be ensured that no bare areas remain and that indigenous species be used to revegetate the disturbed area.

• Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas.								
After Management	Local (1)	Low (1)	Short-term (1)	Very low (3)	Possible	**Insignificant**	- ve	High

13.4.4 Conclusions and Recommendations

Based on the findings of the assessment undertaken by SAS, it is recommended that the proposed management measures presented Table 13-21 be carried into the EMPr for this project and, once approved (assuming such), implemented as far as practical.

13.5 Noise Impact Assessment

The section is informed by the Acoustic Impact Assessment (AIA) which is attached as Appendix G-5.

The screening level Environmental AIA compares existing and proposed noise levels at various specified receptors (noise receivers) which enabled an assessment of changes in noise levels at these locations resulting from the proposed development. Such changes were then assessed against the South African National Standards (SANS, 2008) community or group responses (Table 13-22) to effectively assess the anticipated impacts/responses resulting from such increases.

The noise climate (existing and proposed) of the study area is described in the subsections below and is based on desktop investigation and site surveys undertaken by the specialist.

All impacts associated with the proposed NGEPP were evaluated using a risk matrix, which is a semi-quantitative risk assessment methodology.

Table 13-22: Categories of community/group response (adapted from SANS 10103:2008)

Excess ($\Delta L_{Req,T}$)[a] dB(A)	**Estimated Community or Group Response**	
	Category	**Description**
0 – 10	Little	Sporadic Complaints
5 – 15	Medium	Widespread Complaints
10 – 20	Strong	Threats of community/group action
>15	Very Strong	Vigorous community/group action

Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated.
[a] Δ $L_{Req,T}$ should be calculated from the appropriate of the following:
1) $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation);
2) $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level of the ambient noise given in Table 1 of the code;
3) $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from Table 2 of the code; or
4) $L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in the area because of the proposed development under investigation.

13.5.1 Noise Principles

Sound is defined as any pressure variation (in air, water or other medium) that the human ear can detect. Noise is defined as “unwanted sound”. Noise can lead to health impacts and can negatively affect people’s quality of life. Hearing impairment is typically defined as a decrease in the threshold of hearing. Severe hearing deficits may be accompanied by tinnitus (ringing in the ears). Noise-induced hearing impairment occurs predominantly in the higher frequency range of 3,000 to 6,000 Hertz (Hz), with the largest effect at 4,000 Hz. With increasing equivalent continuous sound pressure level (L_{Aeq}) and increasing exposure time, noise induced hearing impairment occurs even at frequencies as low as 2,000 Hz. However, hearing impairment is not expected to occur at L_{Aeq} levels of 75 dB(A) or below, even for prolonged occupational noise exposure.

The annoyance due to a given noise source is subjective from person to person, and is also dependent upon many non-acoustic factors such as the prominence of the source, its importance to the listener's economy (wellbeing), and his or her personal opinion of the source. Increased exposure to noise can have negative effects on individuals, both physiological (influence on communication, productivity and even impaired hearing) and psychological effects (stress, frustration and disturbed sleep). As such, noise impacts need to be understood to mean one or a combination of negative physical, physiological or psychological responses experienced by individuals, whether consciously or unconsciously, caused by exposure to noise.

More technically, noise impacts are defined as the capacity of noise to induce a nuisance depending upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. Sound levels during the evening and night is approximately 5 to 10 dB(A) lower than during the day (World Health Organisation, 1999).

Typical noise levels are presented in Table 13-23.

Table 13-23: Typical noise levels (Cowan,1993)

Sound Pressure Level (dB(A))	Typical Source	Subjective Evaluation
130	Jackhammers ambulances	intolerable
120 **110**	heavy rock concert grinding on steel	extremely noisy
100 **90**	loud car horn at 3 m construction site with pneumatic hammering	very noisy
80 **70**	kerbside of busy street loud radio or television	loud
60 **50**	department store general office	moderate to quiet
40 **30**	inside private office inside bedroom	quiet to very quiet
20	unoccupied recording studio	almost silent

Research has shown that doubling the distance from a noise source results in a proportional decline in noise level. The standard attenuation rate for hard site conditions is 6 dB(A) per doubling of distance for point sources. For instance, if a receptor is at a position one meter from the source and move one meter further away from the source, the sound pressure level will drop by 6 dB(A), moving to 4 meters, the drop will be a further 6 dB(A), and so on. When ground cover or normal unpacked earth (i.e. a soft site) exists between the source and receptor, the ground becomes absorptive to sound energy. Absorptive ground results in an additional noise reduction of approximately 1.5 dB(A) per doubling of distance. This methodology is only applicable when there are no reflecting or screening objects in the sound path

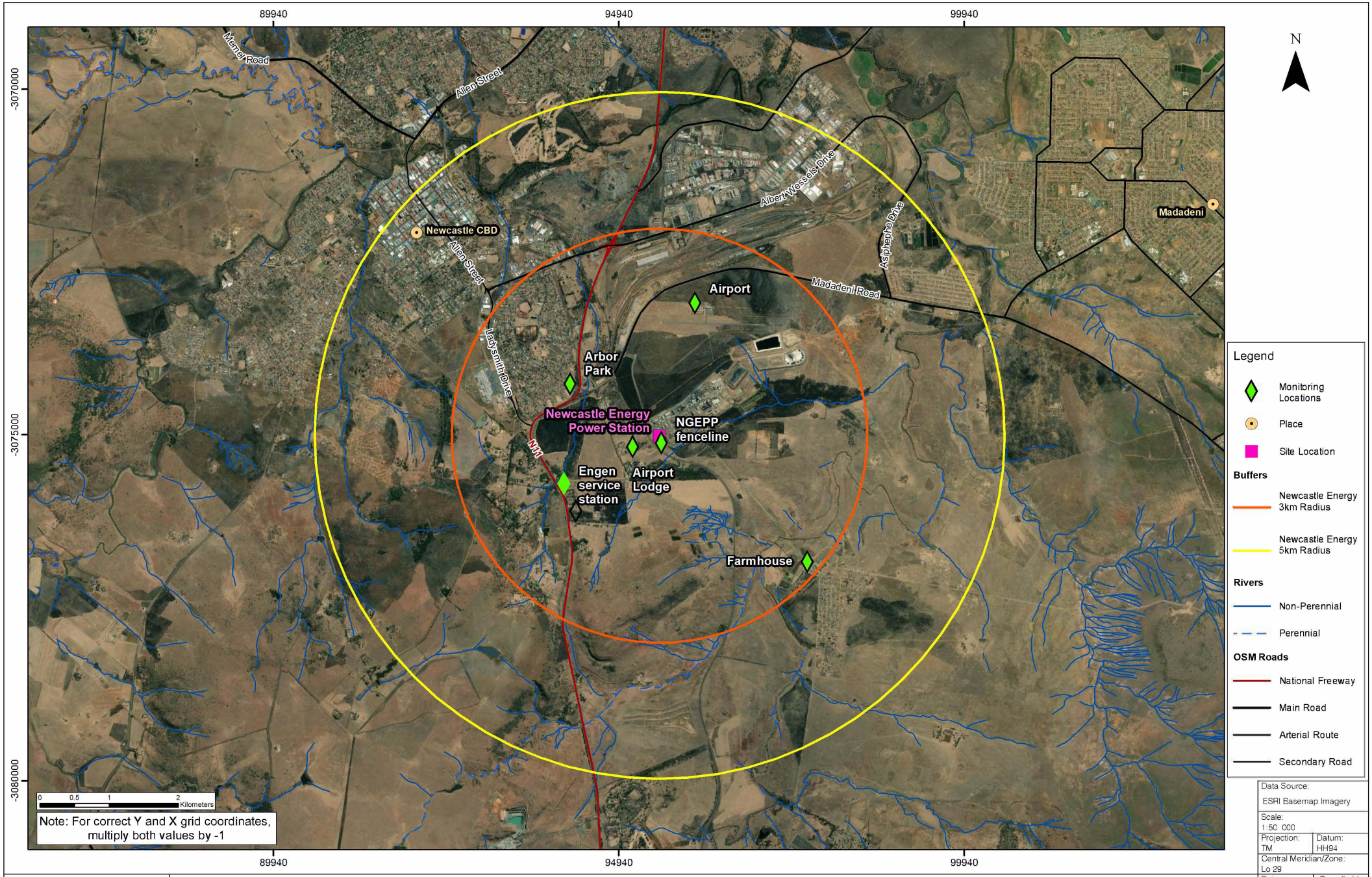
13.5.2 Baseline Monitoring

Ambient sound level measurements were undertaken on 29 to 30 October 2020 at six (6) receptor locations as indicated in Table 13-24 and Figure 13-20. All receptor sound level measurements were free-field measurements (i.e. at least 3.5 m away from any vertical reflecting surfaces). Measurement procedures were undertaken according to the relevant South African Code of Practice SANS 10103:2008. This guides the selection of monitoring locations, microphone positioning and equipment specifications. Sound level measurements were taken with a SABS-calibrated Type 1 Integrating Sound Level Meter (CEL 63X).

Table 13-24: Location of acoustic monitoring points

Receptor ID	Receptor Description	Latitude (S)	Longitude (E)	Distance from Boundary (m)
REC1	Airport Lodge	-27.786614°	29.965367°	385
REC2	Arbour Park	-27.778558°	29.956112°	1 440
REC3	Engen Service Station	-27.791493°	29.955326°	1 500
REC4	Farmhouse	-27.801456°	29.991131°	2 800
REC5	Airport	-27.767829°	29.974360°	1 900
REC6	NGEPP Fenceline	-27.786100°	29.969563°	20

Measurements were taken during the prescribed timeframes in SANS 10103:2008, with day-time monitoring between 06:00 and 22:00 and night-time between 22:00 and 06:00. Measurements were conducted for fifteen minutes at each monitoring location. The sound level meter was calibrated before and after measurements were conducted and no significant drifts (differences greater than 0.5 dB(A)) were found to occur. At each point, the equivalent (L_{Aeq}), maximum (L_{Amax}), and minimum (L_{Amin}) continuous sound pressure levels were measured.



Data Source: ESRI Basemap Imagery
Scale: 1:50 000
Projection: TM
Datum: HH94
Central Meridian/Zone: Lo 29
Date: 27/10/2020
Compiled by: INBRO
Project No: 566508
Fig No: 13-20

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NEWCASTLE GAS ENGINE POWER PLANT

NOISE MONITORING POINTS FOR THE NEWCASTLE ENERGY POWER STATION

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Revision: A Date: 31 03 2021

Results - Baseline (Existing) Noise Environment

Since the proposed NGEPP is located within an industrial complex next to large a chrome plant, the existing noise climate in the vicinity of the facility is classified as being typically industrial in nature while ambient noise at surrounding offsite receptor locations can be described as being typically urban in nature. Sources of ambient noise recorded during the monitoring campaign include road traffic, other industries, business premises, construction activities, as well as birds chirping and insects. Ambient sound level monitoring was conducted on 29 and 30 October 2020 at six (6) receptor locations at points surrounding the proposed NGEPP facility. Daytime and night-time results from this monitoring campaign are presented in Table 13-25 and Table 13-26.

The average day-time (L_{Aeq}) sound level measured outside the proposed NGEPP fenceline was below the SANS 10103*:2008* industrial *rating level* (70 dB(A)), as the existing 18.5 MW cogeneration plant has been mothballed. Average day-time (L_{Aeq}) sound levels measured at Arbour Park was above the SANS 10103:*2008* urban *rating level* (60 dB(A)). Key sources at Arbour Park originated from vehicles travelling along the N11, people talking and people walking, birds chirping and insects as well as industrial noises (example: African Amines (alkyl amines plant), Brother CISA (chrome chemicals plant) and SA Calcium Carbide) from the Karbochem Industrial Complex. Average day-time (L_{Aeq}) sound levels measured at all other urban receptor locations (i.e. Airport Lodge, Engen, Farmhouse, and the Airport) were below this SANS urban *rating level*. The dominant noise sources at these urban receptor locations originated from road traffic, people talking and people walking, a train passing by, an aircraft flying overhead, dogs barking occasionally as well as light construction activities. Industrial noises from the existing Karbochem Industrial Complex were slightly audible only at the Airport Lodge and Farmhouse receptor points.

Table 13-25: Day-time sound level monitoring results

Receptor Description	SANS *rating level* (dBA)	L_{Aeq} (dBA)	L_{Amax} (dBA)	L_{Amin} (dBA)
Airport Lodge	**60**	52.0	77.6	40.4
Arbor Park	**60**	61.3	74.9	40.8
Engen service station	**60**	52.1	68.7	42.6
Farmhouse	**60**	50.2	76.1	36.2
Airport	**60**	52.8	62.1	43.5
NGEPP fenceline	**70**	48.6	67.6	39.3
*Values in red exceed the SANS *10103:2008 rating levels*.				

Average night-time (L_{Aeq}) sound levels measured outside the proposed NGEPP fence line was below the SANS *10103:2008* industrial *rating level* (70 dB(A))[12] as the existing 18.5 MW cogeneration plant has been mothballed. Average night-time (L_{Aeq}) sound levels measured at Arbour Park and the Engen service station was above the SANS *10103:2008* urban *rating level* (50 dB(A)). Key sources at both Arbour park and Engine service station originated from vehicles travelling along the N11, insects, dogs barking as well as industrial noises from the Karbochem Industrial Complex. Average day-time (L_{Aeq}) sound levels measured at all other urban receptor locations (i.e. Airport Lodge, Farmhouse and the Airport) were below this SANS *10103:2008* urban *rating level*. The dominant noise sources at these urban locations originated from road traffic, dogs barking occasionally, light wind noise and traffic. Industrial noises from the existing Karbochem Industrial Complex were slightly audible only at the Airport Lodge and Farmhouse receptor points.

[12] Since NGEPP is proposed to operate within the Karbochem Industrial Complex, the Night-time ($L_{Req,n}$) of 70 dBA has been applied in this study.

Table 13-26: Night-time sound level monitoring results

Receptor Description	SANS *rating level* (dBA)	LA_{eq} (dBA)	L_{Amax} (dBA)	L_{Amin} (dBA)
Airport Lodge	**50**	46.9	68.2	38.4
Arbor Park	**50**	56.9	78.4	37.2
Engen service station	**50**	58.7	74	39.4
Farmhouse	**50**	47.9	71.4	40.2
Airport	**50**	42.0	55.1	32.1
NGEPP fenceline	**70**	46.8	57.1	42.5
*Values in red exceed the SANS *10103:2008 rating levels*.				

13.5.3 Predicted Noise

Acoustic Calculations

Sound power levels (PWL) for different components associated with each of the 13 Rolls-Royce (Bergen B3540V20) gas engines were obtained from the Rolls-Royce Engineers (Table 13-27). Typical sound PWLs were summed (logarithmically) together to obtain a cumulative PWL for the proposed operations, assuming all equipment will be operational simultaneously.

Table 13-27: Operational phase equipment sound power level ratings associated with each gas engine

Source per a generator	Sound Power Level (dB(A))
Engine noise - mechanical sound	98.0
Cooling fan noise - sound of air being moved across the engine	85.0
Alternator noise - cooling air and brush friction	95.0
Induction noise – mechanical sound	95.0
Engine exhaust with silencer	85.0
Logarithmic Total (per an engine)	**101.2**

The logarithmic sum PWLs from 12 Rolls-Royce (Bergen B3540V20) gas engines operating simultaneously was calculated to be 112 dB(A). This logarithmic total noise level was applied to the closest boundary of the proposed operations in relation to each receptor and resultant noise levels at specified distances from the site were calculated using attenuation-over-distance acoustic calculations.

Predicted Noise *Environment*

Based on a worst-case cumulative sound power level of 112 dB(A) *generated by* all equipment associated with the *proposed* NGEPP operating simultaneously (Table 13-27), the resultant *predicted* noise levels at specified distances from the facility are presented in Figure 13-21. Noise levels in the immediate vicinity of the operational activities are predicted to be high, as would be expected. At distances greater than 25 m from the source (approximate location of the fenceline), noise levels reduce considerably, with noise levels at approximately 150 m and 500 m from the source *reducing* to below the SANS *10103:2008* urban day-time and night-time *rating level* of 60 dB(A) and 50 dB(A), respectively.

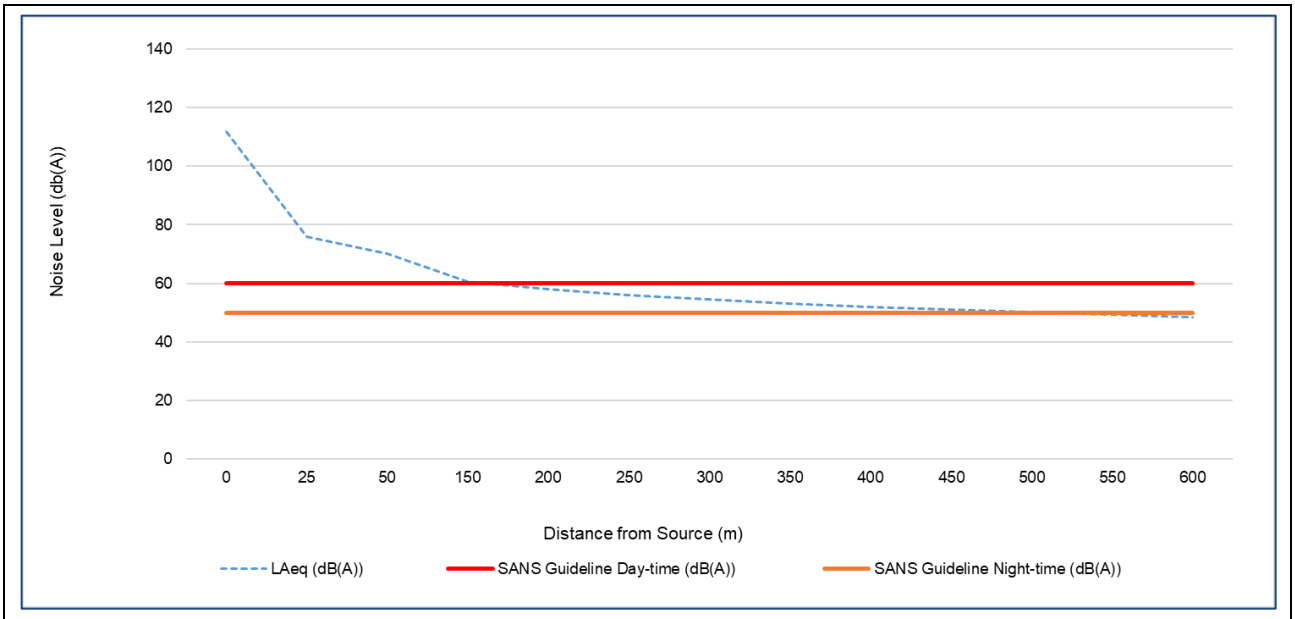

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Figure 13-21: *Environmentally conservative* predicted noise levels associated with the operational phase

Baseline, predicted and resultant noise levels for day-time and night-time at the residential locations are presented in Table 13-28 and Table 13-29, respectively. *The difference in baseline and cumulative noise levels was* assessed using the classifications presented in Table 14-21. It must be noted that these results represent an *environmentally conservative* scenario when operational activities are occurring on the closest boundary of the proposed NGEPP to the receptor in question and do not represent noise levels that will occur all the time.

Increases in noise levels at all offsite receptor points as a result of the NGEPP operational activities will range from 0.0 to 2.2 dB(A) during the day-time. Such marginal increases are classified as resulting in "little" community response. While the predicted cumulative noise level at Arbor Park is above the SANS 10103*:2008* urban day time *rating level* (60 dB(A)), it must be noted that the existing baseline measured at this point was already above the *rating level*. No changes in day-time noise levels are however expected at this receptor. The predicted cumulative noise level at the NGEPP fenceline is above the SANS 10103*:2008* industrial day time *rating level* (70 dB(A)) and is most likely due to its close proximity to the site operations. While this increase is classified as having a strong community response, this point is located along the plant fenceline away from community receptors. *Therefore, no community receptors or sensitive receptors are likely to experience the noise levels at the fenceline of the proposed plant and thus, the predicted community response (strong) at this receptor site likely won't be experienced. At the fenceline, and within the fenceline of the proposed plant, occupational health and safety standards apply.*

At night-time, increases in noise levels at the offsite receptor points as a result of the NGEPP operational activities will range from 0.1 to 5.0 dB(A) during the night-time. While the predicted cumulative noise level at the Airport Lodge, Arbor Park and Engen are above the SANS 10103 urban night-time *rating level* (50 dB(A)), these marginal increases are classified as resulting in "little" community response. Furthermore, existing baseline noise levels measured at Arbor Park and Engen were already above the *rating level*. *The Airport Lodge is the closest off-site receptor site to the proposed NGEPP site and thus, the predicted sound pressure level raises the ambient (baseline) sound pressure level above the Urban District rating level (SANS 10103:2004).*

The predicted cumulative noise level at the NGEPP fenceline is above the SANS 10103 industrial night time *rating level* (70 dB(A)) and is most likely due to its close proximity to the site operations. While, this increase is classified as having a strong community response, this point is located along the plant fenceline away from community receptors. *Therefore, no community receptors or sensitive receptors are likely to experience the noise levels at the fenceline of the proposed plant and thus, the predicted community response (strong) at this receptor site likely would not be experienced. At the fenceline, and within the fenceline of the proposed plant, occupational health and safety standards apply.*

The predicted increases *in ambient sound levels* at all offsite receptors for day and night-time are below the 7 dB(A) threshold for *a "disturbing noise"* as per the South African Noise Control Regulations. Such a situation represents a worst-case scenario, which is unlikely to occur.

Table 13-28: Day-time sound level monitoring results

Receptor Description	Predicted Noise Level dB(A)	Baseline Noise Level dB(A)	Cumulative Noise Level dB(A)	Change in Noise Level dB(A)	Estimated Community Response
Airport Lodge	50.3	52	54.2	2.2	Little
Arbor Park	40.5	61.3	61.3	0.0	Little
Engen service station	40.2	52.1	52.4	0.3	Little
Farmhouse	36.4	50.2	50.4	0.2	Little
Airport	38.7	52.8	53.0	0.2	Little
NGEPP fence line	70.0	48.6	70.1	21.5	Strong
*Values in red exceed the SANS:*2008 rating levels*					

Table 13-29: Night-time sound level monitoring results

Receptor Description	Predicted Noise Level dB(A)	Baseline Noise Level dB(A)	Cumulative Noise Level dB(A)	Change in Noise Level dB(A)	Estimated Community Response
Airport Lodge	50.3	46.9	51.9	5.0	Little
Arbor Park	40.5	56.9	57.0	0.1	Little
Engen service station	40.2	58.7	58.8	0.1	Little
Farmhouse	36.4	47.9	48.2	0.3	Little
Airport	38.7	42.0	43.7	1.7	Little
NGEPP fenceline	70.0	46.8	70.1	23.3	Strong
*Values in red exceed the SANS:*2008 rating levels*					

13.5.4 Impact Assessment

The following impacts relating to noise were assessed and are further described in the subsections that follows:

- Impact N1: Noise impacts during the construction phase (Table 13-30).
- Impact N2: Noise generated during the operational phase (Table 13-31).

Impact N1: Noise impacts during the construction phase

The construction phase will initially include demolition and removal of the existing plant (18.5 MW cogeneration plant) and thereafter construction of a gas fired open cycle thermal power generating plant and axillary infrastructure. Noise generated during the construction phase is considered temporary in nature and the extent, probability, consequence, and significance can readily be managed through standard construction techniques (Table 13-30).

Table 13-30: Impact N1: Noise impacts during the construction phase

Impact N1: Noise impacts during the construction phase								
Activity	Demolition and removal of the existing plant (18.5 MW cogeneration plant) followed by construction of the new gas fired open cycle thermal power generating plant and axillary infrastructure.							
Project Phase	Construction phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Short-term (1)	Very Low (4)	Definite (>90%)	**Very Low**	-ve	High
Management measures: • Planning construction activities in consultation with local communities to ensure activities with the greatest potential to generate noise are planned during periods of the day, thereby less likely resulting in a disturbance. Information regarding construction activities should be provided to all local communities. • All equipment, machines and vehicles to be used onsite during the construction phase are to be the quietest reasonably available and are to be routinely maintained to ensure the effectiveness of the noise suppression systems. • Through site induction programmes, all construction personal (including contractors) should be informed of their responsibilities and the importance of managing noise levels during the construction phase of the project. • When working near a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible; and • Any noise-related complaints received during the construction phase are to be registered and result in the implementation of appropriate modified practices.								
After Management	Local (1)	Low (1)	Short-term (1)	Very low (3)	Definite (>90%)	**Very Low**	- ve	High

Impact N2: Noise generated during the operational phase

The probability of ambient noise being generated from operation of the NGEPP is definite and its impacts are considered irreversible and unavoidable. This screening assessment predicted impacts to result in little community response in the area in which it is proposed to operate. The significance of the impact before and after management measures will therefore be low (Table 13-31).

Table 13-31: Impact N2: Noise impacts during the operational phase

Impact N2: Noise generated during the operational phase								
Activity	Operation for the gas fired open cycle thermal power generating plant							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Long-term (3)	Medium (6)	Definite	**Medium**	- ve	High
Management measures: • Ensure that all gas engines are located within brick walled buildings. • Ensure that exhaust silencers are installed across all engines. • Investigate the use of installing acoustic barriers around noisy operations at the plant. • Undertaking maintenance and repairs for equipment and prioritising quieter models/options. • Ambient noise monitoring campaign to be undertaken once the NGEPP is operational to confirm/refine changes in noise levels at sensitive receptors. • Avoid unnecessary noise, such as shouting, the use of horns, loud site radios, rough handling of material and equipment. • Require employees to wear Personal Protective Equipment (PPE) in noisy areas.								

• Any noise-related complaints received during the operational phase are to be registered and result in the implementation of appropriate modified practices.								
After Management	Local (1)	Low (1)	Long-term (3)	Low (5)	Definite	**Low**	- ve	High

13.5.5 Conclusions and Recommendations

The acoustic impacts associated with the proposed NGEPP were evaluated. The resultant environmental acoustic risks for residential receptors were ranked "low" during the operational phase. With such minimal increases in noise levels during the operational phase, it is envisaged that the facility can be authorised without any major impacts or complaints. The facility is adequately positioned within an industrial area, away from sensitive receptors and will not negatively impact the noise environment at the receptors. Nonetheless, it is recommended that the proposed management measures presented Tables 13-30 to 13-31 be carried into the EMPr for this project and, once approved (assuming such), implemented as far as practical.

13.6 Quantitative Risk Assessment

The section is informed by the Quantitative Risk Assessment (QRA) Report which is attached as Appendix G-6.

13.6.1 Background

The first step in any risk assessment is to identify all hazards. The merit of including a hazard for further investigation is then determined by how significant it is, normally by using a cut-off or threshold value.

Once a hazard has been identified, it is necessary to assess it in terms of the risk it presents to the employees and the neighbouring community. In principle, both probability and consequence should be considered, but there are occasions where, if either the probability or the consequence can be shown to be sufficiently low or sufficiently high, decisions can be made based on just one factor.

During the hazard identification component of for the NGEPP project, the following considerations have been taken into account:

- Chemical identities.
- Location of on-site installations that use, produce, process, transport or store hazardous components.
- Type and design of containers, vessels or pipelines.
- Quantity of material that could be involved in an airborne release.
- Nature of the hazard most likely to accompany hazardous materials spills or releases, e.g., airborne toxic vapours or mists, fires or explosions, large quantities to be stored and certain handling conditions of processed components.

The evaluation methodology assumes that the facility will perform as designed in the absence of unintended events such as component and material failures of equipment, human errors, external events and process unknowns.

The SANS 1461 standard is the requirement for performing MHI risk assessments in South Africa and is primarily based on the Dutch RIVM (2009). The evaluation of the acceptability of the risks is done in accordance with the UK Health and Safety Executive (HSE) ALARP criteria that clearly cover land use criteria, based on the determined risks.

This report is based on SANS 1461 with the exclusion of elements specific to the Occupational Health and Safety Act 85 of 1993 and its MHI regulation, as well as specific requirements not suitable for this report.

The QRA process is summarised with the following steps:

1) Identification of components that are flammable, toxic, reactive or corrosive and that have potential to result in a major incident from fires, explosions or toxic releases.
2) Development of accidental loss of containment (LOC) scenarios for equipment containing hazardous components (including release rate, location and orientation of release).
3) For each incident developed in Step 2, determination of consequences (such as thermal radiation, domino effects, toxic-cloud formation, etc.).
4) For scenarios with off-site consequences (greater than 1% fatality off-site), calculation of maximum individual risk (MIR), taking into account all generic failure rates, initiating events (such as ignition), meteorological conditions and lethality.

Scenarios included in the QRA for the NGEPP have impacts external to the establishment. The 1% fatality from acute affects (thermal radiation, blast overpressure and toxic exposure) is determined as the end point (RIVM 2009). Thus, a scenario producing a fatality of less than 1% at the establishment boundary under worst-case meteorological conditions would be excluded from the QRA.

13.6.2 Risk assessment overview

Risk calculations are not precise. Accuracy of predictions is determined by the quality of base data and expert judgements.

This risk assessment included the consequences of fires and explosions as well as toxic releases at the NGEPP gas to power facility in Newcastle. A number of well-known sources of incident data were consulted and applied to determine the likelihood of an incident to occur.

This risk assessment was performed with the assumption that the site would be maintained to an acceptable level and that all statutory regulations would be applied. It was also assumed that the detailed engineering designs would be done by competent people and would be correctly specified for the intended duty. For example, it was assumed that tank wall thicknesses have been correctly calculated, that vents have been sized for emergency conditions, that instrumentation and electrical components comply with the specified electrical area classification, that material of construction is compatible with the products, etc.

It is the responsibility of the owners and their contractors to ensure that all engineering designs would have been completed by competent persons and that all pieces of equipment would have been installed correctly. All designs should be in full compliance with (but not limited to) the Occupational Health and Safety Act 85 of 1993 and its regulations, the National Buildings Regulations and the Buildings Standards Act 107 of 1977 as well as local by-laws.

A number of incident scenarios were simulated, taking into account the prevailing meteorological conditions, and described in the report.

The following installations were considered for analysis in the QRA:

- Sasol methane rich gas:
  - Methane rich gas (MRG) and LNG will be transported and stored on site. Both these components consist mostly of methane, a flammable gas.
- LNG:
  - LNG would be received from road tankers and stored in 7 x 300 m^3 cryogenic tanks. The LNG from the storage will be regasified before being transported to the gensets.

13.6.3 Consequence Modelling

The scenarios modelled for the NGEPP fuels and chemical installations, are listed Table 13-32. Some of these scenarios are discussed further in the sections below.

Table 13-32: Scenarios modelled

Equipment	Scenarios Modelled	Potential Consequences	Comments/assumptions
Sasol gas pipeline	• Failure • Leak	• Jet fires • Flash fires • VCE	• Pressure: 8 Bar(g) • Volume flow rate: 23 000m^3/h • Pipeline diameter: 150 mm
LNG storage	• Catastrophic failure • Overfill • 10 Minute release • 10 mm Hole	• Pool fire • Flash fires • VCE	• 7x 300 m^3 storage • Temp: -162ºC • Press atmospheric • Area of release:33 m x 36m • Overfill protection failure: SIL-2
LNG road tanker	• Tanker failure • Hose failure • Hose leak	• Pool fire • Flash fires • VCE	• 1 Offloading bays • Max tanker size: 37 m^3 • Area of release: 1200 m^2 • Frequency 65 days per year

Equipment	Scenarios Modelled	Potential Consequences	Comments/assumptions
LNG offloading pumps	• Pump failure • Pump leak	• Pool fire • Flash fires • VCE	• Pump capacity: 100 m^3/h • Pump head: 10 bar
Pipeline to storage	• Pipeline failure • Pipeline leak	• Pool fire • Flash fires • VCE	• Pipeline diameter: 50 mm • Pipeline pressure: 10 bar
Vaporiser	• Catastrophic failure • 10 mm Hole	• Jet fire • Flash fires • Vapour cloud explosion (VCE)	• Temperature =5ºC • Pressure = 2.7bar(g) • Volume flow rate: 23 000m^3/h

A) Gas Pipeline

The methane rich gas / natural gas would be transported via a pipeline to the gensets. A large release from the pipeline could result in a flash fire or a jet fire. The maximum effects to the 1% fatality from the loss of containment events, is shown in Figure 13-22. The coloured lines represent a leak in an easterly orientation, while the black line indicates the extent from all directions.

In the event of a large release, jet fires could result in damage to nearby equipment and under worst cases, fatalities beyond the site boundary into the Karbochem complex to the west and into the space occupied by the general public. However, impacts will not extend to residential areas.

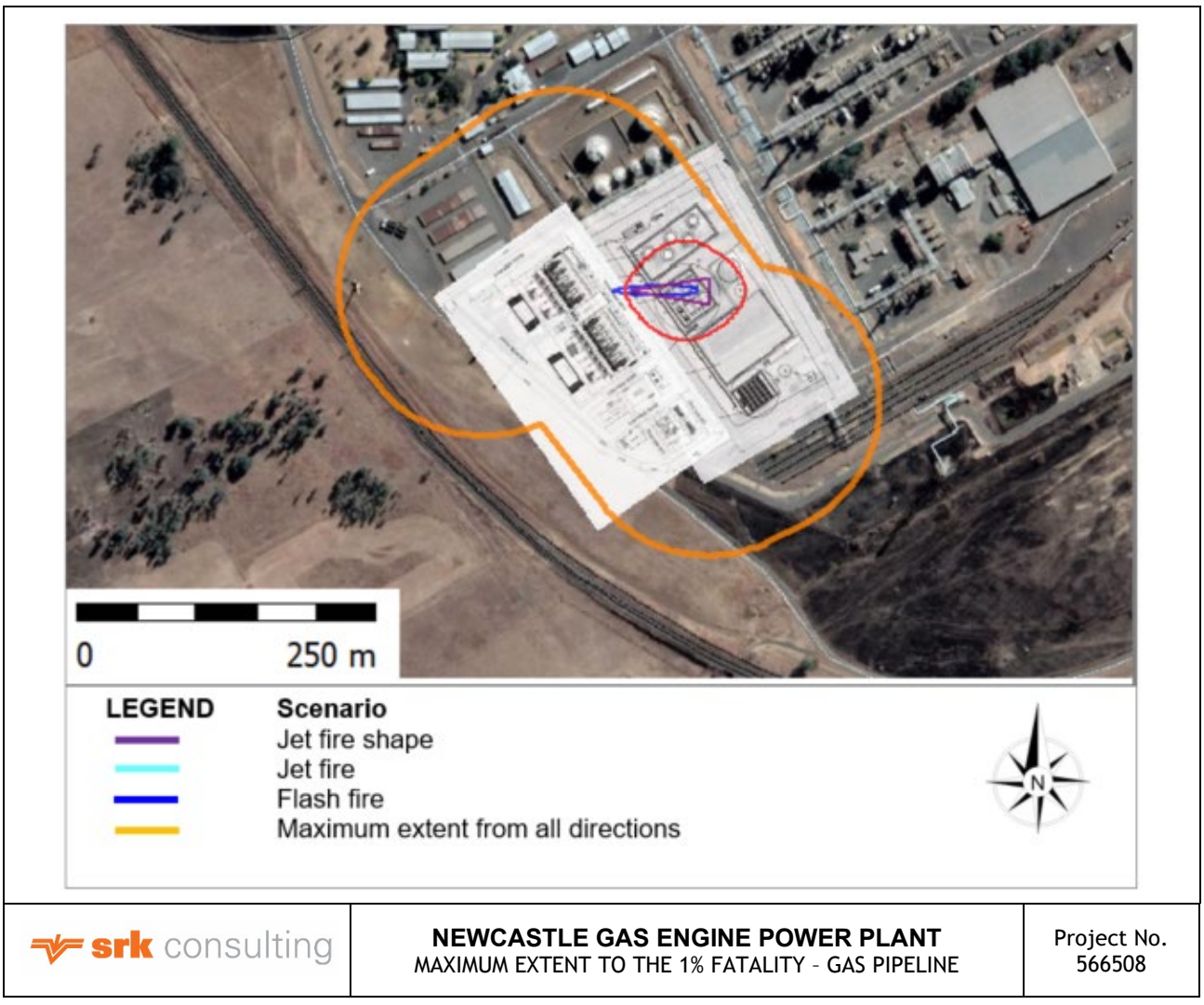

Figure 13-22: Maximum extent to the 1% fatality from the a full-bore failure of gas pipeline (source: Riscom, 2021)

B) LNG Offloading

The LNG from ISO Containers will be received to replenish the LNG in the storage tanks. It is assumed that there would be a single LNG ISO Container every 10 days.

The maximum extent to the 1% fatality will occur from a loss of containment of a 37 m^3 road tanker at low wind speeds, as shown in Figure 13-23. The coloured lines show the maximum extent of the potential effects from a westerly wind direction, while the orange curve indicates the maximum extent from all wind directions.

In this case, the flash fire explosion determines the maximum extent to the 1% fatality. The VCE overpressure for the 1% fatality is equal to 0.1 bar overpressure, that would result in mild damage to the neighbouring property, including damage to the walls and roof.

The impacts from a vapour cloud explosion could result in damage to the LNG storage vessels and piping, that could result in a knock-on effect. However, good engineering of the LNG storage vessels can minimise such events.

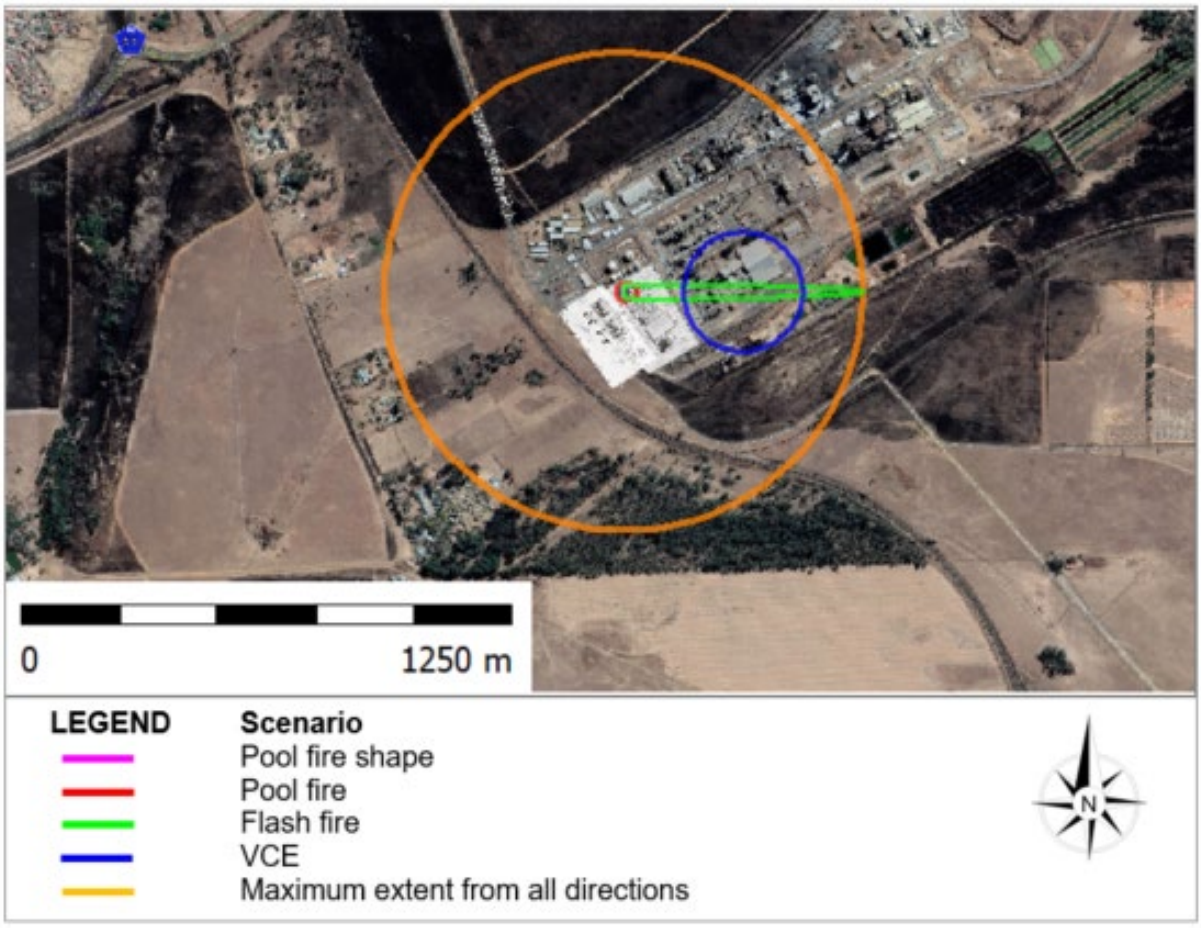

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Figure 13-23: Maximum extent to the 1% fatality from a catastrophic failure of a 37m^3 road tanker (source: Riscom, 2021)

C) LNG Storage

The LNG will be stored in a maximum of 7 x 300 m^3 cryogenic tanks. A loss of containment was assumed to be contained in a 65 x 26.4 m^2 area below the storage vessels.

The maximum extent to the 1% fatality will occur from a release of the entire contents of 300 m^3 LNG storage tank over 10 minutes, as shown in Figure 13-24. The coloured lines show the maximum extent of the potential effects from a westerly wind direction, while the orange curve indicates the maximum extent from all wind directions.

In this case, the flash fire dominates the impacts and determines the maximum extent to the 1% fatality. People in the open, within the flash fire, are assumed to suffer fatal injuries. The VCE overpressure for the 1% fatality is equal to 0.1 bar overpressure, that would result in mild damage to the neighbouring property, including damage to the walls and roof.

The maximum extent of the 1% fatality could extend beyond the site boundary and into the airport property, but would not reach the runway. Impacts could extend into the farmsteads from the west, but would not extend into the residential areas.

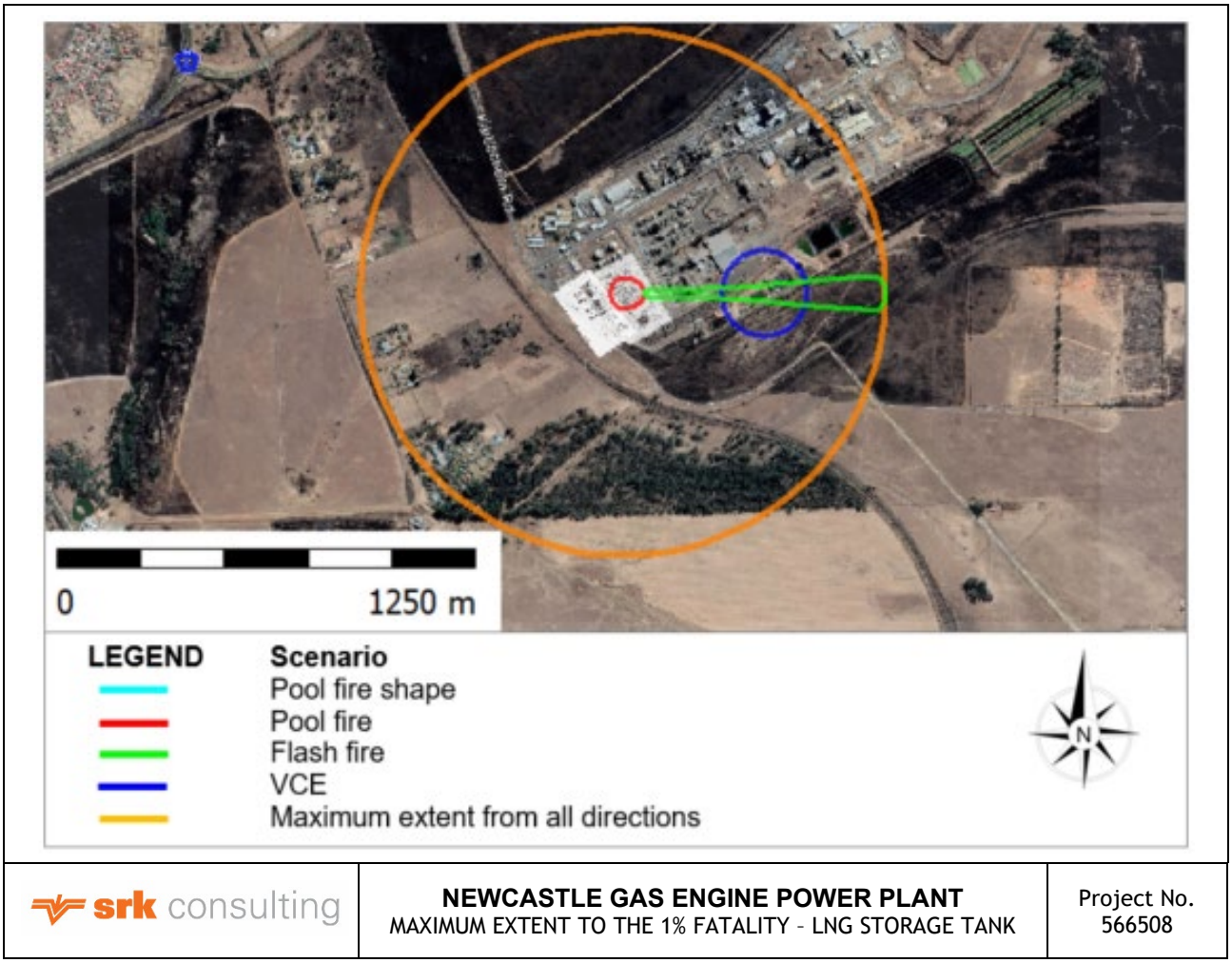

Figure 13-24: Maximum extent to the 1% fatality from a failure of an LNG storage tank (source: Riscom, 2021)

D) LNG Vaporisers

Little detail has been provided regarding the vaporiser, with the exception of the flow rate, temperature and pressure. The worst-case assumptions were made in this instance, and expect the impacts from a vaporiser failure to be less than predicted in this section. The assumptions for the simulations are provided in Section 15.4.

The maximum extent to the 1% fatality will occur from a catastrophic failure of the failure of the inlet to the vaporiser at the inlet process conditions, as shown in Figure 13-25. The coloured lines show the maximum extent of the potential effects from a westerly wind direction, while the orange curve indicates the maximum extent from all wind directions.

In this case the vapour cloud explosions determine the maximum extent to the 1% fatality. People in the open, within the flash fire, are assumed to suffer fatal injuries. The VCE overpressure for the 1% fatality is equal to 0.1 bar overpressure, that would result in mild damage to the neighbouring property, including damage to the walls and roof.

The maximum extent of the 1% fatality could extend beyond the site boundary, but would not impact residential areas.

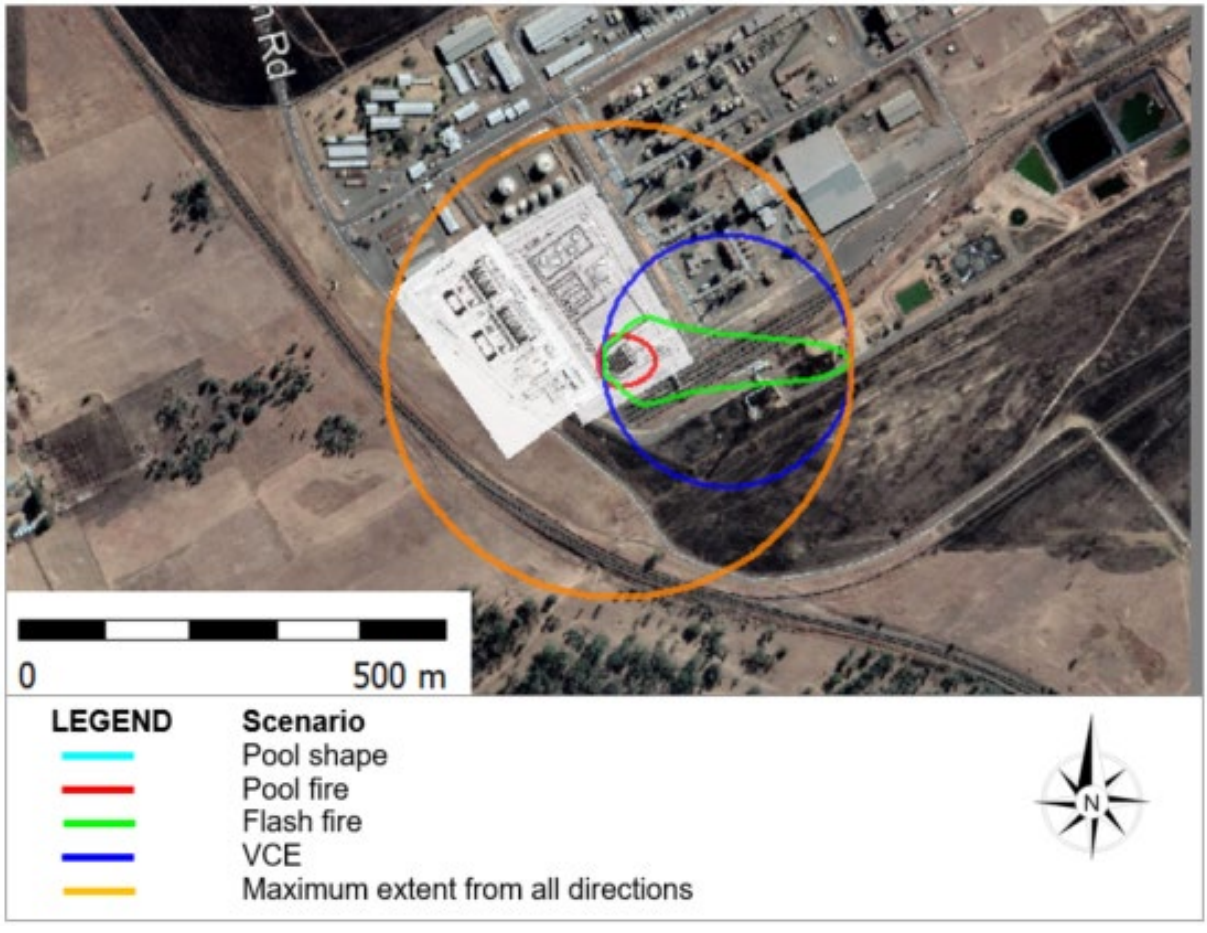

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Figure 13-25: Maximum extent to the 1% fatality from a catastrophic failure of a vaporiser (source: Riscom, 2021)

13.6.4 Maximum Individual Risk

A) Sasol Gas Pipeline

The Sasol pipeline will primary be used for the fuel to the gensets, except for an unexpected loss of supply. The pipeline, from the Sasol gas supply at the western part of the site, will transport methane rich gas to the gensets. The risk of $1x10^{-6}$ fatalities per person per year isopleth, due to a release of the Sasol gas, extended beyond the site boundary, as shown in Figure 13-26 and would classify the NGEPP as a Major Hazard Installation. As a result, the risks to the public from a release of Sasol gas, would be considered tolerable.

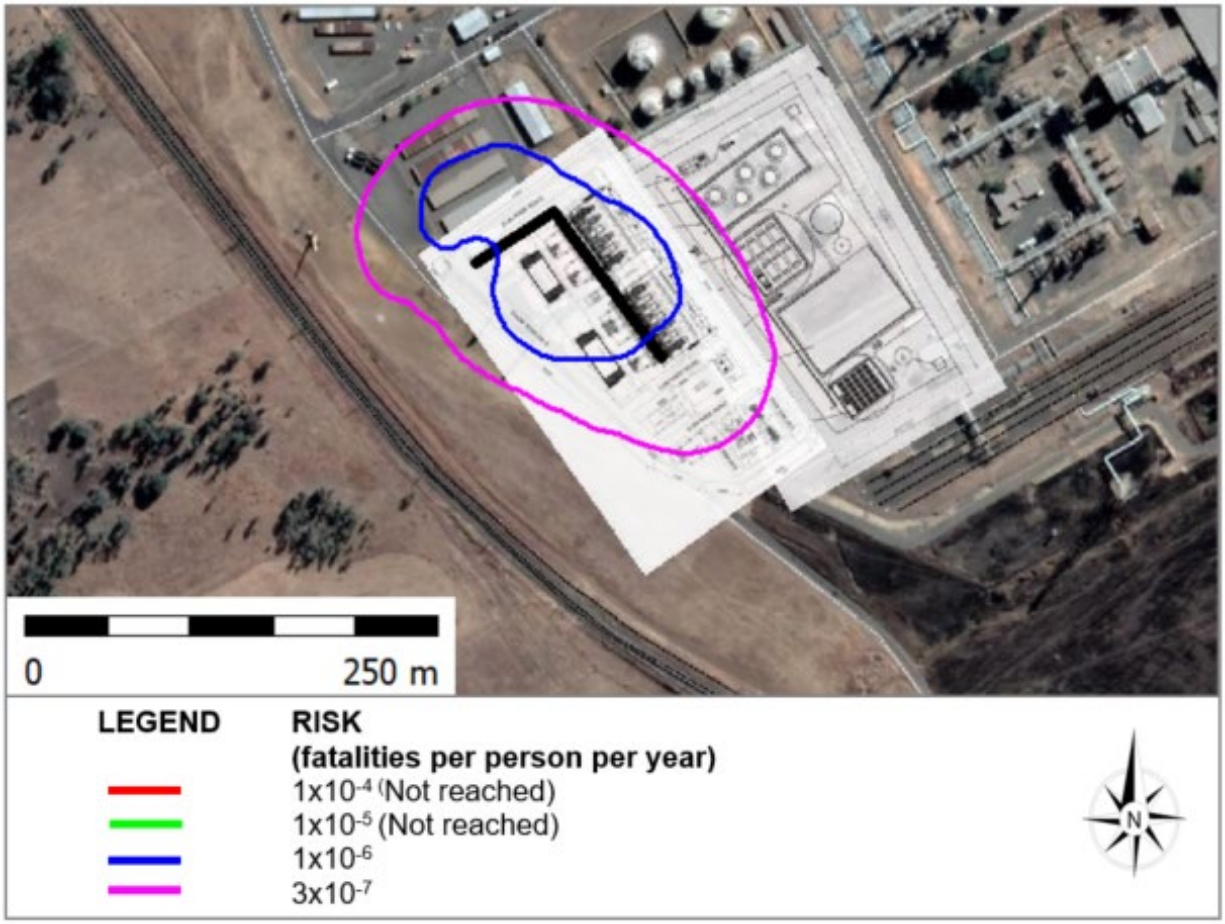

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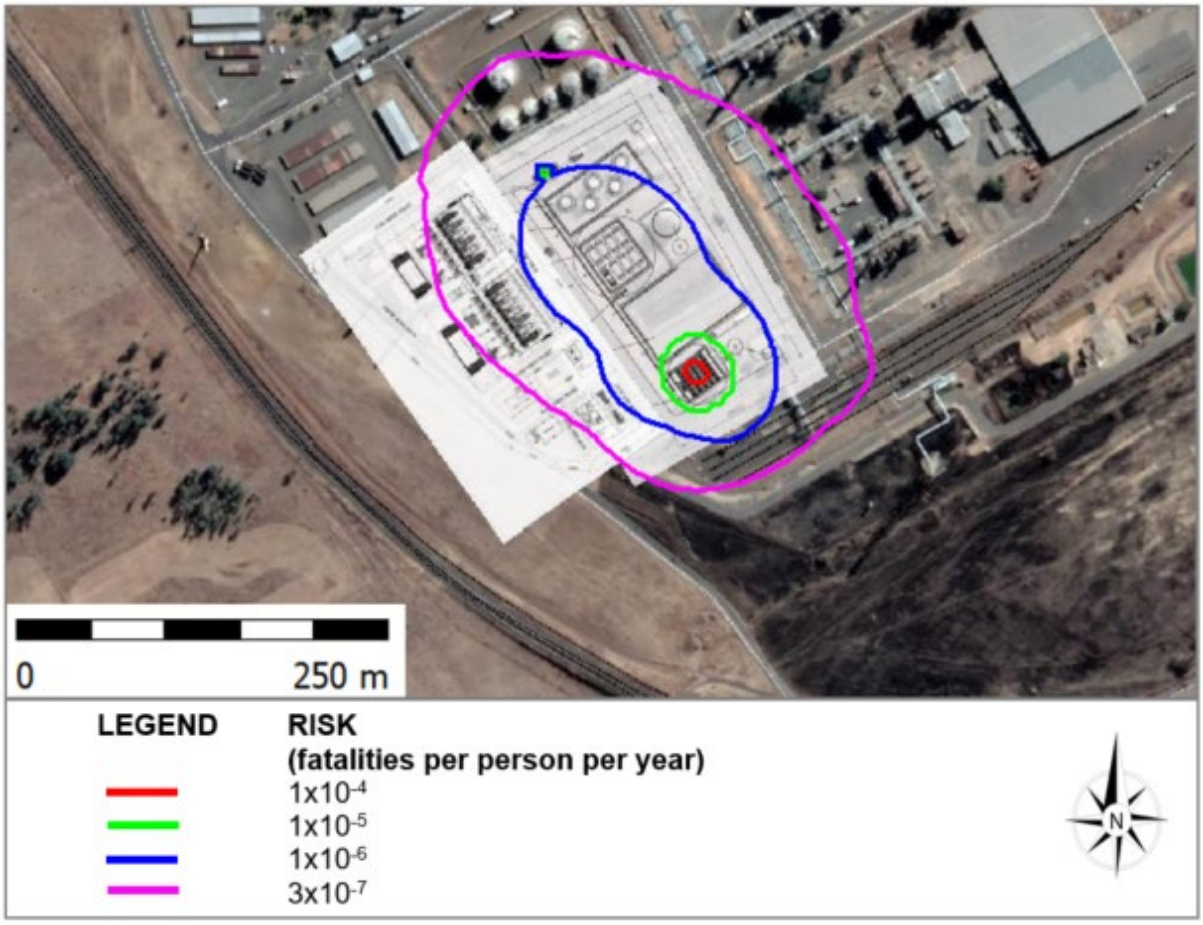
Figure 13-26: Lethal probability isopleth associated with the loss of containment of the pipeline transporting Sasol gas from the take-off point to gensets (source: Riscom, 2021)

B) LNG Installation

The LNG installation consists of the offloading gantry, storage, vaporisers pumps and pipelines.

The risk of $1x10^{-6}$ fatalities per person per year isopleth, due to a release of flammable LNG, extends beyond the Karbochem Industrial Complex site boundary into the to the NGEPP facility, as shown in Figure 13-27. This alone will classify the Karbochem Industrial Complex as a Major Hazard Installation. The risk from fires and explosions from the LNG installation on site would be considered tolerable.



srk consulting	NEWCASTLE GAS ENGINE POWER PLANT LETHAL PROBABLITY ISOPLETH – FLAMMABLE COMPONENT INSTALLATION	Project No. 566508

Figure 13-27: Lethal probability isopleth associated with the flammable component installation (source: Riscom, 2021)

C) Combined Project Risk

The combined project risk is the summation of all the individual risks with installations on the Karbochem Industrial Complex as well as on the NGEPP is shown in Figure 13-28.

The combined risk of $1x10^{-6}$ fatalities per person per year isopleth extends beyond the site boundaries of the Karbochem Industrial Complex as well as on the NGEPP and would classify both the Karbochem Industrial Complex and the NGEPP facilities as Major Hazard Installations.

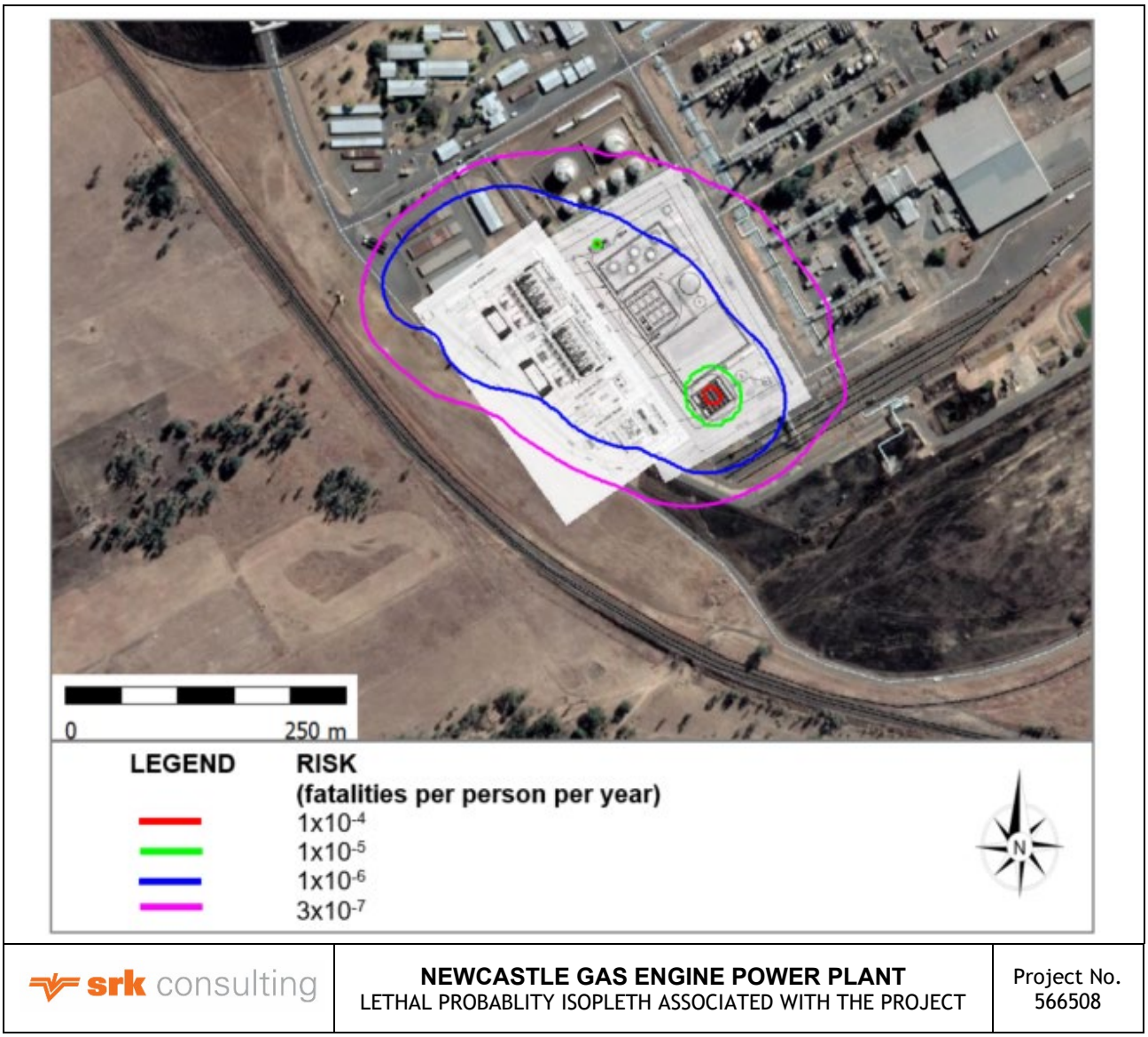


Figure 13-28: Lethal probability isopleth associated with the project (source: Riscom, 2021)

Risks greater than $1x10^{-4}$ fatalities per person per year, considered tolerable for industrial areas but excessive for residential areas, would not extend beyond the project boundary.

The risk of $3x10^{-7}$ fatalities per person per year isopleth indicates the extent for land-use that would be suitable for vulnerable populations, such as hospitals, retirement homes, nursery schools, prisons, large gatherings in the open, and so forth. As no vulnerable people are within the $3x10^{-7}$ fatalities per person per year isopleth, the project risks would be considered acceptable and with the category *Do Not Advise Against.*

13.6.5 Risk Ranking

This risk assessment considered numerous scenarios, determining both consequences and a probability of release. Some scenarios have more serious consequences than others. However, the scenarios of particular interest are those with high-risk frequencies extending beyond the boundary of the site.

Figure 13-29 illustrates the comparison of the $1x10^{-6}$ fatalities per person per year isopleth for the various site installations. The red curve represents the total site risk, while the other installations are shown in other colours. The individual risk would remain within the site boundary. However, the combined site boundary would extend beyond the site boundary.

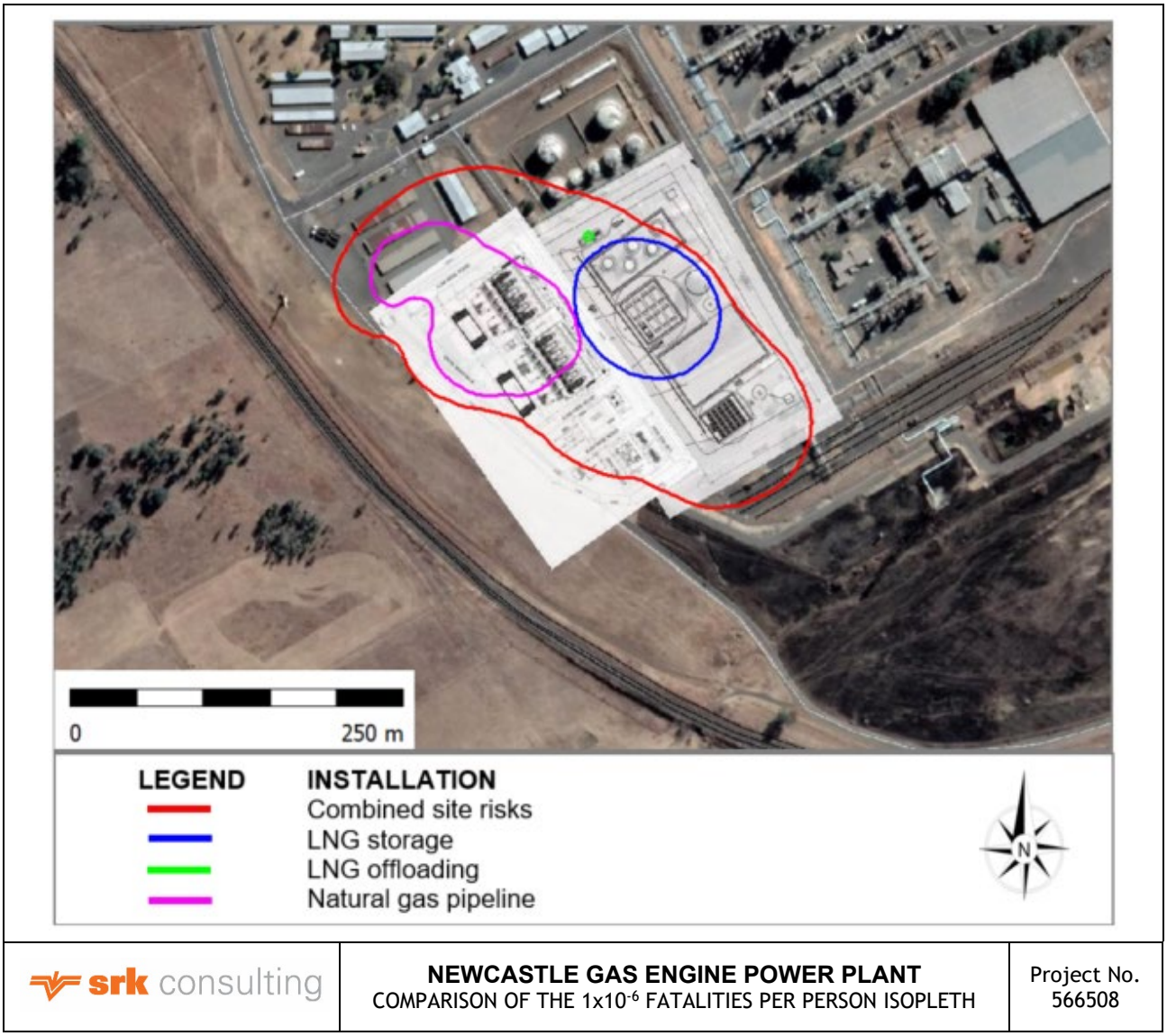


Figure 13-29: Comparison of the $1x10^{-6}$ fatalities per person per year isopleth for various installations (source: Riscom, 2021)

13.6.6 Impact Assessment

The following impacts relating to quantitative risk for the various scenarios modelled (Section 14.6.4) were assessed and are further described in the subsections that follows:

- Impact QR1: Loss of containment of methane rich gas (Table 13-33).
- Impact QR2: LNG ISO container failure (Table 13-34).
- Impact QR3: LNG pipeline failure (Table 13-35).
- Impact QR4: LNG storage (Table 13-36).
- Impact QR5: LNG vaporisers (Table 13-37).

The impact of the NGEPP is assessed in Tables 13-33 to 13-37 below.

[Note: The impact assessment methodology used by the QRA specialist to determine impact significance varies slightly from the methodology prescribed in this EIR. As such, the tables below, have adapted the QRA specialist's impact tables to align with the EIR methodology (i.e. for consistency). The confidence of the significance ratings is still, however, considered to be high.]

Table 13-33: Impact Assessment for loss of containment of methane rich gas

Impact QR1: Loss of containment of methane rich gas								
Activity	Loss of containment under pressure resulting in jet fires and explosions.							
Project Phase	Operational phase.							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	High (3)	Long-term (3)	High (7)	Possible	**Medium**	- ve	Medium
Management measures: • Pipeline design specifications. • Limited mechanical damage due to routing away from vehicles. • Instrumentation including detection and emergency shut down. • Implementation of detailed recommendations presented in Section 13.6.7 of this report as applicable.								
After Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Improbable	**Low**	- ve	Medium

Table 13-34: Impact Assessment for LNG ISO container failure

Impact QR2: LNG ISO container failure								
Activity	Loss of containment under pressure resulting in fires and explosions.							
Project Phase	Operational phase.							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	High (3)	Long-term (3)	High (7)	Possible	**Medium**	- ve	Medium
Management measures: • Designed to specific standards. • Pipeline design specifications. • Limited mechanical damage due to routing away from vehicles. • Implementation of detailed recommendations presented in Section 13.6.7 of this report as applicable.								
After Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Improbable	**Low**	- ve	Medium

Table 13-35: Impact Assessment for LNG pipeline failure

Impact QR3: LNG pipeline failure								
Activity	Loss of containment resulting in fires and explosions.							
Project Phase	Operational phase.							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	High (3)	Long-term (3)	High (7)	Possible	**Medium**	- ve	Medium
Management measures: • Pipeline design specifications. • Limited mechanical damage due to routing away from vehicles. • Instrumentation including detection and emergency shut down. • Implementation of detailed recommendations presented in Section 13.6.7 of this report as applicable.								
After Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Improbable	**Low**	- ve	Medium

Table 13-36: Impact Assessment for LNG storage

Impact QR4: LNG storage								
Activity	Loss of containment resulting in fires and explosions.							
Project Phase	Operational phase.							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	High (3)	Long-term (3)	High (7)	Possible	**Medium**	- ve	Medium
Management measures: • Bunded area. • Pressure vessel with Pressure Safety Valve (PSV). • Emergency shut down systems. • Implementation of detailed recommendations presented in Section 13.6.7 of this report as applicable.								
After Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Improbable	**Low**	- ve	Medium

Table 13-37: Impact Assessment for LNG vaporisers

Impact QR5: LNG vaporisers								
Activity	Loss of containment resulting in fires and explosions.							
Project Phase	Operational phase.							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	High (3)	Long-term (3)	High (7)	Possible	**Medium**	- ve	Medium
Management measures: • Pressure vessel with (PSV). • Instrumentation including detection and emergency shut down. • Implementation of detailed recommendations presented in Section 14.6.8 of this report as applicable.								
After Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Improbable	**Low**	- ve	Medium

13.6.7 Conclusions and Recommendations

The QRA specialist did not find any fatal flaws with the proposed NGEPP that would prevent the project proceeding to the detailed engineering phase of the project. The following are recommended for implementation:

- Compliance with all statutory requirements, i.e., pressure vessel designs.
- Compliance with applicable SANS codes, i.e., SANS 1461, SANS 10087, SANS 10089, SANS 10108, etc.
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs.
- Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.

- Full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm. Including demonstration from the designer that sufficient and reliable instrumentation would be specified and installed at the facility.
- Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment.
  - Including compliance to statutory laws, applicable codes and standards and world's best practice.
  - Including the listing of statutory and non-statutory inspections, giving frequency of inspections.
  - Including the auditing of the built facility against the safety document.
  - Noting that codes such as IEC 61511 can be used to achieve these requirements.
- Demonstration by Newcastle Energy or their contractor that the final designs would reduce the risks posed by the installation to internationally acceptable guidelines.
- Signature of all terminal designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs.
- Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (with input from local authorities).
- Permission not being granted for increases to the product list or product inventories without redoing part of or the full EIA.
- The Karbochem Industrial Complex must review the MHI requirements with regards to the new LNG installation, as required by the MHI regulation.
- Final acceptance of the facility risks with an MHI risk assessment that must be completed in accordance to the MHI regulations (i.e. basing such a risk assessment on the final design and including engineering mitigation).

13.7 Groundwater

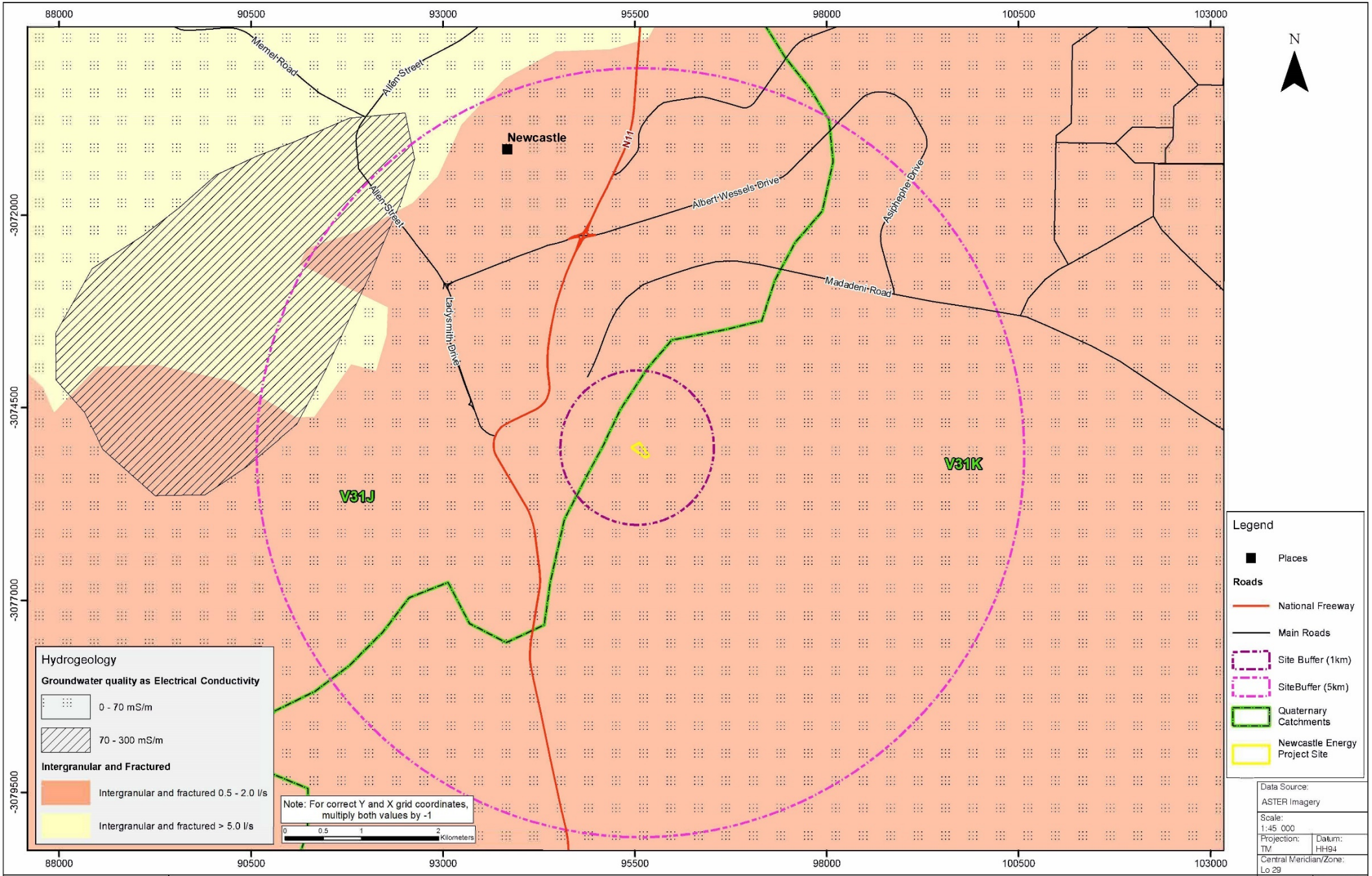
A hydrogeological assessment of the NGEPP site was undertaken by SRK to inform the feasibility study (Appendix G-7). The above study summaries the regional hydrogeology as outlined below and the subsections that follow (also see Figure 13-30).

Aquifers underlying the Newcastle area are intergranular and fractured in nature and largely of the 'd2 type' (associated with typical yields in the range from 0.5 to 2 l/s). Borehole yields recorded in the "eMadlangeni Rural Water supply" dataset range from 0.01 to 5 l/s (SRK, 2015). The higher borehole yields in the dataset are associated with areas of deep weathering, geological structures such as faults and, dolerite dykes and sill contacts.

The aquifer recharge in the area is 3% of the mean annual precipitation (MAP). With an average rainfall of 851 mm/year, groundwater recharge amounts to 26 mm/year.

13.7.1 Test holes and pits

For the hydrogeological assessment, seven hand auger test holes were installed across the site to allow for in-situ permeability testing of the shallow weathered material (i.e. test holes are labelled as "AH" in Figure 13-31 below). The test holes were installed in the vicinity of the backfilled test pits dug for geotechnical investigation by Gevorkyan Geophysics Pty (Ltd) (i.e. test pits are labelled as "TP" in Figure 13-31 below). Test hole (AH-01 to AH-10) profiles are appended to the hydrogeological assessment (Appendix G-7 of this EIR).



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NEWCASTLE GAS ENGINE POWER PLANT

HYDROGEOLOGY MAP

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Revision: A Date: 29 01 2021

Data Source:	ESRI Basemap Imagery
Scale:	1:1 500
Projection: TM	Datum: HH94
Central Meridian/Zone:	Lo 29
Date:	15/10/2020
Compiled by:	BRCH
Project No:	566508
Fig No:	13-31

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NEWCASTLE GAS ENGINE POWER PLANT

DISTRIBUTION OF HYDRAULIC TEST HOLES IN RELATION TO TEST PITS

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Revision: A Date: 05 02 2021

13.7.2 Groundwater occurrence

Both shallow and deep aquifers have been recorded within the study area, characterised as follows:

Shallow aquifer - encompasses the shallow weathered Karoo sandstone, dolerite and shale layers which are of moderate to high permeability. Occurs as a shallow perched aquifer with depth varying across the site. The shallow aquifer was observed at depth from 0.3 mbgl (AH-06) within the Newcastle Energy site and from 1 to 6 m on the neighbouring African Amines site situated approximately 400 m northeast of NGEPP (Jones & Wagener 2007). Aquifer hydraulic conductivity ranging from 3.4 x 10^{-01} to 1.1 m/d was reported for Karbochem shallow aquifer monitoring boreholes, (Bohlweki, 1996). Due to the narrow thickness, the shallow aquifer is generally low yielding.

Deep aquifer - comprises water-bearing zones associated with the fractures within the Karoo lithology, dolerite contact zones and geological contacts. Few deep aquifer boreholes are situated within the Karbochem complex and are used for groundwater monitoring. Their blowout yields are less than 0.1 l/s. Moderate hydraulic conductivity, ranging from 8.6 x 10^{-2} m/d to 4.32 x 10^{-1} m/d, is reported for the Karbochem deep boreholes (Bohlweki, 1996).

13.7.3 Hydraulic testing

The auger holes were in many cases dry and relatively shallow. Consequently, the test holes were subjected to Falling Head Test (FHT).

It is important to note that the auger holes have not fully penetrated the shallow aquifers and lithological material varied in each hole (maximum depth of approximately 2m), hence different permeability response to testing. None of the auger holes have penetrated the deep aquifer.

FHT involved rapid injection of water into uncased test hole to induce rapid displacement of water and measurement of the recession rate using electronic level loggers. FHT was conducted to determine the hydraulic conductivity of the shallow aquifer material which is an essential attribute for the determination of dewatering options and feasibility. FHT results were processed and interpreted using computer program *Aquifer Test 2015.1* developed by Schlumberger Water Services.

The permeability ranging from 0.5 to 0.036 m/d was calculated for the dry test holes. Seepage was recorded only from two test holes (AH-06 and AH07). The hydraulic conductivities of 0.1400 and 0.0413 m/d was calculated for AH-06 and AH-07 respectively and is representative of the shallow aquifers in the area. The large permeability range was also reported from the Karbochem shallow aquifer monitoring boreholes, and implies that within the fill and shallow aquifer material, groundwater would flow over a distance of at least 5 m to 51 m in a year (Bohlweki 1996). However slightly lower permeabilities are expected in areas where residual shale (clay/silty clay) dominate.

13.7.4 Groundwater levels and flow direction

The depth to groundwater in the study area varies across the site, controlled by the local geology, existing potential recharge sources, and topography. The NGEPP test holes AH-06 and AH-07 installed within the vicinity of stormwater drainage, had shallow water levels of 0.34 mbgl (1216.66 mamsl) and 0.81 mbgl (1223.19 mamsl) respectively measured in December 2020 compared to 2.3 mbgl (1242.7 mamsl) (BH45) and 3.6 mbgl (1232.4 mamsl) (BH 51B) measured at the nearest upgradient, and offsite Karbochem monitoring boreholes. Other test holes installed within NGEPP site were recorded dry in December 2020 to approximately 2 mbgl. The same seepage observations were made during the geotechnical investigations i.e. shallow seepage present around the same area (TP-06 and TP-07) (Gevorkyan Geophysics, 2020). This may suggest a direct influence of stormwater recharge to the shallow aquifer in the area around AH-06 and AH-07.

The deep aquifer water level range from 1 to 13.5 with the deepest water level of 13.5 mbgl recorded in borehole a deep aquifer monitoring borehole situated adjacent to Brochem Plant within Karbochem complex.

Interpretation of groundwater elevation data suggest that the groundwater flow direction is to the south east toward a W-E drainage line downgradient of the site. This implies that any potential contamination from site would follow the same flow pattern and discharge as a baseflow to the W-E Karbochem Spruit (south of the site).

13.7.5 Dewatering evaluations

According to the geotechnical investigation (Gevorkyan, 2020), foundations will be excavated up to the bedrock (ranging across the site from 1.3 to 4.3 m) to allow construction of the NGEPP.

This above study confirmed the shallow groundwater occurrence (seepage) in the vicinity of AH-06 (0.34 mbgl) and AH-07 (0.81 mbgl). These two holes are approximately 50m apart along the NW-SE orientated unlined stormwater drainage channel and the eastern boundary fence. Shallow groundwater was not recorded in any other Test holes and Test pits (including TP08, TP09 and TP10 which are downgradient of AH-07, and are excavated deeper than test holes to 4.3, 4.1 and 4m respectively). This may suggest some infiltration of stormwater to shallow groundwater resource in the vicinity of AH06 and AH-07 during rainfall period.

Significant amount of water drains from the Parking at the Karbochem main security gate through the stormwater drainage during rainfall. The clean stormwater from offsite and from the roof must be collected, attenuated and piped/released downgradient of the site.

During the dry season, flow in the stormwater drainage will cease (see Plate 10-1). The perched shallow groundwater occurrence condition around AH-06 and AH-07 is therefore likely to be seasonal and may not occur during dry season (when there is no rainfall recharge). Therefore, through effective management of stormwater in the area, this will eliminate shallow perched groundwater condition and may allow for the safe construction of the NGEPP to take place without extensive dewatering.

Plate 13-2: Stormwater drainage channel during dry season

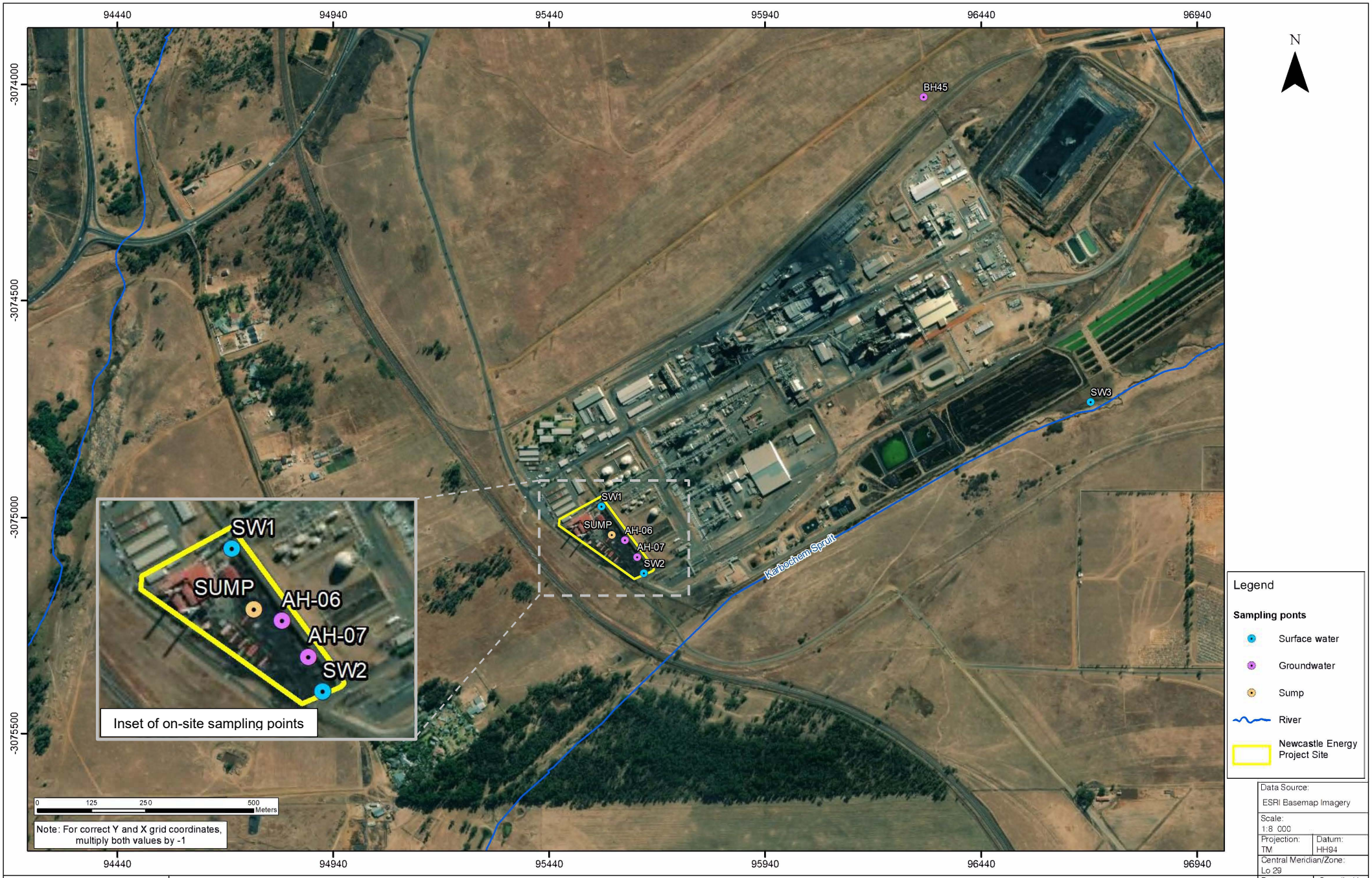
13.7.6 Water quality assessment

An assessment of on-site water quality was undertaken as part of the hydrogeological assessment to inform the feasibility study (Appendix G-7).

Two groundwater seepage samples (AH-06 and AH-07) were taken onsite after auguring, and before Falling Head Test (FHT). The effluent sump was sampled directly using a disposable plastic bailer and two surface water samples (SW1 and SW2) were collected from the stormwater channel on-site, and a third surface water sample (SW3) was collected from the stream downgradient off-site (Figure 13-32). Borehole BH45 upgradient of the Karbochem complex was sampled after purging to ensure that the aquifer representative water is analysed. Physiochemical properties of water were measured onsite using calibrated pH, EC meter, Table 13-38. Samples were stored below 4°C onsite until delivery to Talbot & Talbot Laboratory Pty (Ltd) for the analysis of major ions and, total oil and grease.

Table 13-38: Water sampling physio-chemical properties

Sample ID	T° C	pH	EC (µS/m)	TDS (mg/l)
BH45	23.8	7.1	190	80
AH-06	25.5	6.3	230	132
AH-07	21.7	6.4	310	110
SUMP	24.3	4.0	1 940	995
SW1	25.8	6.6	210	9
SW2	23.8	6.3	920	45
SW3	27.1	7.6	400	190



Data Source: ESRI Basemap Imagery
Scale: 1:8 000
Projection: TM
Datum: HH94
Central Meridian/Zone: Lo 29
Date: 29/01/2021
Compiled by: BRCH
Project No: 566508
Fig No: 13-32

srk consulting

NEWCASTLE GAS ENGINE POWER PLANT

SURFACE AND GROUNDWATER SAMPLING POINTS

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\Groundwater\566508_F5-1_NGEPP_SamplingPoints_A3CL_20210201.mxd

Revision: A Date: 01 02 2021

Groundwater analytical results

It is understood that groundwater onsite is not used for domestic purpose. However, the neighbouring communities rely on groundwater for domestic consumption. As a result, the water quality analytical results were compared to SANS 241 (2015) drinking water quality guidelines (refer to hydrogeological assessment report in Appendix G-7, Table 5-2 and Appendix D).

Results were scrutinised for indications of concentrations that exceed the drinking water quality guidelines and may pose an unacceptable risk to human health with regular consumption. Additionally, supplied analytical results from a Brochem monitoring borehole was included in this scrutiny to provide for the deep aquifer water quality as there is no deep aquifer borehole within NGEPP site. The following inferences were made from the groundwater quality analytical results (Appendix G-7):

- The background sample (BH45) reports good water quality with no influence from industrial activity. Similarly, the deep aquifer borehole in the vicinity of BroChem plant is of good water quality with constituents below the SANS 241 drinking water guidelines.
- The pH of effluent from the plant (Sump sample) is acidic (3.2 pH unit). Similarly, slightly acidic pH (5.8) was observed for AH-07. As expected, the effluent is characterised by elevated concentrations of dissolved metals with Al, Fe, Mn, Ni, U and Pb. This relates closely to elevated concentrations of Total dissolved solids (1 520 mg/l) and EC (203 mS/m) recorded for this sample.
- Samples AH-06 and AH-07 report elevated Al and Fe concentrations, and with acidic pH of 5.8 at AH-07. Elevated manganese concentration of 1.53 mg/l was recorded in AH-07. The two sites are situated downgradient of the sump and may reflect the impact of the historical leaks and/ or the present leaks from the sump. This may suggest that the sump is also a source of perched water in AH-06 and AH-07 vicinity.
- There are no boreholes beyond these points to confirm the groundwater quality downgradient.
- Traces of oil and grease (5-11 ppm) are reported in the sump and onsite groundwater samples (AH-06 and AH-07). Oil and grease were not observed in the background sample (BH45) suggesting probably an on-site source i.e. the sump.

It is *likely* that the sump constitutes a *potential* local source of groundwater contamination, and it must be safely emptied before decommissioning to minimise *potential* impact to the *soil and water environments* in the vicinity.

Surface water analytical results

Three surface water samples (SW1, SW2 and SW3) were analysed for major ions (cations and anions) to characterise the surface water quality. SW1 is a stormwater sample taken fairly upgradient of the site processes and represent background water quality. SW2 is a stormwater sample taken within the site boundary fence downgradient of the site processes whereas SW3 was sampled from the Karbochem Spruit offsite, further downgradient of both Newcastle Energy site and Karbochem complex (Figure 13-32). The following statements summarises the surface water quality:

- Good water quality is reported for the background sample (SW1).
- SW2 reports elevated manganese concentration (4 mg/l) exceeding SANS 241 drinking water guidelines. *A similar* exceedance was observed *at the sump*.
- Slightly elevated Electrical conductivity (94.2 mS/m) and Cl levels at SW2 may suggest seepage from the sump possibly even via shallow groundwater is migrating to stormwater.
- SW3 reports good water quality with constituents analysed below SANS 241 drinking water guidelines suggesting that Karbochem Spruit is of good water quality.
- Traces of oil and grease (3 ppm) was reported for SW2 downgradient of the facility. The background sample (SW1) reported oil and grease concentrations below the laboratory detection limit. This suggests on-site sources *influencing the results at SW2*.

Generally, the NGEPP surface and *shallow* groundwater is characterised by slightly elevated concentrations of dissolved salts, with relatively moderately elevated levels of Na, Mg, Ca and Cl.

13.7.7 Impact Assessment

For the purposes of this report, the impact assessment considers the potential impacts from the site, both from the decommissioning of the existing infrastructure, and potential impacts likely to emanate from the proposed site activities during construction together with the implemented mitigation measures. NGEPP chemical storages and any other potential contamination sources are to be engineered. Therefore, minimal impacts from the chemical storage containers is possible during operation. It is expected that all infrastructure will be removed, and the site rehabilitated post closure. Therefore, minimal potential short term impacts to water resource are anticipated from the removed chemical storage infrastructure post closure.

[Note: The impact assessment methodology used by the hydrogeological specialist to determine impact significance varies slightly from the methodology prescribed in this EIR. As such, the tables below, have adapted the hydrogeological specialist's impact tables to align with the EIR methodology (i.e. for consistency). The confidence of the significance ratings is still, however, considered to be high.]

Decommissioning of existing infrastructure

The following impacts relating to groundwater associated with proposed decommissioning of existing infrastructure were assessed and are further described in the subsections that follow:

- Impact GW1: Poor management of contaminated sump water during decommissioning will result to deterioration of groundwater quality in the immediate vicinity (Table 13-39).
- Impact GW2: Poor management of chemicals (HCl, hydrocarbons and Caustic soda, etc.) from the storage facilities onsite during demolition will result to deterioration of groundwater quality in the immediate vicinity (Table 13-40).
- Impact GW3: Poor management of sewage from the septic tank onsite during demolition will result to deterioration of groundwater quality in the immediate vicinity (Table 13-41).

Table 13-39: Impact Assessment for poor management of contaminated sump water during decommissioning

Impact GW1: Poor management of contaminated sump water during decommissioning								
Activity	Poor management of contaminated sump water during decommissioning of existing co-generation plant will result to deterioration of groundwater quality in the immediate vicinity.							
Project Phase	Demolition phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	High (3)	Short-term (1)	Medium (6)	Probable (>70-90%)	**Medium**	- ve	High
Management measures: • Safely empty the effluent sump before any decommissioning activity, demolish the sump after removing the potential contamination sources at the plant (chemical tanks, and containers etc.) • Contaminated sump water must not be used or discarded on site. This must be transported to the Karbochem effluent treatment plant. • Confirm levels of soil *and groundwater (if any)* contamination for a Phase II site assessment process and remediate as necessary.								
After Management	Regional (2)	Medium (2)	Short-term (1)	Low (5)	Possible (40-70%)	**Very Low**	- ve	High

Table 13-40: Impact Assessment for poor management of chemicals from the storage facilities onsite during demolition

Impact GW2: Poor management of chemicals from the storage facilities onsite during demolition								
Activity	Poor management of chemicals (HCl, hydrocarbons and Caustic soda, etc.) from the storage facilities onsite during demolition will result to deterioration of groundwater quality in the immediate vicinity.							
Project Phase	Demolition phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	High (3)	Short-term (1)	Medium (6)	Probable (>70-90%)	**Medium**	- ve	High
Management measures: • Safely empty the storage tanks of any chemical content before any decommissioning activity, demolish the bund walls only when the storage tanks are removed. • Empty chemical containers must be handled as hazardous and must be removed from site before any demolition activities.								
After Management	Local (1)	High (3)	Short-term (1)	Low (5)	Possible (40-70%)	**Very Low**	- ve	High

Table 13-41: Impact Assessment for poor management of sewage from the septic tank onsite during demolition

Impact GW3: Poor management of sewage from the septic tank onsite during demolition								
Activity	Poor management of sewage from the septic tank onsite during demolition will result to deterioration of groundwater quality in the immediate vicinity.							
Project Phase	Demolition phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	High (3)	Short-term (1)	Medium (6)	Probable (>70-90%)	**Medium**	- ve	High
Management measures: • Safely empty the septic tank before any decommissioning activity, demolish the tank only when the sewage has been removed. • The contaminated material including soil must be removed for safe disposal off-site.								
After Management	Local (1)	High (3)	Short-term (1)	Low (5)	Possible (40-70%)	**Very Low**	- ve	High

Construction of new NGEPP infrastructure

The following impacts relating to groundwater associated with proposed construction of new NGEPP infrastructure were assessed and are further described in the subsections that follow:

- Impact GW4: Impact to surface water – disposal of groundwater seepage to the surface water resource impacting aquatic systems (Table 13-42).

Table 13-42: Impact to surface water – disposal of groundwater seepage to the surface water resource impacting aquatic systems

Impact GW4: Impact to surface water during construction								
Activity	Impact to surface water – disposal of groundwater seepage to the surface water resource impacting aquatic systems							
Project Phase	Construction phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	High (3)	Short-term (1)	Medium (6)	Probable (>70-90%)	**Medium**	- ve	High
Management measures: • Potentially minor seepage from the construction site must be captured and disposed of safely at the Karbochem effluent treatment, this is potentially contaminated water and must not be discharged into the surface water resource.								
After Management	Local (1)	High (3)	Short-term (1)	Low (5)	Possible (40-70%)	**Very Low**	- ve	High

Operation of new NGEPP infrastructure

The following impacts relating to groundwater associated with operation of the new NGEPP were assessed and are further described in the subsections that follow:

- Impact GW5: Impact to water – spillage from the chemical storage tanks and other potential contamination sources contaminating surface and groundwater resource (Table 13-43).

Table 13-43: Impact to water – spillage from the chemical storage tanks and other potential contamination sources contaminating surface and groundwater resource

Impact GW5: Impact to water during operation								
Activity	Impact to water – spillage from the chemical storage tanks and other potential contamination sources contaminating surface and groundwater resource.							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	High (3)	Short-term (1)	Medium (6)	Probable (>70-90%)	**Medium**	- ve	High
Management measures: • All chemical storage facilities are to be bunded and material handled and stored is a safely according to MSDS and related guidelines. Any other potential contamination sources (e.g. sumps) are to be engineered to prevent leakages and seepage to groundwater resource. • Water monitoring to be carried out to ensure water contamination is recorded, and management strategies are implemented timeously.								
After Management	Local (1)	High (3)	Short-term (1)	Low (5)	Possible (40-70%)	**Very Low**	- ve	High

13.7.8 Recommendations

The impacts identified will be ameliorated after implementing the following management measures. Potential groundwater contamination from the current site infrastructure should be avoided by:

- Safely emptying the chemical storage tanks, effluent sump and septic tank onsite before decommissioning of the existing infrastructure to avoid spillages and contamination of soil and groundwater in the area.
- Safely removing all potential contamination sources (chemical storge containers, jet engines, filters) from site before decommissioning of the existing infrastructure.
- Managing potential spillage; and environment (soil and water) accidentally contaminated during decommissioning.
- Confirming levels of soil *and groundwater* contamination for a Phase II site assessment process and remediate as necessary.
- Residual contamination associated with sump must be remediated before subsequent construction of the NGEPP.
- Surface and groundwater monitoring network for the NGEPP should be established and maintained as follows (see Figure 8-1 in the hydrogeological report, Appendix G-7):
  - *A minimum of five (5)* borehole pairs should be installed into shallow (*15* m) and deep (30 m) aquifers *for adequate coverage* of the NGEPP *and LNG facilities*.
  - Two surface water monitoring stations should be established on the stormwater drainage upgradient (SW1) and downgradient (SW2) of the site for surface water monitoring.
  - Sampling and analysis of water quality should be conducted monthly during construction, monthly for the first six month following NGEPP construction, followed by quarterly and then bi-annually depending on the results of the first six month during operation.
  - Based on this study results, water samples should be analysed for Physiochemical Properties (pH, EC, TDS and Alkalinity), Major ions and Trace metal (including Al, B, Ba, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Se, Sr. Ti, U, V and Zn).
  - Monitoring should be systematic and consistent so that meaningful interpretations can be made of the datasets.
  - All monitoring data should be compiled on a database for easy access and interpretation.
- Any minor seepage from the construction site should not be discharged on site or to the surface water resource but should be piped off to Karbochem treatment plant for treatment.

Furthermore, based on the findings of the assessment undertaken by SRK, it is recommended that the proposed management measures presented Tables 13-39 to 13-43 be carried into the EMPr for this project and, once approved (assuming such), implemented as far as practical.

13.8 Surface Water

13.8.1 Regional Surface Water

The Karbochem Industrial Complex occurs in the Buffalo River catchment, the most northerly secondary catchment of the Tugela River catchment. The Ngagane River flows north east towards Newcastle passing within approximately 2 km of the Karbochem Industrial Complex (ESA, 2009).

The Chelmsford Dam is approximately 25 km to the south and upstream of the Karbochem Industrial Complex. ISCOR is situated downstream of Karbochem and is a major user of water from the Ngagane River. The Ncandu River, occasionally contaminated with various industrial runoff waters, flows in a north easterly direction approximately 6.5 km north west of Karbochem. The Karbochem Spruit flows in a north easterly direction, immediately to the South of the Karbochem Industrial Complex into the Ngagane River. It has little or no flow upstream of the Karbochem Complex during dry periods. Downstream flow is predominantly discharged treated effluent and runoff from Karbochem (ESA, 2009).

13.8.2 Site Surface Water

A Hydrology and Flooding Assessment of the NGEPP site was undertaken by SRK to inform the feasibility study (SRK, 2020e). The above study summaries the site surface water aspects below.

The proposed NGEPP development site drains toward the south-east boundary of the site through a partially formalised channel within the existing developed area and over land within the valley lines of the undeveloped areas of the site (see Figure 13-31). A tributary of the Ingagane River (commonly referred to as Karbochem Stream) is south-east of the proposed development site and follows in a south-east direction towards the Ingagane River which in turn follows in a north-east direction.

Based on the proposed design of the NGEPP, all the 'dirty' areas will be under roof reducing the potential 'dirty' water runoff. This means that all the 'dirty' surface water from any bunded areas will be collect by a 'dirty' water system and discharged with the effluent system to the existing Karbochem treatment works.

All the remaining clean water from the roofs and surface runoff will be systematically drained into a formalised system to an attenuation facility before being released into the existing drainage system.

The Hydrology and Flooding Assessment report concludes the following:

- The proposed development is located outside of the 1:100 year floodlines.
- There will be an increase in the peak flow rates and flood volumes when comparing the pre- and post-development clean and dirty catchments due to the proposed development.
- As such, the post-development clean storm water runoff must be attenuated and discharged at the same flow rate as pre-development peak flows. In addition, all dirty storm water runoff from the 1:50 year flood to be collected and discharged to effluent system.

13.8.3 Impact Assessment and recommendations

For the purposes of this report, the potential impacts to surface water have been assessed in Section 13.7.7 as follows:

- During construction:
  - Impact GW4: Impact to surface water – disposal of groundwater seepage to the surface water resource impacting aquatic systems (Table 13-42).
- During operation:
  - Impact GW5: Impact to water – spillage from the chemical storage tanks and other potential contamination sources contaminating surface and groundwater resource (Table 13-43).

Given the above, no further surface impacts are assessed in this section. However, the following are recommended:

- All management measures stipulated to Impact GW4 and Impact GW5 are to be implemented.
- There will be an increase in the peak flow rates and flood volumes when comparing the pre- and post-development clean and dirty catchments due to the proposed development.
- The post-development clean storm water runoff must be attenuated and discharged at the same flow rate as pre-development peak flows.
- All dirty storm water runoff from the 1:50 year flood is to be collected and discharged to effluent system.

13.9 Socio-economic

13.9.1 Socio-economic Environment

According to the 2011 Census Data, Newcastle Municipality has a generally low income population with a large number of people living in abject income poverty as they do not have a reliable source of income. In 2011 the majority of the household's income was between R9 601 – R19 600 per annum (16 017 households) closely followed by households who earn between R19 601 – 38 200 per annum (15 638 households). The majority of the households are headed by men as opposed to women (52% and 42% respectively). In terms of the most recent stats from Global Insight (2018), a very high majority of the households in Newcastle (70%) earn a combined income of less than R40,000 per annum, which translates to an average of R3 300 per month. This is significantly below the national average of household income, which is R103 204 per year, or R8,600 per month. This has implications on the Indigent Support provided by the municipality to the community of Newcastle as there is a growing number of households that earn a combined annual income of a maximum of R40,000. In 2011 the total number of households earning less that R40,000 was 68%, which is 58 427 households out of 86 024 households, and it has since increased in 2018 to 70%, which is 61 436 households out of a total number of 90 347 households (IDP Review, 2020).

The IDP Review, 2020, reports that an analysis of the unemployment rate using the official expanded definition of unemployment reveals that the average rate of unemployment in Newcastle Municipality is low compared to the Amajuba District, but higher than the provincial average of 21.7% and 22.4% among the females and males respectively. Zooming in at ward level, a much clearer picture is painted on the geographical concentration of the unemployed, which is mostly within the Newcastle East Area (i.e. in the townships of Madadeni, Osizweni, Blaauwbosch, and Cavan). There's also a direct correlation between unemployment and the levels of literacy within this area (IDP Review, 2020).

This has implications on the need for coordinated efforts between government and the private sector towards the creation of meaningful job opportunities (IDP Review, 2020).

In this regard, the Amajuba District Growth and Development Plan (DGDP) focusses on seven strategic goals directly aligned to the KZN PGDP. These, in turn, are relevant and applicable to the Newcastle Local Municipality (IDP Review, 2020). Two of these strategic goals are particularly relevant to the NGEPP project, namely:

- Job creation (i.e. expanded provincial economic output and employment.
- Strategic Infrastructure (i.e. strategic infrastructure that provides for social and economic growth and development needs in the Amajuba District).

Although the number of employment opportunities is still to be confirmed by Newcastle Energy, it is projected that the NGEPP project will create permanent skilled employment opportunities in addition to contract employment positions. There will also be direct employment opportunities during the construction phase of the project, as well as upstream processes, downstream processes and service provision related to the industry.

13.9.2 Residential areas in the vicinity of the site

Arbor Park is the closest residential area and is approximately 1.2 km to the north west of the NGEPP site. The suburb of Madadeni is approximately 5 km to the east of the site, and the Newcastle CBD is approximately 2.5 km north east of the site. The Newcastle airport lies approximately 500 m north of the site.

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 NGEPP site. These

establishments and small holdings are all included in the interested and affected party (IAP) database for this project and will be notified during the consultative process.

13.9.3 Impact assessment

Socio-Economic Impacts

The Newcastle Energy is intending to respond to the next RMIPP procurement bidding process, which is expected to be launched by the DMRE during 2021. Responses to such a government bidding process, has to include social and economic development commitments as part of the bidding process. It is expected that these commitments would be binding on the Applicant as part of the generating licence (assuming preferred bidder status is achieved).

Socio-economic impacts have been qualitatively assessed by SRK based on information provided by the client. There are a number of positive socio-economic benefits that will result as a direct and indirect effect of this activity. The most notable being:

- Job creation.
- Increase in GDP.
- Contribution to the increase in energy security.

The no-go option is defined here as the NGEPP 100 MW project not proceeding. Should the development proposal not take place, there would be no social and/or economic benefits to society resulting from the project, and the current trajectory of increasing unemployment, lack of energy security and little or no economic growth is likely to continue. The absence of a positive impact for job creation and GDP, as they are described in this report, is not a negative impact, and so the no-go option would not result in a different impact (merely the absence of these two positive impacts). In terms of contribution to increased energy security, it is assumed that even if this project is not authorised, a similar project elsewhere would be authorised, i.e. additional generating capacity will presumably be achieved elsewhere. Consequently, in terms of energy security, the no-go option would also result in the absence of a positive impact from this project, and not a continued negative impact due to the load shedding, etc.

The following socio-economic impacts were assessed and are further described in the subsections that follow:

- Impact SE1: Employment opportunities during construction (Table 13-44).
- Impact SE2: Employment opportunities during operation (Table 13-45).
- Impact SE3: Increase in GDP during construction and operation (Table 13-46).
- Impact SE4: Contribution to increased energy security during operation (Table 13-47).
- Impact SE5: Potential impacts to neighbouring communities and residents (Table 13-48).

Impact SE1: Employment opportunities during construction

The proposed NGEPP project will create temporary employment opportunities for approximately 700 people over a construction period of 18 months. More than 80% of these temporary work opportunities are envisaged to be for South African based employees, the majority of which are expected to be locally based (Amajuba District and Newcastle Local Municipalities). Indirect job opportunities (industries that provide construction materials and services for the project) would also benefit as a result of the construction of the proposed development.

Table 13-44: Impact Assessment for employment opportunities during construction

Impact SE1: Employment opportunities during construction								
Activity	Demolition of the existing cogeneration plant and site clearance							
Project Phase	Demolition and construction phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Short-term (1)	Very Low (4)	Definite (>90%)	**Very Low**	+ ve	Low
Management measures: • Opportunities to support and stimulate SMME activity locally are to be maximised, wherever practical. • Local recruitment for skilled and unskilled workers must be maximised, wherever practical. • Subcontract to local construction companies were feasible. • Opportunities for skills training are to be optimised, wherever practical.								
After Management	Local (1)	High (3)	Short-term (1)	Low (5)	Definite (>90%)	**Low**	+ ve	Low

Impact SE2: Employment opportunities during operation

During operation, 78 full time work opportunities would be created. Approximately 90% of these permanent work opportunities would be for skilled personnel. All personnel during operation would be South African based employees, of which the intention is to source most of these from local communities (Newcastle Local Municipality and surrounds).

Table 13-45: Impact Assessment for employment opportunities during operation

Impact SE2: Employment opportunities during operation								
Activity	Plant operation and maintenance							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Local (1)	Medium (2)	Medium-term (2)	Low (5)	Definite (>90%)	**Low**	+ ve	Low
Management measures: • Opportunities to support and stimulate SMME activity locally are to be maximised, wherever practical. • Local recruitment for skilled and unskilled workers must be maximised, wherever practical. • Subcontract to local SMMEs and BBBEE compliant enterprises for service provides and suppliers were feasible. • Opportunities for skills training are to be optimised, wherever practical.								
After Management	Local (1)	High (3)	Medium-term (2)	Medium (6)	Definite (>90%)	**Medium**	+ ve	Low

Impact SE3: Increase in GDP during construction and operation

Demolition and construction is expected to take approximately 18 months and the overall investment is in the order of R3 billion. The direct local spend is projected to be in the order of R 1.2 billion. The quantum of indirect and induced spending has not been estimated but would also occur. Local direct spend during the operational phase is projected to be in the order of R 3.61 billion.

Investment (e.g. the purchase of construction material) leads to (direct) new business sales. The suppliers of these goods and services spend their additional income, further adding to the circulation

of money. This secondary expenditure, or demand, results in indirect and induced new business sales, i.e. the multiplier effect.

The construction and operational phases of the development will result in increased government revenue in terms of taxes through a combination of personal income tax, VAT, corporate income tax, etc. Investment in locally procured goods and services will also have an indirect and induced effect on the local economy.

Table 13-46: Impact Assessment for increase in GDP during construction and operation

Impact SE3: Increase in GDP during construction and operation								
Activity	Demolition, construction and operation							
Project Phase	Demolition, construction and operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	Medium (2)	Medium-term (2)	Medium (6)	Probable (>70-90%)	**Medium**	+ ve	Low
Management measures: • Opportunities to support and stimulate SMME activity locally are to be maximised, wherever practical. • Subcontract to local SMMEs and BBBEE compliant enterprises for service provides and suppliers were feasible.								
After Management	Regional (2)	High (3)	Medium-term (2)	High (7)	Definite (>90%)	**High**	+ ve	Low

Impact SE4: Contribution to increased energy security during operation

The main purpose of the proposed NGEPP project is to generate electricity, supply this into the national grid, and thereby contribute to meeting the electricity demand of the country. Putting the consideration that gas to power projects have the potential to enable further development of renewable energy (i.e. a shift from fossil fuel based electricity to renewable energy) aside, this project would result in an additional 100 MW electricity generation capacity, i.e. this impact considers only the contribution to generating capacity.

The impact of energy security on an economy and society is undoubtably a broad and complex topic but broad public opinion is that better energy security is a positive impact and an absence of reliable energy can have extensive negative secondary impacts. Increased energy reliability of could have significant economic benefits for downstream users, in terms of decreased incidence of power outages due to load-shedding. It is recognised that energy reliability is a subset of energy security, however, for the purposes of this assessment they are rated together.

Table 13-47: Impact Assessment for contribution to increased energy security during operation

Impact SE4: Contribution to increased energy security during operation								
Activity	Power generation during operation							
Project Phase	Operational phase							
Potential impact rating	Extent	Intensity	Duration	Consequence	Probability	**Significance**	Status of impact	Confidence
Before Management	Regional (2)	Medium (2)	Medium-term (2)	Medium (6)	Probable (>70-90%)	**Medium**	+ ve	Low
Management measures: • None.								
After Management	Regional (2)	Medium (2)	Medium-term (2)	Medium (6)	Probable (>70-90%)	**Medium**	+ ve	Low

Impact SE5: Potential impacts to neighbouring communities, residents and businesses

The closest neighbors to the NGEPP site are other industrial tenants within the Karbochem Industrial Complex. As described in Section 13.12.2, Arbor Park is the closest residential area, approximately 1.2 km to the north west of the site, and the Newcastle airport lies approximately 500 m north of the site. 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 NGEPP site.

Of the I&AP representatives from neighbouring communities and businesses referred to above, comments and queries have been received from BroChem (Karbochem tenant) and the Newcastle Airport. These are captured and responded to in the Comments and Responses Trail Report (Appendix E).

Other than the particular interests of the I&APs that are participating the process, overarching potential issues that may impact on neighbouring communities, residents and businesses include:

- Air quality.
- Noise.
- Heath and safety risk.

All of the above issues are addressed and assessed Section 13.1 (air quality), Section 13.5 (noise) and Section 13.6 (quantitative risk assessment) respectively.

Given the above, no further assessment of the potential impacts to neighbouring communities, residents and businesses is provided in this section. However, the following is recommended:

- The recommendations and management measures from Section 13.1 (air quality), Section 13.5 (noise) and Section 13.6 (quantitative risk assessment) must be carried forward into the EMPr.
- During the construction phase, good housekeeping measures (e.g. related to the storage of material, equipment and waste) are to be maintained to minimise potential nuisance impact to neighbouring communities and businesses.

13.10 Archaeological and Cultural Heritage Importance

The site falls within an established industrial complex. Since the project area has a long-term industrial history, it is not expected that any places of archaeological or cultural importance occur in the NGEPP *or LNG facility* sites.

Given the above, no further archaeological or cultural heritage impacts are assessed in this section. However, the following is recommended:

- A chance finds procedure is to be developed for the construction phase.
- The above requirement is to be included in the EMPr for construction of the NGEPP.

13.11 Visual Landscape

As the site is surrounded mainly by other industries and vacant land, the aesthetic character of the landscape is not anticipated to be significantly impacted by the proposed development.

Given the above, no further visual or sense of place related impacts are assessed in this section. However, the following is recommended and included in the EMPr:

- During the construction phase, good housekeeping measures (e.g. related to the storage of material, equipment and waste) are to be maintained to minimise potential visual impact to passers-by.

13.12 Waste

13.12.1 Decommissioning and demolition (existing plant)

With respect to the typical closure and demolition actions listed in Section 6.3.1, where practicable, equipment and materials with value will be sold and removed from the site. Equipment with scrap or salvage value will be removed from the facility and stored in a temporary area on the site footprint until removed from site. All other equipment will be demolished and disposed of at appropriately registered waste disposal facilities.

Given the above, no further waste related impacts are assessed in this section. However, the following is recommended and included in the EMPr:

- No on-site waste disposal is permitted.
- All materials that cannot be recycled or sold for salvage value, (general and hazardous) are to be removed from the study site as waste (i.e. general and hazardous waste) and disposed of at an appropriately registered waste disposal facility.
- Liquid waste / effluent such as wash water should be treated on-site or discharged to the Karbochem effluent treatment system.
- The methodology for demolition is be devised by the appointed demolition contractor. This methodology is to include a waste management plan for the decommissioning and demolition waste.

13.12.2 Waste management (proposed plant)

Construction phase

Typical construction related wastes will be produced during the construction phase. Although no further waste related impacts are assessed in this sub-section, the following is recommended and included in the EMPr:

- No on-site waste disposal is permitted.
- All construction wastes (general and hazardous) are to be removed from the study site and disposed of at an appropriately registered waste disposal facility.

- Liquid waste / effluent such as wash water should be treated on-site or discharged to the Karbochem effluent treatment system.
- A construction method statement and waste management plan is to be devised by the appointed construction contractor.

Operational phase

The waste streams that will generated during the operational processes are understood to be limited to waste associated with maintenance activities (scrap/redundant parts, used oils, lubricants etc.) with no solid or liquid effluents generated during electricity generation. The wastes generated during the process will be stored responsibly on site until such time they can be removed by an appropriate waste contractor.

Although no further waste related impacts are assessed in this sub-section, the following is recommended and included in the EMPr:

- No on-site waste disposal is permitted.
- All operational phase wastes (general and hazardous) are to be removed from the study site and disposed of at an appropriately registered waste disposal facility.
- Liquid waste / effluent must discharged to the Karbochem effluent treatment system.
- An operational phase waste management plan is to be compiled and implemented.

13.13 Cumulative Impacts

Cumulative impacts are those that result from the successive, incremental, and /or combined effects of an action, project, or activity when added to other existing, planned, and /or reasonably anticipated future ones (IFC, 2013).

Impacts cannot be assessed in isolation. An integrated approach to impact assessment requires that cumulative impacts be included in the assessment of individual impacts. Cumulative impacts are therefore assessed *de facto.*

This section describes the cumulative nature of the environmental aspects and impacts identified for the project within the context of the receiving environment in the broader Newcastle area.

The key cumulative impacts considered relevant are:

- Risk.
- Air quality.
- Climate change.
- Water quality.
- Socio economics.

13.13.1 Risk

For the risk assessment, the ambient conditions were measured and a model applied to predict the possible future scenarios. The modelled results indicate areas of influence beyond the site boundary. As such, the model outputs can already be considered to be cumulative.

Since the NGEPP will be within the broader Karbochem Industrial Complex, it will be advisable for cumulative risks to be re-evaluated once the NGEPP final designs are completed and an MHI risk assessment undertaken for the proposed NGEPP facilities. Furthermore, at that time, it will be prudent for the Karbochem Industrial Complex to review the MHI requirements for the complex as a whole, as required by the MHI regulation. Based on this, a holistic approach to risk management will need to be adopted across the Karbochem Industrial Complex.

In accordance with sub-regulation 9 of the MHI Regulations, land use planning considerations are required prior to and subsequent to development of the facility to ensure the required buffer zones are maintained.

13.13.2 Air Quality

In South Africa, an important change in the approach to air quality has been the promulgation of regulations with respect to ambient air quality standards under NEM:AQA. Relevant ambient air quality monitoring data was obtained for Richards Bay and predicted modelled outputs were compared against the South African NAAQS.

As stipulated in the Newcastle Environmental Management Framework Desired State of The Environment Report (2014), air quality is a major concern to stakeholders within the region. In order to assess the cumulative impacts of the proposed NGEPP project, the existing industrial activities at the Karbochem Industrial Complex, and other existing developments or emission sources within the Newcastle airshed, ambient air quality data was to be sourced from SAAQIS. SAAQIS is a web based interactive air quality information system that is maintained by the DFFE. The system is informed by 42 air quality monitoring stations across South Africa. Of relevance to the NGEPP, the SAAQIS monitoring station located at the Armscor Dam is currently not in operation and only has valid data for 2016. No recent ambient air quality monitoring data was available from this station. Therefore, a quantitative assessment of the baseline ambient air quality for the proposed NGEPP facility and surroundings could not be undertaken. Therefore, information regarding he current state of the Newcastle airshed was obtained from alternate sources.

The Newcastle Local Municipality (NLM) Integrated Development Plan (IDP) Review, 2020, reports that a study has been conducted with the purpose of assessing the air quality in order to determine the sensitivity of the airshed, the pollution sources of the area and the sensitive receptors. According to the Environmental Management Framework for NLM (2015), the following is noted (IDP Review, 2020):

- Newcastle's central business district is situated in the valley and suffers from poor dispersion conditions during the winter months. As a result, the city suffers short-term pollution episodes. Lower lying areas that are affected include commercial, residential and industrial land uses.
- Current air pollution sources of concern are:
  - Industrial activities (criteria pollutants and others).
  - Waste facilities (dust).
  - Off-site agriculture (dust, herbicides and pesticides).
  - Transport routes (criteria pollutants).
- The ambient air quality of Newcastle is slowly deteriorating, and interventions are needed in order to improve the quality of the air.
- According to the National Framework for Air Quality (2012), in 2007, the air quality rating of Newcastle was classified as potentially poor. Which indicates that air quality may be poor at varying instances and therefore render the area a priority for support in terms of air quality management (IDP Review, 2020).

Based on the Environmental Management Framework for NLM (2015), Newcastle may either be Class 3 Air Quality Area (Alert Area) or a Class 4 Air Quality Area (Transitional Compliant Area). The following is applicable to Class 3 and Class 4 areas respectively (IDP Review, 2020):

- Class 3 Air Quality Area (Alert Area): Newcastle is an area that is Section 24 compliant whereby there is no harm to health or well-being of the citizens due to the air quality. It is also an area where ambient air quality remains within the standards, but sustained air quality management interventions are required in order to, at least, maintain or improve this situation.
- Class 4 Air Quality (Transitional Compliant Area): Air Quality is not Section 24 compliant meaning there is possible harm to health and well-being of the citizens of Newcastle. This type of air quality

is applicable in areas whereby ambient air quality represents a possible threat to health and well-being and requires immediate and sustained air quality management interventions to, at least, bring there are into compliance with the standards within agreed time frames.

If the NGEPP project is approved, it is suggested that the DFFE be petitioned to reinstate and maintain the SAAQIS monitoring station located at the Armscor Dam such that ambient air quality monitoring data can be collected again for future studies and monitoring in the Newcastle airshed. Furthermore, it is suggested that stack and air monitoring data from all industrial tenants at the Karbochem Industrial Complex be pooled and interrogated to obtain an integrated (cumulative) understanding of the air quality status of the industrial complex as a whole, and its combined impact on the Newcastle airshed.

13.13.3 Climate change

By its nature, assessment of climate change is a cumulative assessment. In this regard, as presented in Section 13-2, South Africa's energy sector is the main contributor of GHG emissions and a key category in the national GHG inventory, due to coal being the most widely used fuel in the power sector (i.e. currently accounts for approximately 88% of the country's energy generation).

If we consider that the proposed NGEPP project will effectively replace 100 MW of coal-based energy with a GWP of 607 117.06 t CO2e (0.11% of South Africa's total carbon footprint annually), an effective reduction of 341 333.77 t CO2e (0.067% of South Africa's total carbon footprint annually) can be achieved. While methane rich gas (MRG) proposed as primary fuel is not renewable, it has the potential to reduce, if not significantly, South Africa's total carbon footprint, thereby resulting a favourable (positive) cumulative impact with respect to climate change.

13.13.4 Water Quality

The results of the water quality sampling and analysis undertaken by SRK (see Section 13.7), indicates that, in general, the NGEPP surface and perched groundwater is characterised by slightly elevated concentrations of dissolved salts, with relatively moderately elevated levels of Na, Mg, Ca and Cl relating to Sump water chemistry. It is evident from the analytical results that the effluent Sump is responsible for elevated dissolved Trace metals in groundwater.

The hydrogeological study stipulates that groundwater and surface monitoring must be carried out throughout the operational life of the NGEPP. Since a water quality baseline for the site has now been determined, a monitoring programme will allow for monitoring of any potential cumulative impacts associated with the NGEPP facilities.

If the NGEPP project is approved, it is suggested that water quality monitoring data from all industrial tenants at the Karbochem Industrial Complex be pooled and interrogated to obtain an integrated (cumulative) understanding of the water quality status of the industrial complex as a whole, and its combined impact on the local and regional water resources and aquifers.

13.13.5 Socio-economic

In terms of the socio-economic considerations, cumulative impacts are assessed in terms of the positive impacts i.e. increase in employment, income, skills development and capacity building initiatives; as well as the potential cumulative increase in nuisance impacts associated with the proposed plant. While the construction and operation of the proposed plant is anticipated to contribute in terms of minor negative economic externalities on neighbouring areas, the negative socio-economic impact on the district of the project not occurring will, by virtue of output and job losses, far eclipse identified negative economic externalities. At a time when many businesses are down-scaling or closing operations, the NGEPP project is anticipated to provide an important stimulus for economic growth, especially in terms of the SMME and export sectors. The NGEPP project is expected to provide a net benefit to the district economy.

13.13.6 Management of Cumulative Impacts

The management of cumulative impacts will depend on the context in which the development is occurring i.e. the impacts from other projects and natural drivers. As cumulative impacts result from the actions of multiple stakeholders, the responsibility for their management is collective. For instance, once the NGEPP is fully developed, health and safety risk cannot be managed by Newcastle Energy alone, but requires the involvement of a number of stakeholders including neighbouring industries, local government and civil society.

In the context of the proposed NGEPP, most of the potential negative cumulative impacts can be mitigated through proactive project design and management. Project-specific impacts identified in this report need to be carefully managed to control the cumulative effects of the project.

The EMPr in Appendix H contains the environmental management measures required to address project related impacts.

14 Environmental Management Programme

An EMPr has been prepared for all phases of the proposed development, in accordance with the requirements in Appendix 4 of GN 326, and is included in Appendix H. The EMPr specifies the methods and procedures for managing the environmental aspects of the proposed development, as informed by the specialist studies and good practice. Monitoring requirements are also stipulated. The EMPr must be implemented (along with the requirements of the Environmental Authorisation) and auditing is to be undertaken on a regular basis to ensure compliance with the EMPr.

15 Assumptions, Limitations and Deviations

In accordance with Item 3(1)(p) and Item 3(1)(u) in Appendix 3 of GN 326, this chapter describes the assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.

Assumptions and limitations relevant to this ***Final*** EIR are outlined in subsection 15.1. Where assumptions and limitations have been presented in specialist studies, they have been outlined in subsections 15.2 to 15.5 below (note: not all the specialist studies stipulated assumptions and limitations).

15.1 Environmental Impact Report

This EIR prepared by SRK is based on the following:

- The opinions expressed in this Report have been based on the information supplied to SRK by Newcastle Energy and its technical team that undertook the feasibility study for the project.
- 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.
- An evaluation of different energy sources as part of the energy generation mix is excluded from this EIR. It is assumed, based on the Integrated Resource Plan (IRP) 2010-2030, that this has been decided at a strategic level, and it is assumed this included an assessment of environmental factors. Apart from describing the motivation (or need) for gas generated power as part of the energy mix, this assessment will not consider relative merits of different energy sources.
- Due to the cost of preparing detailed designs and plans, such detailed design/ planning information would only be developed in the event of environmental authorisation being granted. As such, it is anticipated that, as is typically the case in an EIA process, the EIA will assess concept designs.
- This report assumes that the project as described in Section 6 is viable from an engineering design perspective, as well as economically.

- 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. The capacity of using the existing electrical infrastructure to export electricity produced from the NGEPP is still to be confirmed. Should any additional infrastructure need to be constructed and should such infrastructure development trigger any EIA Listed Activities not included in this process, Environmental Authorisation will be applied for via a separate EIA Application and Basic Assessment or Scoping and EIA process as applicable.
- There is an existing gas supply pipeline to the cogeneration plant on site. It is assumed that the pipeline to bring gas to the site is of sufficient capacity and does not require major upgrading.
- There are existing water supply, gas supply and electricity grid tie in points at the NGEPP site. Where upgrades or expansions to the existing infrastructure / tie in points is required, these will be considered in terms of any additional listed activities that may be triggered, either for inclusion in this S&EIR process or via separate applications if/where applicable.

Notwithstanding these assumptions, it is our view that this *Final* EIR provides a good description of the potential issues associated with the proposed development, and a reasonable assessment of the associated environmental impacts.

15.2 Atmospheric Impact Report

The following assumptions were made for the AIR assessment:

- No upset/abnormal conditions have been modelled.
- This assessment aimed to determine the impacts associated with only the proposed gas engines related to the proposed NGEPP. As such, only NO_2, CO, NMHC and PM_{10} were assessed.
- Emission inputs to the model have been based on the information provided, by the plan engineers. It is assumed that the information provided is accurate and complete at the time of modelling.
- It was conservatively assumed that all NO_x is rapidly converted to NO_2.
- NMHCs is a subcategory of Volatile Organic Compounds (VOCs) and commonly refers to compounds such as ethane, ethene, acetylene, propane, propene, n-butane and isoprene. South Africa does not have a direct NAAQS to compare NMHC predicted concentrations to. The predicted NMHC are therefore compared to the benzene NAAQS.
- It was conservatively assumed that Total Particulate Matter (TPM) is PM_{10}.
- In the absence of particle size distribution data, $PM_{2.5}$ was not modelled in this assessment. However, it is conservatively assumed that if PM_{10} is compliant $PM_{2.5}$ will also be compliant.
- Air quality impacts associated with the construction phase of the proposed plant were not assessed as part of this study. While the primary pollutant of concern associated with the construction phase is particulate matter, impacts during this phase of the project are considered negligible and are to occur over a limited period.
- Ambient air quality impacts from this assessment are predicted at areas beyond the fenceline. Within the facility boundary, environmental conditions are prescribed by occupational health and safety criteria which fall outside the scope of this assessment.
- Fugitive emission from vehicles onsite were not assessed as these were considered negligible.
- Due to poor data recovery from ambient air quality monitoring station at the Armscor Dam, a cumulative assessment for the proposed project could not be undertaken.

15.3 Climate Chance Impact Assessment

The following assumptions and limitations apply to the Climate Change Impact 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).
  - 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 conservative 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*.
- 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.
- 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.

15.4 Quantitative Risk Assessment

The risk assessment was developed based on the information provided by NGEPP, and its engineering suppliers. These designs are conceptual and did not include detailed designs, which will be completed before construction. Thus, some information, as required by the risk assessment simulations, were assumed and based on similar installations. However, it is assumed that the relatively large storage tanks, will determine the endpoints from a release and will be the major contributor towards the risks generated. To this end the results obtained in this report may lack the accuracy of a detailed engineered plant. However, the risk generated are expected to represent the facility, provided the vessel size and inventory are not increased.

The evaluation methodology assumed that the facility will perform as designed in the absence of unintended events such as component and material failures of equipment, human errors, external events and process unknowns.

Part of the risk assessment is within the Karbochem Industrial Complex and thus this risk assessment was limited to the area proposed for LNG installation (i.e. to the east of the NGEPP) and did not assess other facilities within the Karbochem Industrial Complex. Should the project proceed, the risk assessment for the Karbochem Industrial Complex should be reviewed, as required by law.

The health and safety risk assessment was performed with the assumption that the site would be maintained to an acceptable level and that all statutory regulations would be applied. It was also assumed that the detailed engineering designs would be done by competent people and would be correctly specified for the intended duty. For example, it was assumed that tank wall thicknesses have been correctly calculated, that vents have been sized for emergency conditions, that instrumentation and electrical components comply with the specified electrical area classification, that material of construction is compatible with the products, etc.

15.5 Acoustic Impact Assessment

In the screening AIA, the following assumptions were made that may impact the results obtained:

- All operating activities are assumed to be operational for 24 hours a day.
- As an *environmentally conservative approach*, the sum of all the operational equipment used simultaneously was used in the acoustic propagation calculation with the noise emanating from the nearest boundary to each respective sensitive receptor.
- Operational phase noise sources are based on estimated sound level data provided by the client.
- The effects of acoustic barriers (i.e. warehouse brick wall enclosures, Noise supressing sheet metal powerhouse structure, hood lining, etc.) have not been accounted for in the calculations. As such, predicted impacts are representative of an *environmental conservative approach*.
- Ambient noise from office block (storeroom, boardroom, admin office, toilets etc.) and the maintenance workshop (tool areas, spares storeroom etc.) have not been considered as part of this assessment as these are expected to be negligible.

16 Environmental Impact Statement

In accordance with Item 3(1)(l) in Appendix 3 of GN 326, this chapter contains:

(i) A summary of the key findings of the environmental impact assessment (refer Section 16.1 below).

(ii) A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers (refer to Figure 16-1).

(iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives (refer Section 16.2 below).

During the Scoping Phase of the S&EIR process, the following key issues were identified and specialist studies have been undertaken to inform this EIA Report:

- Air quality.
- Climate change.
- Health and safety risk.
- Aquatic ecology.
- Terrestrial biodiversity.
- Noise.

In addition, a hydrogeological study was undertaken to inform the feasibility study but was also used to inform the EIR.

16.1 Summary of key findings

The project alternatives as described in Chapter 9, including technology, activity, site location, layout and no-go alternatives, were considered by Newcastle Energy and its technical team during project conceptualisation and prefeasibility phase. The preferred or final alternatives have therefore been built into the project description as presented in Chapter 6 of this report and have subsequently been assessed in Chapter 13 (Environmental Impact Assessment). As such, all resulting impact management measures, avoidance and mitigation measures identified and recommended through the assessment, are in response to the preferred proposed alternatives.

A summary of the key findings of the environmental impact assessment is provided in the sub-sections below.

16.1.1 Air quality

The AIR was undertaken as a specialist study for the required environmental applications on behalf of Newcastle Energy for the proposed project. The US EPA approved CALPUFF dispersion model was used as a dispersion modelling platform to calculate source contributions of NO_2, PM_{10}, CO and NMHC concentrations to the ambient environment under normal plant operating conditions. Key findings are follows:

- All predicted maximum period average and short term (P99 1-hour and 24-hour) average concentrations for NO_2, PM_{10}, CO and NMHC (modelled as benzene) demonstrate full compliance with the respective National Ambient Air Quality Standards (NAAQS) at all receptors.
- The predicted plume isopleths for NO_2, PM_{10}, CO and NMHC primarily extend in a south easterly direction due to prevailing wind direction from the northwest.
- While elevated (higher than baseline) air pollutant concentrations are predicted in the nearfield to Newcastle Energy, complex terrain in the study area has resulted in elevated ground level air pollutant concentrations also being predicted along a ridge located approximately 9km south east from the proposed facility. Predicted period and P99 average air pollutant concentrations along this ridge demonstrate full compliance with the respective NAAQS.
- An ambient air quality monitoring station at Armscor Dam operated by DFFE was identified on the SAAQIS. Due to poor data recovery from this station, a cumulative assessment for the proposed project could not be undertaken.
- Based on the contribution of the predicted air pollutant concentrations to the respective NAAQS, the overall impact of the project on the surrounding environment is likely to be low.

16.1.2 Climate change

While the project is not a renewable energy project, 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 potentially the associated carbon tax liability and make the project more resilient to climate change risk (refer Section 13.2.10).

16.1.3 Health and safety risk

Risk calculations are not precise. Accuracy of predictions is determined by the quality of base data and expert judgements. This risk assessment included the consequences of fires and explosions as well as toxic releases at the NGEPP gas to power facility in Newcastle. A number of well-known sources of incident data were consulted and applied to determine the likelihood of an incident to occur.

It is the responsibility of the owners and their contractors to ensure that all engineering designs would have been completed by competent persons and that all pieces of equipment would have been

installed correctly. All designs should be in full compliance with (but not limited to) the Occupational Health and Safety Act 85 of 1993 and its regulations, the National Buildings Regulations and the Buildings Standards Act 107 of 1977 as well as local by-laws.

A number of incident scenarios were simulated, taking into account the prevailing meteorological conditions, and described in the report.

The following installations were considered for analysis in the QRA:

- Sasol methane rich gas.
- LNG.

A) Notifiable Substances

The General Machinery Regulation 8 and its Schedule A on notifiable substances, requires any employer who has a substance equal to or exceeding the quantity listed in the regulation to notify the divisional director. A site is classified as a Major Hazard Installation if it contains one or more notifiable substances or if the off-site risk is sufficiently high. The latter can only be determined from a quantitative risk assessment.

Methane (compressed) is listed as a notifiable substance at a threshold value of 15 t stored in a single vessel. As the LNG is not a compressed gas, LNG will not be classified as notifiable substance.

B) Sasol Gas

The Sasol gas would be the main source of energy to the NGEPP gas to power facility in Newcastle and would be supplied to gensets at approximately 8 bar(g). A loss of containment could result in las fires, jet fires and explosions. The maximum damage would result from large jet fires that could extend beyond the site boundary, but would not reach residential or vulnerable populations.

C) LNG Installation

The LNG installation consisting of ISO Container offloading storage, regasifier / vaporiser with associated pumping and pipelines transporting the LNG to the gensets.

The maximum extent from a large release of LNG at the storage area, could extend over1 km downwind to the 1% fatality.

The risk of $1x10^{-6}$ fatalities per person per year isopleth, would extend beyond the Karbochem Industrial Complex site boundary, and that alone qualifies the Karbochem Industrial Complex as a Major Hazard Installation. The risks from the LNG facility would not impact any residential areas or vulnerable populations.

The risks to the public would be within the “ALARP”[13] range and considered tolerable to the general public.

D) Impacts onto Neighbouring Properties and Residential Areas

While the large releases can extend just over 940 m downwind from the release. Large releases would mostly be within the Karbochem Industrial Complex, but could extend into the airfield to the north.

Residential vulnerable populations would not be impacted from this development.

[13] “**ALARP**” stands for ‘as low as reasonably practicable’. As used in the UK, it is the region between that which is intolerable, at $1x10^{-4}$ per year, and that which is broadly acceptable, at $1x10^{-6}$ per year. A further lower level of risk, at $3x10^{-7}$ per year, is applied to either vulnerable or very large populations for land-use planning.

The risks of the installation would be within a short distance of the NGEPP and would not impact the airfield to the north, nor vulnerable facilities. Thus, the risks to the public from the development of the NGEPP would be considered tolerable.

E) Major Hazard Installation

The QRA investigation concluded that under typical design conditions, assuming conservative design options and inventories, the proposed power plant could be considered as a Major Hazard Installation, depending on the hazardous chemicals used on site as well as the layout of the power station. Furthermore, the risks of the LNG installation alone would classify the Karbochem Industrial Complex as a Major Hazardous Installation

The QRA study is not intended to replace the Major Hazard Installation risk assessment which should be completed prior to construction of the facility.

16.1.4 Aquatic ecology

No wetlands or other sensitive freshwater habitat occur in positions which are likely to be directly affected by the proposed NGEPP project. Due to the nature of the NGEPP project on the study site and relative locality to the Karbochem Spruit, the proposed project is considered to pose a very low risk of further impact to the already largely impacted river system. In addition, the NGEPP study site is not subject to any zones of regulation as per the National Water Act (Act No. 36 of 1998), as the study site does not fall within the 100 m zone of regulation (as applicable to rivers) of the Karbochem Spruit. As such, no development constraints are applicable from a watercourse management perspective. It is, however, highly recommended that the NGEPP study site is developed responsibly and that necessary authorisation from the relevant competent authorities are granted.

16.1.5 Terrestrial biodiversity

No significant direct terrestrial biodiversity impacts as a result of the NGEPP project on the study are are anticipated. However, the potential for indirect impacts such edge effects resulting alien plant species proliferation in surrounding more natural areas may have the possibility to occur. As a result, should the NGEPP project receive approval, responsible construction techniques and general good housekeeping is considered essential to ensure that potential impacts are adequately mitigated and minimised as much as possible.

16.1.6 Noise

Based on a cumulative sound power level of 112 dB(A) stemming from all equipment associated with the 12 Rolls-Royce (Bergen B3540V20) gas engines operating simultaneously the resultant noise levels at specified distances from the source were determined. Noise levels in the immediate vicinity of the operational activities are predicted to be high, as would be expected for an industrial operation. At distances greater than 25 m from the source (approximately fenceline location), noise levels reduce considerably, with noise levels at approximately 150 m and 500 m from the source dropping to below the SANS urban day-time and night-time guideline of 60 dB(A) and 50 dB(A), respectively.

Increases in noise levels at all offsite receptor points as a result of the NGEPP operational activities will range from 0.0 to 2.2 dB(A) during the day-time. Such marginal increases are classified as resulting in “little” community response. At night-time, increases in noise levels at the offsite receptor points as a result of the NGEPP operational activities will range from 0.1 to 5.0 dB(A) during the night-time. While the predicted cumulative noise level at the Airport Lodge, Arbor Park and Engen are above the SANS 10103 urban night-time guideline (50 dB(A)), these marginal increases are classified as resulting in “little” community response.

All impacts associated with the proposed NGEPP were evaluated using a risk matrix, which is a semi-quantitative risk assessment methodology. The resultant environmental acoustic risks for residential receptors were ranked “low” during the operational phase. With such minimal increases in noise levels during the operational phase, it is envisaged that the facility can be authorised without any major impacts or complaints. The facility is adequately positioned within an industrial area, away from sensitive receptors and will not negatively impact the noise climate at the receptors. Nonetheless, the following key general mitigation and management measures for the operational phase as presented in Section 13.5 are recommended for inclusion in the EMPr for implementation.

16.1.7 Hydrogeology

Groundwater assessment was carried out for the proposed NGEPP site to establish the baseline groundwater characteristics prior construction, and to evaluate shallow aquifer dewatering requirements. The following conclusions are drawn from the observations made:

- The existing chemical storage tanks, chemical containers, filters, septic tank, and effluent sump constitute the potential source of groundwater contamination onsite. It is confirmed that only the current effluent sump is contaminating groundwater and surface water immediately downgradient. It is however noted that all potential contamination sources will be removed before the construction of the new power plant. As noted in Section 13.7.8, it will be necessary for NGEPP to confirm levels of soil contamination via a Phase II site assessment process and remediate as necessary.
- The Hydrocensus survey confirmed the reliance on groundwater for domestic use by the neighbouring farming community approximately 1.3 km west of the site, and Newcastle airport borehole situated upgradient, approximately 2km north of the site. There are no groundwater users in the immediate vicinity (2 km radius) downgradient of the site.
- Depth to water table on site is shallow (0.34 mbgl - 0.81 mbgl) along the stormwater drainage channel. Other test holes across the site were dry during field investigation suggesting some groundwater recharge from the stormwater drainage. This implies that dewatering will not be required if the stormwater drainage is improved or managed and localised groundwater recharge around AH-06 and AH-07 is stopped.
- Slightly deeper water levels (3 – 12mbgl) were observed from offsite boreholes. The predominant groundwater flow is Southeast toward Karbochem Spruit and associated wetlands. Potential groundwater contamination from site would also follow the same flow paths to the Karbochem Spruit and wetlands downgradient of the site, being the main potential receptor. There are no private groundwater users (human receptors) recorded immediately downgradient of the site.

It is confirmed from this study that the existing effluent sump is impacting the groundwater quality in the vicinity. Poor management of sewage, chemical storage tanks (acid and caustic soda), effluent in the sump during decommissioning has the potential to impact the soil, surface and groundwater in the area. Without good controls and management, pollution of the surface and groundwater can occur from the planned power plant.

16.2 Impact Summary

A summary of the positive and negative impacts and risks of the proposed activity is provided in Table 16-1.

Table 16-1 Impact Assessment Summary

Potential Impacts	Significance	
	Pre-mitigation	Post-mitigation
Air Quality (nuisance / health risk)		
Impact AQ1: Dust emissions due to the demolition of the existing cogeneration plant and site clearance (Table 13-6).	Very Low	Very Low
Impact AQ2: Dust emissions during the construction phase (Table 13-7).	Very Low	Very Low
Impact AQ3: Dust and gas emissions during the operational phase (Table 13-8).	Low	Low
Climate Change		
Impact CC1: GHG emissions resulting from the Construction Phase (Table 13-14).	Low	Low
Impact CC2: GHG emissions resulting from the Operational Phase (Table 13-15).	High (+ve)	High (+ve)
Impact CC3: Impact of increased temperatures during operation (Table 13-16).	Insignificant	Insignificant
Impact CC4: Impact of decreased annual rainfall or increased drought periods during operation (Table 13-17).	Low	Low
Impact CC5: Impact of increased fire days, intense thunderstorms and damaging flood events during operation (Table 13-18).	Low	Low
Aquatic Ecology		
Impact AE1: Disturbance to wetlands or other freshwater habitat (demolition of existing plant construction of new one) (Table 13-19).	Very Low	Insignificant
Impact AE2: Disturbance to wetlands or other freshwater habitat (operational phase) (Table 13-20).	Low	Low
Terrestrial Biodiversity		
Impact TD1: Disturbance to terrestrial biodiversity (Table 13-21).	Very Low	Insignificant
Noise		
Impact N1: Noise impacts during the construction phase (Table 13-30).	Very Low	Very Low
Impact N2: Noise generated during the operational phase (Table 13-31).	Medium	Low
Risk (loss of containment / fire / explosion / exposure)		
Impact QR1: Loss of containment of methane rich gas (Table 13-33).	Medium	Low
Impact QR2: LNG ISO container failure (Table 13-34).	Medium	Low
Impact QR3: LNG pipeline failure (Table 13-35).	Medium	Low
Impact QR4: LNG storage (Table 13-36).	Medium	Low
Impact QR5: LNG vaporisers (Table 13-37).	Medium	Low
Groundwater and Surface Resources		
Impact GW1: Poor management of contaminated sump water during decommissioning will result to deterioration of groundwater quality in the immediate vicinity (Table 13-39).	Medium	Very Low
Impact GW2: Poor management of chemicals (HCl, hydrocarbons and Caustic soda, etc.) from the storage facilities onsite during demolition will result to deterioration of groundwater quality in the immediate vicinity (Table 13-40).	Medium	Very Low
Impact GW3: Poor management of sewage from the septic tank onsite during demolition will result to deterioration of groundwater quality in the immediate vicinity (Table 13-41).	Medium	Very Low
Impact GW4: Impact to surface water – disposal of groundwater seepage to the surface water resource impacting aquatic systems (Table 13-42).	Medium	Very Low
Impact GW5: Impact to water – spillage from the chemical storage tanks and other potential contamination sources contaminating surface and groundwater resource (Table 13-43).	Medium	Very Low
Socio-economic		
Impact SE1: Employment opportunities during construction (Table 13-44).	Very Low (+ve)	Low (+ve)
Impact SE2: Employment opportunities during operation (Table 13-45).	Low (+ve)	Medium (+ve)
Impact SE3: Increase in GDP during construction and operation (Table 13-46).	Medium (+ve)	High (+ve)
Impact SE4: Contribution to increased energy security during operation (Table 13-47).	Medium (+ve)	Medium (+ve)

Figure 16-1 below shows the proposed plant footprint in relation to surrounding environmental sensitivities.

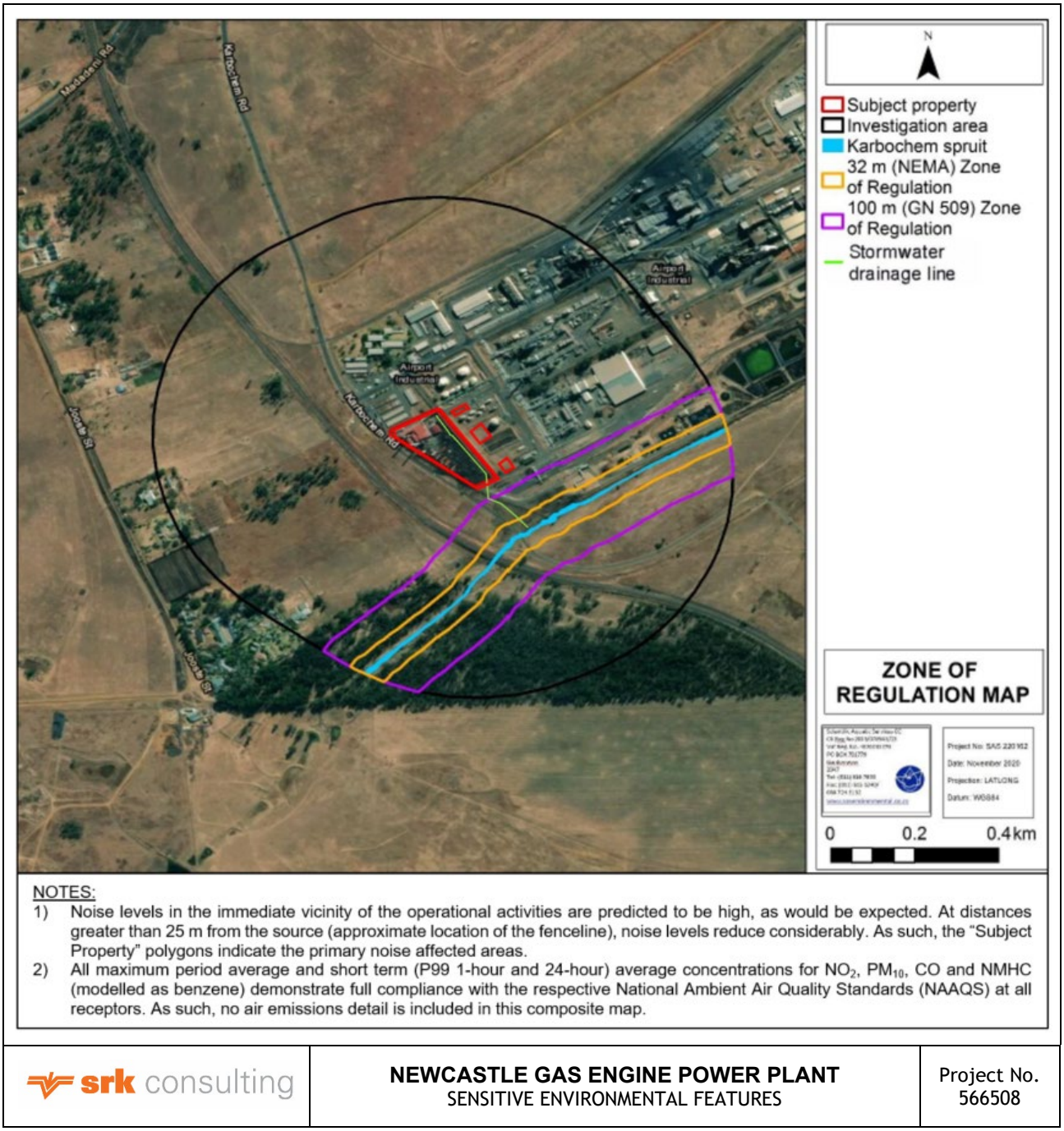


Figure 16-1: Sensitive environmental features in the vicinity of the site (Source: adapted from SAS Zone of Regulation Map (SAS, 2021a))

17 EAP Affirmation

Section 16 (1) (b) (iv), Appendix 1 Section 3 (1) (r), Appendix 2 Sections 2 (i) and (j) and Appendix 3 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998 (NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

- The correctness of the information provided in the report.
- The inclusion of comments and inputs from stakeholders and interested and affected parties.
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.
- The level of agreement between the EAP and interested and affected parties on the Plan of Study for undertaking the environmental impact assessment.

SRK and the EAPs managing this project hereby affirm that:

- To the best of our knowledge the information provided in the report is correct, and no attempt has been made to manipulate information to achieve a particular outcome. Some information, especially pertaining to the project description, was provided by the applicant and/or their sub-contractors. In this respect, SRK's standard disclaimer (inserted in this report) pertaining to information provided by third parties applies.
- In addition to the previous point, and with reference to SRK's standard disclaimer, the results of specialist studies have been summarised in the report without any attempt to manipulate the findings of the specialists. All recommendations from specialists are captured in the report, and where this has involved changing the wording of the recommendation, such changes are intended to make the recommendations clearer and enforceable, and without any intent to alter the understood intent of those recommendations.
- If applicable, information and responses provided by the EAP to interested and affected parties are clearly presented in the report. Where responses are provided by the applicant (not the EAP), these are clearly indicated.
- With respect to EIA Reports, SRK will take account of interested and affected parties' comments and, insofar as comments are relevant and practicable, accommodate these during the Impact Assessment Phase of the EIA process.

EAP Name: Marius van Huyssteen

Signature: _____ Date: 04 June 2021

18 Authorisation Opinion

In accordance with Item 3(1)(q) in Appendix 3 of GN 326, this chapter provides a reasoned opinion as to whether the proposed activity should or should not be authorised, and recommended conditions that should be made in respect of that authorisation. In this section, a qualified opinion is ventured.

The EAP is of the opinion that this EIR, the attached EMPr and the attached specialist reports comply with the relevant guidelines and contain all the information required in terms of GN 326 to enable DFFE to take a decision.

The fundamental decision is whether to allow development that brings socio-economic advantages and is consistent with planning and development policies, given the potential environmental impacts. In this case, identified potential negative impacts arising from the proposed NGEPP project can be managed to remain within acceptable environmental limits so long as measures set out in the EMPr are implemented.

The EAP believes that the EIR and specialist studies have confirmed that the Newcastle Energy's preferred technology, site and layout alternatives are acceptable.
The EMPr stipulates the mitigation measures identified that will mitigate the potential impacts identified to within acceptable limits.
In conclusion, SRK is of the opinion that on purely 'environmental' grounds (i.e. the project's potential socio-economic and biophysical implications) the application, as it is currently articulated in this EIR, should be approved.
This statement is conditional on implementation of the mitigation measures stipulated in the EMPr. These measures include undertaking further investigations and monitoring during the remaining project phases and the operational phase.
The results of the investigations and monitoring may result in refinement of certain environmental measures and provisions.

18.1 Conditions of Authorisation

If DFFE authorises this NEMA application, the following project specific conditions (as included in the EMPr) are also recommended for inclusion in the Environmental Authorisation:

- The mitigation measures stipulated in the risk assessment report (and in the EMPr) for the mitigation of the high-risk areas must be included in the final project detailed design to reduce risks to acceptable levels.
- An MHI risk assessment based on the final detailed design must be submitted and approved by the relevant authorities, as required by legislation, prior to commencement of construction.
- An application for an AEL application must be submitted to the Amajuba District Municipality prior to commencement of operation.
- *Development and implementation of a routine ambient air quality monitoring program to determine whether there are any significant increases in emissions and impacts at sensitive receptors as a result of the proposed project. Ambient monitoring for SO_2, NO_2, PM and CO is to be included as a condition for authorisation to the project.*
- Due to the existing effluent sump being a source of contamination of groundwater and surface water immediately downgradient, it will be necessary for a levels of soil contamination to be confirmed via a Phase II site assessment process and remediation as necessary.
- *Levels of soil and groundwater contamination are to be confirmed via a Phase II site assessment process prior to construction and remediate as necessary.*
- A surface and groundwater monitoring network for the NGEPP should be established and maintained in accordance to the specifications provided in the hydrogeological report.

- On finalisation of the detailed design and site development plan, but prior to commencement of construction, a detailed stormwater management plan must be prepared for approval.
- The post-development clean storm water runoff must be attenuated and discharged at the same flow rate as pre-development peak flows. In addition, all dirty storm water runoff from the 1:50 year flood must be collected and discharged to effluent system.

19 The Way Forward

Notification of the availability of this ***Final*** EIR ***will be*** distributed to registered IAPs. The report can also be accessed as an electronic copy on SRK's website, via the "public documents" link (https://docs.srk.co.za/en/za-newcastle-gas-engine-power-plant-100-mw-ipp-project-scoping-eia).

IAPs are encouraged to review this ***Final*** EIR and send written comment by 17h00 on ***05 July*** **2021**. Comments on this report could influence decisions taken by the competent authority and must be forwarded to:

PO Box 1969, Westville, 3630

Fax: (031) 279 1204

Email: smkhize@srk.co.za

Reference: 566508/NGEPP-EIA

Any comments made on this ***Final*** EIR will be submitted to the DFFE for a decision on the application.

Prepared by

SRK Consulting - Certified Electronic Signature
srk consulting
566508/FEIR/44349/Report1
9038-2762-4464/VHUY-04/05/2021
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database

M. van Huyssteen *CEAPSA*

Principal Environmental Scientist / Partner

Reviewed by

SRK Consulting - Certified Electronic Signature
srk consulting
566508/44349/Report1
6853-3574-4402-GARR-04/05/2021
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R. Gardiner *Pr.Sci.Nat; EAPASA*

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.

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Appendices

Appendix A: EAP CV

Appendix B: EIA application

Appendix B-1: EIA application form

Appendix B-2: EAP declaration of independence

Appendix B-3: Updated landowner consent

Appendix B-1: EIA application form

Appendix B-2: EAP declaration of independence

Appendix B-3: Updated landowner consent

Appendix C: Public participation plan in accordance with the GN R. 650 Directions (including DFFE Approval)

Appendix D: Proof of public participation activities

Appendix D-1: Newspaper notice and on-site poster

Appendix D-2: Email notifications to IAP database

Appendix D-1: Newspaper notice and on-site poster

Site Notice:

NOTIFICATION OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION AND ATMOSPHERIC EMISSION LICENCE

Proposed Newcastle Gas Engine Power Plant 100 MW Independent Power Producer Project, Newcastle, KwaZulu-Natal

Notice is hereby given that Newcastle Energy (Pty) Ltd. (Newcastle Energy) intends to lodge an application for Environmental Authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) with the National Department of Environment, Forestry and Fisheries (DEFF). Newcastle Energy also intends to apply for an Atmospheric Emissions License (AEL) in terms of the National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA) with the Amajuba District Municipality.

Project details: Newcastle Energy own an existing 18.5 MW capacity gas fired co-generation plant within the Karbochem Industrial Complex in Newcastle, KwaZulu-Natal. Through the Newcastle Gas Engine Power Plant (NGEPP) Independent Power Producer (IPP) project, Newcastle Energy proposes to increase its electricity generation capacity, within the same site, to approximately 100 MW.

The proposed project is subject to the following:

- A Scoping and Environmental Impact Assessment (EIA) process in terms of the NEMA 2014 EIA Regulations, as amended.
- An application for an AEL in terms of the NEM:AQA listed activity Subcategory 1.4 “Gas combustion installations”.

All Interested and Affected Parties are invited to register with SRK Consulting (contact details below) and to submit comments on the Draft Scoping Report by 17 November 2020.

The Draft Scoping Report will be available for review from 19 October 2020 from:

- SRK’s website via the following link: https://docs.srk.co.za/en/za-newcastle-gas-engine-power-plant-100-mw-ipp-project-scoping-eia
- From SRK on request.

Contact details: Mr. Siphelele Mkhize of SRK Consulting

Email: smkhize@srk.co.za
Tel: 079 082 2685 / 031 279 1200

Date of this notice: 15 October 2020

srk consulting

Plate 1: Site Notices at N11 turn off to Karbochem Industrial Complex (27°46'28.73"S; 29°57'49.71"E)

Plate 2: Site Notice placed at Karbochem main gate entrance (27°47'2.21"S; 29°58'7.51"E)

Plate 3: Site Notice placed at Newcastle Energy northern gate (27°47'6.48"S; 29°58'6.91"E)

Plate 4: Site Notice placed at Newcastle Energy Main Entrance (27°47'8.22"S; 29°58'8.95"E)

Plate 5: Site Notice placed at Southern Boundary of Newcastle Energy Plant (27°47'10.97"S; 29°58'13.13"E)

Newspaper Notice (as published):

NOTICES

NOTIFICATION OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION AND ATMOSPHERIC EMISSION LICENCE

Proposed Newcastle Gas Engine Power Plant 100 MW Independent Power Producer Project, Newcastle, KwaZulu-Natal

Notice is hereby given that Newcastle Energy (Pty) Ltd. (Newcastle Energy) intends to lodge an application for Environmental Authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) with the National Department of Environment, Forestry and Fisheries (DEFF). Newcastle Energy also intends to apply for an Atmospheric Emissions License (AEL) in terms of the National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA) with the Amajuba District Municipality.

Project details: Newcastle Energy own an existing 18.5 MW capacity gas fired co-generation plant within the Karbochem Industrial Complex in Newcastle, KwaZulu-Natal. Through the Newcastle Gas Engine Power Plant (NGEPP) Independent Power Producer (IPP) project, Newcastle Energy proposes to increase its electricity generation capacity, within the same site, to approximately 100 MW.

The proposed project is subject to the following:

- A Scoping and Environmental Impact Assessment (EIA) process in terms of the NEMA 2014 EIA Regulations, as amended.
- An application for an AEL in terms of the NEM:AQA listed activity Subcategory 1.4 "Gas combustion installations".

All Interested and Affected Parties are invited to register with SRK Consulting (contact details below) and to submit comments on the Draft Scoping Report by 17 November 2020.

The Draft Scoping Report will be available for review from 19 October 2020 from:

- SRK's website via the following link: https://docs.srk.co.za/en/za-newcastle-gas-engine-power-plant-100-mw-ipp-project-scoping-eia
- From SRK on request.

Contact details: Mr. Siphelele Mkhize of SRK Consulting
Email: smkhize@srk.co.za
Tel: 079 082 2685 / 031 279 1200

CM002016SE

Date of this notice: 16 October 2020

srk consulting

INVITATION TO REGISTER ON SANRAL NRA 11-014-2015/1 AMAJUBA PLC DATABASE

The above mentioned PLC wishes to invite all SMME's who are doing construction work from Grade 1 to Grade 6CE .The entity must be fully compliant with the following: Company name , Directors ID's, Gender , Physical address , Postal address , Proof of residence , Ward number , Contact person , contact number , email address , company registration number , CIDB grading , BEE certificate , CSD registration , letter of good standing if any, VAT number and tax clearance certificate. It must be stipulated in the profile if you are involved in any other construction related works eg surveying etc.

NB: The Company must be from within Amajuba District Municipality, company profiles shall be delivered by hand at No 03 Plattberg Village Ladysmith Rainbow Civils Offices .

Telephonic, telegraphic, telex, facsimile, e-mailed or electronic applications will NOT be accepted. If you have submitted before there is no need to submit again.

PLEASE INDICATE WARD NUMBER OUTSIDE THE ENVELOPE

LATE SUBMISSIONS WILL NOT BE ACCEPTED

CLOSING DATE- 28 October 2020.

Enquiries can be directed to MV Nxumalo PLO 082 743 0094

CM001996

PUBLIC PARTICIPATION PROCESS

DMR Reference No. KZN30/5/1/1/2/122 MR

Kangra Coal (Pty) Ltd – Invitation to Register as Interested and Affected Parties

Location and Nature of Activity: Kangra Coal (Pty) Ltd, owns the Welgedacht Exploration Company (hereafter referred to as Welgedacht) which comprises of the Umgala, Aasvolkrans and Zimbutu Collieries. These mines were operating in the vicinity of Utrecht since 1963.

Umgala/ Knight's Hill, one of the mines that was operated by the Welgedacht Exploration Company is located approximately 45 km from Newcastle and approximately 3 km from Utrecht. The project is located within the magisterial district of Amajuba and the local municipality of eMadlangeni.

A portion of the Umgalas Colliery dump is experiencing spontaneous combustion and Kangra Coal is in the process of investigating ways of extinguishing the fire and rehabilitating the dump in such a manner that it does not catch fire in future.

Registration as Interested and Affected Parties

The National Environmental Management Act, 1998 (Act No.107 of 1998) ("NEMA"), Section 23 promotes the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities. This section also ensures adequate and appropriate opportunity for public participation in a decision that may affect the environment.

Interested an Affected Parties ("I&APs") are therefore invited to register and participate and to kindly submit any comments, proposals for extinguishing the spontaneous combustion on the dump. Proposals, comments and requests for registration are to reach Ms Niketiwe Dlamini by the **17 November 2020**, using the contact details provided below. I&AP's should please refer to the Department of Mineral Resource's ("DMR")

Reference number above and must provide their comments together with their name, contact details. A mitigation plan will be compiled by Kangra Coal and will be made available to all registered Interested and Affected Parties for review and comment.

For more information contact: Ms Niketiwe Dlamini from Kangra Coal.

Contact Detail:

Tel: 017 730 6309/ 076 727 4968
E Mail: niketiwe.dlamini@kangracoal.co.za
Mail: P.O Box 745, Piet Retief, 2380

KANGRA

Inkomba yeDMR KZN30/5/1/1/2/122 MR

Kangra Coal (Pty) Ltd - Isimemo Sokubhalisa Njengamaqembu Anentshisekelo Nathintekile

Indawo Kanye Nohlobo Lomsebenzi: I Kangra Coal (Pty) Ltd ingumnikazi we (Welgedacht Exploration Company (ngemuva kwalokhu okubizwa ngokuthi Welgedacht) okubandakanya Umgala, Aasvolkrans and Zimbutu Collieries. - Lezi zimayini bezisebenza endaweni ese-Utrecht kusukela ngo-1963

Umgala/ Knight's Hill enye yezimayini ezazisetshenzwa yi Welgedacht Exploration Company etholakala cishe ngamakhilomitha angama-45 ukusuka eNewcastle futhi cishe amakhilomitha ama-3 ukusuka e-Utrecht. Le phrojekthi itholakala esifundeni sikamantshi waseMajuba kanye nomasipala wendawo eMadlangeni.

Ingxenye yokulahla udoti welahle kwi Umgala Colliery ibhekene nokushisa okuzenzekelayo kanti neKangra Coal isemkhankasweni wokuphenya izindlela zokucisha umlilo nokuvuselela indawo yokulahla inkunkuma ngendlela yokuthi ingabi nomlilo ngokuzayo.

Ukubhaliswa Anentshisekelo Nathintekayo

• Umthetho Wokuphathwa kwemvelo zwelonke, I National Management Act, 1998 (Act No 107 of 1998) ("NEMA") Section 23 igqugquzela ukusetshenziswa kwamathuluzi afanele okuphathwa kwemvelo ukuze kuqinisekiswe ukulawulwa kwemvelo kwemisebenzi. Lesi sigaba siqinisekisa nethuba elanele nelifanele lokubamba iqhaza komphakathi esinqumweni esingathinta imvelo.
Abanetshisekelo nabathintekayo (I&APs) bayamenywa ukhuthi baphawule bathumele noma yikuphi ukuphawula, iziphakamiso zokucima umlilo ozenzekelayo endaweni yokulahla ilahle. Iziphakamiso, ukuphawula kanye nezicelo zokubhaliswa kufanele zifinyelele ku Nkosazana Niketiwe Dlamini ungakendluli umhlaka **17 Novemba 2020** usebenzisa imininingwane yokuxhumana enikezwe ngezansi. Ama-I & AP kufanele abheke kwinombolo eyinkomba yoMnyango Wezokumbiwa phansi ("DMR") ngenhla futhi kufanele anikeze imibono yabo kanye namagama abo, imininingwane yokuxhumana. Uhlelo lokunciphisa luzohlanganiswa yiKangra Coal futhi luzotholakala kubo bonke ababhalisile abanentshisekelo nabathintekayo ukuze babuyekeze futhi baphawule.

Uma ufuna kwazi kabanzi chumana no Nks Niketiwe Dlamini we Kangra Coal.

Imininingwane Yokuxhumana:

Ucingo: 017 730 6309/ 076 727 4968
iE Mail: niketiwe.dlamini@kangracoal.co.za
iPosi: P.O Box 745, Piet Retief, 2380

KANGRA

CM002022SE

Appendix D-2: Email notifications to IAP database

Appendix E: Comments and Response Trail Report

Appendix F: DFFE approval of the FSR and Plan of Study for the EIA (18 February 2021)

Appendix G: Specialist Studies

Appendix G-1: Atmospheric Impact Report

Appendix G-2: Climate Change Impact Assessment

Appendix G-3: Aquatic Ecological Impact and Compliance Statement

Appendix G-4: Terrestrial Biodiversity Compliance Statement

Appendix G-5: Acoustic Impact Assessment

Appendix G-6: Quantitative Risk Assessment

Appendix G-7: Hydrogeological Assessment

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Appendix G-7: Hydrogeological Assessment

Appendix H: Environmental Management Programme

SRK Report Distribution Record

Report No.	566508/FEIR

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