Atmospheric Impact Report for Proposed Gas-to-Power Plant in Newcastle, South Africa

Report Prepared for

Newcastle Energy (Pty) Ltd.

Report Number 566508/AIR

Report Prepared by

srk consulting

June 2021

Atmospheric Impact Report for Proposed Gas-to-Power Plant in Newcastle, South Africa

Newcastle Energy (Pty) Ltd.

SRK Consulting (South Africa) (Pty) Ltd.
Section A Second Floor, Suite 02/B1
Norfolk House
54 Norfolk Terrace, off Blair Atholl Drive
Westville 3630
South Africa

e-mail: Durban@srk.co.za
website: www.srk.co.za

Tel: +27 (0) 31 279 1200
Fax: +27 (0) 31 279 1204

SRK Project Number 566508/AIR

June 2021

Compiled by:

H. Tularam (Pr.Sci.Nat)
Senior Scientist

Email: HTularam@srk.co.za

Reviewed by:

M. van Huyssteen (CEAPSA)
Partner

Author:

H. Tularam

Executive Summary

Newcastle Energy (Pty) Ltd. (Newcastle Energy), a subsidiary of Vutomi Energy (Pty) Ltd. (Vutomi), own a18.5-megawatt (MW) capacity gas fired cogeneration (steam and power) plant at the Karbochem Industrial Complex in Newcastle, KwaZulu-Natal. Through a Newcastle Gas Engine Power Plant (NGEPP) Independent Power Producer (IPP) project, Newcastle Energy proposes to increase its electricity generation capacity to approximately 100 MW.

SRK Consulting (South Africa) (Pty) Ltd. (SRK) has been appointed as the Environmental Assessment Practitioner (EAP) to undertake the required environmental applications on behalf of Newcastle Energy for the proposed project. As part of these applications, an Atmospheric Impact Report (AIR) (this report) is required in terms of Section 45 of the National Environmental Management Air Quality Act (NEM: AQA). This report serves to assess potential ambient air quality impacts from the new NGEPP.

This assessment accounts for potential criteria pollutants 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). An emissions inventory was compiled using technical performance data specific to the 13 identical Rolls-Royce (Bergen B3540V20) engines proposed to be installed at the facility. This assessment makes use of the Level 3 California Puff (CALPUFF) atmospheric dispersion model to assess the potential impacts that the proposed expansion may have on air quality on the Newcastle airshed. 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).

Key findings 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 DEFF 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 comparison of the predicted air pollutant concentrations against the respective NAAQS, the overall impact of the project on the surrounding environment is likely to be low.

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.
- 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 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.

Table of Contents

List of Tables

List of Figures

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 SRKõs investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

AEL	-	Atmospheric Emission License
AIR	-	Atmospheric Impact Report
AQIA	-	Air Quality Impact Assessment
CO	-	Carbon monoxide
DC	-	Direct Current
DEA	-	Department of Environmental Affairs
DMRE	-	Department of Mineral Resources and Energy
EAP	-	Environmental Assessment Practitioner
EIA	-	Environmental Impact Assessment
HP	-	High pressure
HV	-	High voltage
IBL	-	Inside battery limits
IPP	-	Independent Power Producer
LNG	-	Liquefied Natural Gas
Mamsl	-	Mean above sea level
MES	-	Minimum Emissions Standards
MM5	-	Fifth Generation Mesoscale Model
MW	-	Megawatt
MWe	-	Megawatt electric
NAAQS	-	National Ambient Air Quality Standards
NEM: AQA	-	National Environmental Management Air Quality Act
NEMA	-	National Environmental Management Act
Newcastle Energy	-	Newcastle Energy (Pty) Ltd.
NGEPP	-	Newcastle Gas Engine Power Plant
NO_2	-	Nitrogen dioxide
NOx	-	Nitrogen oxides
OBL	-	Outside battery limits
PM	-	Particulate matter
PM10	-	Particulates with an aerodynamic diameter of less than 10 Õm
RM IPP	-	Risk Mitigation Independent Power Producer
S&EIR	-	Scoping and Environmental Impact Reporting
SO_2	-	Sulfur dioxide
SRK	-	SRK Consulting (South Africa) (Pty) Ltd.
UHC	-	Unburned Hydrocarbons
US EPA	-	United States Environmental Protection Agency
VOC	-	Volatile Organic Compound
Vutomi	-	Vutomi Energy (Pty) Ltd

1 Introduction

1.1 Background

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

During August 2020, the Department of Mineral Resources and Energy (DMRE) released a tender calling for qualifications and proposals for new electricity generation capacity under the Department's Risk Mitigation Independent Power Producer (RM IPP) Procurement Programme (Tender No.: DMRE001/2020/21).

Through the Newcastle Gas Engine Power Plant (NGEPP) Independent Power Producer (IPP) project, Newcastle Energy proposes to increase its electricity generation capacity to approximately 100 MW and intends to submit a bid for the above RM IPP Procurement Programme Tender.

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

SRK Consulting (South Africa) (Pty) Ltd. (SRK) has been appointed as the Environmental Assessment Practitioner (EAP) to undertake the required environmental applications on behalf of Newcastle Energy for the proposed project. As part of these applications, an Atmospheric Impact Report (AIR) (this report) is required in terms of Section 45 of the National Environmental Management Air Quality Act (NEM: AQA). This report serves to assess potential ambient air quality impacts from the new NGEPP.

1.2 Project description and approach

The project involves decommissioning, demolition and as well as removal of the existing cogeneration plant and thereafter engineering, procurement, construction, commissioning and operation of the new 100 MW NGEPP as well as associated infrastructure. The 100 MW capacity will be achieved via 13 Rolls-Royce (Bergen B3540V20) gas engines each of 8.8 MW. This AIR accounts for all criteria pollutants likely to be 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). An emissions inventory was compiled using technical performance data. This assessment makes use of California Puff (CALPUFF), a level 3 atmospheric dispersion model, to assess the potential impacts that the proposed expansion may have on air quality in the Newcastle airshed. Predicted long-term (period) and short-term 99th percentile (P99) average concentrations are compared with the relevant National Ambient Air Quality Standards (NAAQS), as published in Government Notice 1210 of 2009 (Government Gazette 32816) and 2013 (Government Notice 893, Government Gazette 37054). The findings from this study have been presented in the format prescribed by the AIR Regulations described further in the sections below.

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

1.3 Scope of report

1.3.1 Atmospheric Impact Report

In terms of Section 53(f) of NEM: AQA, the Department of Environmental Affairs (DEA) developed and published "*Regulations Regarding Air Dispersion Modelling, 2014*". The regulations were published in Government Gazette No. 37804 on 11 July 2014 under Government Notice (GN) No. 533.

The ñ*Code of Practice*ò contained in Appendix A of the regulations (GN533 of Government Gazette No. 37804), is prescribed as the technical Code of Practice for air dispersion modelling, and provides technical standards on the application of air dispersion models.

The Code of Practice is applicable to:

a) The development of an air quality management plan, as contemplated in Chapter 3 of the Act.
b) The development of a priority area air quality management plan, as contemplated in Section 19 of the Act.
c) The development of an Atmospheric Impact Report (AIR), as contemplated in Section 30 of the Act.
d) The development of a specialist AQIA study, as contemplated in Section 37(2)(b) of the Act.

In accordance with the application of the requirements of the Code of Practice to an AIR report or a specialist AQIA study (as per points *c)* and *d)* above), this assessment is submitted in accordance with the prescribed format for an Air Dispersion Modelling Study.

The Scope of Report for this assessment will, therefore, follow the regulations prescribing the format of an Air Dispersion Modelling Study Report, and will provide all the information available and relevant in order to comply with the requirements of the regulations regarding air dispersion modelling (Code of Practice).

1.3.2 Specialist study requirements

The requirements of any specialist are specified in Appendix 6 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 1-1 lists the requirements from GN 326 and provides a reference to the applicable chapter of this document where each objective is addressed.

Table 1-1: Specialist report requirements (Appendix 6 of GN 326, 07 April 2017)

Specialist reports requirements	Reference in this Document
(1) A specialist report prepared in terms of these Regulations must contain -	
(a) details ofð	
(i) the specialist who prepared the report; and	This report ñ*Atmospheric Impact Report for Proposed Gas-to-Power Plant in Newcastle, South Africa*ò
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix B
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix A
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Chapter 1

Specialist reports requirements	Reference in this Document
(cA) an indication of the quality and age of base data used for the specialist report;	Chapter 6
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Chapter 5 and Chapter 6
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Chapter 4
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Chapter 1
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Chapter 2
(g) an identification of any areas to be avoided, including buffers;	Chapter 2 and Chapter 7
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Chapter 7
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Chapter 7
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Chapter 8
(k) any mitigation measures for inclusion in the EMPr;	Chapter 9 and Chapter 11
(l) any conditions for inclusion in the environmental authorisation;	Chapter 9 and Chapter 11
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Chapter 9 and Chapter 11
(n) a reasoned opinionð (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Chapter 9, Chapter 10 and Chapter 11
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(q) any other information requested by the competent authority.	N/A
(2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Chapter 1

2 Project location

The location and extent of Newcastle Energy is presented in Table 2-1. Figure 2-1 on the following page provides a locality map of the project site within the Karbochem Industrial Complex in Newcastle.

Table 2-1: Location and extent of Newcastle Energy

Criteria	Details
Physical Address of the Plant	3 Karbochem Road, Newcastle
Description of Site (Where No Street Address)	Lease 1, Karbochem Industrial Complex
Coordinates of Approximate Centre of Operations	X: 792597 m E Y: 6923052 m S UTM Zone 35
Extent (km²)	17.8
Elevation Above Mean Sea Level (m)	1232
Province	KwaZulu-Natal
Metropolitan/District Municipality	Amajuba District Municipality
Local Municipality	Newcastle Local Municipality
Designated Priority Area (if applicable)	N/A

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: 2-1
Revision: A Date: 12 04 2021

srk consulting

NEWCASTLE GAS ENGINE POWER PLANT (NGEPP)

AERIAL VIEW OF NGEPP SITE

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

3 Project Details

3.1 NGEPP and Associated Infrastructure Development

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

It is important to note that although the directly calculated output based on 13 engines at 8.8 MW each would be around 121 MW, one of the 13 engines will always be on stand-by while the remaining 12 will output the 100 MW. Furthermore, there will be an 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).

The NGEPP requires the storage of back-up fuel (to the volume equivalent of a three-day supply reserve) in the form of Liquefied Natural Gas (LNG).

In this regard, Newcastle Energy has proposed the development of a 2 100 m^3 LNG storage facility constituting the following:

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

The proposed LNG storage facility is proposed to be located within the Karbochem Industrial Complex, on the site to the east of the NGEPP site as shown in Figure 2-1.

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

The project will broadly involve the following components:

1) Main gas station, including gas distribution piping to gas engines at 4 to 6 bar pressure and gas flow meters.
2) Portable water supply.
3) Raw water supply points.
4) Fire water supply, including underground fire water ring main, fire hydrants, fire hose reels.
5) Demineralised water supply points.
6) Engine house, including:
    - Rolls-Royce Gas Engines 13 X 8.8 MW B35:40V20AG2 (N+1) coupled to 11kV/50Hz alternators fitted on a main frame and suspended on rubber vibration damping mountings.
    - Noise supressing sheet metal powerhouse structure.
    - 5 000 kg crane to run along the length of the engine house to facilitate maintenance activities.
    - Engines main gas supply piping.
    - Compressed air system for starting the engines including 30 bar receiver, starting air module and piping.
    - Silencers (45 dBA) and exhaust stacks with 33 m height. The stacks are grouped together to support each other and to reduce construction cost.
    - Engines oil cooling system.

- Engines oil filling system.
- Oil storage area for new oil.
- Oil storage area for used oil.
- Engines intercooler and jacket water cooling radiators fitted with electric fan motors mounted at ground level so as to optimize construction cost and to facilitate maintenance activities.
- Header tanks at normal atmospheric pressure with a surface area of approximately 1 m^2, to facilitate coolant level maintenance.
- Air intake system with filtration elements.
- Air ventilation system to remove heat generated by air flow through the alternators and radiation from other hot surfaces from the powerhouse.
- Fire protection system.
- Gas and fire detectors.
- Offloading bay.

7) High voltage (HV) yard to step up from 11 kV to 132 kV, including interconnecting transformers, line feeders and Eskom tie in point.
8) HV Substation, including switchgear, synchronising breakers, uninterrupted power supply and direct current (DC) systems.
9) Compressor room with 30 bar starting air compressors.
10) Effluent management infrastructure, including sump and electric pump and piping to Karbochem.
11) Main gate security office, including toilets.
12) Road access and storm drainage.
13) Office block, including:
    - Admin office.
    - Power plant manager office.
    - CEO office.
    - 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 3-1. A preliminary process flow diagram for the power plant is depicted in Figure 3-2. A provisional general arrangement layout for the NGEPP is shown in Figure 3-3.

3.2 Gas Engine Details

Bergen Engines supplies medium-speed engines for marine and power generation applications, and for the oil and gas industry. Marine engines are marketed through the Rolls-Royce Marine sales organization while engines for the power and for the oil and gas industry via the Rolls-Royce Power Systems sales organization. Since 1984, Rolls-Royce have developed, manufactured and installed more than 600 lean-burn gas engines for industrial power stations and municipal uses. The B-gas

engineôs 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 Unburned hydrocarbons (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 ñleaned-outò 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)).

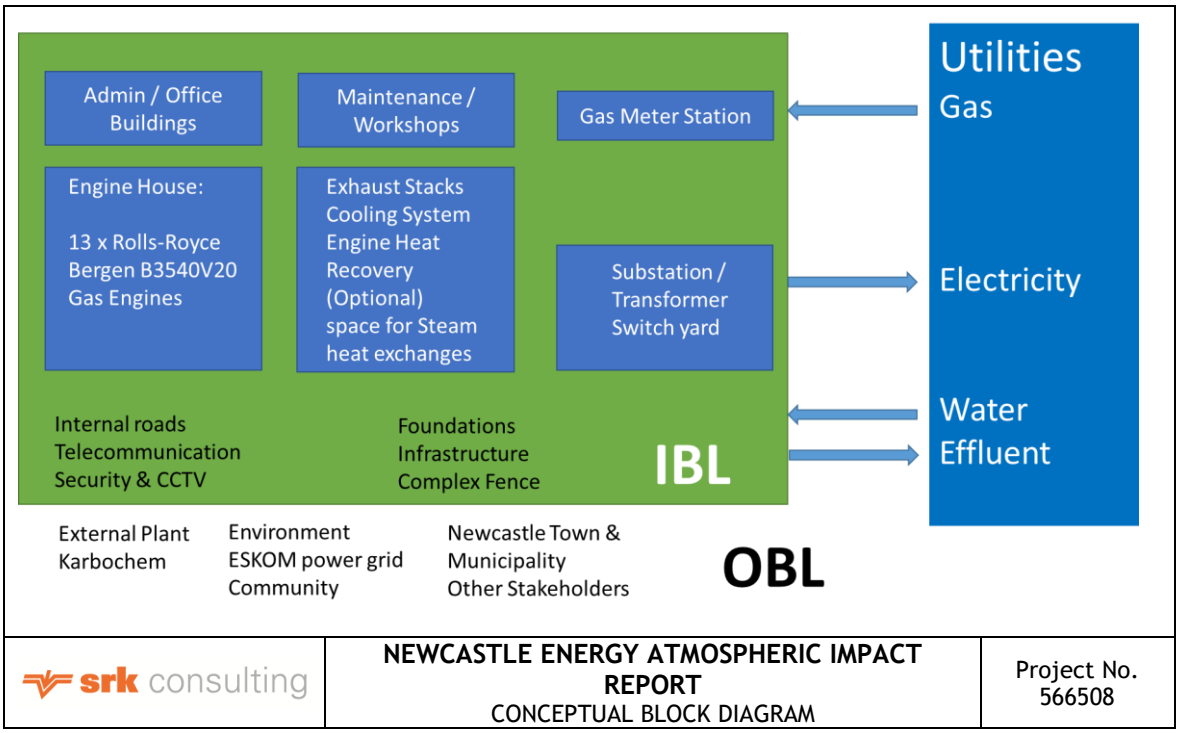
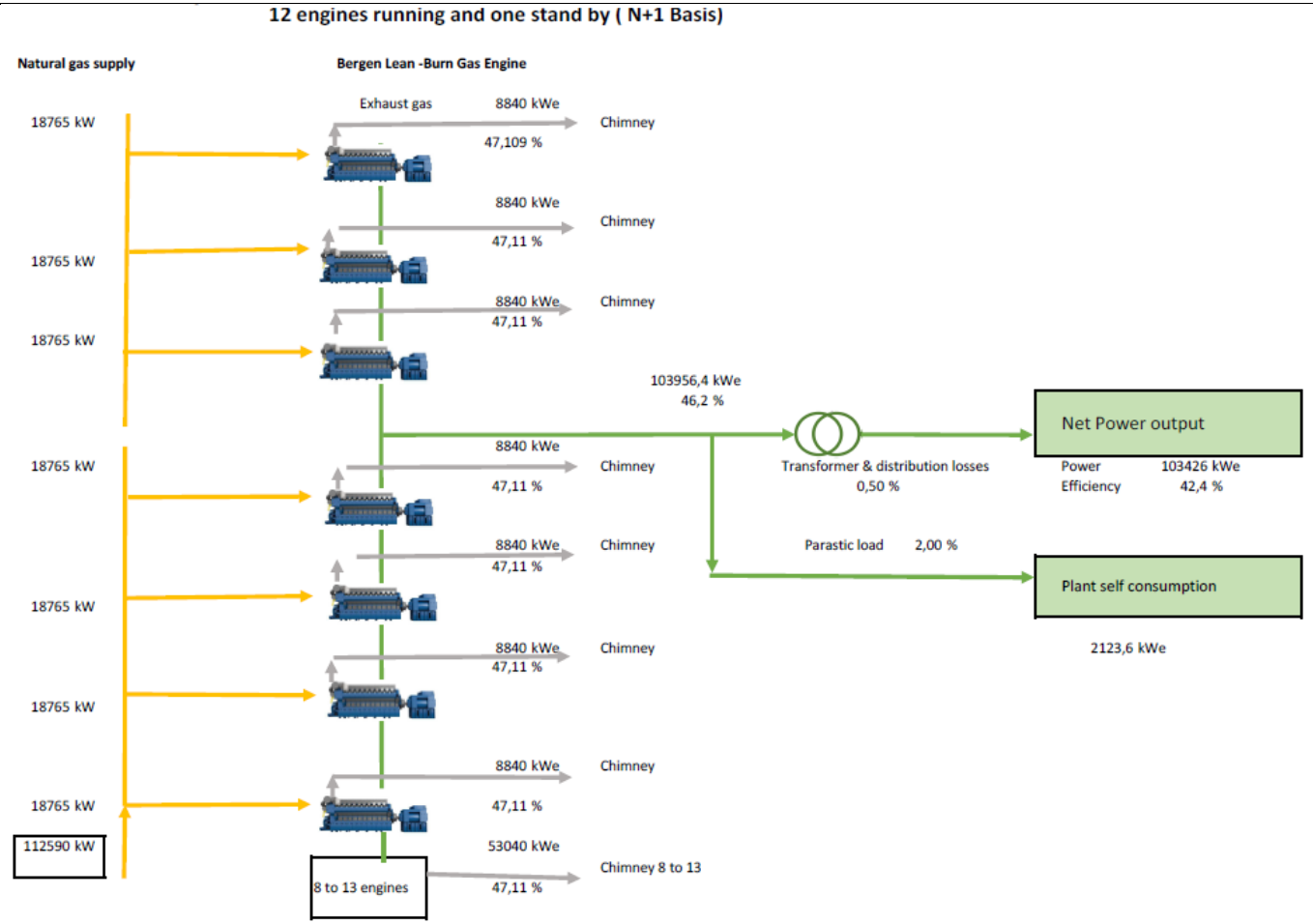


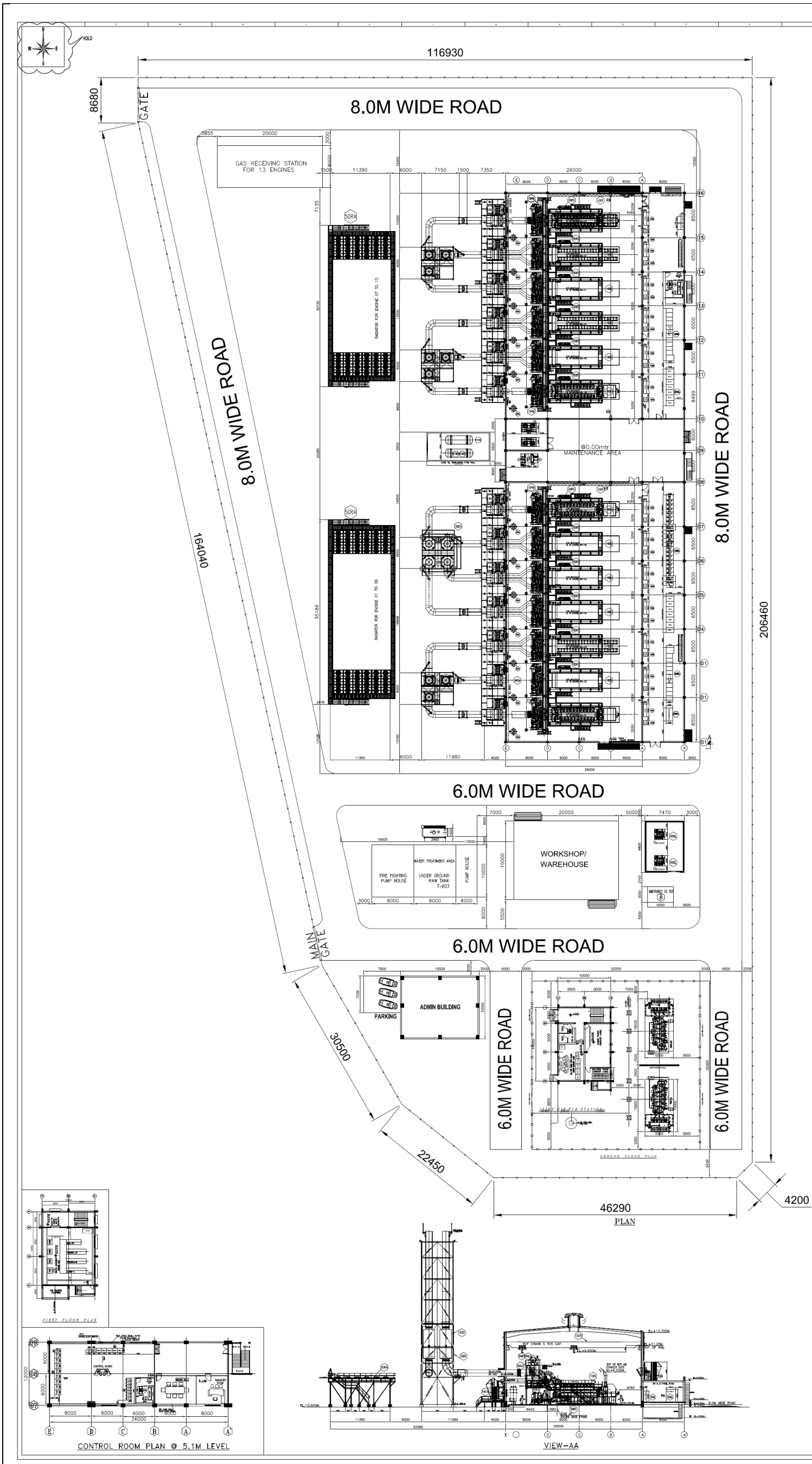
Figure 3-1: Conceptual block diagram



Note: 1. Fuel lower heating value: 36 MJ/nm^3
2. Natural gas methane no-80
3. Minimum gas pressure: 4.5 barg
4. Exhaust gas flow per engine: 49 900 kg/hr and exhaust gas temperature: 375 ÁC
5. Calculations are preliminary and may change later with detail engineering

srk consulting	NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT POWER PLANT PROCESS FLOW	Project No. 566508

Figure 3-2: Preliminary power plant process flow 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	-
-	SSDG 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:	Originator:	Date:	Scale:	Format:	Sheet:
XXXXXX	Rolls-Royce	13.10.2020	1:235	A0	01/02

Mass (Kg): NA | Drawing No: 13ST-11-001 | Revision: 1

THE INFORMATION IN THIS DOCUMENT IS THE PROPERTY OF BERGEN ENGINES - A ROLLS-ROYCE POWER SYSTEMS COMPANY. THE DOCUMENT IS NOT TO BE COPIED OR DOWNLOADED TO ANY THIRD PARTY OR USED FOR THE PURPOSE OF MANUFACTURE WITHOUT PRIOR PERMISSION. SUCH COPYRIGHT MUST NOT BE REMOVED, AND THE DOCUMENT MUST BE TREATED AS PRIVATE AND CONFIDENTIAL.

srk consulting

NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT
PROVISIONAL PLANT GENERAL ARRANGEMENT LAYOUT

Project No. 566508

Figure 3-3: Provisional plant general arrangement layout

4 Meteorological conditions

4.1 Climate conditions at the project site

Meteorological conditions affect how pollutants emitted into the air are directed, diluted and dispersed within the atmosphere. Incorporation of reliable meteorological data into an air quality assessment is therefore of the utmost importance.

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 used in the dispersion modelling assessment. A description of the CALMET-ready data set is provided in subsection 7.1.1. In addition, meteorological data was acquired from www.worldweatheronline.com for Newcastle (the project area). The South African Air Quality Information System (SAAQIS) indicates that there is a monitoring station capable of measuring meteorological parameters located at the Armscor Dam, however this station is currently not in operation. A summary of the meteorological parameters obtained from World Weather Online and Lakes Environmental is provided in Table 4-1. A discussion of rainfall and temperature conditions for the project site is presented in subsections 4.1.1 and 4.1.2 respectively. Wind field data from Lakes Environmental is also analysed in subsection 4.1.3.

Table 4-1: Summary of data acquired from January 2017 to December 2019 for this study

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

4.1.1 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.

Total monthly rainfall is presented in Table 4-2 for the 2017, 2018 and 2019. 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 4-1.

Table 4-2: Monthly rainfall for Newcastle

Month	2017	2018	2019
Units	mm	mm	mm
January	36.6	10.3	69.8
February	76.8	12.4	77.4
March	8.4	45.0	42.2
April	8.4	7.8	70.3
May	21.3	11.4	0.8
June	0.8	0.3	0.3

Month	2017	2018	2019
Units	mm	mm	mm
July	0.5	0.5	0.0
August	1.6	9.8	0.3
September	2.3	2.2	39.3
October	16.3	18.8	50.3
November	23.2	19.0	127.9
December	22.5	22.1	148.7
Total	**218.7**	**159.3**	**627.3**

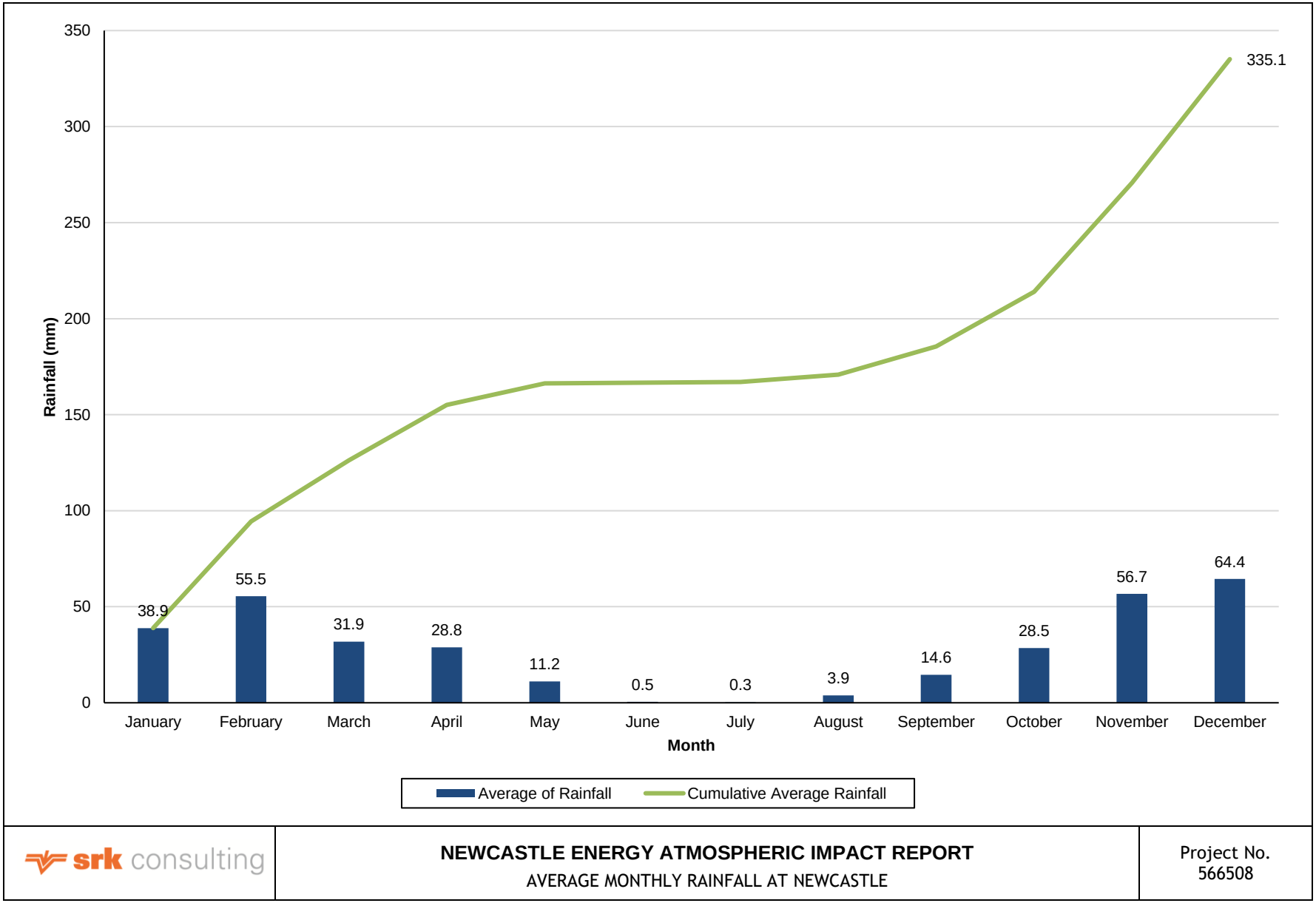


Figure 4-1: Average monthly rainfall for Newcastle for the period January 2017 to December 2019

4.1.2 Temperature

Ambient air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the emissions plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing depth and inversion layers.

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 Table 4-3 and Figure 4-2 below.

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

Table 4-3: Average monthly temperature for Newcastle (January 2017 to December 2019)

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

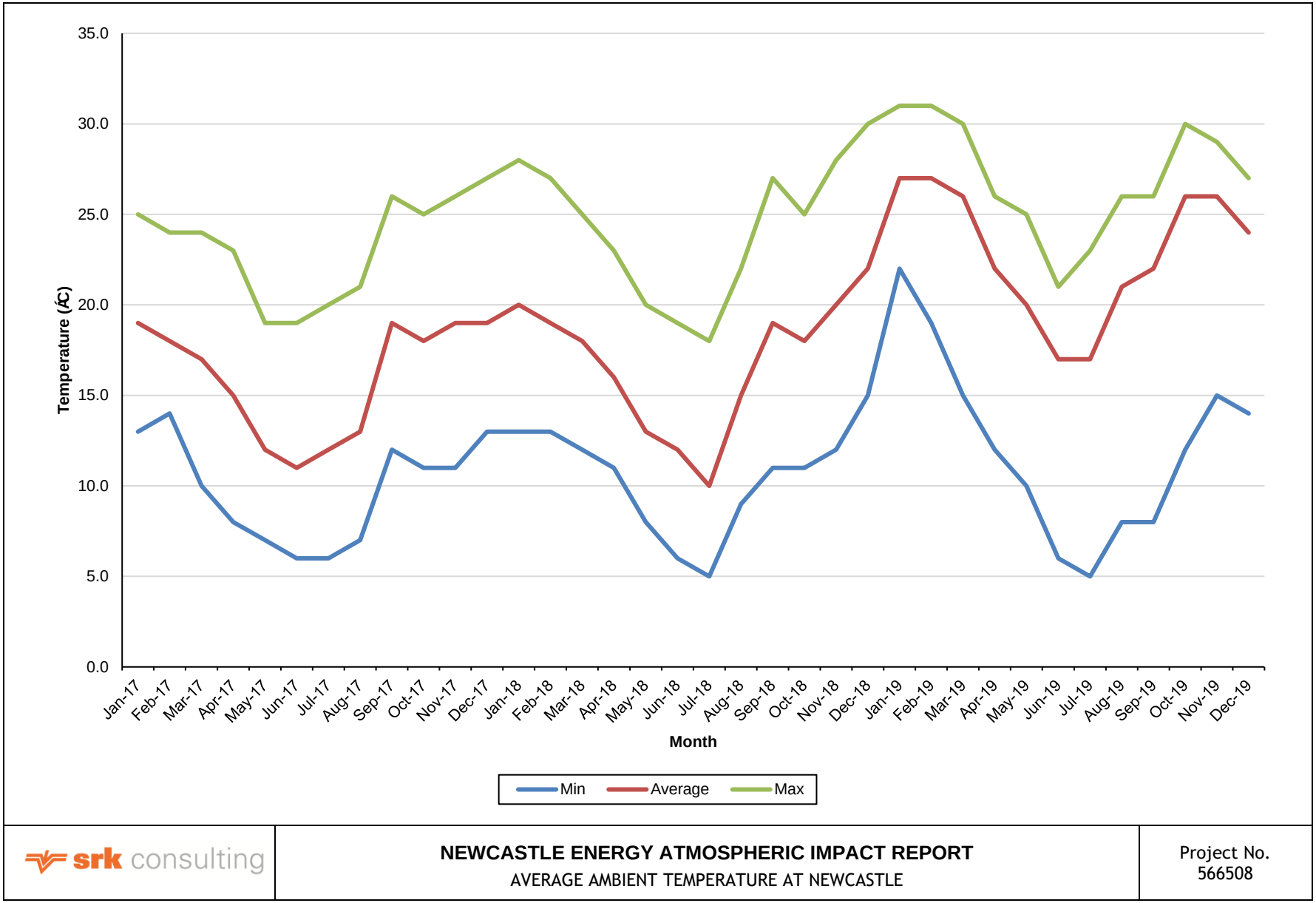


Figure 4-2: Average ambient temperatures for Newcastle for the period January 2017 to December 2019

4.1.3 Wind Field

The wind field for an area is an important parameter with respect to air quality. The degree to which wind field influences air pollution dispersion depends on wind speed and wind direction. Higher wind speeds result in larger plume travel distance and increased dilution of the pollutants while lower, more stable wind conditions result in shorter plume travel distances and build-up of air pollutant levels (with particular reference to gaseous pollutants) over a smaller area. Wind direction influences the spatial distribution of the plume.

Annual, day and night wind roses using wind field data have been generated in WRPLOT View V8.0.2. Figure 4-3 (a) - (d) show the period, day and night wind roses for 2017 to 2019.

Key findings are as follows:

- 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 6.97%.
- Day time (06:00 ï 18:00) wind speed average is 2.43 m/s with calm conditions at 10.78%.
- Night-time (18:00 ï 23:00) wind speed average is 2.45 m/s with calm conditions at 2.04%.
- Night-time (00:00 ï 06:00) wind speed average is 2.13 m/s with calm conditions at 3.29%.

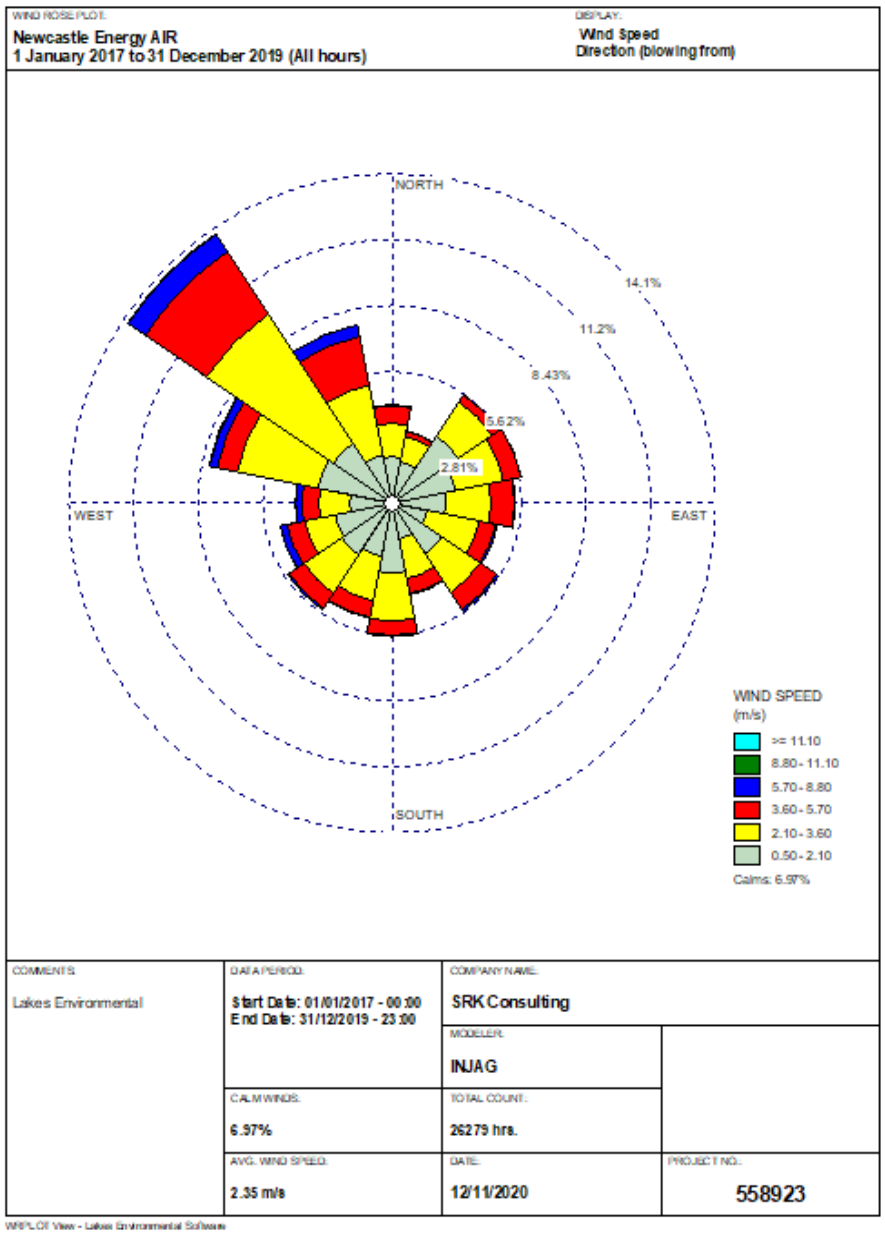


Figure 4-3 (a): All hours

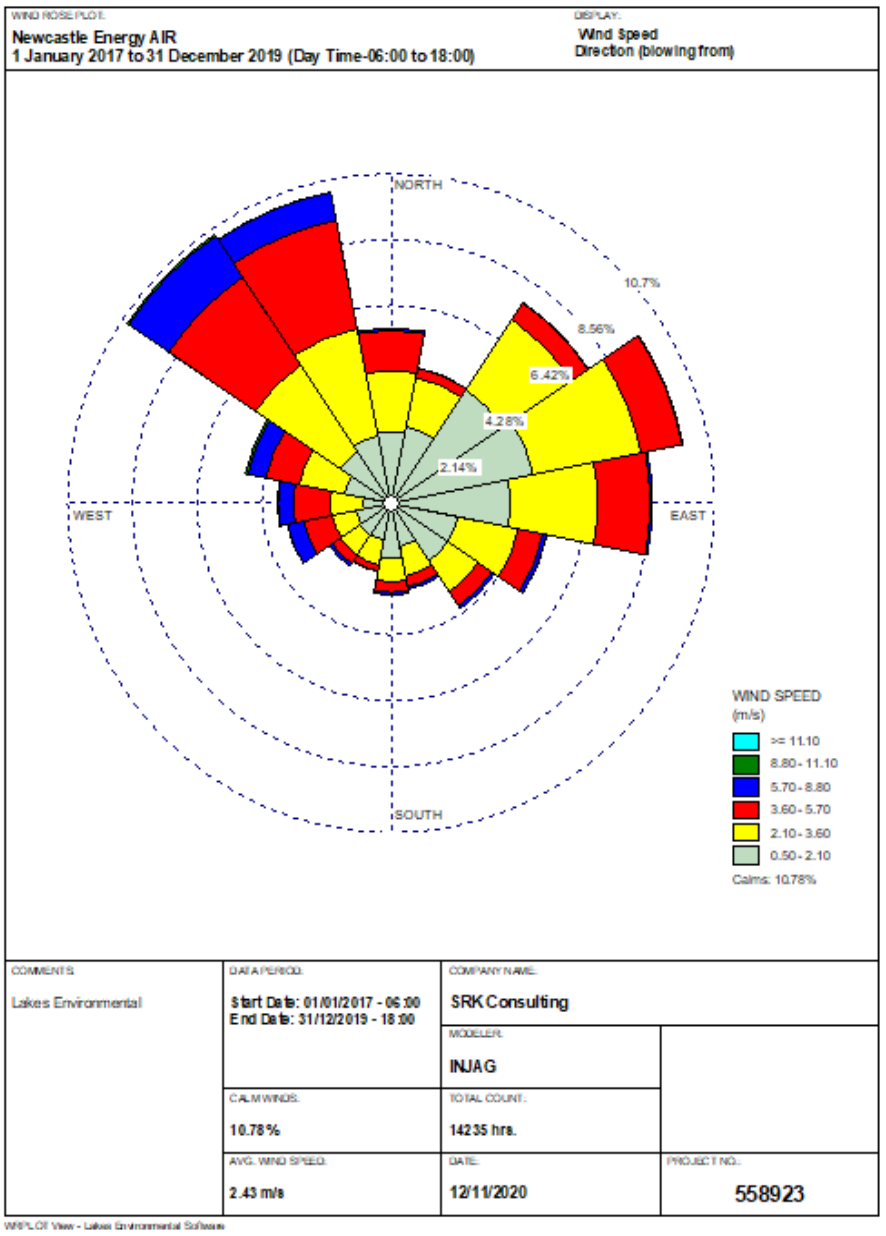


Figure 4-3 (b): (Day Time 06:00-18:00)

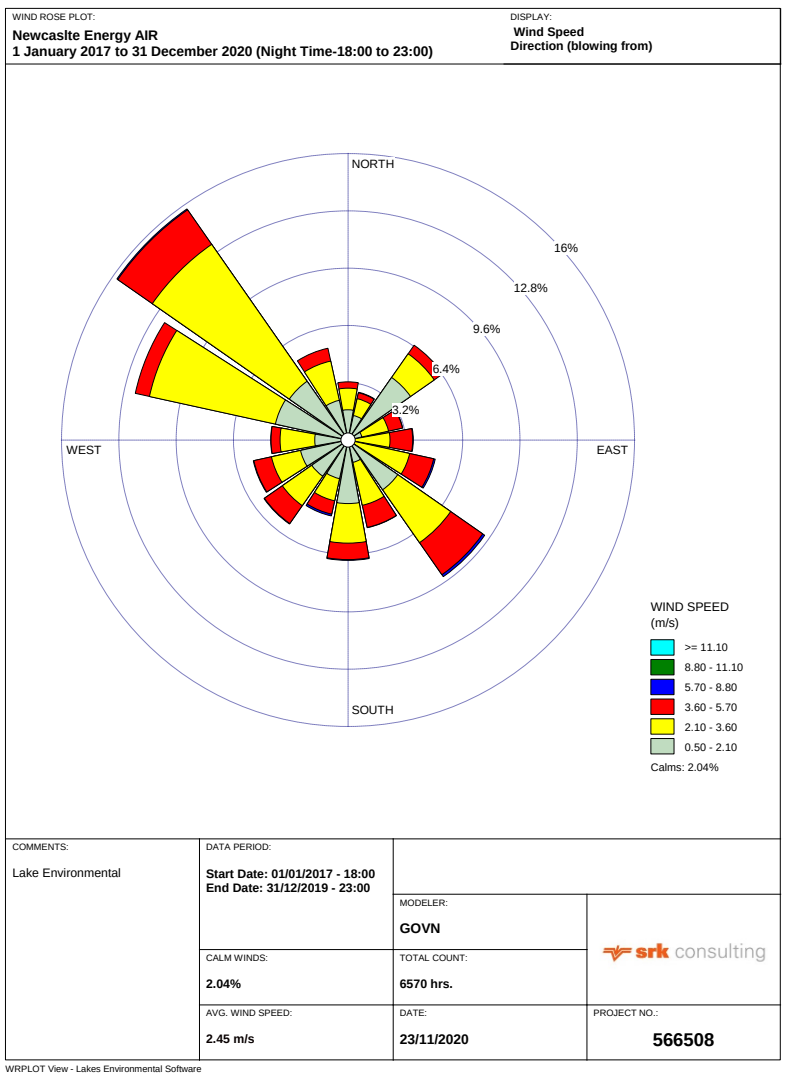


Figure 4-3 (c): (Night Time 18:00-23:00)

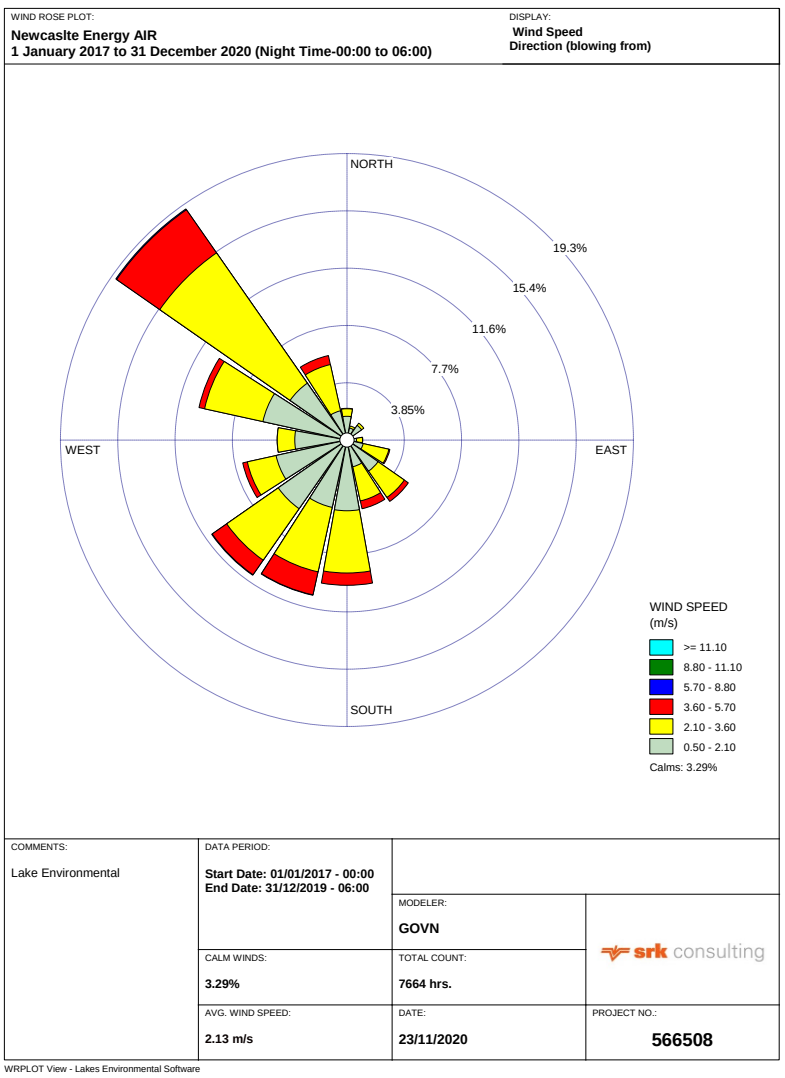


Figure 4-3 (d): (Night Time 00:00-06:00)

srk consulting	**NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT** ALL HOURS, DAY TIME AND NIGHT TIME WIND ROSES	Project No. 566508

Figure 4-3: All hours, day time and night time wind roses for January 2017 to December 2019

Seasonal wind roses are presented in Figure 4-4 (a) ï (d). The highest average wind speeds were recorded during spring with a speed of 2.71 m/s and calm conditions at 6.12%. The lowest average wind speeds were recorded in Autumn with speeds at 2.04 m/s and calm conditions at 8.27%.

During spring (Figure 4-4 (a)), winds from the north-northwest, northwest and west-northwest wind are predominant. During summer (Figure 4-4 (b)), these northwesterly winds are sustained however components of winds between the northeast to south-southwest occur more frequently than in spring. During autumn and winter (Figure 4-4 (c) and Figure 4-4 (d), respectively), the predominant northwesterly winds are still sustained however the frequency of winds occurring between the northeast to south are decreased and the there is a slight increase of winds occurring from the west-southwest, southwest and south-southwest.

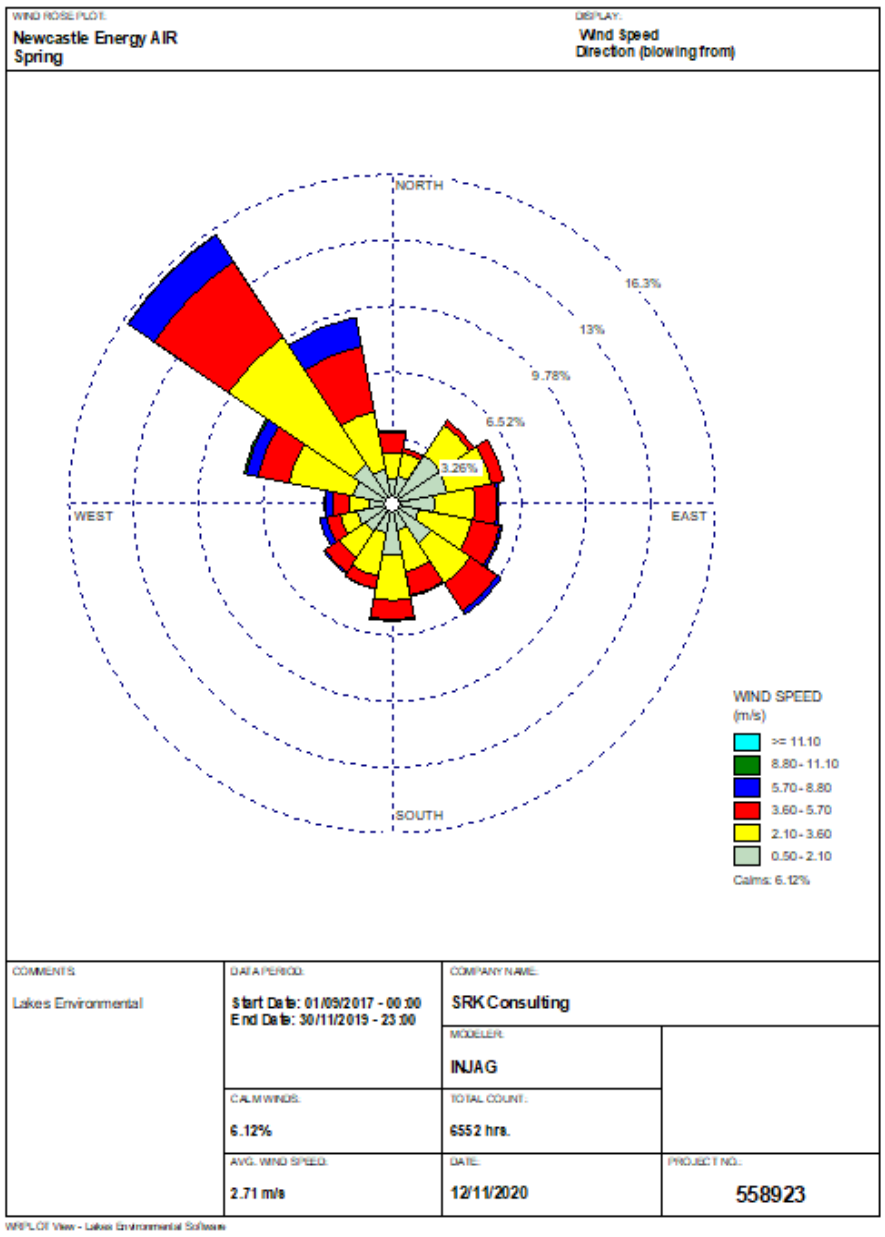


Figure 4-4 (a): Spring

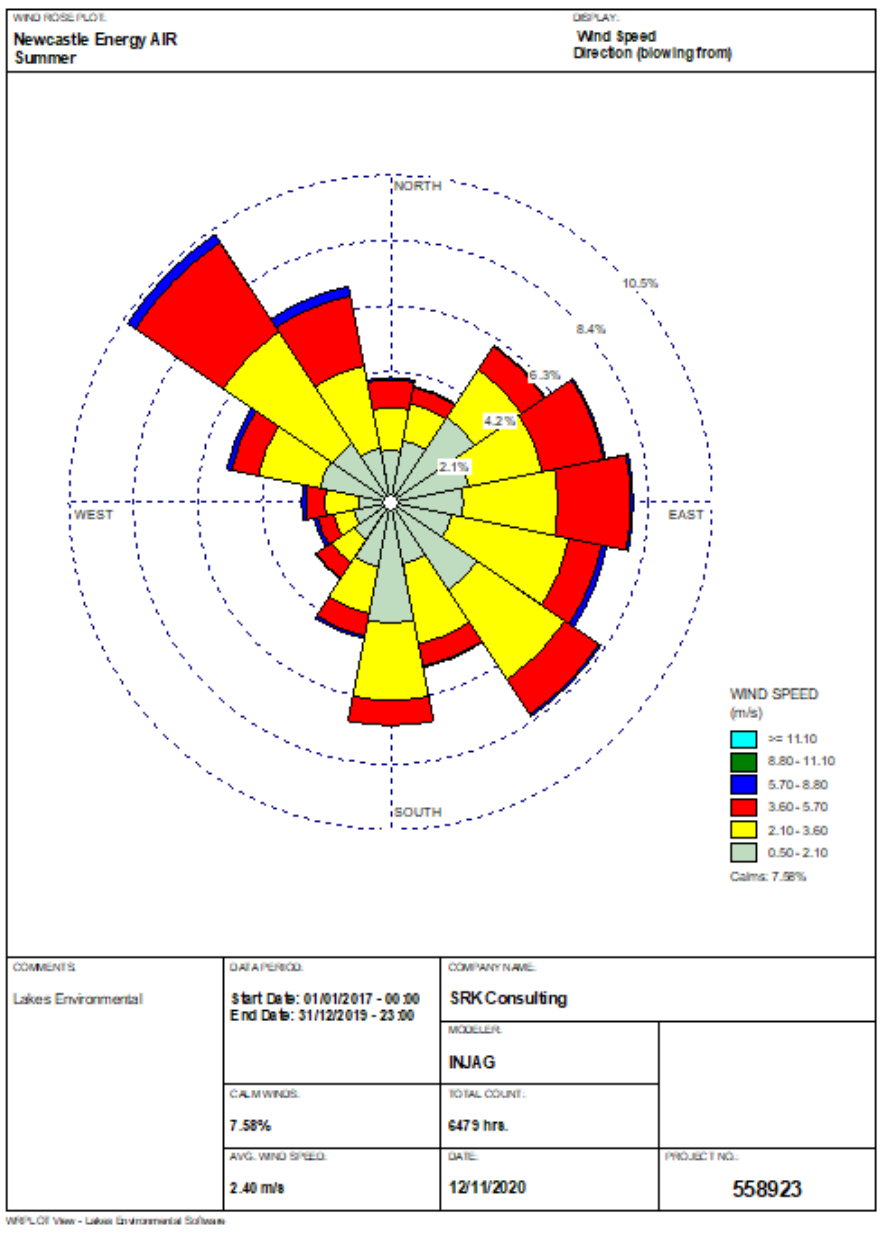


Figure 4-4 (b): Summer

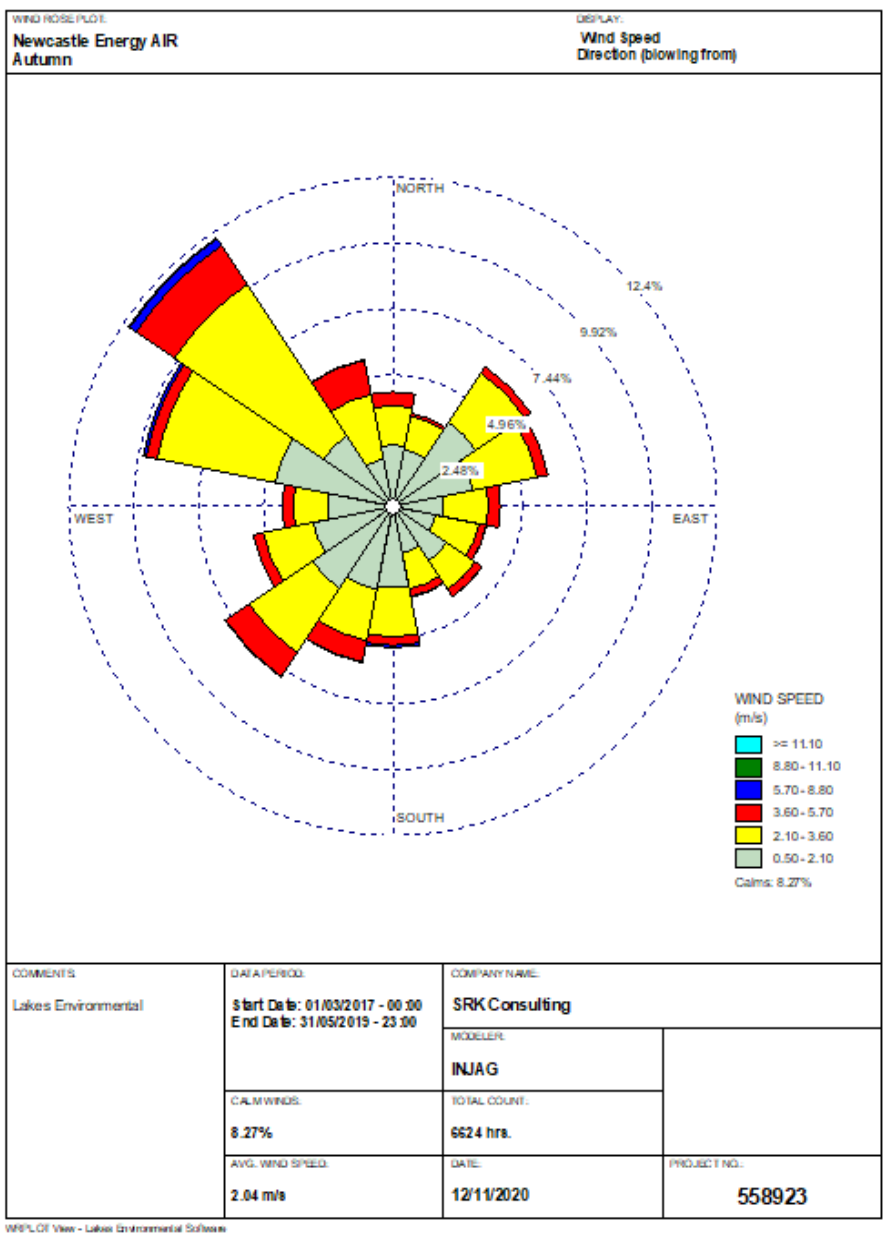


Figure 4-4 (c): Autumn

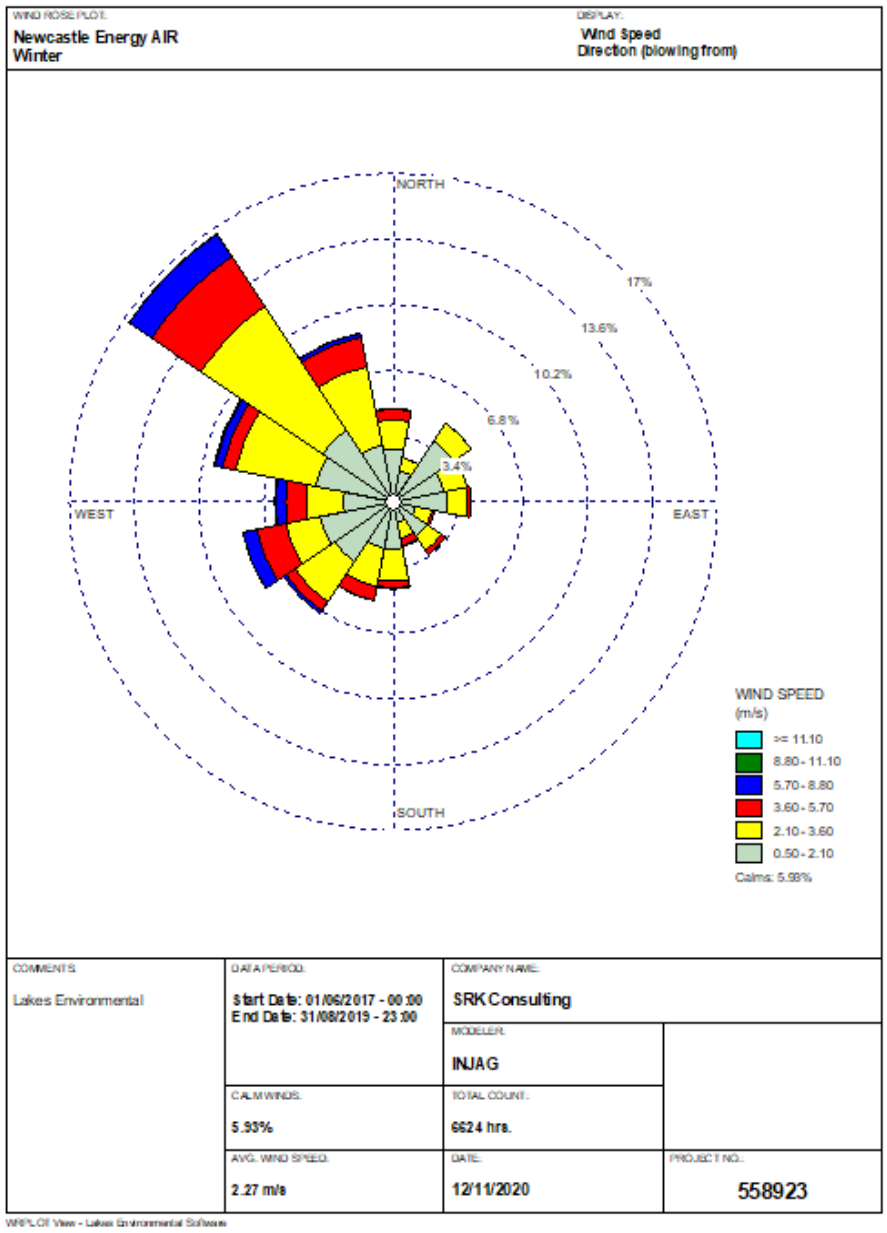


Figure 4-4 (d): Winter

srk consulting	NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT SEASONAL WIND ROSES	Project No. 566508

Figure 4-4: Seasonal wind roses for January 2017 to December 2019

5 Legislative Framework

In South Africa, the main legislation governing air quality is the NEM: AQA. As the overarching law regulating air quality within South Africa, the NEM: AQA aims to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development. Furthermore, the NEM: AQA outlines national norms and standards regulating air quality monitoring, management and control by all spheres of government.

The NEM: AQA introduces a system based on ambient air quality standards and corresponding emission limits to achieve these. Three significant regulations stemming from NEM: AQA have been promulgated in this regard and are as follows:

- Government Notice 1210 of 2009 (Government Gazette 32816): National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), National Ambient Air Quality Standards (NAAQS). Amendments were subsequently published in Government Notice 893 of 2013 (Government Gazette 37054).
- Government Notice 248 of 2010 (Government Gazette 33064): National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), List of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage. Amendments were subsequently published in Government Notice 893 of 2013 (Government Gazette 37054) and Government Notice 1207 of 2018 (Government Gazette 42013).
- Government Notice R533 of 2014 (Government Gazette 37804): regulations regarding air dispersion modelling

Further described in the following subsections are the relevant NAAQS and Minimum Emissions Standards (MES) as applicable to this assessment.

5.1 National Ambient Air Quality Standards

The NAAQS provide the goals for air quality management plans and the context within which the effectiveness of these management plans is measured. The NAAQS identifies priority pollutants, the determination of priority areas affected by these pollutants and the setting of ambient standards with respect to these pollutants within these areas.

5.1.1 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 5-1.

Table 5-1: Ambient air quality standards for NO_2

Standard	Maximum 1-hour Concentration	Annual Average Concentration
Units	Õg/m^3	Õg/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		

5.1.2 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 plantõs 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 Õm) are presented in Table 5-2. PM_{10} is important as it provides a measure of respirable dust, which has the potential to affect human health.

Table 5-2: Ambient air quality standards for PM_{10}

Standard	24-hour	Annual Average
Units	Õg/m^3	Õg/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		

5.1.3 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 5-3.

Table 5-3: Ambient air quality standards for CO

Standard	Maximum 1-hour Concentration	8-hour Average Concentration
Units	Õg/m^3	Õg/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		

5.1.4 Benzene

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 5-4 and is provided in this study for reference in the absence of a total VOC standard.

Table 5-4: Ambient air quality standards for benzene.

Standard	Annual Average Concentration
Units	Õg/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	

5.2 Minimum Emission Standards

The listed activity applicable for the NGEPP in terms of Section 21 of the NEM: AQA is Category 1: Combustion Installations, and specifically Subcategory 1.4: Gas Combustion Installations. The proposed project will require an Atmospheric Emission License (AEL) in terms of Section 21 of the 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, a description of Subcategory 1.4 and the standards that apply are presented in Table 5-5.

Table 5-5: Associated Minimum Emission Standards for Subcategory 1.4 (Gas Combustion Installations)

Description	Gas combustion (including gas turbines burning natural gas) used primarily for steam raising or electricity generation.		
Application	All installations with design capacity equal to and greater than 50 MW heat input per unit, based on the lower calorific value of the fuel used.		
Substance or mixture of substances		**Plant Status**	**mg/Nm^3 under normal conditions of 3% O_2, 273 Kelvin and 101.3 kPA**
Common Name	**Chemical symbol**		
Particulate matter	N/A	New	10
		Existing	10
Sulphur dioxide	SO_2	New	400
		Existing	500
Oxides of nitrogen	NO_x expressed as NO_2	New	50
		Existing	300

The following special arrangements shall apply - *Reference conditions for gas turbines shall be 15% 02, 273K and 101.3kPa*

6 Ambient Background Concentrations

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 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 Department of Environment, Forestry and Fisheries (DEFF). The system is informed by 42 air quality monitoring stations across South Africa. The SAAQIS has a monitoring station located at the Armscor Dam but 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. Information regarding the current state of the Newcastle airshed was thus 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):

- Newcastleôs 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 a 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.

7 Dispersion Modelling Methodology

Air pollution dispersion models can calculate ambient concentrations and deposition levels as a function of emission source parameters, emission rates, terrain features and meteorological conditions. These models are useful tools in determining spatial and temporal patterns in the ground level concentrations and deposition attributed to emissions from various sources. As per the Regulations Regarding Air Dispersion Modellingô (GNR 533 of 2014), hereafter ñModelling Regulationsò, the level of assessment is dependent on technical factors such as geophysical and meteorological context and the complexity of the emissions inventory. The temporal and spatial resolution and accuracy required from a model must also be considered.

7.1 Model Used and Model Input Parameters

The California Puff (CALPUFF) model, which was employed in this assessment, uses an integrated Lagrangian puff modelling system. This system incorporates source related factors and meteorological factors to estimate pollutant concentration from point sources continuously.

The United States Environmental Protection Agency (US EPA) CALPUFF View 8.4 modelling software package was used to model particulate and gaseous emissions resulting from the NGEPP operations. This air dispersion model is designed for long-range dispersion of airborne pollutants in puff plumes

and is the recommended Level 3 model prescribed in the Modelling Regulations. The following input parameters were used to inform the model and will be discussed in the sections that follow:

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

7.1.1 Meteorological data

The CALPUFF model requires hourly average meteorological data as input, including wind speed, wind direction, a measure of atmospheric turbulence, ambient air temperature and mixing height. In the absence of suitable long term hourly on-site data sets for all the input parameters required for modelling, as previously mentioned in Section 4.1 , a 3-year model ready meteorological dataset was purchased from Lakes Environmental. The Lakes Environmental data is based on Fifth Generation Mesoscale Model (MM5) that is generated in the 3D.DAT format. This format comprises of three-dimensional data over many vertical layers in a horizontal grid. For this model simulation exercise, hourly meteorological data for the period 1 January 2017 to 31 December 2019 was used.

7.1.2 Description of receptor grid

As defined in the Modelling Regulations (2014), ambient air quality objectives are applied to areas outside the facility fenceline (i.e. beyond the facility boundary). Within the facility boundary, environmental conditions are prescribed by occupational health and safety criteria. In terms of the Modelling Regulations, the facility boundary is defined on these criteria:

- The facility fenceline or the perimeter where public access is restricted.
- If the facility is located within another facility boundary, it is the boundary of the encompassing facility.
- If a public access road passes through the facility, it is the perimeter along the road allowance.

The size of the Cartesian (X:Y) grid area is larger than the NGEPP project area in order to determine the extent of the pollutant plume beyond the plant boundary. The modelling domain, centered around the facility, extends for 22.5 km from east to west and 22.5 km from north to south.

7.1.3 Specified Sensitive Receptors

A key part of the assessment process is to identify potential sensitive receptors for which impact predictions can be made. Sensitive receptors are sites of potential health impact. Examples of sensitive receptors include schools, shopping centers, hospitals, office blocks and residential areas. A list of potential sensitive receptors within a 10 km radius of the project site are presented in Table 7-1 and Figure 7-1. These receptors were selected on the basis of population exposure and comprise suburbs, industries and commercial enterprises.

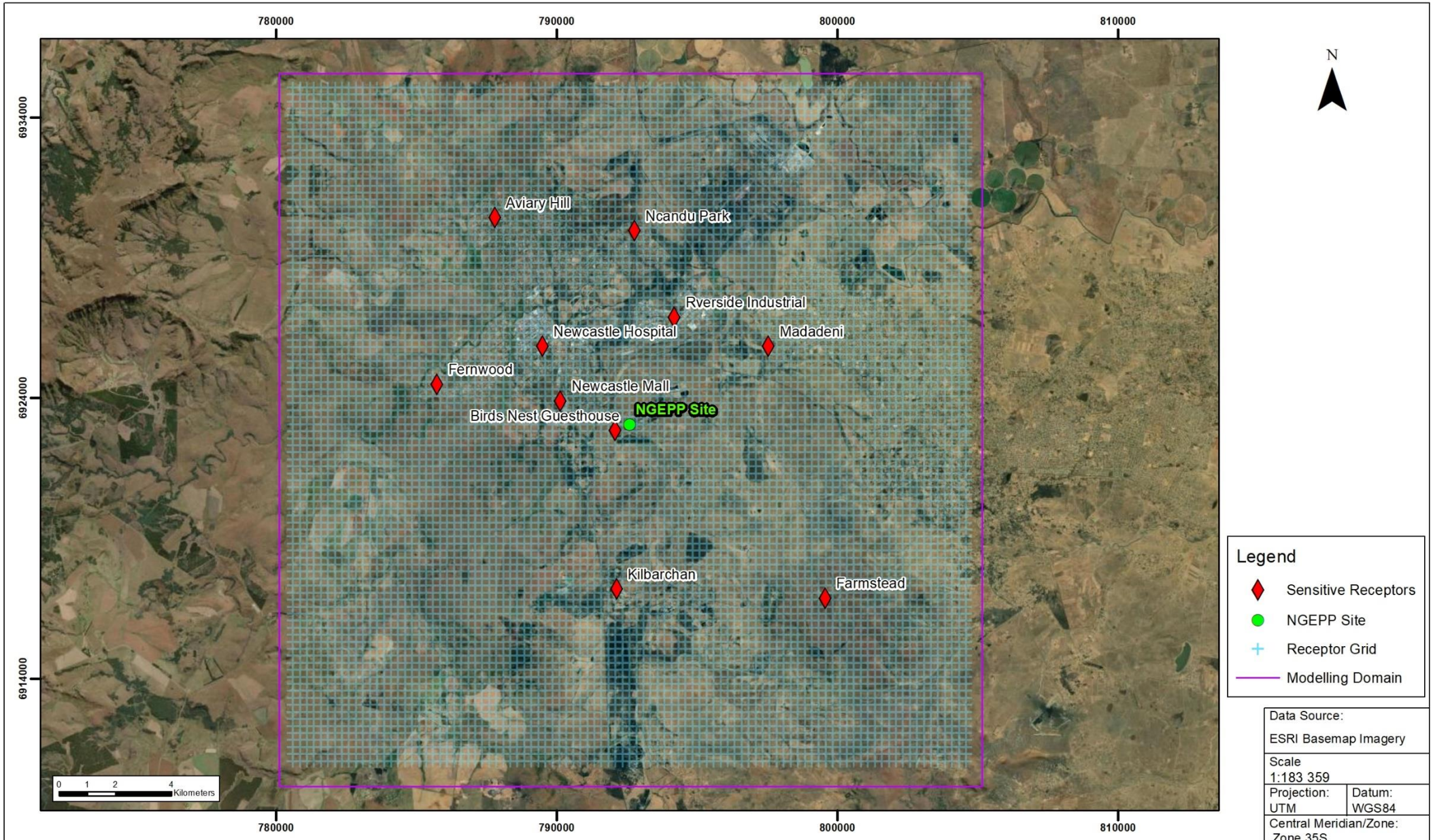
Table 7-1: Sensitive receptors included in the model

Receptor	Distance from Site (km)	X UTM m E	Y UTM m S
Birds Nest Guesthouse	0.5	792090	6922840
Newcastle Mall	2.6	790132	6923896
Fernwood	7	785732	6924493
Farmstead	9.3	799544	6916916

Receptor	Distance from Site (km)	X UTM m E	Y UTM m S
Madadeni	5.7	797549	6925845
Newcastle Hospital	4.2	789492	6925845
Aviary Hill	8.8	787796	6930422
Ncandu Park	7.0	792769	6929964
Kilbarchan	5.9	792137	6917197
Riverside Industrial	4.1	794193	6926880

7.1.4 Description of Topographical Data

Topography can influence meteorological parameters (such as temperature inversions, local wind circulations, etc.) that may worsen or improve air quality on a local scale. The ñGeo pre-processoró section in the model was used to set the elevation characteristics across the modelling domain, which assumes that the receptors, such as towns/villages, may potentially be above the source base. Terrain data downloaded from WebGIS (www.webgis.com) for the study area was processed using the ñGeoò processor function in CALPUFF and imported into the model, yielding a 3D-model and because of this, all identified receptors were assigned heights when inserted into the model. A topographical map is presented in Figure 7-2. In a west to east direction across the site, elevations vary between 1 183.4 to 1 317.4 meters above mean sea level (mamsl). In a north to south direction across the site elevations vary between 1 187.2 to 1 306.5 mamsl.



Data Source: ESRI Basemap Imagery	
Scale 1:183 359	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: Zone 35S	
Date: 23/11/2020	Compiled by: INBRO
Project No. 566508	Fig No. 7-1

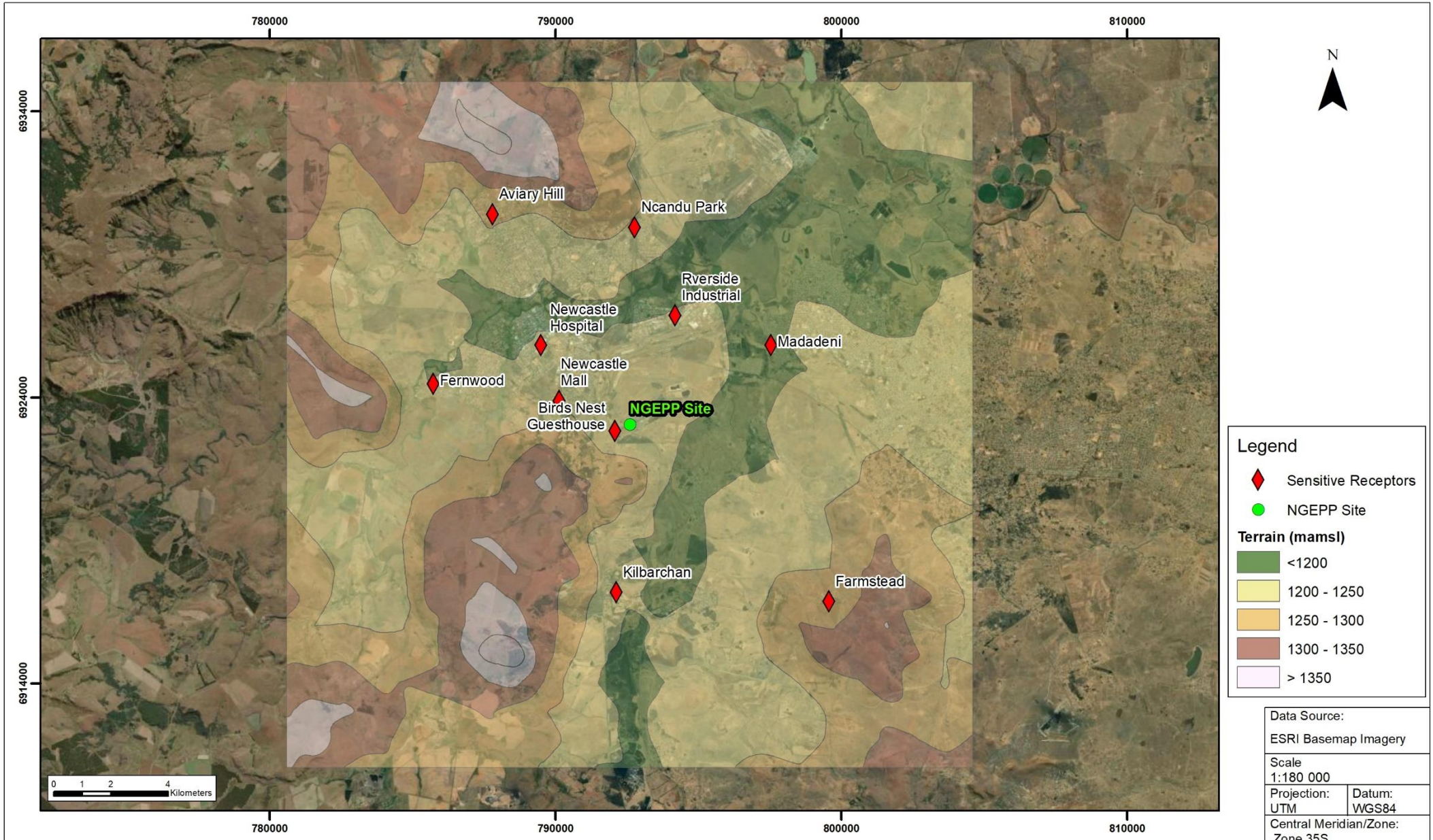
srk consulting

NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT

RECEPTOR GRID

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\AQ\566508_F7-1_NGEPP_AQ_Recptor_Grid_A4CL_20201123.mxd

Revision: A Date: 08 12 2020



Data Source: ESRI Basemap Imagery	
Scale 1:180 000	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: Zone 35S	
Date: 23/11/2020	Compiled by: INBRO
Project No. 566508	Fig No. 7-2

srk consulting

NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT

TERRAIN OF THE PROJECT AREA

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\AQ\566508_F7-2_NGEPP_AQ_Terrain_A4CL_202011231.mxd

Revision: A Date: 02 12 2020

7.1.5 Emission Inventory

An emissions inventory was developed for the proposed NGEPP project. The emission inventory outlines types of pollutants and emission rates for each of the relevant sources at the proposed thermal power generating plant. Stacked physical parameters (which were obtained from the client) and estimated stack emission rates (based on performance data sourced for 13 Rolls-Royce (Bergen B3540V20) gas engines) are presented in Table 7-3. Note that all 13 stacks were included in the air dispersion model.

Table 7-2: **Stack emission source parameters**

Stack	Height	Diameter	Dry Gas Velocity	Area of Stack	Gas Temperature	NO_2	CO	NMHC	PM
Units	m	m	m/s	m^2	ÁC	g/s	g/s	g/s	g/s
Stack 1	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 2	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 3	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 4	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 5	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 6	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 7	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 8	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 9	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 10	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 11	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 12	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5
Stack 13	33	1.2	26	1.13	375	5.4	8.2	2.4	1.5

7.1.6 Selection of Model Output Statistics

The model output statistics which were used for the figures and tables that follow, are representative of 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 projectôs 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 but rather a statistical distribution of the fifth highest 24-hour average PM_{10} concentrations over the modelling period.

7.2 Assumptions and limitations

The following assumptions have been made for the 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 emissions from vehicles onsite were not assessed as these were considered negligible.
- Due to poor data recovery from the ambient air quality monitoring station at the Armscor Dam, a cumulative assessment for the proposed project could not be undertaken.

8 Dispersion Modelling Results

Predicted long-term (period average) and short term (P99 1-hour and 24-hour) average concentrations for the pollutants of concern (i.e. NO_2, CO, PM_{10} and NMHC) were simulated using the US EPA approved CALPUFF dispersion model. Concentration results at specified sensitive receptors are presented in tabular format, while concentration isopleths are presented graphically 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.

The predicted plume isopleths predominantly disperse in a south easterly direction across the site due to the prevailing wind direction from the northwest due to topography of the area, as the plume disperses to the south east (which typically decrease with the distance away from the site) and merge near an area of high elevations (approximately 9km away from the proposed facility). This results in similar concentrations predicted around the fence line of the facility occurring offsite.

8.1 NO_2 Concentrations Modelled

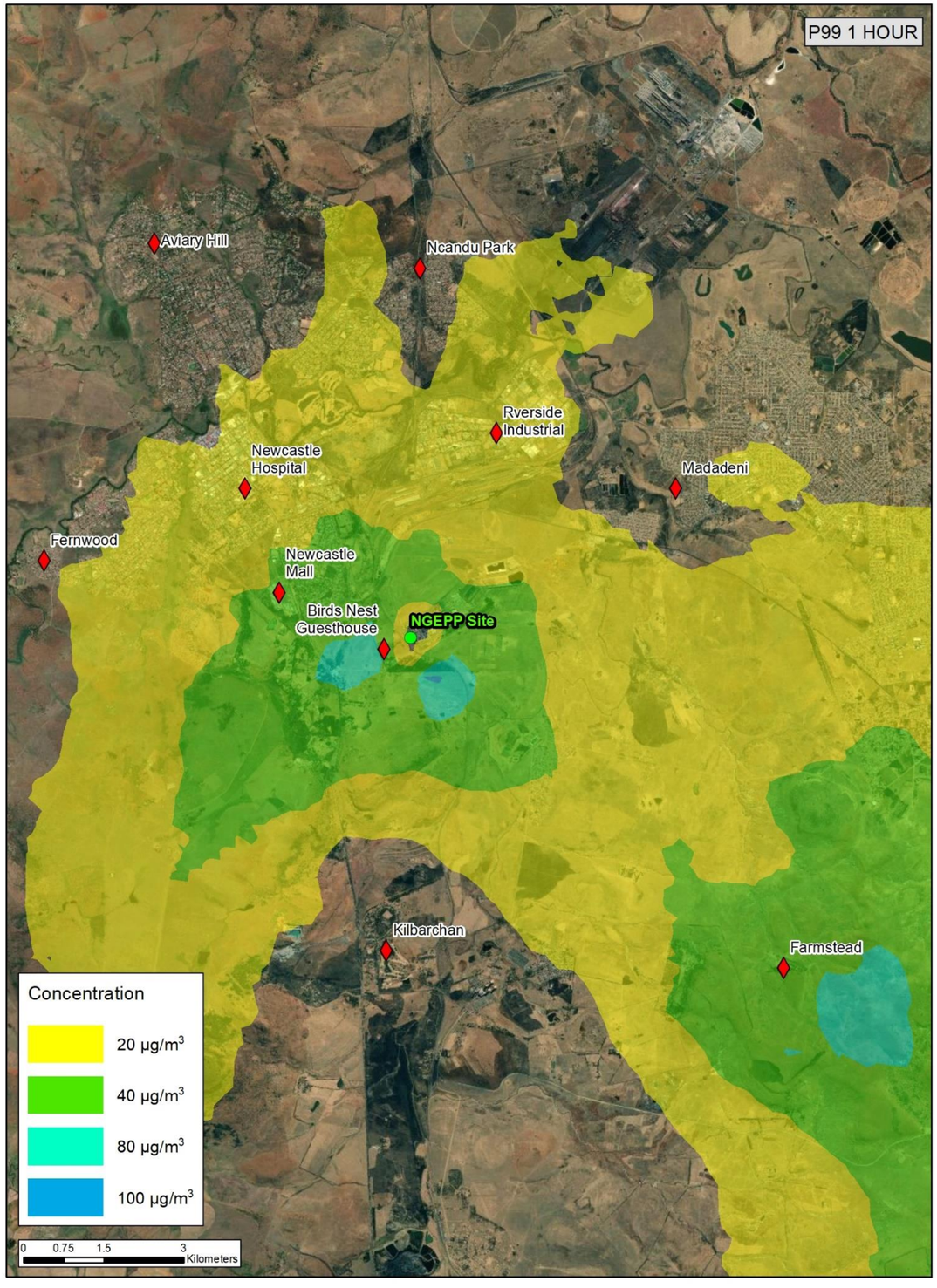
The predicted ambient NO_2 concentrations from the proposed NGEPP project at each discrete receptor, as well as the maximum predicted concentration, are presented in Table 8-1 while plume isopleths are presented in Figure 8-1. Long-term (3- year period average) and short-term (P99 1-hour average) predicted NO_2 concentrations have been compared with the relevant NAAQS of 40 Õg/m^3 and 200 Õg/m^3 respectively.

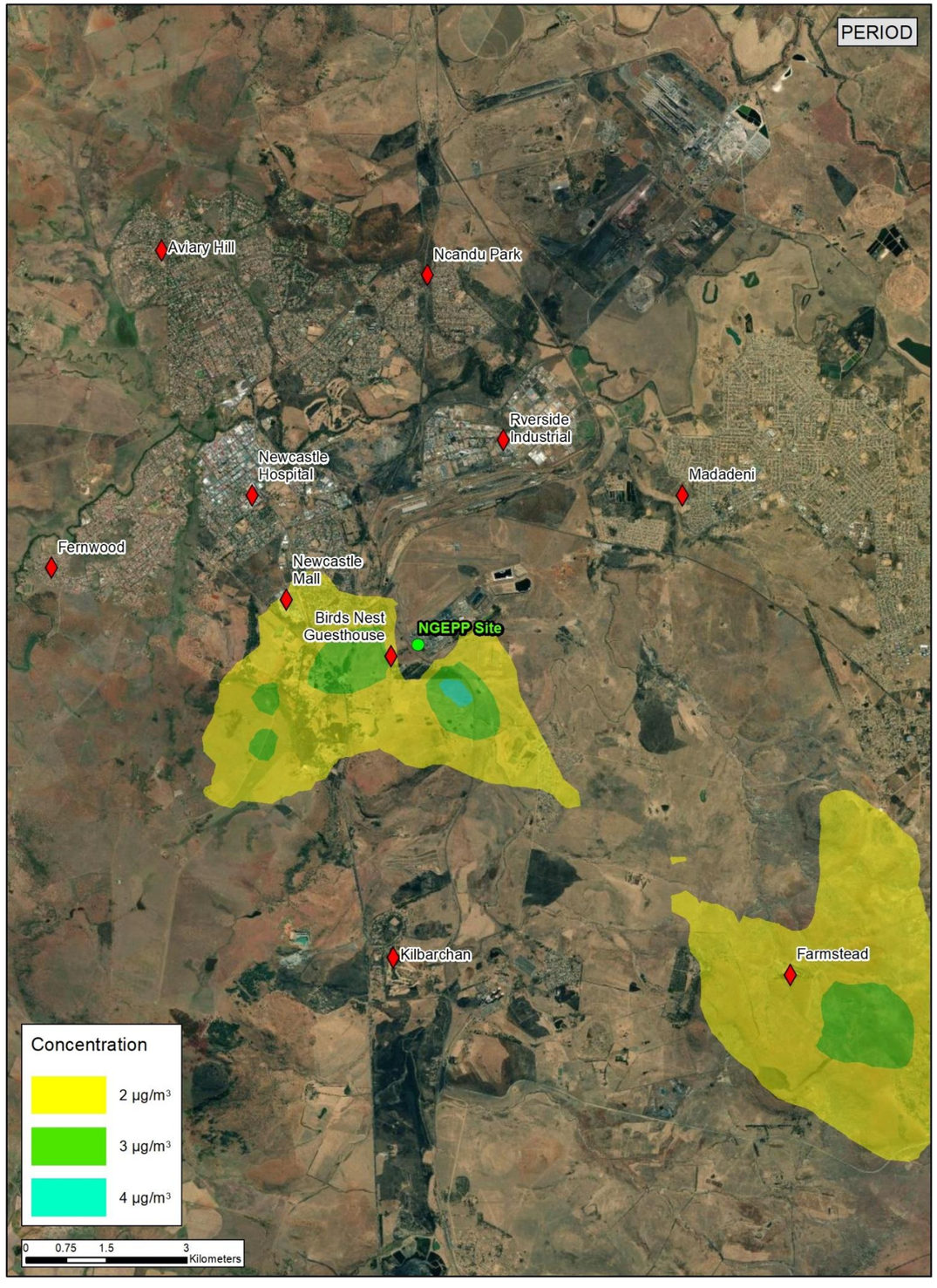
Predicted P99 1-hour NO_2 concentrations at sensitive receptors range from 10.8 Õg/m^3 (Kilbarchan) to 64.4 Õg/m^3 (Birds Nest Guesthouse). The maximum offsite predicted P99 1-hour average NO_2 concentration of 102.1 Õg/mį is below the respective NAAQS of 200 Õg/mį

Predicted period NO_2 concentrations at sensitive receptors range from 0.5 Õg/m^3 (Kilbarchan) to 2.5 Õg/m^3 (Birds Nest Guesthouse). The maximum offsite predicted period average NO_2 concentration of 4.4 Õg/mį is below the respective NAAQS of 40 Õg/mį.

Table 8-1: Predicted NO_2 concentrations at the sensitive receptors

Sensitive Receptor	P99 1-hour average	Period average
Units	Õg/mį	Õg/mį
Birds Nest Guesthouse	64.4	2.5
Newcastle Mall	43.7	2.1
Fernwood	18.5	0.8
Farmstead	48.0	2.2
Madadeni	17.5	0.8
Newcastle Hospital	25.8	1.1
Aviary Hill	15.6	0.6
Ncandu Park	18.3	0.8
Kilbarchan	10.8	0.5
Riverside Industrial	24.0	0.9
Farmstead	53.3	2.2
Maximum predicted concentration	102.1	4.4
NAAQS	**200**	**40**





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: 8-1

srk consulting

NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT

PREDICED NO_2 EMISSIONS

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\AQ\566508_F8-1_NGEPP_AQ_NO2_A3CL_20201117_.mxd

Revision: A Date: 02 12 2020

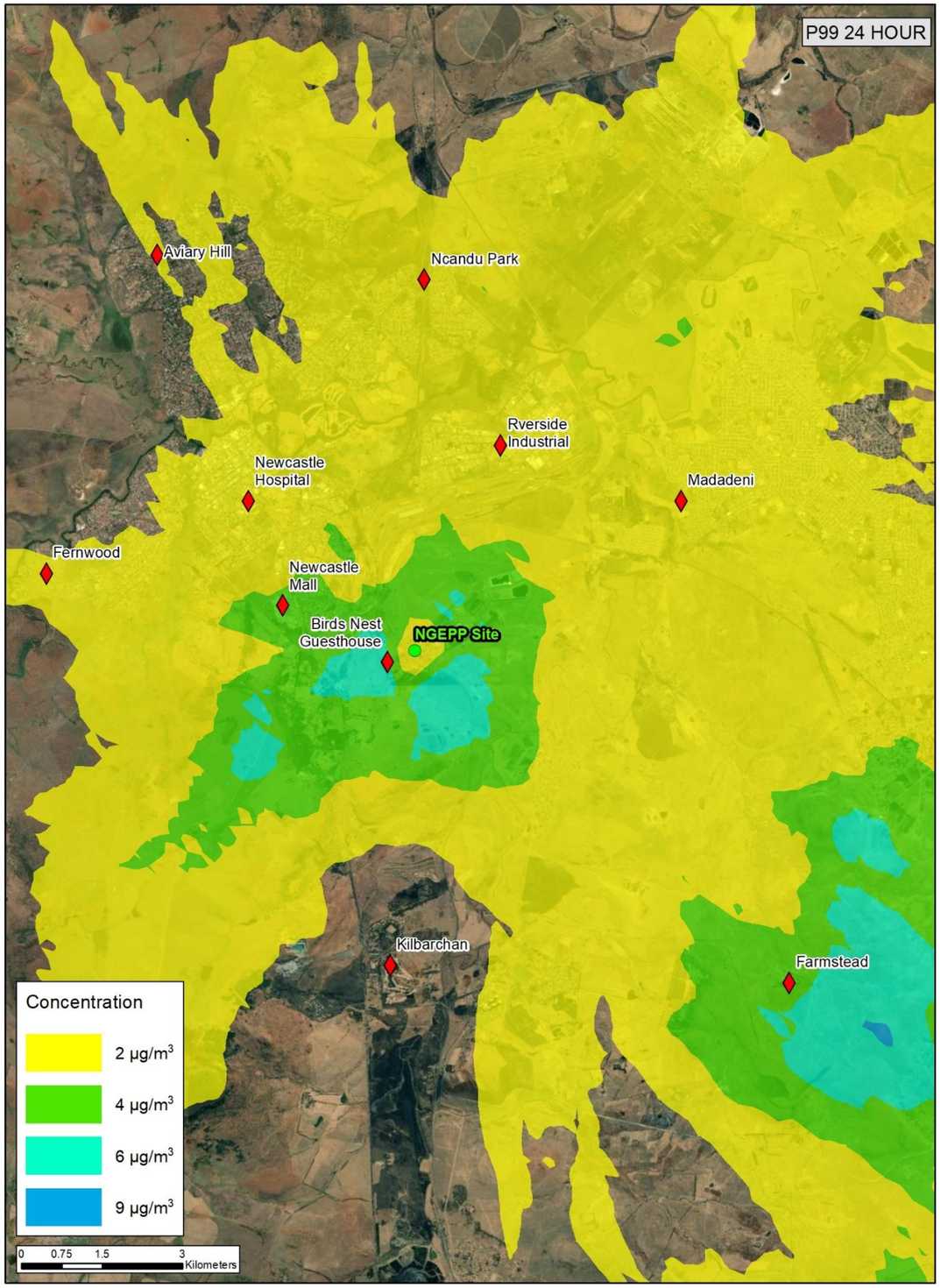
8.2 PM_{10} concentrations modelled

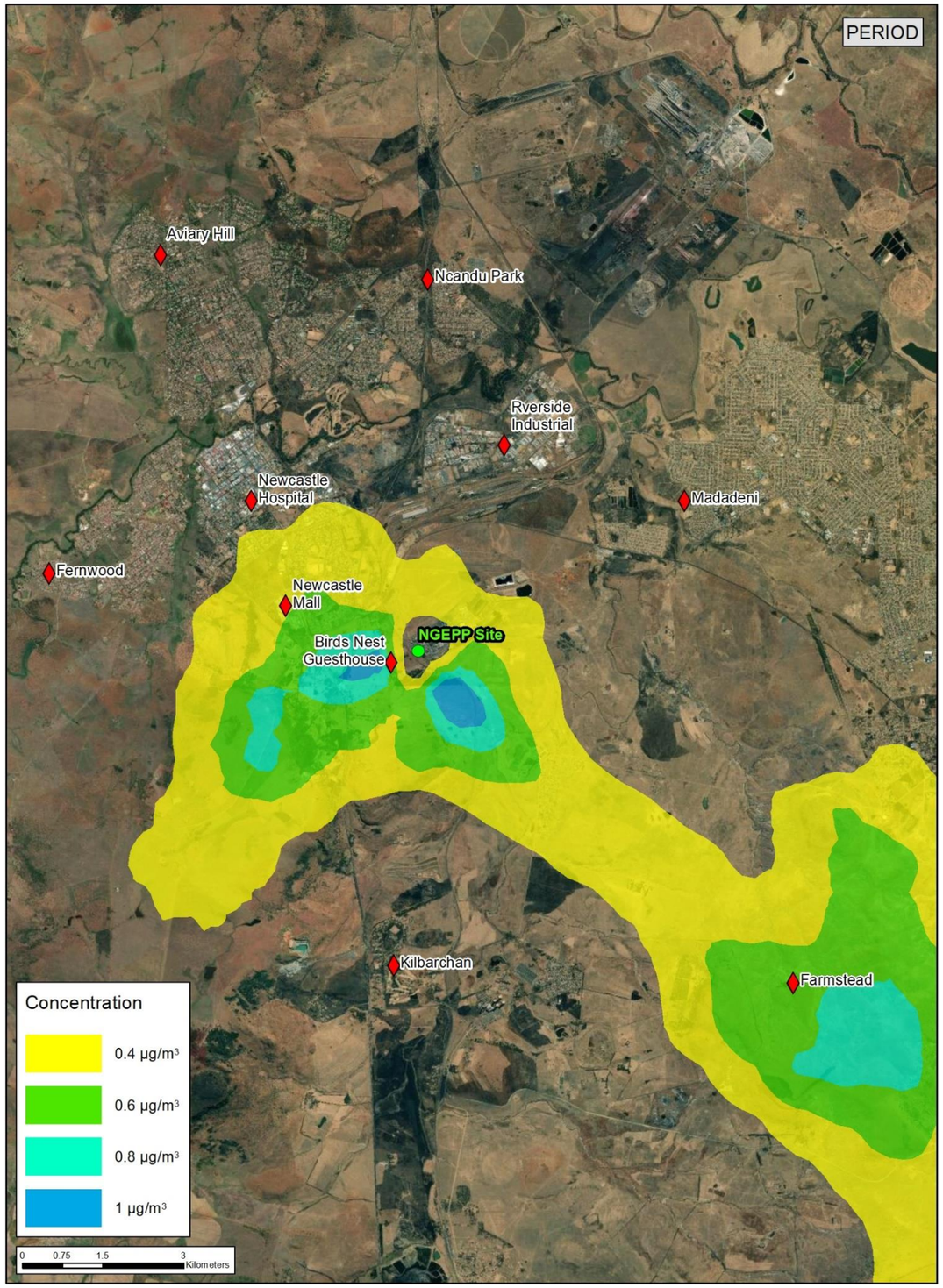
The predicted ambient PM_{10} concentrations from proposed NGEPP project at each discrete receptor, as well as the maximum predicted offsite concentrations, are presented in Table 8-2 while plume isopleths are presented in Figure 8-3. Long-term (3- year period average) and short-term (P99 24-hour average) predicted PM_{10} concentrations have been compared with the relevant NAAQS. It is highlighted that it was conservatively assumed that all TPM emitted was in the PM_{10} size fraction.

Predicted P99 24-hour PM_{10} concentrations at sensitive receptors range from 1.1 Õg/m³ (Kilbarchan) to 6.5 Õg/m³ (Birds Nest Guesthouse). The maximum offsite predicted P99 24-hour PM_{10} concentration of 9.4 Õg/m³ is below the respective NAAQS of 75 Õg/mį. Predicted period PM_{10} concentrations at sensitive receptors range from 0.1 Õg/m³ (Kilbarchan) to 0.7 Õg/m³ (Birds Nest Guesthouse). The maximum offsite predicted period PM_{10} concentration of 1.2 Õg/m³ is below the respective NAAQS of 40 Õg/mį.

Table 8-2: Predicted PM_{10} concentrations at the sensitive receptors

Sensitive Receptor	P99 24-hour	Period
Units	Õg/mį	Õg/mį
Birds Nest Guesthouse	6.5	0.7
Newcastle Mall	4.3	0.6
Fernwood	2.2	0.2
Farmstead	4.1	0.6
Madadeni	2.6	0.2
Newcastle Hospital	2.4	0.3
Aviary Hill	2.1	0.2
Ncandu Park	2.7	0.2
Kilbarchan	1.1	0.1
Riverside Industrial	3.2	0.3
Farmstead	5.0	0.6
Maximum predicted concentration	9.4	1.2
NAAQS	**75**	**40**





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: 8-2

srk consulting

NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT

PREDICED PM_{10} EMISSIONS

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\AQ\566508_F8-2_NGEPP_AQ_PM10_A3CL_20201218.mxd

Revision: A Date: 02 12 2020

8.3 CO concentrations modelled

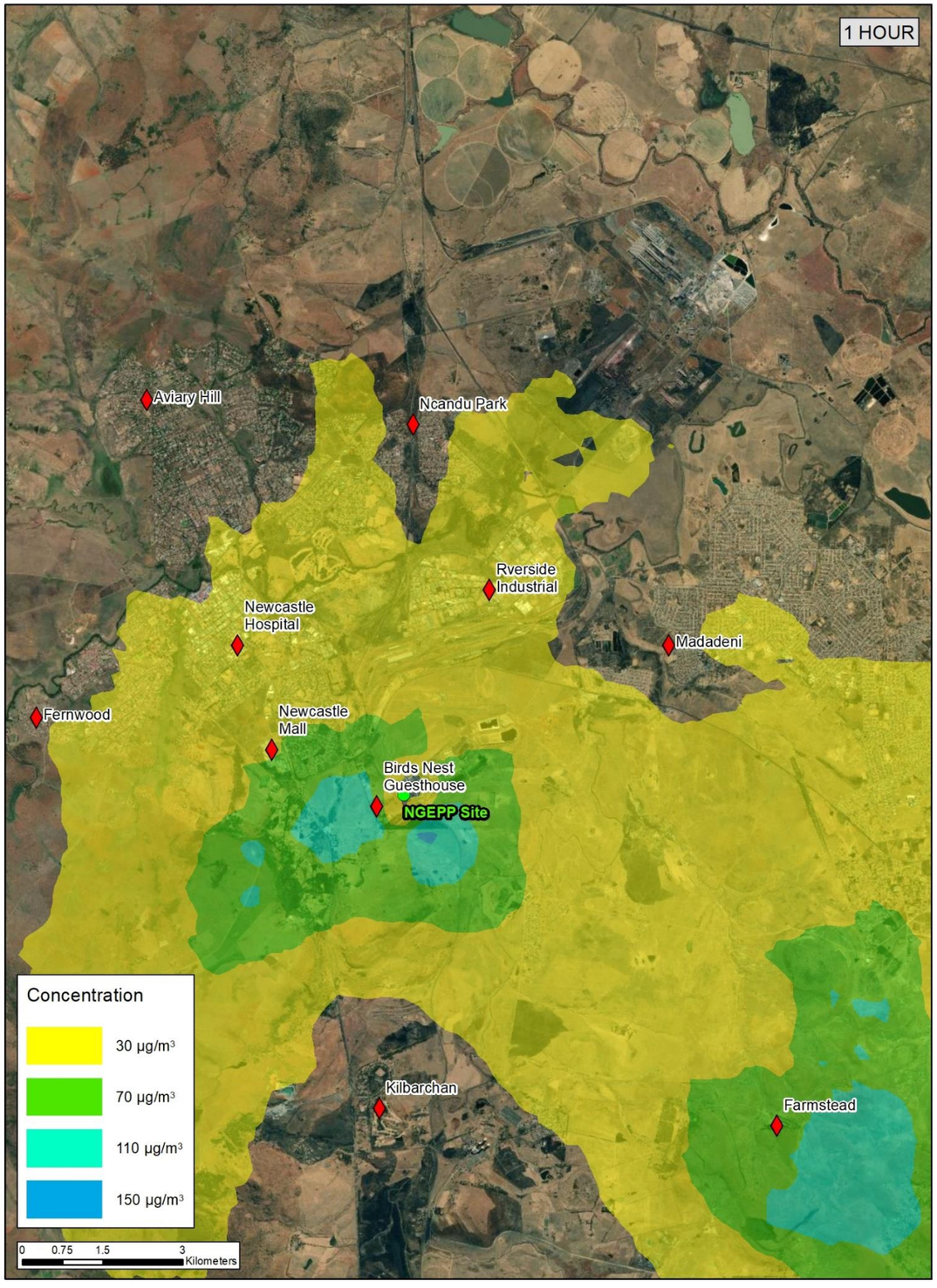
The predicted ambient CO concentrations from proposed NGEPP project at each discrete receptor are presented in Table 8-3 and the plume isopleths are presented in Figure 8-3. Short-term (P99 1-hour average and P99 8-hour average) predicted CO concentrations have been compared with the relevant NAAQS.

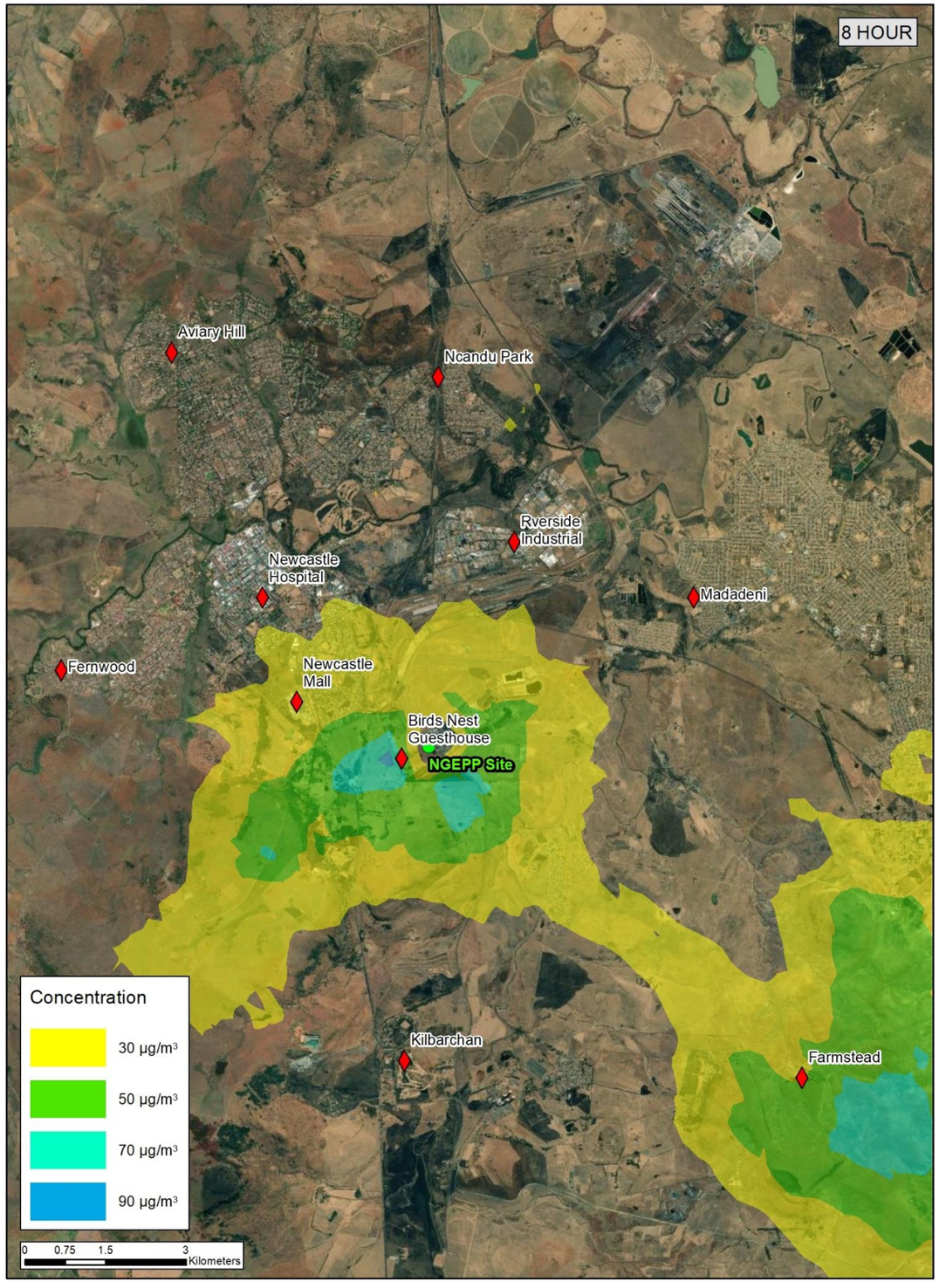
Predicted P99 1-hour CO concentrations at sensitive receptors range from 16.4 Õg/m³ (Kilbarchan) to 97.7 Õg/m³ (Birds Nest Guesthouse). The maximum offsite predicted P99 1-hour average CO concentration of 155 Õg/m³ is below the NAAQS of 3 000 Õg/m³.

Predicted P99 8-hour CO concentrations at sensitive receptors range from 10.8 Õg/m³ (Kilbarchan) to 67.7 Õg/m³ (Birds Nest Guesthouse). The maximum offsite predicted P99 8-hour CO concentration of 98.1 Õg/mį is below the NAAQS of 1 000 Õg/m³.

Table 8-3: Predicted CO concentrations at the sensitive receptors

Sensitive Receptor	P99 1-Hour	P99 8-Hour
Units	Õg/mį	Õg/mį
Birds Nest Guesthouse	97.7	67.7
Newcastle Mall	66.3	35.2
Fernwood	28.1	18.2
Farmstead	73.0	35.5
Madadeni	26.6	20.2
Newcastle Hospital	39.2	24.8
Aviary Hill	23.6	14.9
Ncandu Park	27.9	19.6
Kilbarchan	16.4	10.8
Riverside Industrial	36.5	21.3
Farmstead	80.9	47.8
Maximum predicted concentration	155	98.1
NAAQS	**30 000**	**10 000**





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: 8-3

srk consulting

NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT

PREDICED CO EMISSIONS

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

Revision: A Date: 15 10 2020

8.4 NMHC concentrations modelled

The predicted ambient NMHC concentrations from proposed NGEPP project at each discrete receptor are presented in Table 8-4 and the plume isopleths are presented in Figure 8-4. Long-term (3- year period average) predicted NMHC concentrations have been compared with the Benzene NAAQS.

Predicted period Benzene concentrations at sensitive receptors range from 0.2 Õg/m^3 (Kilbarchan) to 1.9 Õg/m^3 (Birds Nest Guesthouse). The maximum predicted period NMHC concentration of 1.9 Õg/m^3 is below the benzene NAAQS of 5 Õg/m^3.

Table 8-4: Predicted period average NMHC concentrations at the sensitive receptors

Sensitive Receptor	Period
Units	Õg/mį
Birds Nest Guesthouse	1.1
Newcastle Mall	0.9
Fernwood	0.3
Farmstead	1.0
Madadeni	0.4
Newcastle Hospital	0.5
Aviary Hill	0.3
Ncandu Park	0.3
Kilbarchan	0.2
Riverside Industrial	0.4
Farmstead	1.0
Maximum predicted concentration	1.9
NAAQS	**5**

N

Rverside Industrial
Newcastle Hospital
Madadeni
Fernwood
Newcastle Mall
Birds Nest Guesthouse
NGEPP Site
Kilbarchan
Farmstead

Concentration
1 µg/m^3
1.3 µg/m^3
1.7 µg/m^3
1.9 µg/m^3

0 0.75 1.5 3 Kilometers

Legend
Sensitive Receptors
NGEPP Site

Data Source: ESRI Basemap Imagery	
Scale: 1:70 000	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: Zone 35S	
Date: 17/11/2020	Compiled by: INBRO
Project No: 566508	Fig No: 8-4

srk consulting

NEWCASTLE ENERGY ATMOSPHERIC IMPACT REPORT

PREDICTED PERIOD AVERAGE NMHC EMISSIONS

Path: G:\566508_NEWCASTLE_ENERGEY_ENV_VHUY\8GIS\GISPROJ\MXD\AQ\566508_F8-4_NGEPP_AQ_Benzene_ANN_A3CL_20201117.mxd

Revision: A Date: 02 12 2020

9 Impact Assessment

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 DEFF in making a decision.

This section describes the anticipated impacts of the NGEPP. During the Environmental Impact Reporting phase, these impacts will be given a rating based on the methodology described in Section 9.1 and the findings of the specialist assessments. The identification of potential impacts of the proposed activity is based on the following factors:

- The legal requirements.
- The nature of the proposed activity.
- The nature of the receiving environment.
- The DEFF Screening Tool.

9.1 Impact Assessment Methodology

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 9-1 below.

Table 9-1: Criteria used to determine the Consequence of the Impact

Rating	Definition of Rating	Score
A. Extentï 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. Intensityï 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. Durationï 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 9-2.

Table 9-2: Method used to determine the Consequence Score

Combined Score (A+B+C)	0 ï 2	3 ï 4	5	6	7	8 ï 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 9-3.

Table 9-3: Probability Classification

Probabilityï 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 9-4 below.

Table 9-4: 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 9-5 below.

Table 9-5: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive ï a ôbenefitõ)
	ï ve (negative ï a ôcostõ)
Confidence of assessment	
The degree of confidence in predictions based on available information, SRKõs 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 as described 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. Mitigation measures will be classified as either:

- **Essential:** must be implemented and are non-negotiable; or
- **Optional:** must be shown to have been considered, and sound reasons provided by the proponent, if not implemented.

9.2 Air Quality Impact Assessment

9.2.1 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 9-6: 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

9.2.2 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 9-7: 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

9.2.3 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 9-8: 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.]

10 Conclusions

This 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 predict source contributions of NO_2, PM_{10}, CO and NMHC concentrations to the ambient environment under normal plant operating conditions. Key findings 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 DEFF 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 comparison 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.

11 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 a 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.

Prepared by

SRK Consulting - Certified Electronic Signature
srk consulting
566508/44348/Report
3260-7113-7409-HOWG-03/06/2021
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

H. Tularam (*Pr. Sci. Nat*)

Senior Scientist

Project Partner

SRK Consulting - Certified Electronic Signature
srk consulting
566508/AIR/44348/Report
328/298-6434/VHUY-03/06/2021
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*)

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.

12 References

Department of Environmental Affairs (2009): National Ambient Air Quality Standards. Government Gazette (No. R 1210 of 2009), 24 December 2009 (No. 32816).

Department of Environmental Affairs (2014): Regulations Regarding Air Dispersion Modelling (No. R. 533), Government Gazette, 11 July 2014, (No. 37804).

Department of Environmental Affairs: (2013): List of Activities which result in Atmospheric Emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage (No. R.893), Government Gazette, 22 November 2013, (No. 37054), as amended by GN 551 in 2015 and GN 1207 in 2018.

Government Notice 326, of the Environmental Impact Assessment Regulations as per the National Environmental Management Act (Act 107 1998) (NEMA).

NEM: AQA, No. 39 of 2004. National Ambient Air Quality Standards (NAAQS). Notice No.: 1210. Government Gazette No. 32816. 24 December 2009

Newcastle Local Municipality. 2014. Desired State of The Environment Report, Environmental Management Framework, May 2014.

Newcastle Local Municipality. 2020. Final Integrated Development Plan (IDP) Review (2020/21) - Development Planning and Human Settlements, Newcastle Local Municipality, June 2020 (IDP Review, 2020).

Preston-Whyte R.A. and Tyson, P. D. 2000. The weather and climate of Southern Africa. Second edition.

Preston-Whyte, R. A. and Diab, R. D. 1980. Local weather and Air Pollution Potential: the case of Durban. Environmental Conservation, vol. 7, no. 3.

Preston-Whyte, R. A., Diab, R. D. and Tyson, P. D. 1976. Towards an Inversion Climatology of Southern Africa: part 2, non-surface inversions in the lower atmosphere. South African Geographical Journal, vol. 59, no. 1.

SRK, 2020. Draft Scoping Report for the Proposed Newcastle Gas Engine Power Plant, KwaZulu-Natal. 566508/DSR EXTRACTS

Steynor, A. 2006. Introduction to South African Climate. http://www.csag.uct.ac.za/module_1,

World Weather Online. 2020. https://www.worldweatheronline.com/

Appendices

Appendix A: Specialist Declaration & CV

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

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

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

PROJECT TITLE

Atmospheric Impact Report for Proposed Gas-to-Power Plant in Newcastle, South Africa

Kindly note the following:

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

Departmental Details

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

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

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

1. SPECIALIST INFORMATION

Specialist Company Name:	SRK Consulting South Africa (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	2	Percentage Procurement recognition	125%
Specialist name:	Hasheel Tularam			
Specialist Qualifications:	MSc Environmental Science			
Professional affiliation/registration:	Pr. Sci. Nat 117336			
Physical address:	2nd Floor Norfolk House, 54 Norfolk Terrace, Westville			
Postal address:	PO Box 1969, Westville, 3630			
Postal code:	3630	Cell:	083 282 5724	
Telephone:	031 279 1235	Fax:		
E-mail:	Htularam@srk.co.za			

2. DECLARATION BY THE SPECIALIST

I, Hasheel Tularam, declare that –

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

Signature of the Specialist

SRK Consulting South Africa (Pty) Ltd

Name of Company:

26 April 2021

Date

Details of Specialist, Declaration and Undertaking Under Oath

Page 2 of 3

3. UNDERTAKING UNDER OATH/ AFFIRMATION

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

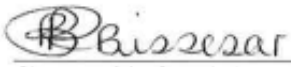
Signature of the Specialist

SRK Consulting South Africa (Pty) Ltd

Name of Company

26 April 2021

Date



Signature of the Commissioner of Oaths

28/04/2021

Date

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

Reesha Bissesar (Administrator)

REF No: 9/1/8/2 (R/O) KZN (Pinetown)

Commissioner of Oaths

Hasheel Tularam

Senior Scientist

Profession	Environmental Science (Air Quality)
Education	Doctor of Philosophy in Environmental Science, University of University of KwaZulu-Natal, South Africa (Current) Bachelor of Science (Masters), Environmental Science, University of KwaZulu-Natal, South Africa (2014) Bachelor of Science (Honours), Environmental Science, University of KwaZulu-Natal, South Africa (2011) Bachelor of Science, Geography and Environmental Management, University of KwaZulu-Natal, South Africa (2009)
Registrations/ Affiliations	Pr.Sci.Nat, South Africa, Reg No 117336 Chairman for National Association for Clean Air KZN Branch

Specialisation

Hasheel is a passionate and enthusiastic environmental consultant with nine yearsô cumulative experience in the air quality management industry. He is actively involved in a range of meteorological, ambient air quality and stack emission monitoring campaigns in his career. This background, complimented by his knowledge in Geographic Information Systems (GIS) has allowed him to undertake atmospheric dispersion modelling assessments ranging from initial screening level to complex source and terrain models using various predictive modelling platforms such as ADMS, AERMOD and CALPUFF. Compiling atmospheric emission license (AEL) applications (SAAELIP), undertaking National Atmospheric Emissions Inventory Submissions (NAEIS), developing industry specific air quality management plans along with practicing a range of other air quality services, has allowed him to attain a comprehensive understanding of the principles National Environmental Management: Air Quality Act 39 of 2004.

Expertise

Hasheel currently holds an MSc in Environmental Science and is broadening his prospects in the air quality management field by working towards a PhD focused on ñAir pollution Monitoring and Dispersion Modelling in the eThekwini Municipalityò through the University of Kwa-Zulu Natal. He also has recently begun exploring his talents into acoustic monitoring and modelling for a diverse range of client operations in Southern Africa. By playing an active role in the National Association for Clean Air (NACA) committee (KZN Branch Chairman 2015 - 2020), Hasheel keeps abreast with current air quality related matters in South Africa. His is also a SACNASP registered Professional Natural Scientist. His expertise includes:

- Atmospheric Impact Assessment Reports
- Air Quality Management Plans
- Atmospheric emission licensing;
- Air quality and acoustic monitoring
- Acoustic impact assessments

Employment

2020 ï Current	SRK Consulting (Pty) Ltd, Senior Scientist, Environmental Department, Durban
2017 ï 2019	WSP Environmental (Pty) Ltd, Senior Consultant, Durban
2013 ï 2016	WSP Environmental (Pty) Ltd, Consultant, Durban
2010 ï 2012	WSP Environmental (Pty) Ltd, Assistant Consultant, Durban

Languages

English ï read, write, speak (Excellent)

Hasheel Tularam

Senior Scientist

Publications

1. Tularam, Hasheel & Ramsay, Lisa. (2011) Air Quality of the Durban South Basin linked to Synoptic Events for the Year 2009. NACA Journal, Page 21 ï 25.

2. Tularam, Hasheel & Ramsay, Lisa. (2014) Synoptic Influences on Air Pollution Events in the Durban South basin, 2006 to 2010. University of KwaZulu-Natal, August, 2014, http://hdl.handle.net/10413/11065

3. Tularam, H. Ramsay, L. Muttoo, M. Brunekreef, B. Meliefste, K. de Hoog, K. Naidoo, R (2019): Harbour and Intra-City Drivers of Air Pollution: Findings from a Land Use Regression Model, Durban, South Africa. NACA Journal, Page 20 ï 26.

Presentations

1. Tularam, Hasheel. ñAir Quality of the Durban South Basin linked to Synoptic Events for the Year 2009.ò National Clean Air Association, East London, South Africa, 2012.
2. Tularam, Hasheel. ñScreen3 Dispersion Modelling Seminar.òEO2HEAVEN, Durban, South Africa, 2013.
3. Tularam, Hasheel. ñAir Pollution Modelling and Monitoring Seminar.ò Guest Lecturer University of KwaZulu-Natal, Durban, South Africa, 2013.
4. Tularam, Hasheel. ñSynoptic Influences on Air Pollution Events in the Durban South Basin, 2006 to 2010.ò National Association Clean Air, Durban, South Africa, 2014.
5. Tularam, Hasheel. ñHarbour and Intra-City Drivers of Air Pollution: Findings from a Land Use Regression Model, Durban, South Africaò National Association Clean Air, Stellenbosch, South Africa, 2019.
6. Tularam, Hasheel. ñHarbour and Intra-City Drivers of Air Pollution: Findings from a Land Use Regression Model, Durban, South Africaò International Society for Environmental Epidemiology, Utrecht, Netherlands,

Hasheel Tularam

Senior Scientist

Key Experience: Air Quality Compliance

Location:	Kwa-Zulu Natal, South Africa
Project duration & year:	2020
Client:	Richards Bay Coal Terminals (RBCT)
Name of Project:	Air Quality Impact Assessment for RBCT
Project Description:	SRK were appointed to conduct a specialist Air Quality Impact Assessment (AQIA) for the RBCT operations. The primary aim of this AQIA was to assess the air pollutant emission concentrations (primarily particulate matter) emanating from the terminal operations. AERMOD View was used as a modelling platform to calculate pollutant concentrations at key receptor points away from the Port and to compare these concentrations with the relevant National Ambient Air Quality Standards (NAAQS).
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging
Value of Project:	N/A

Location:	Kwa-Zulu Natal, South Africa
Project duration & year:	2018 - 2019
Client:	SAPREF
Name of Project:	Air Quality Impact Assessment for SAPREF
Project Description:	A specialist Air Quality Impact Assessment (AQIA) for SAPREF operations was undertaken to fulfil their AEL requirements. The primary aim of this AQIA was to assess the air pollutant emission concentrations emanating from the refinery. Californian Puff (CALPUFF) View 8.1 was used as a dispersion modelling platform to calculate pollutant concentrations at key receptor points away from the refinery and to compare these concentrations with the relevant National Ambient Air Quality Standards (NAAQS).
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience: Air Quality Compliance

Location:	Kwa-Zulu Natal, South Africa
Project duration & year:	2016 - 2017
Client:	Transnet Port Terminals
Name of Project:	Transnet Port Terminals AEL Application
Project Description:	The terminal undertakes a listed activity in terms of Section 21 of the National Environmental Management: Air Quality Act, Act. No 39 of 2004 (NEM: AQA) and was issued with a Provisional AEL which requires consistent monitoring and management of the terminal's emissions. Assisted TPT with their initial AEL application in 2012 following which the terminal was awarded with a provisional AEL valid until 21 March 2017.
Job Title and Duties:	Duties included undertaking the AEL application, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging
Value of Project:	N/A

Location:	Kwa-Zulu Natal, South Africa
Project duration & year:	2016
Client:	Transnet Port Terminals
Name of Project:	Air Quality Impact Assessment for Proposed Tippler Shed, Richards Bay
Project Description:	This specialist AQIA aimed to assess the ambient impact of particulate matter emissions from the proposed tippler. A cumulative air pollution dispersion model for the Richards Bay airshed using Californian Puff (CALPUFF) View 7.5.1 as part of the then proposed Slab EF project was previously developed. This model has been built upon for the third tippler assessment and has been conducted in accordance with the Regulations Regarding Air Dispersion Modelling (the Modelling Regulations from here forward), Government Notice 533 of 2014 (Government Gazette 37804). To assess the impact of the third tippler predicted concentrations between the current TPT emissions (2016 emissions excl. tippler 3) and proposed TPT emissions (2016 emissions incl. tippler 3) have been compared
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging
Value of Project:	N/A

Location:	Tugela, KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	Sappi Tugela (Pty) Ltd
Name of Project:	Air Quality Impact Assessment for a Green Energy Power Project
Project Description:	Sappi proposed the installation and operation of a biomass boiler. The installation is termed the Green Energy Power Project (GEPP) and will generate up to 40 MW of electrical power to supply the mill as well as the national grid. To investigate the impact of this project on the surrounding environment, a Basic Assessment was undertaken. A specialist Air Quality Impact Assessment (AQIA) formed a critical part of this study was also undertaken. AERMOD was used as a dispersion modelling platform to assess the current (baseline) scenario and a proposed scenario that included the biomass boiler. All current and proposed concentrations were compared against the NAAQS.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience — Air Quality Compliance

Location:	Vanderbijlpark, Gauteng, South Africa
Project duration & year:	2016
Client:	The Council for Scientific and Industrial Research (CSIR).
Name of Project:	Air Quality Management Plan for SARCO Foundry
Project Description:	The Council for Scientific and Industrial Research (CSIR) appointed us to develop and undertake an Air Quality Management Plan (AQMP) for SARCO. The AQMP aimed to assess and manage any potential impacts that on the surrounding environment from SARCOôs operations as well as update the existing AEL. AERMOD was used as a dispersion modelling platform and results compared to the NAAQS. Results from an occupational monitoring survey were used to further augment the foundryôs AQMP.
Job Title and Duties:	Duties included undertaking the AQMP, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging
Value of Project:	N/A

Location:	Cape Town, Western Cape, South Africa
Project duration & year:	October 2014 ï April 2015
Client:	FFS Refiners (Pty) Ltd
Name of Project:	Proposed Modifications to FFS Brackenfell storage facility
Project Description:	Client required an Air Quality Impact Assessment and Atmospheric Emissions License amendment application for the proposed modifications of the FFS Brackenfell storage facility. Fugitive tank emissions were estimated for total volatile organic compounds (TVOCs) and benzene using the United States Environmental Protection Agency TANKS 4.09d model. The assessment was then conducted using the screening level modelling platform, SCREEN3, to predict cumulative ambient concentrations resulting from both existing and proposed scenarios of the FFS Brackenfell storage facility.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	Dormac ï Division of Southerly Holdings (Pty) Ltd.
Name of Project:	Air Quality Impact Assessment for a Proposed Dry Dock
Project Description:	Undertook an environmental authorisation process for a proposed dry-docking facility in Durban. An AQIA was required to evaluate the significance of the potential impacts on ambient air quality due to the dry-docking facility operating in the area. Air pollution emissions from the abrasive blasting and spray painting of ship hulls were calculated using emission factors and equations while SCREEN3 was used as a dispersion modelling platform for the study
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience Air Quality Compliance

Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	Shell and British Petroleum (BP) South African Petroleum Refineries (SAPREF).
Name of Project:	Independent Verification of Tank Emissions
Project Description:	An independent verification of all storage tank emission calculations was undertaken for SAPREFôs Atmospheric Emission License (AEL) application. Volatile organic compound (VOC) emissions from storage tanks were calculated with use of United States Environmental Protection Agencyôs (USEPA) TANKS model (Tanks 4.0.9d) as it is a recommended model in terms of the NEMAQA. A report was compiled outlining results of the TANKS model calculations, with comparison and verification of the SAPREF Shell model calculations
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Location:	Saldanha, Western Cape, South Africa
Project duration & year:	2016
Client:	Transnet Port Terminals
Name of Project:	Iron Oxide Relationship to Staining Study for TPT Saldanha
Project Description:	This study aimed to assess the ambient particulate and dust fallout levels and the relationship between these and the staining of surfaces in Bluewater Bay, Langebaan and Vredenburg. The analysis comprised a literature review on iron ore staining, an interrogation of continuous ambient particulate measurements and meteorological data at Bluewater Bay and Vredenburg. The data was assessed to determine the relationships between concentrations peaks and specific meteorological scenarios. A Tier 3 (CALPUFF) modelling analysis of worst case (highest) iron ore throughputs at the site and potential impacts at key receptors as well as the decreases in ambient particulates and dust fallout associated with recommended dust abatement technologies and practices was developed and assessed accordingly. Recommendations as to how the facility can reduce its emissions were also provided.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience Air Quality Compliance

Location:	Cape Town, Western Cape, South Africa
Project duration & year:	2016
Client:	FFS Refiners (Pty) Ltd
Name of Project:	Proposed Modifications to FFS Cape Town Harbour storage facility
Project Description:	During 2010, FFS Refiners (Pty) Ltd (FFS) proposed to expand their Cape Town Harbour (CTH) tank farm with the addition of five storage tanks and two oil fired heaters (one for back-up purposes). FFS wished to change product storage (from heavy fuel oil, HFO, to naphtha) in two of the proposed tanks for which environmental authorisation was granted. However, to assess the change in emissions as a result of the product change, the existing emissions inventory was updated using the United States Environmental Protection Agency's (US EPA) TANKS model as well as National Pollutant Inventory (NPI) emission factors. SCREEN3 was used as the Tier 1 dispersion modelling platform for this study. Modelled output concentrations were compared to the National Ambient Air Quality Standards (NAAQS) under the National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA) where applicable.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Location:	Newcastle, KwaZulu-Natal, South Africa
Project duration & year:	2014
Client:	Silicon Technology (Pty) Ltd
Name of Project:	Air Quality Screening Assessment - Air Pollution Incident
Project Description:	Two baghouse compartments on Siltech's Furnace Stacks became congested, causing the system to significantly overheat and resulting in a fire incident. The Amajuba District Municipality had requested Siltech to undertake an air pollution dispersion modelling assessment in accordance with The Regulations Regarding Air Dispersion Modelling (2014). Predicted air pollutant concentrations were compared with the South African National Ambient Air Quality Standards (NAAQS) by using SCREEN3 as a dispersion modelling platform.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience

Air Quality Compliance

Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2013
Client:	Shell and British Petroleum (BP) South African Petroleum Refineries (SAPREF).
Name of Project:	Air Quality Impact Assessment - SAPREF Cleaner Fuels Phase 2
Project Description:	In order to meet stringent fuel specifications that were issued by the National Department of Environmental Affairs, SAPREF was required to undertake various modifications to their existing fuel refining process. This upgrade triggered the need for Environmental Impact Assessment (EIA) for which a comprehensive air quality impact assessment was required. Emissions from petroleum storage tanks were estimated using United States Environmental Protection Agencyôs (USEPA) TANKS 4.0.9 model while proposed stack emissions were calculated. ADMS (Tier 2) was used as a dispersion modelling platform to estimate emissions during the construction phase as well as the operational phase of the project. Modelled outputs where plotted onto a solid GIS platform (ArcGIS 10) and predicted concentrations were tested for compliance with national air quality standards as a result of the upgrade.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2013
Client:	Shell and British Petroleum (BP) South African Petroleum Refineries (SAPREF).
Name of Project:	Air Quality Impact Assessment - SAPREF Cleaner Fuels Phase 2
Project Description:	In order to meet stringent fuel specifications that were issued by the National Department of Environmental Affairs, SAPREF was required to undertake various modifications to their existing fuel refining process. This upgrade triggered the need for Environmental Impact Assessment (EIA) for which a comprehensive air quality impact assessment was required. Emissions from petroleum storage tanks were estimated using United States Environmental Protection Agencyôs (USEPA) TANKS 4.0.9 model while proposed stack emissions were calculated. ADMS (Tier 2) was used as a dispersion modelling platform to estimate emissions during the construction phase as well as the operational phase of the project. Modelled outputs where plotted onto a solid GIS platform (ArcGIS 10) and predicted concentrations were tested for compliance with national air quality standards as a result of the upgrade.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience

Air Quality Compliance

Location:	Richards Bay, KwaZulu-Natal, South Africa
Project duration & year:	2014
Client:	Transnet National Ports Authority (TNPA).
Name of Project:	Air Quality Impact Assessment on a Galley Waste Compactor
Project Description:	TNPA wished to install a galley waste compactor as well as associated infrastructure at the port of Richards Bay. A specialist air quality impact assessment was required to assess the odour impact of the waste compactor. The New South Wales (NSW) Environmental Protection Agency (EPA) 2001 approach was adopted as it presents odour concentration criteria for complex mixtures of odorous air pollutants and considers the population density of the area in which the facility is to be installed. ADMS v5 was used as a dispersion modelling platform to calculate odour concentrations away from the waste compactor. Odour plumes were generated on ArcGIS 10 and presented against backdrop imagery for ease of interpretation. Different scenarios were identified and developed to assess the worst-case odour emissions from compaction of galley waste
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Location:	Pietermaritzburg, KwaZulu-Natal, South Africa
Project duration & year:	2014
Client:	Air Quality Impact Assessment on the Recycling of Poly polychlorinated biphenyl (PCB)-contaminated transformer oils.
Name of Project:	Air Quality Impact Assessment on a Galley Waste Compactor
Project Description:	FFS Refiners Pietermaritzburg plant proposed to recycle polychlorinated biphenyl (PCB)-contaminated transformer oils through their existing hydrogenation plant. As part of the environmental authorisation process, a specialist air quality impact assessment was required to quantify the increase in criteria air pollutant concentrations in the vicinity of the FFS plant with addition of the hydrogenation plant stack. A complete emissions inventory was developed using stack monitoring data, engineering specifications for the proposed stack as well the United States Environmental Protection Agency's (US EPA) TANKS model. AERMOD was used as a dispersion modelling platform for this study. Modelled concentrations where compared against results measured during a passive sampling campaign to allow for model validation as well as the National Ambient Air Quality Standards (NAAQS) defined under the NEM:AQA 2004 to ascertain compliance.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience — Air Quality Compliance

Location:	Eastern Cape, South Africa
Project duration & year:	2014
Client:	Great White Ltd.
Name of Project:	Air Quality Impact Assessment for Emissions Emanating the Koedoeskloof Landfill Site.
Project Description:	This study served to scientifically inform the delineation of an effective and locally representative buffer zone that limits the nuisance potential of the site and protects human health. The application of internationally-recognised methods, environmentally conservative assumptions and site-specific data was used to compile an emissions inventory of gaseous and particulate pollutants for the site. A Tier 2 atmospheric dispersion model (ADMS v5) together with emission scenarios that incorporated site-specific terrain, meteorological and emission data was developed for this study. Furthermore, geospatial tools (ArcGIS 10) was used to plot dispersion outputs such that an appropriate buffer zone based on relevant South African or internationally accepted human health and nuisance criteria could be identified.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A
Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2014
Client:	Africa SunOil Refineries (Pty) Ltd.
Name of Project:	Air Quality Impact Assessment for a Proposed Coal-fired Boiler
Project Description:	Africa SunOils wished transfer of a coal-fired boiler from an existing plant in Verulam to their plant in Mobeni, Durban South Basin (DSB). Given the sensitivity of the local community and steps taken by the eThekwini Municipality to reduce air pollution in the DSB, it was considered imperative that an elementary screening analysis be conducted to assess impacts on ambient concentrations on key pollutants. SCREEN3 was used as a modelling platform and emissions were combined with background concentrations to ascertain compliance with the respective NAAQS.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience	Key Experience
Location:	Saldhana, Western Cape, South Africa
Project duration & year:	2014
Client:	ArcelorMittal - Saldanha Works (Pty) Ltd.
Name of Project:	Air Quality Impact Assessment for a Proposed Briquetting Operation
Project Description:	The production process undertaken at ArcelorMittal, generates a high-value fine material by-product that can be briquetted and used in other processes. The proposed briquetting operation required a specialist air quality impact assessment to further inform those involved in environmental authorisation process. ADMS v5 was used as a modelling platform and ArcGIS10 was used as the geospatial software tool to generate isopleths showing the plume dispersion away from the plant. Results were compared with the relevant National Ambient Air Quality Standards to assess the impact on surrounding receptors.
Job Title and Duties:	Duties included undertaking the impact assessment, project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2014
Client:	Sappi Saiccor (Pty) Ltd
Name of Project:	Air Quality Impact Assessment, Durban, KwaZulu-Natal, South Africa
Project Description:	The Amakhulu Project saw the expansion of the Sappi Saiccor Mill to increase its chemical cellulose production as well as expand the magnesium cooking process by the installation of magnesium digesters and a reduction in number of calcium digesters. The emissions inventory for the plant included emissions from the plantôs point sources (stacks), line sources (roads and rail) and area sources (coal and woodchip stockpiles). The emissions from the N2 (National Route 2) were used to calculate background concentrations of key pollutants. ADMS v5 was used to calculate annual average and worst-case 24-hour and hourly concentrations for selected pollutants for comparison with the NAAQS. Recommendations were made as to how the facility can further reduce its environmental impact.
Job Title and Duties:	Duties included project undertaking the impact assessment, coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience	Key Experience
Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2014
Client:	eThekwini Municipality.
Name of Project:	Air emissions Testing and Air Quality Assessment
Project Description:	Facilitated an air emissions testing and air quality assessment at the Tongaat and Mobeni Crematoriums each owned and managed by the eThekwini Municipality. The survey aimed at quantitatively determining the TOC, PM, metals, HCL, HF, NH_3, CO, SO_2, NO_x, as well as dioxin and furan emissions concentrations from the crematorium stack. Comparisons were made with the Minimum Emission Standards (MES) in terms of Section 21(3)(a) of NEMAQA. Recommendations were provided to each crematorium to reduce the impact of the incineration system currently operated at the plant
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming, budgeting, invoicing and progress reporting, and product packaging.
Value of Project:	N/A

Key Experience:	Air Quality Monitoring
Location:	East London, South Africa
Project duration & year:	2019-present
Client:	East London Industrial Development Zone
Name of Project:	East London Industrial Development Zone ambient air quality monitoring
Project Description:	Ambient air quality monitoring study for the ELIDZ over a three-year period from January 2019 to December 2021 and quarterly reporting.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Location:	Gauteng, South Africa
Project duration & year:	2020-present
Client:	Transnet Pipelines
Name of Project:	Transnet Pipelines ambient air quality monitoring
Project Description:	Ambient air quality monitoring study for Transnet Pipelines over a three-year period from January 2020 to December 2022 and quarterly reporting.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience

Air Quality Monitoring

Location:	South Africa
Project duration & year:	2019
Client:	Transnet Port Terminals
Name of Project:	Installation and maintenance of Weather Stations for Transnet Port Terminals
Project Description:	Installed three meteorological stations located at Transnet Port Terminals (Transnet) Durban Container Terminal, Cape Town Container Terminal and Cape Town Agri Ro-Ro Terminal. These meteorological stations serve to provide meteorological conditions specific to the Ports locality. Each meteorological station is an *iWeathar Edge 6*$^{+}$ unit that measures temperature, humidity, barometric pressure, wind speed, wind direction, solar radiation and rainfall
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Location:	Richards Bay, KwaZulu-Natal, South Africa
Project duration & year:	2011 - 2020
Client:	Transnet Port Terminals
Name of Project:	Dust Management and Monitoring Program for Transnet Port Terminals
Project Description:	Provided Transnet Port Terminals with specialist air quality support and monitoring services in the Port of Richards Bay. The project includes monitoring of ambient concentrations of fine particulate matter (PM_{10}) and dust deposition, compiling an Atmospheric Emission Licence (AEL) for the facility and developing site-specific dust reduction and management strategies.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2019 - 2020
Client:	Transnet Port Terminals.
Name of Project:	Air Quality Monitoring Survey for Transnet, Durban
Project Description:	The aim of the project was to assess the current levels of dust pollution with relevance to the national ambient air quality standards published in the National Environmental Management: Air Quality Act (No 39 of 2004) as well as guidelines contained in SANS 1929:2005. Once an understanding of ambient dust levels and emission sources had been obtained, a management and control system was developed in order to mitigate the potential for exceedence of the relevant standards and guidelines.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Project duration & year:	2016
Client:	Hosaf Fibres (Pty) Ltd.
Name of Project:	Air Quality Monitoring Survey for Hosaf
Project Description:	Hosaf Fibres wished to quantify their VOC emission contribution to the surrounding air quality in the Durban South Industrial Basin. An ambient air quality monitoring survey with the use of passive samplers as well as active (real-time) monitoring equipment. Results not only informed the client of their VOC emission contribution but, were also used in the atmospheric emission license process.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience

Air Quality Monitoring

Location:	Durban, KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	Buckman Laboratories.
Name of Project:	Air Quality Monitoring Survey for Buckman Laboratories
Project Description:	A fenceline and source apportionment survey was conducted at Buckman Laboratories in Hammarsdale, KZN. As a US-based company, Buckman Laboratories pride themselves on achieving minimal environmental impact, which is being assessed through a passive sampling network, supported by a multi-parameter mobile monitoring trailer
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A

Location:	Richards Bay, KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	Transnet Port Terminals.
Name of Project:	Air Quality Specialist Study for Proposed Storage Area Expansion
Project Description:	Transnet Port Terminals (TPT) had proposed to expand storage areas within their existing Richards Bay Terminal (RBT). The RBT has historically experienced challenges with regard to air quality issues. This specialist air quality assessment sought to evaluate the air quality impacts associated with the proposed open storage area and associated increases in materials handling within the RBT. Results from the study revealed that PM_{10} emissions emanating from the proposed stockpile are not expected to have significant impacts at off-site receptors. The findings and recommendations of this specialist study were intended to further inform those involved in the Environmental Impact Report (EIR) for the project.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A

Location:	KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	FFS Refiners (Pty) Ltd
Name of Project:	Seasonal Air Quality Monitoring Surveys for FFS
Project Description:	FFS Refiners has six process plants that perform a number of activities which include the production and blending of different grades of fuel oil, made from used lubricating oil, and other waste oils from industry. The production process results in a host of environmental externalities being generated. Facilitated the monitoring of various air pollutants at each of the FFS plants in terms of the current South African National Ambient Air Quality Standards where applicable. Monitoring and providing sound advice to FFS refiners has been an on-going task for several years.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience: Acoustics

Location:	Richards Bay, KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	FFS Refiners (Pty) Ltd
Name of Project:	Acoustic Impact Assessment
Project Description:	TPT RCB proposed the installation of a third rail wagon tippler to increase the export capacity of the port. The specialist environmental Acoustic Impact Assessment (AIA) aimed to quantify all noise sources from the proposed third tippler facility as well as determine how this will impact the existing noise climate in Richards Bay. To characterise the ambient noise climate in the vicinity of the port, a noise monitoring campaign was conducted at five sampling points (the portôs main entrance gates, at Foskor and at the two closest residential areas, Arboretum and Tuzi Gazi) on the 9th and 10th of February 2016. The Computer Aided Nosie Abatement (CadnaA) acoustic modelling software was used to predict noise levels, which were then added to the background (measured) sound levels for each receptor. The change was evaluated and categorised in terms of the SANS 10103.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Location:	Mpumalanga, South Africa
Project duration & year:	2016
Client:	Anglo American Thermal Coal
Name of Project:	Acoustic Impact Assessment
Project Description:	Undertook a comprehensive Environmental Impact Assessment (EIA) for a proposed mining area Block Z. A specialist was required to assess potential noise levels during the mining of Block Z and determine how this noise will impact on the existing noise climate of the region. A comprehensive noise monitoring survey was conducted at the colliery to characterise the baseline (existing) noise environment while Noise Navigator™, a well validated sound level database was used to source the sound power level of various sources while CadnaA Version 4.3 was used as a modelling platform.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Location:	Nelspruit, Mpumalanga, South Africa
Project duration & year:	2016
Client:	Sappi Southern Africa Limited.
Name of Project:	Acoustic Impact Assessment
Project Description:	Sappi wished to embark on an expansion project which comprises of two main project components, namely (i) expansion to the existing specialised cellulose production; and (ii) construction of a sawmill. The specialist environmental acoustic impact assessment (AIA) aimed to quantify all noise sources at the mill during both construction and operational phases of the expansion project and identify how this will impact on the existing noise climate of the region. Noise levels from potential sources as a result of the proposed expansion project were estimated using data from the Noise Navigator™, a well validated sound level database while CadnaA version 4.3 was used as a modelling platform.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A

Hasheel Tularam

Senior Scientist

Key Experience

Acoustics

Location:	Pemba, Mozambique
Project duration & year:	2016
Client:	Mozambique National Port and Rail Authority
Name of Project:	Acoustic Impact Assessment
Project Description:	Undertook a comprehensive Environmental Impact Assessment (EIA) of the proposed Logistics Base, Sub-Sea Area and Residential Area. As part of the EIA phase, a specialist environmental acoustic impact assessment (AIA) was required to assess potential noise sources at the port during both the construction and operational phases and determine how this noise will impact on the existing noise climate of the region. Various mitigation measures were outlined in the Environmental Management Plan to aid the Port in further reducing their noise impact
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Location:	KwaZulu-Natal, South Africa
Project duration & year:	2016
Client:	Scheepers, Spies & Mdaka Inc
Name of Project:	Acoustic Impact Assessment on a Proposed Taxi Rank
Project Description:	A specialist noise impact assessment was required for a proposed taxi rank to be developed at the Mtubatuba Ridge Estate. The assessment included a baseline investigation of the existing noise climate through environmental monitoring; a compliance assessment of the existing noise levels against the relevant South African National Standards (SANS) day- and night-time guidelines; a review of the meteorological character of the site; the development of a comprehensive noise inventory of all proposed noise sources associated with the taxi rank; and acoustic modelling with the use of CadnaA, to determine the impacts of the proposed taxi rank development on surrounding community. Further to the impact assessment, a range of recommendations were provided to ensure that the noise impact is contained as much as possible.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A
Location:	White River, Mpumalanga, South Africa
Project duration & year:	2016
Client:	Sonae Novobord (Pty) Ltd.
Name of Project:	Environmental Noise Survey (June 2013 ï May 2014)
Project Description:	Conducted environmental noise monitoring at the Sonae Novobord White River plant since 2009. The project includes day and night time monitoring in accordance with the SANS 10103:2008 methodology, data analysis, compliance assessment and reporting. Recommendations as to how the plant can reduce its noise impact in the area in which it operates are also provided.
Job Title and Duties:	Duties included project coordination and management of the project team, liaison with the client, project programming.
Value of Project:	N/A

Appendix B: External Peer Review

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

23 May 2021 **Our Ref: 20210523_SRK**

H. Tularam (Pr.Sci.Nat)
Senior Scientist
SRK Consulting (South Africa) (Pty) Ltd.
Westville

Email: htularam@srk.co.za

Proposed Gas-to-Power Plant at Newcastle Energy (Pty) Ltd. in Newcastle, South Africa

REVIEW OF ATMOSPHERIC IMPACT REPORT

1. INTRODUCTION

IMA Trader was approached by SRK Consulting (South Africa) (Pty) Ltd on behalf of Newcastle Energy (Pty) Ltd to conduct a high-level review of the Newcastle Gas Engine Power Plant (NGEPP) Atmospheric Impact Report (AIR) conducted by SRK Consulting (Pty) Ltd (SRK), dated December 2020. Given that this is a high-level review and many readers are not likely to be Air Quality Scientists, complex technical jargon is avoided where possible; replaced by our professional opinion on whether the AIR answers, as best practically possible in a planning stage, fundamental questions of air quality impacts that may be raised by stakeholders.

Given that each technical aspect of the complex modelling cannot be replicated and checked in such a review, it is assumed that SRK adheres to the *ñCode of Practice for Air Dispersion Modelling in Air Quality Management in South Africa, 2014ò* as promulgated under the National Environmental Management: Air Quality Act, 2004: Regulations Regarding Air Dispersion Modelling (GNR533 of 2014).

2. PROJECT OVERVIEW

SRK Consulting (Pty) Ltd (SRK) completed an Atmospheric Impact Report (AIR) for Newcastle Energyôs proposed Gas-to-Power Plant in Newcastle, KwaZulu-Natal (KZN), South Africa. The proposed project requires Environmental Authorisation (EA), and subsequently Newcastle Energy appointed SRK to be the Environmental Assessment Practitioner (EAP).

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, which will provide them with the opportunity to submit a bid for new electricity generation

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

capacity under the Department of Mineral Resources and Energy's (DMRE's) Risk Mitigation Independent Power Producer (RM IPP) Procurement Programme (Tender No.: DMRE001/2020/21). Given that the existing AEL for NGEPP will need to be reviewed, in terms of Section 45 of the National Environmental Management Air Quality Act (NEM: AQA), the EAP recognised that an Atmospheric Impact Report (AIR) would be required for the proposed development and, therefore, commissioned an Air Quality Impact Assessment as a key specialist study, assessing potential ambient air quality impacts from the new NGEPP.

To comply with the prescribed requirements for an AIR, SRK conducted predictive dispersion modelling using CALPUFF (US EPA Tier 3 equivalent) to calculate P99 1-hour, P99 24-hour and long-term (period average) concentrations across the model domain, based on the time periods specified for each pollutant in the National Ambient Air Quality Standards (NAAQS).

The criteria pollutants assessed in the AIR include Nitrogen Dioxide (NO2), Carbon Monoxide (CO), Particulate Matter (PM10) and Non-methane hydrocarbons (NMHC; modelled as Benzene). All results were benchmarked against the current NAAQS. MM5 prognostic meteorological data from Lakes Environmental was pre-processed in AERMET and then used to characterise the surface and upper air meteorological conditions over the site as an essential component of dispersion modelling in the absence of adequate on-site observational data. Complex terrain data (topography) was also applied using AERMAP.

Dispersion modelling results showed that $PM_{2.5}$, NO_2, CO and Benzene concentrations at all receptor sites for all averaging periods assessed were below their respective NAAQS. In order to ensure concentrations, remain compliant at all receptor sites, and given the requirement for Environmental Authorisation as well as the requirement for an AEL, SRK provided a range of recommendations.

3. CHAPTER COMMENTS

3.1 Chapter 1: Introduction, Background, Project Description and approach, and Scope of Report

- A concise background and description of the reason/requirement for the project is provided as the introduction to this chapter.
- It is difficult to distinguish whether or not the existing Newcastle Energy plant holds an existing Atmospheric Emissions Licence (AEL). Based on the explanation in this chapter which makes reference to Section 45 of the National Environmental Management Air Quality

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

Act (NEM:AQA), this implies there will be a review of an existing AEL, which in terms of Section 45 then requires an AIR to be conducted. However, this is not made clear up front.

- Details of the appointment by Newcastle Energy and SRK (Pty) Ltd and the purpose of the AQIA report by SRK (Pty) Ltd, are clearly explained and defined in a logical and easy-to read format in this chapter.
- The project description is briefly outlined, the criteria pollutants assessed are listed and the averaging periods assessed in the model are defined. The application of a Tier 3 model, CALPUFF, is stated.
- Readers will find the sub-chapter on ñAtmospheric Impact Reportò (Chapter 1.3.1) informative, as it is applied well to this study specifically. The chapter explains the relevance of the Regulations to this study.
- The information provided in sub-chapter 1.3.2, although largely generic for all EIA specialist studies, has been linked with good detail to the specific chapters of the AIR from which the required information can be found.

3.2 Chapter 2: Project Identification Requirements

- The presentation of the information in this chapter in table format is useful and easy to read. However, the details provided in Chapter 2.1, although useful for the authorôs or EAPôs purposes or for submissions of AEL applications and NAEIS reporting in future, are not essential and possibly deter from the purpose of the report.
- In Table 2-3 in Chapter 2.2 the coordinates for the approximate centre of operations does not have any units stated. It would appear these are in UTM, but it also does not state which UTM zone these were in. It would perhaps be better to present the coordinates as decimal degrees latitude and longitude.
- A site locality map is provided to present the location of the new NGEPP site within the Karbochem Industrial Complex in Newcastle
- No detail or map is provided for the locations of selected sensitive receptors.
- The project phases and their estimated durations have not been defined, nor have any deliverable timeframes been stated.

3.3 Chapter 3: Project Details

- A brief but informative description of the new project and the processes, as well as process diagrams, are provided in this chapter.
- There is some repetition between the information in this chapter and that in the chapters preceding.

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

- This section lacks logical flow from this chapter on project detail and process flow (Chapter 3) to the next chapter (Chapter 4 ï on Meteorolgoy), making it difficult for the reader to follow.

3.4 Chapter 4: Meteorological Conditions

- Whilst the chapter on Climate in Southern Africa (Chapter 4.1) is interesting and provides a background, this information is irrelevant to the modelling study. The focus of the study is in Newcastle and thus, the general climate of SA is not the level of detail that is required for the micro-climate at Newcastle. It would make more sensen to omit Chapter 4.1 completely and start Chapter 4 with the text in chapter 4.2, which provides a good introduction to the section, providing a background and reason why the meteorological data is required and then moves on to define the MET data that was used for this study site.
- In Chapter 4.2 it is confusing why additional met data from www.worldweatheronline.com for Newcastle was acquired and included in the report. The consideration thereof would have been adequate and the use of the CALMET data would be sufficient on its own.
- Page 13, Chapter 4.2, paragraph two uses terminology that may be too technical for the non-specialist reader, specifically pertaining to CALMET data. This could perhaps be clarified in terms of the MET data preparation and processing in order to assist readers.
- In Chapter 4.2s, the brief introductory paragraphs for each climatological parameter (i.e. wind, rain, temperature) provides a good explanation about the effect of each parameter on the dispersion of pollutants.
- The presentation of WR plot wind roses are good and readable (Page 19-20).
- In terms of the wind roses in Figures 4-5 and 4-6, it may be useful to add the additional wind vector dotted lines for the secondary and tertiary wind directions (i.e. for SE, S-SE and E-SE).
- To help the reader understand and interpret Figures 4-5 and 4-6 (page 19-20), it may be better to place each figure and explanatory text on the same page. For example, to place Figure 4-5 directly below the bullet points on page 18, and Figure 4-6 directly below or after the last paragraph on page 18 to assist comprehension of the local climate.

3.5 Chapter 5: Legislative Framework

- Legislative frameworks and guidelines should be easy to read and understand for the reader in this chapter. The National Ambient Air Quality Standards (NAAQS) as set out in GNR 1210 of 2009 and GNR 486 of 2012 should be familiar to most readers. Mention should

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

perhaps be made in Chapter 5 of the ó*Regulations Regarding Air Dispersion Modellingô* (GNR 533 of 2014), which also forms part of the legal framework.

- Page 21, Chapter 5, the last sentence preceding chapter 5.1 makes reference to some ñinternational guidelinesò in the subsections that follow. However, no further reference is made to any international guidelines. Perhaps this needs to be removed.
- A clear and well-structured presentation of all criteria/priority pollutants and their respective NAAQS is provided in this chapter.

3.6 Chapter 6: Air Quality Monitoring

- Given that no actual air quality monitoring was undertaken as part of this study, it doesnt make logical sense to name this chapter as ñAir Quality Monitoringò Perhaps a better suited chapter name would be ñAmbient Background Concentrationsò
- Page 23, Chapter 6, paragraph one states that no cumulative assessment was conducted because there was poor data recovery from ambient air quality monitoring stations. Given that there was poor data availability from the AAQMS, it would have been useful for SRK to conduct a baseline monitoring assessment at the fenceline of the site and in the surrounding area prior, or simultaneously, to the dispersion modelling exercise. A baseline monitoring exercise would have enabled a cumulative assessment, which is required in accordance with the *Regulations Regarding Air Dispersion Modellingô*(GNR 533 of 2014) ï (Modelling Regs).
- Especially given that air quality is a major concern and a sensitive issue to stakeholders within the region, as stipulated in the Newcastle Environmental Management Framework Desired State of The Environment Report (2014), it would have been considered critical to assess the cumulative air quality impacts of the new NGEPP project.
- In summary, this chapter states that no quantitative cumulative impact assessment was undertaken and that only a descriptive/qualitative assessment of the background ambient air quality conditions was conducted and is briefly defined in this chapter. This chapter highlights the sensitivity of the Newcastle area in terms of air quality issues recognised by the municipality and sensitive receptors.

3.7 Chapter 7: Dispersion Modelling Methodology

- This chapter provides a logical structure of the following sub-sections which together comprise and outline the methodology that was applied for the dispersion modelling in this study:
    - Model Used
    - Meterorological Data

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

- Description of Receptor Grid
- Specified Sensitive Receptors
- Description of Topographical Data
- Emission Inventory
- Model Output
- Assumptions and Limitations

- There should be consistency in the naming of the above sub-sections chapter headings, using uppercase for all words throughout or only uppercase for the first wordôs first letter.
- Given the way in which these input parameters are introduced here in Chapter 7.1, it is suggested to rather present the subsections which follow (chapters 7.1 to 7.7) as third order headings, i.e. ñ7.1.1 Met data; 7.1.2 Receptor Gridé ò and then the second order chapter heading above (chapter 7.1.) can be modified to be ñModel used and Model Input Parametersò If so, then it would be best to make chapter 7.8 below a first order heading on its own (i.e. Chapter 8. Assumptions and Limitations)
- In terms of Chapter 7.1, the suitability of various dispersion models to predicting dispersion of pollutants was researched by the reviewer to assess whether CALPUFF is the suitable and preferred tool for this application. Recent journal articles revealed that whilst AERMOD produces reasonably accurate results and remains the default dispersion model of the US EPA for many purposes, and whilst ADMS Urban is slightly more accurate and preferred in the UK and much of the European Union, more specialised software tools have been developed over the past two decades (such as CALPUFF). The difference in predictions between the two programs on a point source estimation is relatively small, but AERMOD falls short when it comes to modelling long-range dispersion of airborne pollutants in puff plumes. CALPUFF is therefore considered adequate for this study and remains the preferred long-range dispersion model by the South African authorities in the ñModelling Regsô
- Chapter 7.2 on page 25 is the second chapter in the AIR for Meteorological Data. Chapter 4.2 also provides Meteorological information. It may be worth combining the two chapters into this single chapter 7.2 in order to avoid repetition.
- In Chapter 7.4 on page 26, a reasonable number (10) of sensitive receptors were defined and examined through modelling, although none were measured for baseline concentrations.
- The Emissions Inventory Chapter (Chapter 7.6) on pages 29-30 is very brief and lacks substantial detail. Given this, and despite the few technical terms in this chapter, the average reader should find it easy to follow and understand.
- It must be noted that estimation of emissions based on the typical performance data from the proposed engines is largely an estimate and of relatively high confidence. Whilst it would be ideal to have actual measured stack emissions data from similar sources, it is the best

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

estimate that can be used at this planning phase for modelling. Actual emissions impacts may vary according to a multitude of real-world factors and must therefore be measured and mitigated throughout, given that the Newcastle area is sensitive to air quality issues.

- From table 7.2 on page 30 it states the stack and emissions data for a total of 13 stacks, but it is not stated whether or not only 12 stacks were modelled, given that it was explained in the earlier sections of the AIR that only 12 stacks will be operational with one stack always being on standby.
- In terms of Chapter 7.7, despite the technical nature of inputs and outputs for dispersion modelling in CALPUFF, this Section is well-written and can be understood by the average reader.
- This chapter explains that the long-term (period average) of all hourly data (across the three year period) was considered and modelled. It is unknown why the long-term hourly average output statistic was chosen instead of the long-term annual average. No explanation for the reason of selection is provided. In contrast, the highest concentrations for an annual averaging period would represent the highest annual concentrations achieved at the plotted receptors for any of the years considered (three years were modelled). This technique is useful because in the case of the annual ambient standards for instance, no exceedances of the ambient Air Quality Guidelines are allowed.
- In Chapter 7.7, it is stated that the short-term (24 hours and 1-hour) results are presented as the modelled 99th percentile (P99) concentrations. This is in line with the Regulations Regarding Air Dispersion Modelling which state that, ñthe 99th percentile concentrations are recommended for short-term assessment with the NAAQS since the highest predicted ground-level concentrations (100th percentile) can be considered outliers due to complex variability of meteorological processes. This might cause exceptionally high concentrations that the facility may never actually exceed in its lifetimeò
- For readers with limited understanding of dispersion modelling this section (Chapter 7.7) will help to understand compliance or non-compliance at P99 (the 99th percentile). Point two in Chapter 7.7 provides a description on how the 99th percentile for 1-hour and 24-hour is calculated and why it is used over other percentiles to assist the non-specialist reader.
- The Assumptions and limitations listed in Section 7.8 state that It was conservatively assumed that all NOx is rapidly converted to NO2. In accordance with the Modelling Regulations, a conversion factor of 75% could have been applied instead of assuming a 100% conversion.
- Furthermore, in this Chapter 7.8 it was conservatively assumed that Total Particulate Matter (TPM) is PM10. This is a highly conservative assumption which is likely to overestimate PM10 emissions. It was also stated that in the absence of particle size distribution data, PM2.5 was not modelled in this assessment. The estimation of PM2.5 emissions could have been

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

calculated by applying a calculated ratio of PM10:PM2.5 if baseline measured PM10 and PM2.5 data in the area of the Facility could have been available. This is also a highly conservative assumption which is likely to overestimate PM2.5 emissions.

- It would make logical sense to separate chapter 7.8 from the preceding sub-sections and make it a first order chapter on its own ï i.e. Chapter 8 Assumptions and Limitations.

3.8 Chapter 8: Dispersion Modelling Results

- The modelled results for each priority/criteria pollutant are presented in a concise and simple structured format on pages 32 ï 39. Each section provides a brief interpretation of results, followed by a clear and simple table of modelled results compared with the relevant NAAQS, followed by the two maps side-by-side showing the isopleth plumes for each averaging period modelled.
- Overlaying the modelled isopleth plumes in google earth is an effective tool to help the reader to identify the locations of highest concentrations and the spatial distribution of the typical plume.

3.9 Chapter 9: Impact Assessment

- Chapter 9 (pages 40 ï 44) provides the Impact Assessment for the AIR study. It is not common practice to include this impact assessment in the formal AIR. The Impact Assessment for the AIR is usually included as the Appendix to the AIR or, more commonly, is only included in the Air Quality Section of the EIA document.

3.10 Chapter 10: Conclusions

- The purpose of the AIR study, the tools and approach applied in the study and the results of the dispersion modelling are clearly summarised for the average reader in the concluding chapter. The larger technical document was effectively condensed by distilling out the most pertinent results or points in this chapter. Long technical documents can easily become overwhelming and hence not properly read, understood, or utilised for decision making purposes, which defeats their purpose.

3.11 Chapter 11: Recommendations

- Recommendations are clearly defined, and although largely generic, provide a good guideline for promoting effective management and maintenance at the proposed plant in order to maintain and promote compliance of emissions with the regulated standards.

CK No. 98/73181/23
VAT Reg. 4410178968
326 Old Howick Road
Hilton 3245
Tel: +27 (0)83 763 5636
Email: megan@imatrader.co.za
Email: andrew@imatrader.co.za

4. CONCLUSIONS

SRK have met all the basic the requirements of a high-quality AIR by modelling predicted ambient air pollutant concentrations at receptor sites. At times, the reader may benefit from better descriptions of specific scientific terms and concepts, but in most cases substantial detail was provided. Inclusion of a baseline monitoring exercise to determine background ambient concentrations, and hence enabling the estimation of cumulative impacts from the new NGEPP, would have added substantial value to the study, as expressed in the review points above. The report is technically detailed, and suitable for an audience with reasonable understanding of air quality concepts. The findings are clear and the results are presented in scientifically sound and traditionally conventional formats enabling easy-reading.

Review compiled and drafted independently by:

Megan McNamara B.Sc. (Hons) M.Sc.
Air Quality Scientist

And

Andrew Simpson B.Sc. (Hons) M.Sc. Pr.Sci.Nat.
Professional Natural Scientist & Air Quality Specialist

srk consulting

Section A, 2nd Floor,
Suite 02/B1, Norfolk House
54 Norfolk Terrace
Off Blair Atholl Drive
Westville, 3630
P O Box 1969
Westville, 3630
South Africa
T: +27 (0) 31 279 1200
F: +27 (0) 31 279 1204
E: durban@srk.co.za
www.srk.co.za

3 June 2021
566508

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

Attention: Marius van Huyssteen

Dear Mr. Van Huyssteen

Response to Peer Review of the Newcastle Energy Atmospheric Impact Report

SRK Consulting (South Africa) (Pty) Ltd. (SRK) has been appointed as the Environmental Assessment Practitioner (EAP) to undertake the required environmental applications on behalf of Newcastle Energy for the proposed project. As part of the EIA, the need for an Atmospheric Impact Report (AIR) has been identified and SRK has also been appointed to undertake the AIR. As the AIR was undertaken by an in-house specialist IMA Trader 20 CC (IMA) was appointed by SRK to undertake a peer review.

This letter details the comments received from the peer reviewer on the 23 May 2021 and the associated responses by SRK in Table 1 below.

Table 1: Comments and Responses

Peer Review Comment	SRK Response
Chapter 1: Introduction, Background, Project Description and approach, and Scope of Report	
A concise background and description of the reason/requirement for the project is provided as the introduction to this chapter.	Noted with thanks.
It is difficult to distinguish whether or not the existing Newcastle Energy plant holds an existing Atmospheric Emissions Licence (AEL). Based on the explanation in this chapter which makes reference to Section 45 of the National Environmental Management Air Quality Act (NEM:AQA), this implies there will be a review of an existing AEL, which in terms of Section 45 then requires an AIR to be conducted. However, this is not made clear up front.	The existing plant does not hold an AEL as it has been decommissioned. The new plant will need to apply for an AEL should environmental authorisation be granted.

Peer Review Comment	SRK Response
Details of the appointment by Newcastle Energy and SRK (Pty) Ltd and the purpose of the AQIA report by SRK (Pty) Ltd, are clearly explained and defined in a logical and easy-to read format in this chapter.	Noted with thanks.
The project description is briefly outlined, the criteria pollutants assessed are listed and the averaging periods assessed in the model are defined. The application of a Tier 3 model, CALPUFF, is stated.	Noted with thanks.
Readers will find the sub-chapter on "Atmospheric Impact Report" (Chapter 1.3.1) informative, as it is applied well to this study specifically. The chapter explains the relevance of the Regulations to this study.	Noted with thanks.
The information provided in sub-chapter 1.3.2, although largely generic for all EIA specialist studies, has been linked with good detail to the specific chapters of the AIR from which the required information can be found.	Noted with thanks.
Chapter 2: Project Identification Requirements	
The presentation of the information in this chapter in table format is useful and easy to read. However, the details provided in Chapter 2.1, although useful for the author's or EAP's purposes or for submissions of AEL applications and NAEIS reporting in future, are not essential and possibly deter from the purpose of the report.	Noted - this has been subsequently removed.
In Table 2-3 in Chapter 2.2 the coordinates for the approximate centre of operations does not have any units stated. It would appear these are in UTM, but it also does not state which UTM zone these were in. It would perhaps be better to present the coordinates as decimal degrees latitude and longitude.	Added UTM zone as well as units in meters.
A site locality map is provided to present the location of the new NGEPP site within the Karbochem Industrial Complex in Newcastle	Noted.
No detail or map is provided for the locations of selected sensitive receptors.	Sensitive receptors are outlined in section 7.1.4. A map is provided here showing the locations of selected sensitive receptors.
The project phases and their estimated durations have not been defined, nor have any deliverable timeframes been stated.	Noted - this has however been presented in the EIA report.
Chapter 3: Project Details	
A brief but informative description of the new project and the processes, as well as process diagrams, are provided in this chapter.	Noted with thanks.
There is some repetition between the information in this chapter and that in the chapters preceding.	Noted - this has been addressed.
This section lacks logical flow from this chapter on project detail and process flow (Chapter 3) to the next chapter (Chapter 4 – on Meteorology), making it difficult for the reader to follow.	Noted - this has been addressed.

Peer Review Comment	SRK Response
Chapter 4: Meteorological Conditions	
Whilst the chapter on Climate in Southern Africa (Chapter 4.1) is interesting and provides a background, this information is irrelevant to the modelling study. The focus of the study is in Newcastle and thus, the general climate of SA is not the level of detail that is required for the micro-climate at Newcastle. It would make more sensen to omit Chapter 4.1 completely and start Chapter 4 with the text in chapter 4.2, which provides a good introduction to the section, providing a background and reason why the meteorological data is required and then moves on to define the MET data that was used for this study site.	Noted - this chapter has been removed.
In Chapter 4.2 it is confusing why additional met data from www.worldweatheronline.com for Newcastle was acquired and included in the report. The consideration thereof would have been adequate and the use of the CALMET data would be sufficient on its own.	Noted for future reference.
Page 13, Chapter 4.2, paragraph two uses terminology that may be too technical for the non-specialist reader, specifically pertaining to CALMET data. This could perhaps be clarified in terms of the MET data preparation and processing in order to assist readers.	Noted - this has been addressed.
In Chapter 4.2s, the brief introductory paragraphs for each climatological parameter (i.e. wind, rain, temperature) provides a good explanation about the effect of each parameter on the dispersion of pollutants.	Noted with thanks.
The presentation of WR plot wind roses are good and readable (Page 19-20).	Noted with thanks.
In terms of the wind roses in Figures 4-5 and 4-6, it may be useful to add the additional wind vector dotted lines for the secondary and tertiary wind directions (i.e. for SE, S-SE and E-SE).	Noted for future reference.
To help the reader understand and interpret Figures 4-5 and 4-6 (page 19-20), it may be better to place each figure and explanatory text on the same page. For example, to place Figure 4-5 directly below the bullet points on page 18, and Figure 4-6 directly below or after the last paragraph on page 18 to assist comprehension of the local climate.	Noted - this has been addressed.
Chapter 5: Legislative Framework	
Legislative frameworks and guidelines should be easy to read and understand for the reader in this chapter. The National Ambient Air Quality Standards (NAAQS) as set out in GNR 1210 of 2009 and GNR 486 of 2012 should be familiar to most readers. Mention should perhaps be made in Chapter 5 of the *'Regulations Regarding Air Dispersion Modelling'* (GNR 533 of 2014), which also forms part of the legal framework.	Noted – the Regulations Regarding Air Dispersion Modelling has been included.
Page 21, Chapter 5, the last sentence preceding chapter 5.1 makes reference to some "international guidelines" in the subsections that follow. However, no further reference is made to any international guidelines. Perhaps this needs to be removed.	Noted – this has been corrected.

Peer Review Comment	SRK Response
A clear and well-structured presentation of all criteria/priority pollutants and their respective NAAQS is provided in this chapter.	Noted with thanks.
Chapter 6: Air Quality Monitoring	
Given that no actual air quality monitoring was undertaken as part of this study, it doesn't make logical sense to name this chapter as "Air Quality Monitoring". Perhaps a better suited chapter name would be "Ambient Background Concentrations".	Noted – this has been corrected.
Page 23, Chapter 6, paragraph one states that no cumulative assessment was conducted because there was poor data recovery from ambient air quality monitoring stations. Given that there was poor data availability from the AAQMS, it would have been useful for SRK to conduct a baseline monitoring assessment at the fenceline of the site and in the surrounding area prior, or simultaneously, to the dispersion modelling exercise. A baseline monitoring exercise would have enabled a cumulative assessment, which is required in accordance with the *Regulations Regarding Air Dispersion Modelling'* (GNR 533 of 2014) – (Modelling Regs).	SRK duly acknowledges this limitation and recommend that a background air quality monitoring campaign for sulphur dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter (PM) and Carbon Monoxide (CO) be included as a condition for authorisation to the project. Furthermore, a recommendation related to the development and implementation of a routine emissions monitoring and ambient air quality monitoring program to determine whether there are any significant increases in emissions and impacts at sensitive receptors has been stipulated in the report.
Especially given that air quality is a major concern and a sensitive issue to stakeholders within the region, as stipulated in the Newcastle Environmental Management Framework Desired State of The Environment Report (2014), it would have been considered critical to assess the cumulative air quality impacts of the new NGEPP project.	Noted – a background air quality monitoring campaign is to be undertaken to assess the cumulative air quality impacts of the new NGEPP project.
In summary, this chapter states that no quantitative cumulative impact assessment was undertaken and that only a descriptive/qualitative assessment of the background ambient air quality conditions was conducted and is briefly defined in this chapter. This chapter highlights the sensitivity of the Newcastle area in terms of air quality issues recognised by the municipality and sensitive receptors.	Noted.
1.7 Chapter 7: Dispersion Modelling Methodology	
This chapter provides a logical structure of the following sub-sections which together comprise and outline the methodology that was applied for the dispersion modelling in this study: - Model Used - Meteorological Data - Description of Receptor Grid - Specified Sensitive Receptors - Description of Topographical Data - Emission Inventory - Model Output - Assumptions and Limitations	Noted with thanks.

Peer Review Comment	SRK Response
There should be consistency in the naming of the above sub-sections chapter headings, using uppercase for all words throughout or only uppercase for the first word's first letter.	Noted – this has been corrected.
Given the way in which these input parameters are introduced here in Chapter 7.1, it is suggested to rather present the subsections which follow (chapters 7.1 to 7.7) as third order headings, i.e. "7.1.1 Met data; 7.1.2 Receptor Grid…" and then the second order chapter heading above (chapter 7.1.) can be modified to be "Model used and Model Input Parameters". If so, then it would be best to make chapter 7.8 below a first order heading on its own (i.e. Chapter 8. Assumptions and Limitations)	Noted – this has been corrected.
In terms of Chapter 7.1, the suitability of various dispersion models to predicting dispersion of pollutants was researched by the reviewer to assess whether CALPUFF is the suitable and preferred tool for this application. Recent journal articles revealed that whilst AERMOD produces reasonably accurate results and remains the default dispersion model of the US EPA for many purposes, and whilst ADMS Urban is slightly more accurate and preferred in the UK and much of the European Union, more specialised software tools have been developed over the past two decades (such as CALPUFF). The difference in predictions between the two programs on a point source estimation is relatively small, but AERMOD falls short when it comes to modelling long-range dispersion of airborne pollutants in puff plumes. CALPUFF is therefore considered adequate for this study and remains the preferred long-range dispersion model by the South African authorities in the 'Modelling Regs'.	Noted.
Chapter 7.2 on page 25 is the second chapter in the AIR for Meteorological Data. Chapter 4.2 also provides Meteorological information. It may be worth combining the two chapters into this single chapter 7.2 in order to avoid repetition.	Noted – this has been corrected.
In Chapter 7.4 on page 26, a reasonable number (10) of sensitive receptors were defined and examined through modelling, although none were measured for baseline concentrations.	Noted.
The Emissions Inventory Chapter (Chapter 7.6) on pages 29-30 is very brief and lacks substantial detail. Given this, and despite the few technical terms in this chapter, the average reader should find it easy to follow and understand.	Noted.
It must be noted that estimation of emissions based on the typical performance data from the proposed engines is largely an estimate and of relatively high confidence. Whilst it would be ideal to have actual measured stack emissions data from similar sources, it is the best estimate that can be used at this planning phase for modelling. Actual emissions impacts may vary according to a multitude of real-world factors and must therefore be measured and mitigated throughout, given that the Newcastle area is sensitive to air quality issues.	Noted.
From table 7.2 on page 30 it states the stack and emissions data for a total of 13 stacks, but it is not stated whether or not only 12 stacks were modelled, given that it was explained in the earlier sections of the AIR that only 12 stacks will be operational with one stack always being on standby.	Note that all 13 stacks were included in the air dispersion model (12 operational + 1 Standby = 13)

Peer Review Comment	SRK Response
In terms of Chapter 7.7, despite the technical nature of inputs and outputs for dispersion modelling in CALPUFF, this Section is well-written and can be understood by the average reader.	Noted.
This chapter explains that the long-term (period average) of all hourly data (across the three year period) was considered and modelled. It is unknown why the long-term hourly average output statistic was chosen instead of the long-term annual average. No explanation for the reason of selection is provided. In contrast, the highest concentrations for an annual averaging period would represent the highest annual concentrations achieved at the plotted receptors for any of the years considered (three years were modelled). This technique is useful because in the case of the annual ambient standards for instance, no exceedances of the ambient Air Quality Guidelines are allowed.	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. Due to full compliance against the annual average NAAQS being demonstrated across all pollutants assessed in this study by the long-term (period average), no further investigation was deemed necessary.
In Chapter 7.7, it is stated that the short-term (24 hours and 1-hour) results are presented as the modelled 99th percentile (P99) concentrations. This is in line with the Regulations Regarding Air Dispersion Modelling which state that, "the 99th percentile concentrations are recommended for short-term assessment with the NAAQS since the highest predicted ground-level concentrations (100th percentile) can be considered outliers due to complex variability of meteorological processes. This might cause exceptionally high concentrations that the facility may never actually exceed in its lifetime".	Noted – this has been corrected.
For readers with limited understanding of dispersion modelling this section (Chapter 7.7) will help to understand compliance or non-compliance at P99 (the 99th percentile). Point two in Chapter 7.7 provides a description on how the 99th percentile for 1-hour and 24-hour is calculated and why it is used over other percentiles to assist the non-specialist reader.	Noted.
The Assumptions and limitations listed in Section 7.8 state that It was conservatively assumed that all NOx is rapidly converted to NO2. In accordance with the Modelling Regulations, a conversion factor of 75% could have been applied instead of assuming a 100% conversion.	Noted – a conservative approach was adopted for this assessment.
Furthermore, in this Chapter 7.8 it was conservatively assumed that Total Particulate Matter (TPM) is PM_{10}. This is a highly conservative assumption which is likely to overestimate PM_{10} emissions. It was also stated that in the absence of particle size distribution data, $PM_{2.5}$ was not modelled in this assessment. The estimation of PM2.5 emissions could have been calculated by applying a calculated ratio of PM_{10}:$PM_{2.5}$ if baseline measured PM_{10} and $PM_{2.5}$ data in the area of the Facility could have been available. This is also a highly conservative assumption which is likely to overestimate $PM_{2.5}$ emissions.	Noted – a conservative approach was adopted for this assessment.
It would make logical sense to separate chapter 7.8 from the preceding sub-sections and make it a first order chapter on its own – i.e. Chapter 8 Assumptions and Limitations.	Noted – this has been corrected.
1.8 Chapter 8: Dispersion Modelling Results	

Peer Review Comment	SRK Response
The modelled results for each priority/criteria pollutant are presented in a concise and simple structured format on pages 32 – 39. Each section provides a brief interpretation of results, followed by a clear and simple table of modelled results compared with the relevant NAAQS, followed by the two maps side-by-side showing the isopleth plumes for each averaging period modelled.	Noted – this has been corrected.
Overlaying the modelled isopleth plumes in google earth is an effective tool to help the reader to identify the locations of highest concentrations and the spatial distribution of the typical plume.	Noted – this has been corrected.
1.9 Chapter 9: Impact Assessment	
Chapter 9 (pages 40 – 44) provides the Impact Assessment for the AIR study. It is not common practice to include this impact assessment in the formal AIR. The Impact Assessment for the AIR is usually included as the Appendix to the AIR or, more commonly, is only included in the Air Quality Section of the EIA document.	Noted.
1.10 Chapter 10: Conclusions	
The purpose of the AIR study, the tools and approach applied in the study and the results of the dispersion modelling are clearly summarised for the average reader in the concluding chapter. The larger technical document was effectively condensed by distilling out the most pertinent results or points in this chapter. Long technical documents can easily become overwhelming and hence not properly read, understood, or utilised for decision making purposes, which defeats their purpose.	Noted with thanks.
1.11 Chapter 11: Recommendations	
Recommendations are clearly defined, and although largely generic, provide a good guideline for promoting effective management and maintenance at the proposed plant in order to maintain and promote compliance of emissions with the regulated standards.	Noted with thanks.

Yours faithfully,

SRK Consulting (South Africa) (Pty) Ltd

Hasheel Tularam *PrSciNat*
Senior Scientist (Air Quality and Noise)