EIMS | ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

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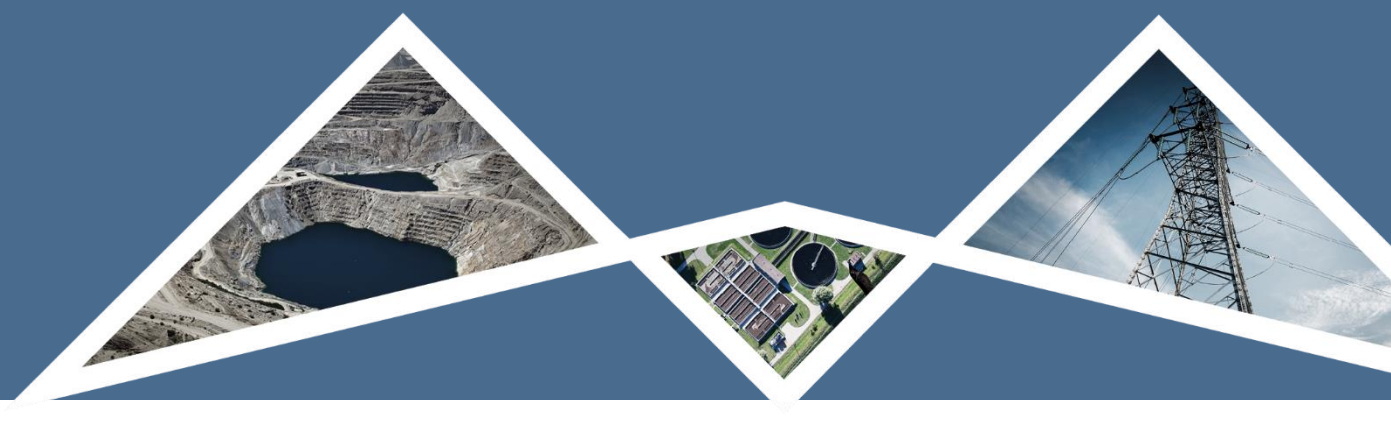
EIA REPORT

KELVIN POWER PLANT COMBINED CYCLE GAS TURBINE PROJECT
14/12/16/3/3/2/2537



DOCUMENT DETAILS

EIMS REFERENCE:	1607
DOCUMENT TITLE:	EIA Report: Kelvin Power Combined Cycle Gas Turbine Project

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
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REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2024/08/14	ORIGINAL DOCUMENT	EIA Report for Public Review

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List of Abbreviations & Acronyms

ACSA	Airports Company South Africa
AEL	Air Emissions License
AIDS	Acquired immunodeficiency syndrome
AIP	Alien Invasive Plants
APPA	Air Pollution Prevention Act
AQA	Air Quality Act
AQMS	Air Quality Monitoring Station
ASAPA	Association of Southern African Professional Archaeologists
ASTM	American Standard Testing Methodology
ATNS	Air Traffic and Navigation Service
BPG	Best Practice Guideline
CA	Competent Authority
CBA	Critical Biodiversity Area
CBD	Central Business District
CCGE	Combined Cycle Gas Engine
CCGT	Combined Cycle Gas Turbine
CCS	Carbon Capture and Storage
CoE	City of Ekurhuleni
CRM	Cultural Resource Management
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
DPWR	Department of Public Works, Roads and Transport
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act
EHV	Extra High Voltage
EIA	Environmental Impact Assessment
EIMS	Environmental Impact Management Service (Pty) Ltd
EMPr	Environmental Management Programme
ESA	Ecological Support Area
ESMS	Environmental and Social Management System
FOLU	Forestry and Other Land Use
FPIC	Free, Prior, and Informed Consent
FPL	Food Poverty Line
GDARDE	Gauteng Department of Agriculture, Rural Development and the Environment
GHG	Green House Gas
GIS	Geographical Information Systems
GPEMF	Gauteng Province Environmental Management Framework
GWP	Global Warming Potential
HIA	Heritage Impact Assessment
HRSG	Heat Recovery Steam Generator
I&APs	Interested and Affected Parties

ICE	Internal Combustion Engine
ICP	Informed Consultation and Participation
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IFC	International Finance Corporation
IOGP	International Association for Oil & Gas Producers
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUA	Integrated Unit of Analysis
KPI	Key Performance Indicator
KPS	Kelvin Power Station
LED	Local Economic Development
LM	Local Municipality
LUCF	Land-Use Change and Forestry
mamsl	Meters above mean sea level
MES	Minimum Emissions Standards
MHI	Major Hazardous Installation
MM	Metropolitan Municipality
MPRDA	Mineral and Petroleum Resources Development Act
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NCCRP	National Climate Change Response Policy
NCEP	National Centres for Environmental Prediction
NDP	National Development Plan
NEMA	National Environmental Management Act
NEMAQA	National Environmental Management: Air Quality Act
NEMBA	National Environmental Management Biodiversity Act
NEMWA	National Environmental Management Waste Act
NERSA	National Energy Regulator of South Africa
NFA	National Forests Act
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act
NOAA	National Oceanic and Atmospheric Administration
NPAES	National Protected Areas Expansion Strategy
NWA	National Water Act
OCGT	Open Cycle Gas Turbine
OHSA	Occupational Health and Safety Act
PAJA	Promotion of Administrative Justice Act
PM	Particulate Matter
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PPP	Public Participation Process
PPR	Public Participation Report
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANS	South African National Standard
SAWS	South African Weather Service

SDF	Spatial Development Framework
SEMA	Specific Environmental Management Act
SPLUMA	Spatial Planning and Land Use Management Act
SSVR	Site Sensitivity Verification Report
SWMP	Stormwater Management Plan
UIF	Unemployment Insurance Fund
UNFCC	United Nations Framework Convention on Climate Change
WHO	World Health Organisation
WUL	Water Use License
WULA	Water Use Licence Application

EXECUTIVE SUMMARY

Kelvin Power (Pty) Ltd (hereafter referred to as Kelvin) has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioners (EAPs) to assist with undertaking the necessary application processes (including the statutory public participation) and to compile and submit the required documentation in support of their proposed development of a Combined Cycle Gas Turbine (CCGT) Power Plant at the Kelvin Power Station located in Kempton Park, City of Ekurhuleni Metropolitan Municipality.

Kelvin, the Applicant, proposes to develop a CCGT Power Plant with generation capacity of up to 600 megawatts (MW) to be supplied to the Eskom grid. The proposed CCGT Power Plant will comprise of gas turbine(s), heat recovery boiler(s) and steam turbine(s). The main structures comprising the plant include a control room, gas turbine units, mechanical draft cooling tower, steam turbine building, heat recovery steam generator (HRSG) and HRSG stack, water treatment plant for cooling tower water, raw water and demineralised water tanks, fuel gas compressor building, a High Voltage switchyard, auxiliary buildings and administration buildings. Other possible infrastructure includes additional water and treated sewage wastewater reticulation pipelines, as well as electricity transmission lines to the Sebenza substation adjacent to the power station. The proposed CCGT plant will be located at the previous A-station location, which has been decommissioned. Kindly refer to Figure 1 for the locality map showing the proposed development location.

A CCGT power plant burns natural gas to produce electricity in a two staged process, creating a pressurised gas which powers a gas turbine that is connected to an electricity generator. The heat recovery system generator then captures exhaust heat produced by the gas turbine to power a steam turbine to produce additional power to run an electricity generator.

Kelvin plans to receive Natural Gas to the CCGT plant via Sasol's existing gas pipeline network. A pipeline connection will be required to connect to the existing gas pipeline network. It is noteworthy that various gas suppliers are currently being engaged for the supply of gas to the CCGT plant via the existing Sasol gas pipeline system.

The CCGT configuration will allow for the use of the waste heat for production of electricity thus allowing for production of electricity with the use of less fuel. The proposed power plant is anticipated to require gas supplied at approximately 40 bar and will consume approximately 21 kg/s with a net efficiency of approximately 60%.

The proposed CCGT includes Medium Voltage (MV) to Extra High Voltage (EHV) step-up transformers to raise the voltage to the grid specification. Electricity generated at the Kelvin Power CCGT Plant will be evacuated from the plant by means of new 275kV lines from the generating plant to the Sebenza 275/88kV Substation located adjacent (approximately 250m) to the proposed CCGT plant. The Sebenza Substation already has bays allocated for the integration of Kelvin Power within the substation network. The Sebenza Substation is connected to the Eskom grid via two 275kV powerlines to Prospect Substation each with a transfer capacity of 625MVA.

Kelvin Power also aims to construct a diesel storage area and a chemical stores area whose combined capacities will be between 80 and 500 cubic metres.

The proposed development triggers various listed activities in terms of the National Environmental Management Act (Act 107 of 1998 – NEMA) Listing Notices 1, 2 and 3 and a full Scoping and Environmental Impact Assessment process is being undertaken. The relevant Water Use Licence (WUL) and Air Emissions Licence (AEL) applications will be submitted for the triggers under the National Water Act (Act 36 of 1998 – NWA) and National Environmental Management Air Quality Act (Act No. 39 of 2004 as amended – NEMAQA) respectively.

This report aims to comply with the requirements of Appendix 3 of the Environmental Impact Assessment Regulations, 2014, promulgated under the National Environmental Management Act (NEMA- Act 107 of 1998) and fulfils the requirements of a EIA Phase Report.

PURPOSE OF THE EIA REPORT

The purpose of the EIA process is to:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Scoping report;
- Identify the location of the development footprint within the approved site as contemplated in the accepted Scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- Determine nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives and the degree to which these impacts can be reserved, may cause irreplaceable loss of resources and can be avoided, managed or mitigated;
- identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted Scoping report based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted Scoping report through the life of the activity;
- identify suitable measures to avoid, manage or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

PUBLIC PARTICIPATION PROCESS

The Public Participation Process (PPP) for the proposed project has been undertaken in accordance with the requirements the NEMA in line with the principles of Integrated Environmental Management. The PPP commenced on the 14th of February 2024 with an initial call to register notification. The comments received from I&APs during the initial call to register and commenting period to date have been captured in the Public Participation Report in Appendix C, and a summary of the issues raised and how they were addressed is included in Section 8.7 of this report.

The scoping report was made available for public review and comments for a period of 30 days from the 16th of March – 17 April 2024. Comments received during the Scoping Report review period were collated and added to the Public Participation Report and included in the summary of issues in Section 8.7 of this report.

Comments received during this EIA Report review will also be collated and added to the Public Participation Report and the summary in Section 8.7 of this report will be updated accordingly for inclusion in the finalised EIA Report to be submitted to the CA.

This EIA Report will be made available for public review and comment for a period of 30 days. Contact details are provided below:

- Environmental Impact Management Services (Pty) Ltd (EIMS)
- P.O. Box 2083 Pinegowrie 2123
- Phone: 011 789 7170 / Fax: 086 571 9047
- Contact: Jolene Webber
- Email: Kelvin@eims.co.za

PROJECT ALTERNATIVES AND ENVIRONMENTAL IMPACT ASSESSMENT

A scoping assessment was undertaken to identify all the potential risks and impacts associated with each phase of the proposed CCGT project as well as potentially feasible alternatives. Each of the identified risks and impacts at the various project phases were assessed. The assessment criteria (see Section 10.1 for the EIMS Impact

Assessment Methodology) include the nature, extent, duration, magnitude / intensity, reversibility, probability, cumulative impact, and irreplaceable loss of resources.

After considering the broad range of alternative types that exist (i.e. location, process, technology, and activity options), the layout and the no-go alternatives were the only reasonable options identified and assessed in this EIA. No alternative layouts were identified for this development as no environmentally sensitive features were identified within the project site thus, the preferred layout alternative was assessed and is being applied for.

Various impacts have been identified, with inputs from various specialists, in relation to the proposed project and these have been subjected to a scoping level impact assessment. The impacts were determined to have a Medium to Low negative final significance, whilst climate change impacts had a high negative final significance. The following impacts were determined to have a potentially moderate positive / negative final significance (see Section 10.3 for full list of identified impacts and the significance of each):

- Negative Impacts:
    - Construction Dust Pollution;
    - Chemical Spills during Construction;
    - Generation of Waste during construction;
    - Construction Noise to Biodiversity;
    - Soil Contamination;
    - Operational Air Emissions;
    - Operational Noise Impacts;
    - Social – concerns about crime, safety and traffic
    - Job Losses (Decommissioning Phase).
- Positive Impacts:
    - Employment Creation (Construction and Operational Phases)
    - Generation of electricity and energy security

The identified potential impacts of moderate to high significance were further assessed during the EIA phase of the project. Mitigation measures have been identified and included in the EIA Report and EMPr. **Three (3) EMPRs have been prepared for this project, as the main EMPr attached as Appendix G1 for the CCGT power plant and Generic EMPs are included for the power evacuation powerlines and the Gas Pipeline. Refer to Appendices G1 and G2**, based on inputs from the Environmental Assessment Practitioner (EAP), public consultation, and specialist assessments during the EIA phase of the project. The associated EMPs identified appropriate mitigation mechanisms for avoidance, minimisation and / or management of the negative impacts and enhancement of the positive impacts.

1 INTRODUCTION

Kelvin Power (Pty) Ltd (hereafter referred to as Kelvin) has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioners (EAPs) to assist with undertaking the necessary application processes (including the statutory public participation) and to compile and submit the required documentation in support of their proposed development of a Combined Cycle Gas Turbine (CCGT) Power Plant at the Kelvin Power Station located in Kempton Park, City of Ekurhuleni Metropolitan Municipality.

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A CCGT power plant burns natural gas to produce electricity in a two staged process, creating a pressurised gas which powers a gas turbine that is connected to an electricity generator. The heat recovery system generator then captures exhaust heat produced by the gas turbine to power a steam turbine to produce additional power to run an electricity generator.

Kelvin plans to receive Natural Gas to the CCGT plant via Sasol's gas pipeline network. A short pipeline connection will be required to connect to the Sasol gas pipeline network. It is noteworthy that various gas suppliers are currently being engaged for the supply of gas to the CCGT plant via the Sasol gas pipeline system.

The CCGT configuration will allow for the use of the waste heat for production of electricity thus allowing for production of electricity with the use of less fuel. The proposed power plant is anticipated to require gas supplied at a pressure of approximately 40 bar and will consume approximately 21 kg/s and produce energy with a net efficiency of approximately 60%.

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Kelvin Power also aims to construct a diesel storage area and a chemical stores area whose combined capacities will be between 80 and 500 cubic metres.

The proposed development triggers various listed activities in terms of the National Environmental Management Act (Act 107 of 1998 – NEMA) Listing Notices 1, 2 and 3 and a full Scoping and Environmental Impact Assessment process is being undertaken. The relevant Water Use Licence (WUL) and Air Emissions Licence (AEL) applications will be submitted for the triggers under the National Water Act (Act 36 of 1998 – NWA) and National Environmental Management Air Quality Act (Act No. 39 of 2004 as amended – NEMAQA) respectively.

This report aims to comply with the requirements of Appendix 3 of the Environmental Impact Assessment Regulations, 2014, promulgated under the National Environmental Management Act (NEMA- Act 107 of 1998) and fulfils the requirements of a Environmental Impact Assessment Report.

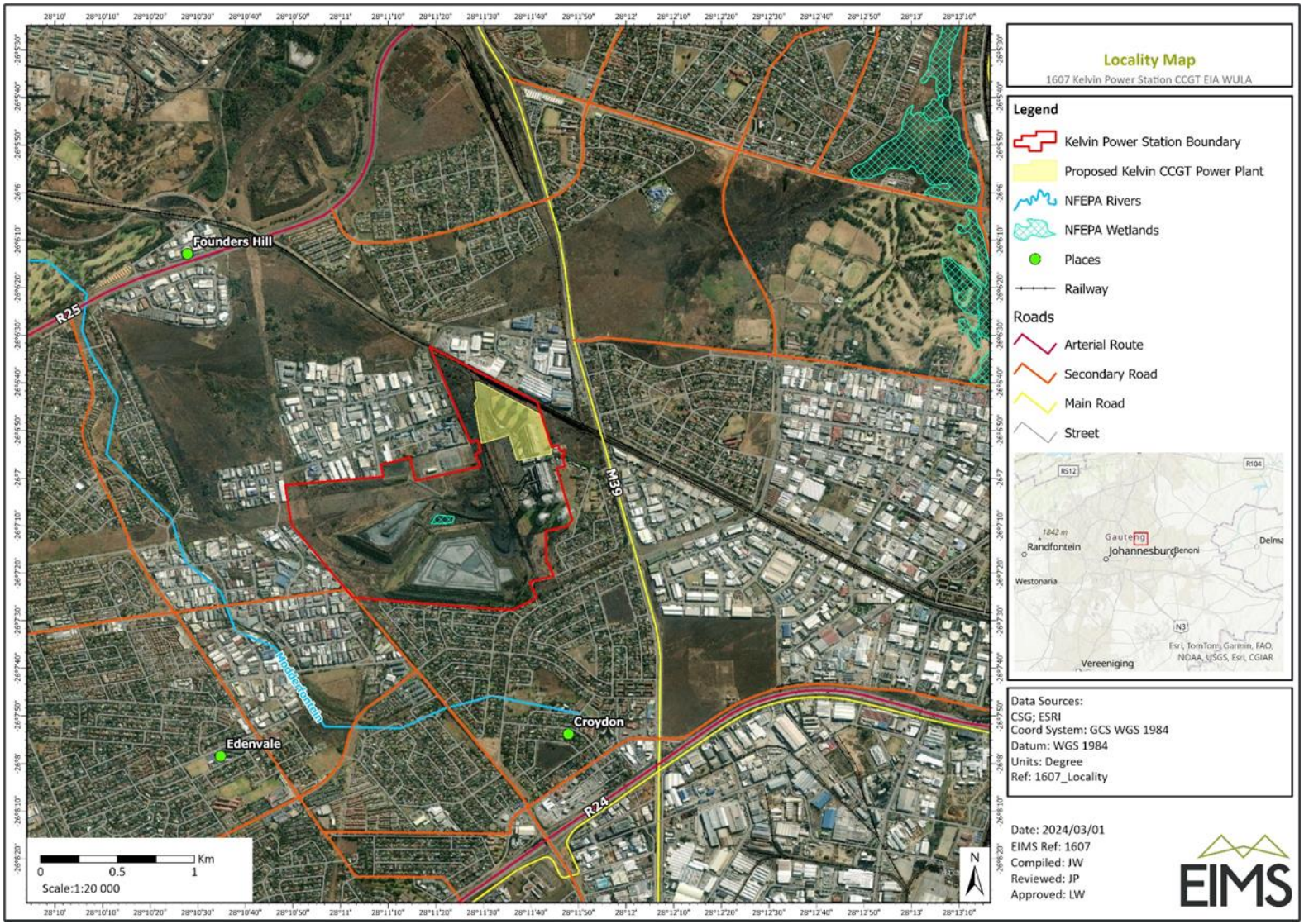

Figure 1: Map showing the proposed development area (yellow outline) and the Kelvin Power Station boundary (red outline).

1.1 REPORT STRUCTURE

This report has been compiled in accordance with the 2014 NEMA EIA Regulations, as amended. A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 1 below.

Table 1: Report structure.

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 3(a):	Details of – i. The EAP who prepared the report; and ii. The expertise of the EAP, including a curriculum vitae;	Section 1.2
Appendix 3(b):	The location of the activity, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties on which the activity is to be undertaken; Se	Section 2
Appendix 3(c):	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is - (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 2
Appendix 3(d):	A description of the scope of the proposed activity, including (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Section 3 & 4
Appendix 3(e):	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 5
Appendix 3(f):	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;	Section 6
Appendix 3(g):	A motivation for the preferred development footprint within the approved site;	Section 7
Appendix 3(h):	A full description of the process followed to reach the proposed development footprint within the approved site, including: (i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the	Section 7 Section 7.1

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
	Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the preferred alternative development location within the approved site;	Section 8 Section 8.7 Section 9 Section 10 Section 10.1 Section 10.3
Appendix 3(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 10
Appendix 3(j)	An assessment of each identified potentially significant impact and risk, including (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources;	Section 10

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
	and (vii) the degree to which the impact and risk can be mitigated;	
Appendix 3(k):	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 12
Appendix 3(l):	An environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 10.3 Section 11
Appendix 3(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 12.1
Appendix 3(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	7.7
Appendix 3(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	12
Appendix 3(p)	Description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	13
Appendix 3(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	12
Appendix 3(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	N/A
Appendix 3(s)	An undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	15

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 3(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
Appendix 3(u)	An indication of any deviation from the approved scoping report, including the plan of study, including (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	N/A
Appendix 3(v)	Any specific information that may be required by the competent authority; and	The report is in line with DFFE requirements noted in the scoping acceptance letter
Appendix 3(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act	N/A

1.2 DETAILS OF THE EAP

Environmental Impact Management Services (Pty) Ltd (EIMS) has been appointed by Kelvin to assist in preparing and submitting the relevant environmental applications, associated reports and documentation, and to undertake a Public Participation Process (PPP) in support of the proposed Kelvin Station CCGT project. EIMS is a private and independent environmental management consulting firm that was founded in 1993. EIMS has in excess of 30 years' experience in conducting EIA's, including EIA's relating to power stations, transmission and distribution infrastructure.

In terms of Regulation 13 of the EIA Regulations (GNR 982) as amended, an independent EAP, must be appointed by the applicant to manage the application. EIMS and the compiler of this report are compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations, as well as Section 1 of the NEMA. This includes, inter alia, the requirement that EIMS:

- Is objective and independent;
- Has expertise in conducting EIA's;
- Complies with the NEMA, the environmental regulations and all other applicable legislation;
- Considers all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

The details of the EIMS EAP's who compiled this report are as follows:

Table 2: EAP Details.

Name of Practitioner	John von Mayer (Project Manager/EAP)	Qaphela Magaqa (Consultant/Junior EAP)
Tel No:	+27 11 789 7170	+27 11 789 7170
Fax No:	+27 86 571 9047	+27 86 571 9047
E-mail:	kelvin@eims.co.za	kelvin@eims.co.za
Professional Registrations:	Professional Natural Scientist with the South African Council for Natural Scientific Professions - SACNASP (400336/11). Registered EAP with the Environmental Assessment Practitioners Association of South Africa - EAPASA (2019/1247).	Registered Certificated Natural Scientist with the South African Council for Natural Scientific Professions - SACNASP (148967). Registered Candidate EAP with the Environmental Assessment Practitioners Association of South Africa - EAPASA (2022/6016).

Mr John von Mayer is a senior consultant at EIMS and has been involved in numerous significant projects the past 14 years. He has experience in Project Management, small to large scale Environmental Impact Assessments, Environmental Auditing, Water Use Licensing, and Public Participation. He is a Registered Professional Natural Scientist (400336/11) with the South African Council Natural and Scientific Professions (SACNASP) as well as a registered Environmental Assessment Practitioners Association of South Africa (EAPASA) Environmental Practitioner (2019/1247).

Qaphela Magaqa holds a BSc (Honours) degree in Geographical Information Systems and a BSc (majors in Geology and Geography). In addition, he has completed a course on Environmental Law at the North West University. Qaphela is an EAPASA registered candidate Environmental Assessment Practitioner (2022/6016) and SACNASP Registered Certificated Natural Scientist (148967) with 4 years of professional experience. His expertise lies in environmental management, waste management, GIS, compliance auditing, public

participation, and reporting. Qaphela is currently involved in various projects which include undertaking and managing various ongoing projects, environmental compliance monitoring, environmental authorisation, GIS mapping and Water Use License Applications (WULA) projects.

The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with environmental impact assessment and relevant application processes) of the consultants that were involved in the EIA process and the compilation of this report are attached as Appendix A

1.3 SPECIALIST STUDIES

The DFFE National Web based Environmental Screening Tool is a is a geographically based web-enabled application that allows for the screening of environmental sensitivities on sites where developments are earmarked. A Screening Tool Report was generated from the DFFE Screening tool as per the requirements of Regulation 16 (1)(b)(v) of the EIA Regulations 2014, as amended, and was included in the Application for EA. The screening Tool provided a list of specialist studies for consideration and inclusion in the Scoping and EIA process. Further to the screening tool, a site sensitivity verification was undertaken and a Site Sensitivity Verification Report (SSVR) was compiled to consider the recommendations of the DFFE Screening Tool Report and to provide a rationale for the selection of specialist studies included in line with the recommendations of the Plan of Study for EIA included in this EIA report. Table 3 shows the list of studies were identified by the screening tool and the EAP's suggested sensitivities of the various themes as per the findings of the EAP's Site Sensitivity Verification Report.

Table 3: List of Screening Tool Identified Specialist Studies

Specialist Discipline/ Assessments	Screening Tool Level of Sensitivity	EAP Suggested Level of Sensitivity	Motivation
Agricultural Impact Assessment	Very High	Low	The site is located on a property/site that is utilised for power generation since the 1950s, the proposed development is not anticipated to impact agricultural resources. A DFFE compliant agriculture/land use land capability/soils compliance statement has been compiled by a suitably qualified specialist
Landscape/Visual Impact Assessment	Not specified	Low	The proposed development is located in a brownfield site whose land use has been power generation. The development site currently has power station infrastructure including cooling towers, the proposed development is therefore not anticipated to cause any visual/landscape intrusions as the proposed infrastructure is expected to be shorter/smaller than the currently existing power station infrastructure.
Archaeological and Cultural Heritage Impact Assessment	High	Low	A previous heritage assessment was already completed for the decommissioning project in 2021. It is possible that exemption from the requirements of a full HIA will be granted by SAHRA for the CCGT project, and an exemption letter is to be submitted to SAHRA in this regard. The exemption letter has been prepared by a suitably qualified heritage specialist. If exemption is not granted by SAHRA then an HIA will be undertaken.
Palaeontology Impact Assessment	Low	Low	No impacts on palaeontology are expected as a result of the project. The project is located within a low palaeontology sensitivity area.
Terrestrial Biodiversity Impact Assessment	Very High	Unknown	A DFFE compliant Terrestrial Biodiversity compliance statement has been prepared by a suitably qualified specialist as the proposed development is located in a brownfield site with various disturbances.

Specialist Discipline/ Assessments	Screening Tool Level of Sensitivity	EAP Suggested Level of Sensitivity	Motivation
Aquatic Biodiversity Impact Assessment	Low	Low	The nature of the development and components of the development during the construction and operational phases will not pose any risk to aquatic ecosystems and no wetlands are located within or near the site. Therefore no specialist aquatic studies were undertaken.
Hydrology Assessment	Not specified	Low	The proposed Kelvin Power Station site situated on the boundary of two quaternary catchments, A21C and A21A, with 97% of the site in quaternary catchment A21C (Juksei River Catchment). An unnamed tributary drains north-west for approximately 1.1km to confluence with the Modderfonteinspruit from the Kelvin Power ash dams where effluent is discharged (downstream of the power station), no impacts on hydrology have been identified as the project is significantly far from any water resources.
Noise Impact Assessment	Not specified	High	The proposed development is neighboured by industrial and residential developments. A DFFE compliant Noise Assessment has been undertaken by a suitably qualified specialist.
Traffic Impact Assessment	Not specified	Low	The proposed development of a CCGT plant is not anticipated to cause any significant impacts on traffic. It is anticipated that during construction there may be delivery trucks bringing in components of the proposed plant and increased number of workers traveling to site. However, it is understood that these activities will cause only minor disruptions to traffic. The CCGT plant will be fuelled by gas that will be piped to the plant as such, no significant traffic impacts have been identified.
Geotechnical Assessment	Not specified	Low	The proposed CCGT plant will be built in a brownfield site that is currently being utilized for power generation infrastructure. It is understood that a geotechnical study was undertaken for the area previously and significant no geotechnical risks or issues were identified or have occurred on site, as such, no geotechnical studies have been deemed necessary for this EIA study. Aspects relating to soil erosion will be dealt with in the soils compliance statement.
Climate Impact Assessment	Not specified	Unknown	A Climate Impact Assessment has been undertaken by a suitably qualified specialist.
Health Impact Assessment	Not specified	Unknown	A full DFFE compliant Air Quality Assessment has been undertaken, and will cover the health risks/aspects associated with the development of the Kelvin Power CCGT plant.
Socio-Economic Assessment	Not Specified	Unknown	A socio-economic study has been undertaken by a suitably qualified specialist.

Specialist Discipline/ Assessments	Screening Tool Level of Sensitivity	EAP Suggested Level of Sensitivity	Motivation
Ambient Air Quality Impact Assessment	Not Specified	Unknown	An Air Quality Impact Assessment has been undertaken by a suitably qualified specialist. The ambient air quality has been assessed as part of the Air Quality Impact Assessment/study.
Air Quality Impact Assessment	Not Specified	Unknown	An Air Quality Impact Assessment has been undertaken by a suitably qualified specialist.
Plant Species Assessment	Medium	Low	A DFFE compliant Terrestrial Biodiversity compliance statement has been undertaken by a suitably qualified specialist and it covers the plant species theme.
Animal Species Assessment	High	Low	A DFFE compliant Terrestrial Biodiversity compliance statement will be undertaken by a suitably qualified specialist. The proposed development is located on a brownfield site and is not anticipated to have significant impacts on animal species.
Civil Aviation Theme	Very High	Very High	A compliance statement has been prepared by the EAP.

A Major Hazardous Installation Qualitative Risk Assessment has been undertaken as was deemed necessary for the Kelvin Power CCGT development by the EAP. The proposed CCGT plant intends to receive piped natural gas which will be combusted in the electricity generation process. Furthermore, a chemical and diesel storage area will be established and as such the EAP deemed it necessary to appoint a specialist to evaluate the level of risk for the proposed activities.

As part of this EIA several specialist studies have been commissioned to investigate key impacts that require further investigation. A list of the preliminary specialist studies is included in Table 4.

Table 4: List of specialist studies to inform this EIA application.

Specialist Discipline	Company/Organisation
Air Quality	Airshed Planning Professionals
Climate Change	Airshed Planning Professionals
Ecology (compliance statement)	The Biodiversity Company
Heritage (Exemption Letter)	PGS Heritage

Specialist Discipline	Company/Organisation
Soils (compliance statement)	The Biodiversity Company
Noise	Airshed Planning Professionals
Socio-economic	Equispectives Research and Consulting Services
Major Hazardous Installation - Qualitative Risk Assessment	RISCOM
Civil Aviation	EIMS

2 LOCATION AND PROPERTY DESCRIPTION

Kelvin wishes to develop a CCGT Power Plant at the existing Kelvin Power Station which is situated within the City of Ekurhuleni Metropolitan Municipality, Kempton Park and is approximately 5 km north west of the O.R. Tambo International Airport. The proposed development is to be located at the previous coal powered Kelvin A-Station Power Plant that is undergoing a decommissioning process. The proposed gas pipeline connection is to be located within an existing Kelvin Power servitude. The centre point of the site is approximately 26° 6'45.84"S, 28°11'36.42"E. Refer to Figure 3 for the DFFE compliant locality map.

A description of the application area and location as well as the properties are included in Table 5 below.

Table 5: Locality details

EA Application Area (ha)	The EA application area (proposed Kelvin Power CCGT plant) covers ~15 ha.	
Magisterial District	The proposed project falls within the Ekurhuleni North Magisterial District, Gauteng Province.	
Distance and direction from nearest towns	The EA Application area is situated ~4km to the west of Kempton Park CBD, 11 km east of Sandton, and ~14km south east of Midrand.	
Farm Name, Number and Portion as well as 21-digit Surveyor General Code	**Farm Name, Number and Portion**	**21 Digit Surveyor General Code**
	Zuurfontein Farm 33-IR portion 391 RE Zuurfontein Farm 33-IR portion 82 RE	T0IR00000000003300391 T0IR00000000003300082
Linear Infrastructure Coordinates	Powerline	Start: 28° 11’ 30.79” E 26° 06’ 52.39 S Mid: 28° 11’ 30.05” E 26° 06’ 53.30 S End: 28° 11’ 28.30” E 26° 06’ 53.70 S
	Powerline	Start: 28° 11’ 32.07” E 26° 06’ 52.13” S Mid: 28° 11’ 31.14” E 26° 06’ 53.67” S End: 28° 11’ 30.05” E 26° 06’ 54.30” S
	Gas Pipeline	Start: 28° 11’ 54.25” E 26° 06’ 50.99” S Mid: 28° 11’ 43.79” E 26° 06’ 45.73” S End: 28° 11’ 33.35” E 26° 06’ 42.00” S

Kindly refer to Figure 2 below for a map showing the proposed development location and boundary of the site.

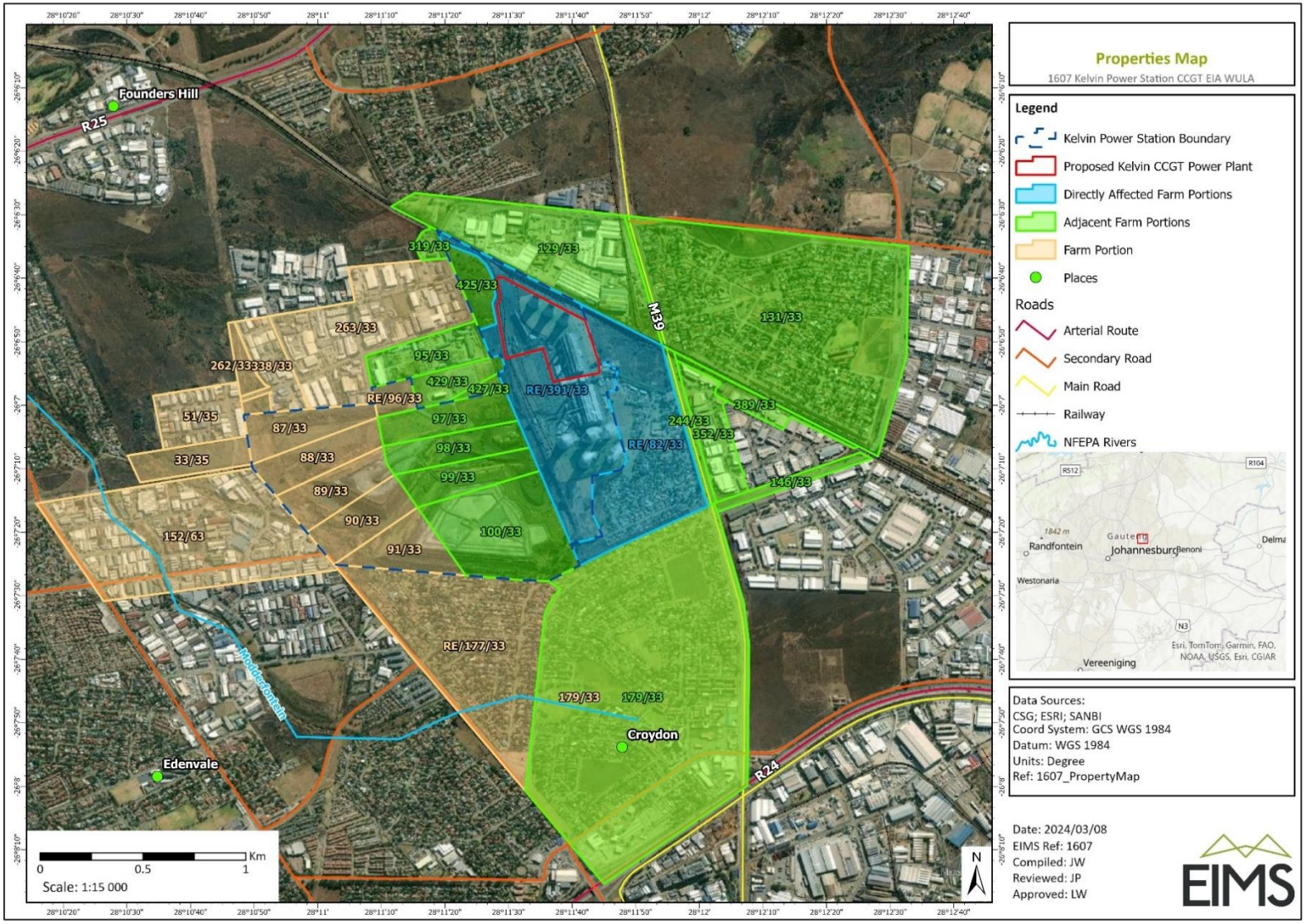

Figure 2: Map Showing Proposed Development Area and Affected Properties.

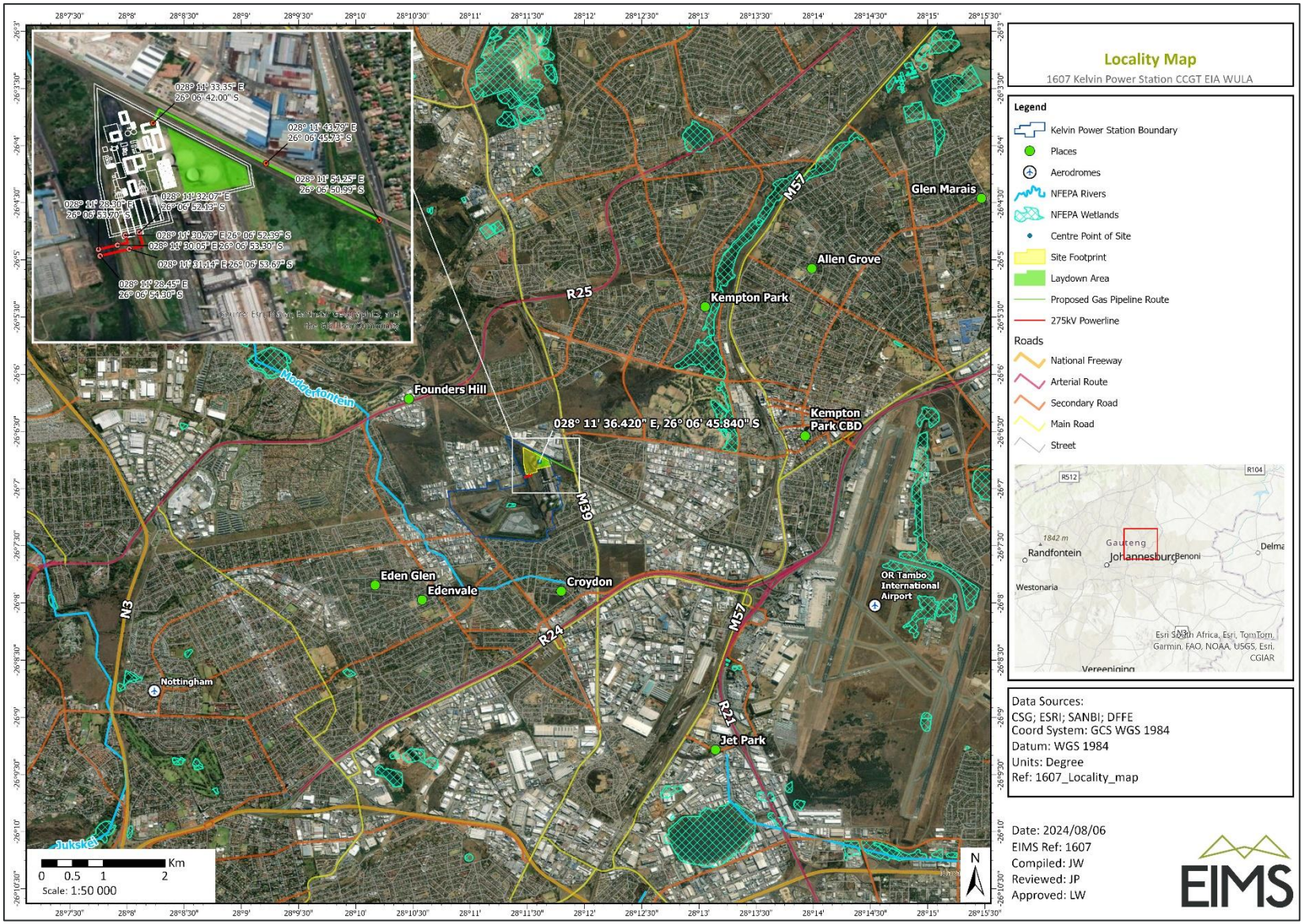

Figure 3: DFFE Locality Map

3 DESCRIPTION OF THE PROPOSED ACTIVITY

This section contains a description of the proposed Kelvin CCGT Power plant project and its associated infrastructure. At the end of this section, the applicable listed activities[1] relating to the project are presented.

3.1 PROJECT DESCRIPTION

This section aims to describe the proposed project and associated structures and infrastructure. The project description enables a clear understanding of the project related activities and their extent (spatial and temporal) to gain an understanding of the potential impacts which require specific mitigation.

3.1.1 PROJECT OVERVIEW

Kelvin intends to construct a CCGT plant with generation capacity of up to 600 MW at the previous Kelvin A-station site area. Kelvin aims to supply the electricity generated to Eskom through a Power Purchase Agreement (PPA).

Project Configuration Options:

Hybrid Solution (Worst-Case Scenario and Subject of Specialist Studies):

The CCGT[2] Power Plant will feature a hybrid solution involving two different gas turbine frame sizes operated in CCGT mode. This solution, considered the worst-case scenario and therefore the focus of specialist studies, will consist of:

- One smaller CCGT: With a capacity of up to 150 MW.
- One larger CCGT: With a capacity of up to 450 MW.

Together, these CCGT plants will have a combined capacity to generate approximately 600 MW. The facility will also include associated high-voltage switchgear and control systems.

Alternative Solution (Single Large Gas Turbine):

The alternative to the hybrid solution is a configuration that consists of one large gas turbine operating in CCGT mode, coupled with one large steam turbine. This configuration is expected to provide similar capacity, with the following features:

One large gas turbine and one large steam turbine combined to achieve approximately 600 MW of power generation.

The facility will similarly include associated high-voltage switchgear and control systems.

While both configurations aim to achieve the same power output, the hybrid solution is regarded as the worst-case scenario due to the complexity and potential environmental impacts associated with the operation of two different gas turbine sizes.

Operation Process:

1. **Fuel Supply:**
    - Natural gas will be supplied from the Sasol gas pipeline network (A pipeline connection is required).
2. **Electricity Generation and Heat Recovery:**

[1] "activity" means an activity identified in any notice published by the Minister or MEC in terms of the NEMA, NEMWA, NWA and/or NEMAQA as a listed activity or specified activity that may not commence without the requisite authorisation granted by the Minister or MEC;

[2] A CCGT power plant refers to a gas turbine consisting of a heat recovery system generator that captures exhaust heat produced by the gas turbine to power a steam turbine to produce additional power to run a generator or mechanical drive.

- The gas turbines will combust the natural gas, converting it into mechanical energy that drives a generator to produce electric power.
- The combustion process will also generate hot exhaust gas. The hot exhaust gas will be captured by a Heat Recovery Steam Generator (HRSG).

3. **Steam Cycle:**
    - Treated water in the HRSG will be heated, producing high-pressure steam.
    - The high-pressure steam will drive a steam turbine, converting the potential energy into mechanical energy to power a generator.
    - The steam will then be condensed and recycled back to the boiler.

Main Structures and Components:

- Up to three (3) gas turbines and generators using gas as a fuel source.
- Up to three (3) HRSGs for capturing exhaust heat.
- Up to two (2) steam turbines.
- Control room.
- Mechanical draft cooling tower for steam condensation.
- Steam turbine building.
- Up to three (3) HRSG main stacks (50 to 100 meters high).
- Up to three (3) bypass stacks (20 to 50 meters high, 2-meter diameter).
- Water treatment plant for process water and fire fighting purposes.
- Raw water and demineralized water tanks.
- Firewater storage and control system.
- Fuel gas compressor building.
- High Voltage switchyard.
- Auxiliary and administration buildings.
- Compressed air station for service and process air.
- Closed Fin-fan coolers for lubrication oil cooling.
- Site access roads.
- Diesel storage area (maximum capacity of 50m^3) with off-loading facilities.
- Diesel generator for black start up and emergency operation.

Electrical Equipment:

- The plant will include electrical equipment associated with the generation and evacuation of power, such as generators, transformers, MV motors, LV motors, circuit breakers, busbars, cabling, substation, and associated auxiliaries.

Ancillary Infrastructure:

- The ancillary infrastructure will include access roads within the site boundary, warehousing and buildings, workshops, guard house, administration and control building, ablution facilities, storage facilities, maintenance and cleaning area, operational and maintenance control centre, and fencing.

Construction Phase:

- Temporary work areas, including laydown areas, will be established during the construction phase. A laydown has been identified and will be located towards the eastern boundary of the site where the current A-station cooling towers (to be demolished) are located.

Cycle Efficiency:

- The proposed CCGT Power Plant configuration will utilize waste heat from the gas turbine to generate steam for the steam turbine, resulting in increased cycle efficiency and reduced fuel consumption.

- The proposed power plant is anticipated to require gas supplied at a pressure of approximately 40 bar and will consume approximately 21 kg/s with a net efficiency of approximately 60%.

Power Evacuation:

- The plant will include high voltage (HV) to medium voltage (MV) step-up transformers to tie the generators to the national grid. Electricity generated will be evacuated via two new 275kV transmission lines .
- Eskom and City Power share ownership of the Sebenza Substation, which has space allocated for the integration of Kelvin Power via two 275kV bays. The Sebenza Substation is connected to the Eskom grid via two 275kV powerlines.

Water Supply:

- Treated wastewater from the Diepsloot Wastewater Treatment Works, brought in through an existing pipeline network, will be treated at the proposed CCGT Power Plant's water treatment plant and will be reticulated for use throughout the plant.
- Additional water may be sourced from Randwater or on-site boreholes.

Waste Water Discharge:

- Treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel.

Table 6 below provides a Description and dimensions of key infrastructure for the proposed Kelvin Power CCGT Power Plant.

Table 6: Description and dimensions of key infrastructure

Component	Description
Control Room	Small distributed control room to control the operations of the CCGT plant – approximately 100m^2 in size and 15m high.
GT Generator Step-up Transformer	Generator step-up transformers (GSU) are the critical link between the power station and the transmission network, often operated day and night at full load.
ST Generator Step-up Transformer	
Steam Turbine Building	The steam generated from the CCGT is moved to a steam turbine where the potential energy contained in the steam will be converted to mechanical energy powering a generator that will produce electricity. The steam is then discharged into a condenser where it is then collected and returned to the boiler to produce more steam (recycling). The steam turbine building will cover an area of approximately 2000m^2 and will be approximately 35m high.
Laydown / maintenance area	A general laydown and maintenance area covering an area of 22 200 m^2. This will allow for placement of equipment during construction as well as maintenance of the CCGT plant.
Cooling Towner	Rows of mechanical cooling towers covering an area of approximately 2500 m^2. The height of the towers is approximately 20m.
Cooling Tower Water Treatment Plant	A separate, small water treatment plant for treatment of cooling tower water covering an area of approximately 200m^2.

Component	Description
Gas Turbine Unit(s)	Gas turbine units consisting of one large gas turbine and potentially several small CCGT options to complement the large CCGT. The height of the gas turbine building will be approximately 35m. Up to three stacks would be included with a height of 50m – 100m.
Heat Recovery Steam Generator(s)	CCGT power plants refer to a gas turbine system with an additional component known as a heat recovery steam generator (HRSG) for cogeneration. Waste heat recovered from the gas turbine exhaust to power a steam engine for the generation of power. The footprint is approximately 420m^2.
Heat Recovery Steam Generator Stack(s)	The HRSG stack is the exhaust outlet for the HRSG. It releases the flue gases (after heat recovery) into the atmosphere at a safe height. The height of the HRSG is approximately 20 - 50m
Water Treatment Plant	Waste water from the Diepsloot Waste Water Treatment Works, brought in through an existing pipeline network will be treated at the Kelvin Power CCGT water treatment plant, and will be reticulated for usage through the plant through small reticulation pipelines. After use, the treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel. The Water Treatment Plant that will cover an area of approximately 3000m^2. Approximately 52,000 m3/ day of this grey water is available to the Site. After use, the treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel. Additional water may be sourced from Randwater or on-site boreholes.
Raw Water and Demineralized Water Tank	Two tanks each with a 45m circumference, each covering an area of 150m^2.
Fuel Gas compressor and building	For gas pressurisation and gas conditioning including gas heating.
High Voltage Switchyard	A HV Switchyard that will cover an area of approximately 10 000 m^2. The MV to EHV Step-up transformers will be installed here to tie the generators to the grid

Kelvin Power wishes to commission the proposed CCGT plant in 2027/2028. The planned operational life cycle of the proposed CCGT plant is 20 years from commissioning. Kindly refer to Figure 5 below for a 3D image of a typical CCGT power plant.

3.1.2 DURATION FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

Construction of the Kelvin CCGT power plant should commence within five (5) year from the date of issuance of the EA. The proposed CCGT power plant has a planned operational life cycle of 20-years from the date of commissioning, which the EA will be required to be valid for.

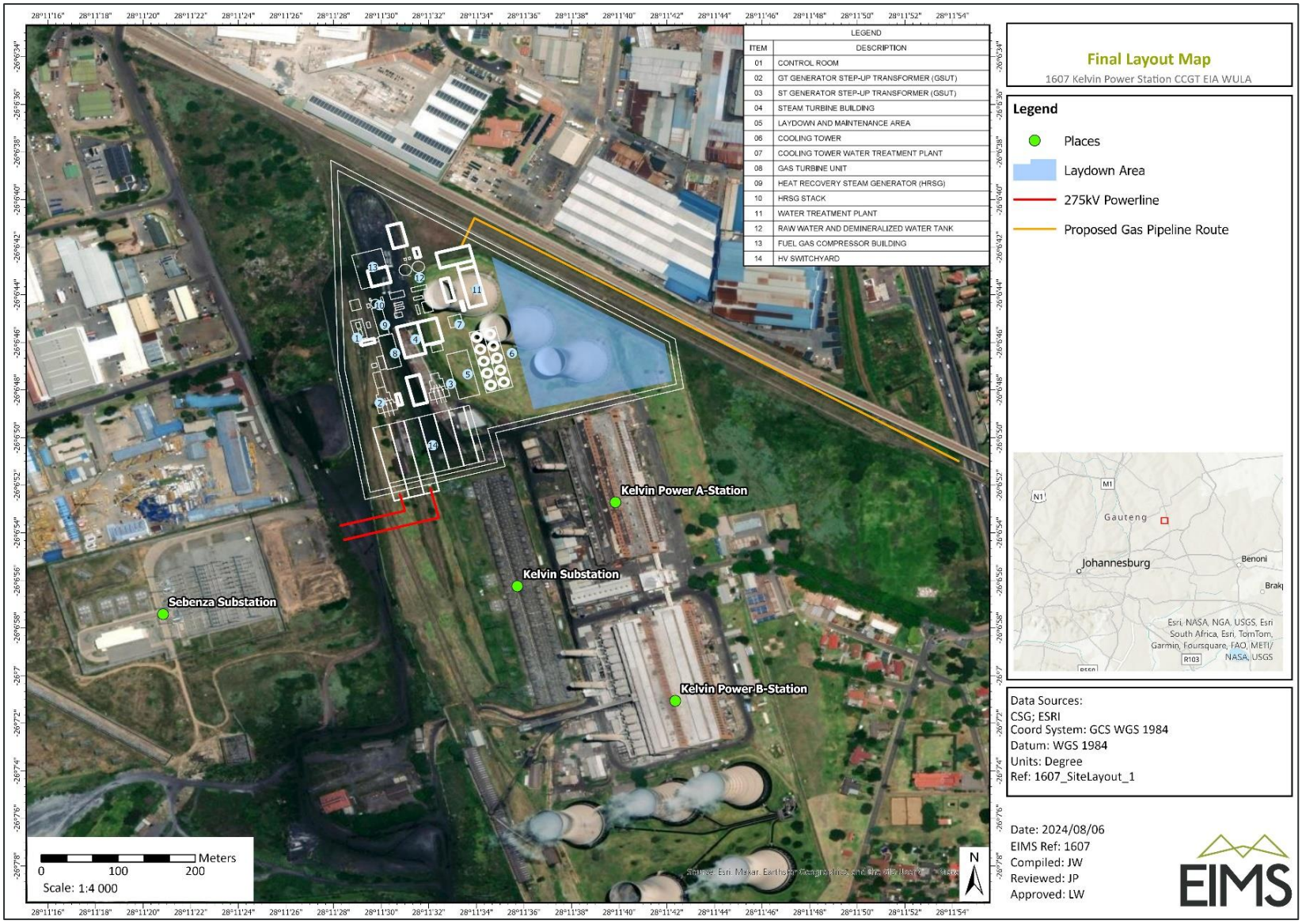

Figure 4: Final Site Layout Map

Figure 5: 3D Representation of a Typical CCGT Plant (Source: www.ge.com).

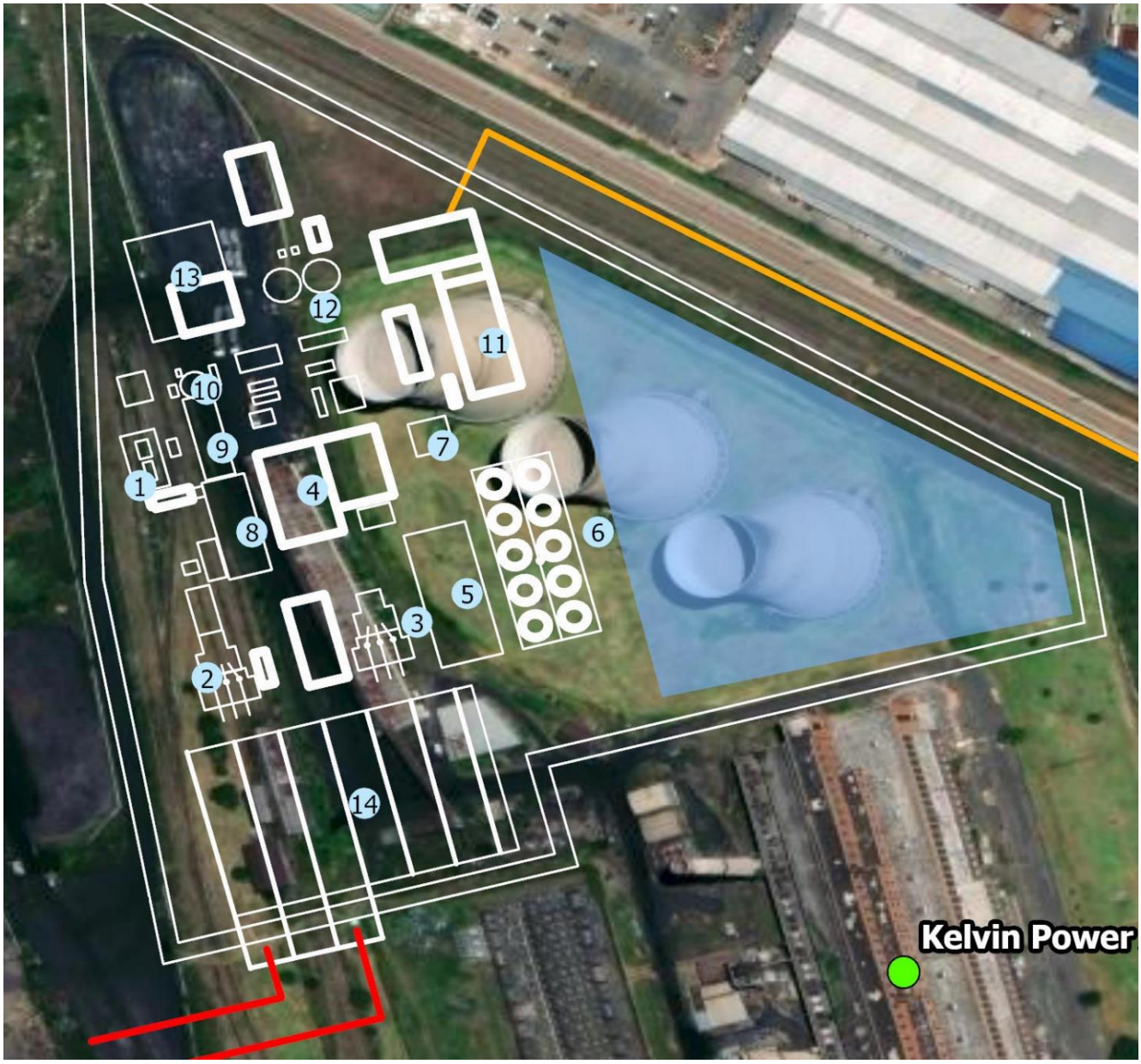

Figure 6: Zoomed in layout map

4 LISTED AND SPECIFIED ACTIVITIES TRIGGERED

In terms of Section 24(2) of NEMA, the Minister and/or any MEC in concurrence with the Minister may identify activities which require authorisation as these activities may negatively affect the environment. Environmental Impact Assessment (EIA) Regulations were promulgated in 2014 and amended in 2023 in terms of Section 24(5) and Section 44 of the National Environmental Management Act (NEMA), Act 107 of 1998 and consist of the following:

- *Regulation 982* provides details on the processes and procedures to be followed when undertaking an Environmental Authorisation application process (also referred to as the EIA Regulations);
- *Listing Notice 1* (Regulation 983) defines activities which will trigger the need for a Basic Assessment process;
- *Listing Notice 2* (Regulation 984) defines activities which trigger an Environmental Impact Assessment (EIA) process. If activities from both R 983 and R 984 are triggered, then an EIA process will be required; and
- *Listing Notice 3* (Regulations 985) defines certain additional listed activities for which a Basic Assessment process would be required within identified geographical areas.

The above regulations were assessed to determine whether the proposed project will trigger any of the above listed activities, and if so, which Environmental Authorisation Process would be required. The triggered listed activities presented in Table 7 will require authorisation in terms of GNR 984 Listing Notice 2 of the NEMA EIA Regulations 2014 as amended. A Scoping and EIA process is required in line with all the requirements of the NEMA EIA Regulations, 2014, as amended.

Table 7: Listed Activities in terms of NEMA EIA Regulations, 2014 and NEMAQA Section 21 Relevant to Project

Listing Notice	Activity Description	Applicability
Listing Notice 1 of the EIA Regulations, 2014		
60	*The expansion and related operation of facilities or infrastructure for the bulk transportation of dangerous goods - (i) in gas form, outside an industrial complex, by an increased throughput capacity of 700 tons or more per day.*	A gas pipeline linking the CCGT plant to the Sasol gas pipeline system will be required. The new pipeline will have a throughput capacity of greater than 700 tons per day.
Listing Notice 2 of the EIA Regulations, 2014		
2	*The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more.*	The CCGT plant will generate up to 600MW of electricity.
4	*The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.*	Dangerous goods stored on site would be chemicals for the water treatment plant and diesel storage. Exact volumes cannot be accurately determined at this stage however the combined storage of all dangerous goods

Listing Notice	Activity Description	Applicability
		will definitely exceed 80 cubic meters and will definitely be less than 500 cubic meters
6	*The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding:* *(i) activities which are identified and included in Listing Notice 1 of 2014;* *(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or* *(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.*	An AEL is required for the CCGT. A WUL will also be required.
9	*The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is-* *(a) temporarily required to allow for maintenance of existing infrastructure;* *(b) 2 kilometres or shorter in length;* *(c) within an existing transmission line servitude; and* *(d) will be removed within 18 months of the commencement of development*	Electricity generated at the Kelvin Power CCGT Plant will be evacuated from the plant by means of two new 275kV lines (or possibly cables) with an approximate length of 250 m from the generating plant to the Sebenza 275/88kV Substation located adjacent to the proposed CCGT plant
Listing Notice 3 of the EIA Regulations, 2014		
4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas.*	The project involves development of access roads wider than 4m, with a reserve less than 13,5 m in areas considered as high agricultural potential land (land capability class value of 12).

Listing Notice	Activity Description	Applicability
Section 21 of NEM:AQA		
1.4	*Gas combustion installations*	The CCGT power plant utilises gas combustion.
1.5	*Reciprocating Engines*	When combusting diesel during the monthly testing of the generators and in emergency events

No waste management license activities are triggered by the proposed project based on the types and volume of waste expected to be generated.

A water use application process is currently underway for WUL listed activities Section 21 (f) and (h).

5 POLICY AND LEGISLATIVE CONTEXT

This section provides a description of the policy and legislative context within which the development is proposed. The primary legal requirement for this project stems from the need for an EA to be granted by the competent authority which is the DFFE in accordance with the requirements of both NEMA. In addition, there are numerous other pieces of legislation governed by many acts, regulations, standards, guidelines and treaties on an international, national, provincial and local level, which should be considered in order to assess the potential applicability of these for the proposed activity. The key legislation applicable to this project is discussed in the subsections below.

5.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

The constitution of any country is the supreme law of that country. The Bill of Rights in Chapter 2 Section 24 of the Constitution of South Africa Act (Act No. 108 of 1996) makes provisions for environmental issues and declares that: *"Everyone has the right -*

a) to an environment that is not harmful to their health or well-being; and

b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

i. prevent pollution and ecological degradation;

ii. promote conservation; and

iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

The EIA and associated impact mitigation actions are conducted to fulfil the requirement of the Bill of Rights.

5.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA)

The main aim of the NEMA is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA EIA Regulations, the applicant is required to appoint an EAP to undertake the EIA process, as well as conduct the public participation process towards an application for EA. In South Africa, EIAs became a legal requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any Member of Executive Council (MEC), with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant EA. On 21 April 2006, the Minister of Environmental Affairs and Tourism (now Department of Forestry, Fisheries and the Environment – DFFE) promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were amended a number of times between 2010 and 2022. The NEMA EIA Regulations, 2014, as amended, are applicable to this project.

The objective of the EIA Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the listed activities that are triggered by the proposed project. The purpose of these procedures is to provide the competent authority with adequate information to make informed decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorised, and that activities which are authorised are undertaken in such a manner that the environmental impacts are managed to acceptable levels.

In accordance with the provisions of Sections 24(5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIAs in order to apply for, and be considered for, the issuing of an EA. These EIA Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity.

An environmental Scoping and Impact Assessment process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and Impact Assessment studies accordingly provide a mechanism for the comprehensive assessment of activities that are likely to have more significant

environmental impacts. Figure 7 below provides a graphic representation of all the components of a full EIA process. The listed activities the proposed project triggers and consequently requires authorisation prior to commencement are detailed in Section 4.

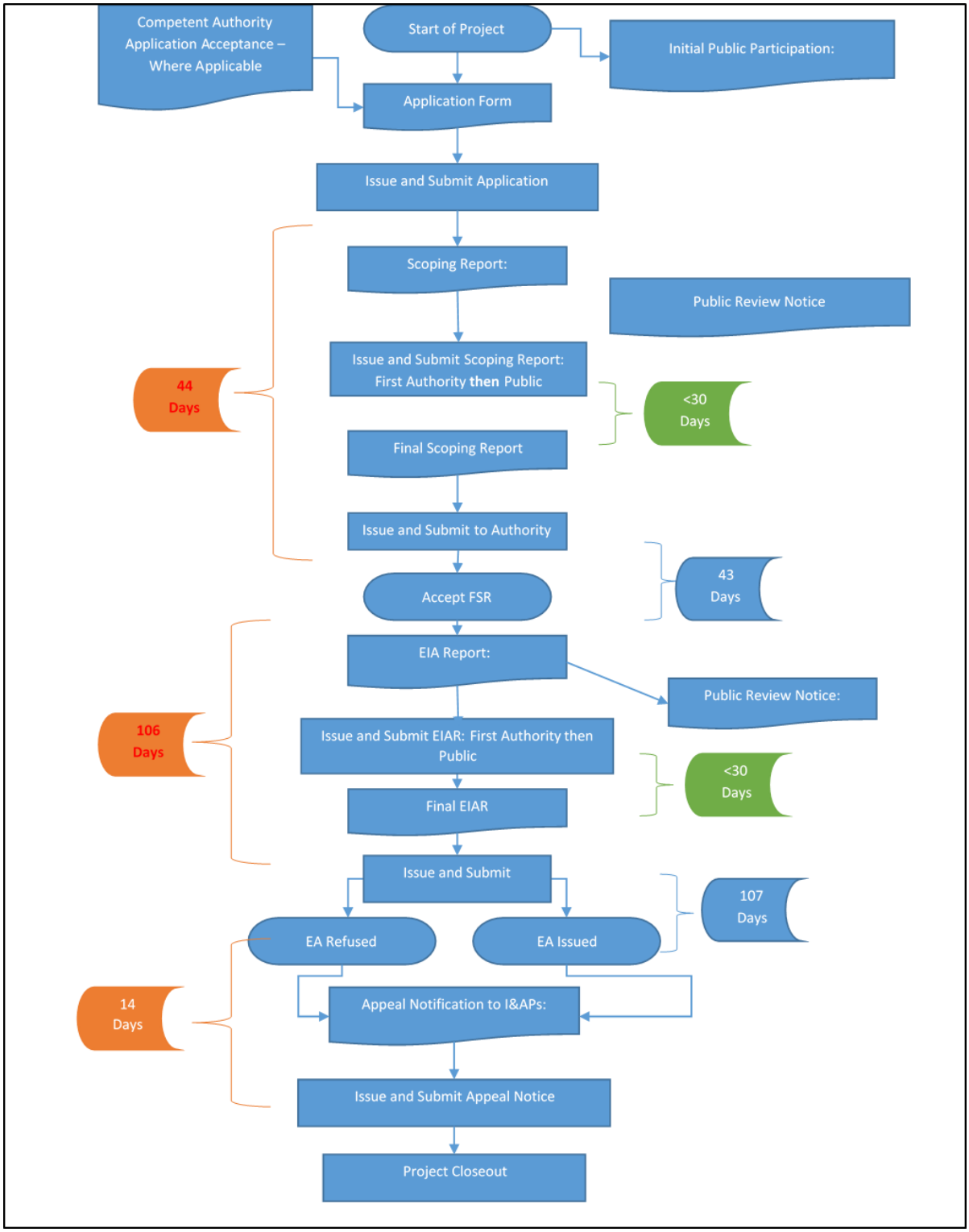

Figure 7: EIA process diagram.

The DFFE have published a number of guidelines and protocols which have been considered in the compilation of this report and include but not limited to:

- Public Participation Guideline in terms of NEMA EIA Regulations (2017).

- Need and desirability Guideline in terms of NEMA (2012).
- National guideline on minimum information requirements for preparing Environmental Impact Assessments for mining act activities that require environmental authorisation (2018).
- 2004 Information Series covering various aspects of the EIA process.
- Procedures for assessment and minimum criteria for specialist studies.

The impacts of climate change as a result of, as well as potentially affecting the project, are addressed by the environmental management tools of integrated environmental management (IEM) and EIA, as prescribed by the NEMA 107 of 1998. Given that the purpose of EIA is to give effect to the general objectives of IEM (section 24(1), NEMA), including sustainable development, there is a logical and necessary interrelationship between climate change and EIA.

NEMA sets out the general objectives of IEM in South Africa, of which the following two are of relevance for this report:

- Identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities. This is to be done with a view to minimising negative impacts, maximising benefits and promoting compliance with the principles of environmental management set out in section 2 (of NEMA).
- Ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them.

A Screening Tool Report was generated from the DFFE Screening tool as per the requirements of Regulation 16 (1)(b)(v) of the EIA Regulations 2014, as amended, and was included in the Application for EA. The screening Tool provided a list of specialist studies for consideration and inclusion in the Scoping and EIA process. In this regard, a Site Sensitivity Verification Report (SSVR) has been compiled to consider the recommendations of the DFFE Screening Tool Report and to provide a rationale for the selection of specialist studies included in line with the recommendations of the Plan of Study for EIA. Please refer to Appendix E for the Screening Tool Report and accompanying SSVR.

5.3 THE NATIONAL WATER ACT

The purpose of the NWA is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:

a) meeting the basic human needs of present and future generations;

b) promoting equitable access to water;

c) redressing the results of past racial and gender discrimination;

d) promoting the efficient, sustainable and beneficial use of water in the public interest;

e) facilitating social and economic development;

f) providing for growing demand for water use;

g) protecting aquatic and associated ecosystems and their biological diversity;

h) reducing and preventing pollution and degradation of water resources;

i) meeting international obligations;

j) promoting dam safety;

k) managing floods and droughts,

l) and for achieving this purpose, to establish suitable institutions and to ensure that they have appropriate community, racial and gender representation.

The NWA makes provision for two types of applications for water use licences, namely individual applications and compulsory applications. The NWA also provides that the responsible authority may require an assessment by the applicant of the likely effect of the proposed licence on the resource quality, and that such assessment be subject to the NEMA EIA Regulations. A person may use water if the use is –

- Permissible as a continuation of an existing lawful water use (ELWU);
- Permissible in terms of a general authorisation (GA);
- Permissible under Schedule 1; or
- Authorised by a licence.

The above water use processes are described in Figure 8.

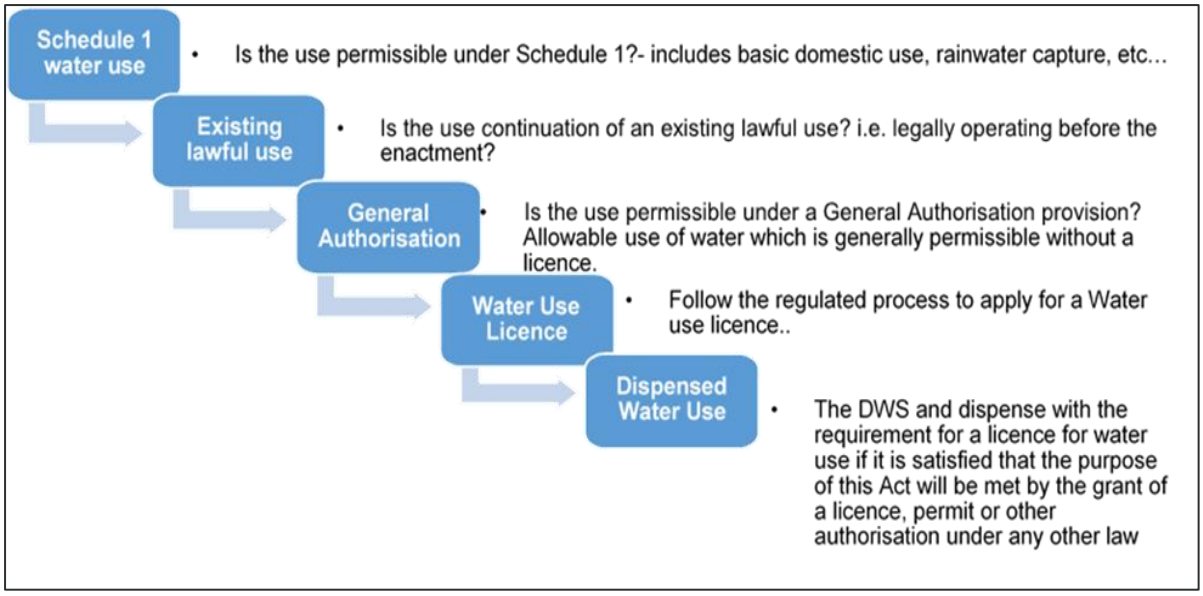

Figure 8: Authorisation processes for new water uses.

The NWA defines 11 water uses in Section 21 of the Act. A water use may only be undertaken if authorised by the DWS. The water uses for which an authorisation or licence can be issued include:

a) Taking water from a water resource;

b) Storing water;

c) Impeding or diverting the flow of water in a watercourse;

d) Engaging in a stream flow reduction activity contemplated in section 36;

e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;

g) Disposing of waste in a manner which may detrimentally impact on a water resource;

h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

i) Altering the bed, banks, course or characteristics of a watercourse;

j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

k) Using water for recreational purposes.

A watercourse is defined in terms of the Act as follows:

a) a river or spring;

b) a natural channel in which water flows regularly or intermittently;

c) a wetland, lake or dam into which, or from which, water flows; and

d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks;

The regulated area of a watercourse for section 21(c) or (i) of the Act water uses, is similarly defined in terms of the Act as follows:

a) The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

b) In the absence of a determined 1 in 100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or

c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

Kelvin Power has an existing WUL (ref: 03/A21C/FGH/1110) for Section 21 (f), (g), and (h) for their coal fired power station. As such, an application process has been initiated for the KPS CCGT power plant. Listed Water Uses applied for are Section 21 (f) and (h).

5.4 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (NEMWA)

On 1 June 2014, the NEMWA came into force. Waste is, accordingly, subject to all the provisions of the NEMWA.

The objectives of this Act are:

a) to protect health, well-being and the environment by providing reasonable measures for-

   i. minimising the consumption of natural resources;

   ii. avoiding and minimising the generation of waste;

   iii. reducing, re-using, recycling and recovering waste;

   iv. treating and safely disposing of waste as a last resort;

   v. preventing pollution and ecological degradation;

   vi. securing ecologically sustainable development while promoting justifiable economic and social development;

   vii. promoting and ensuring the effective delivery of waste services;

   viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and

   ix. achieving integrated waste management reporting and planning;

b) to ensure that people are aware of the impact of waste on their health, well-being and the environment;

c) to provide for compliance with the measures set out in paragraph (a); and

d) generally, to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being.

Section 16 of the NEMWA states:

1. A holder of waste must, within the holder's power, take all reasonable measures to-

a) "*Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;*

b) *Reduce, re-use, recycle and recover waste;*

c) *Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;*

d) *Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;*

e) *Prevent any employee or any person under his or her supervision from contravening the Act; and*

f) *Prevent the waste from being used for unauthorised purposes.*"

The NEMWA provides for specific waste management measures to be implemented, as well as providing for the licensing and control of waste management activities. No NEMWA listed activities have been identified for this project. However, Kelvin Power will be responsible for ensuring that all waste produced at the CCGT plant is handled in accordance with the requirements of the Waste Act.

The Waste Classification and Management Regulations (GNR 634) are published under the NEMWA. The purpose of these Regulations is to –

d) Regulate the classification and management of waste in a manner which supports and implements the provisions of the Act;

e) Establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management Licence;

f) Prescribe requirements for the disposal of waste to landfill;

g) Prescribe requirements and timeframes for the management of certain wastes; and

h) Prescribe general duties of waste generators, transporters and managers.

Waste classification, as presented in Chapter 4 of these regulations, entails the following:

i) Wastes listed in Annexure 1 of these Regulations do not require classification in terms of SANS 10234;

j) Subject to sub regulation (1), all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation;

k) Waste must be kept separate for the purposes of classification in terms of sub regulation (2), and must not be mixed prior to classification;

l) Waste-must be re-classified in terms of sub regulation (2) every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors;

m) Waste that has been subjected to any form of treatment must be re-classified in terms of sub regulation (2), including any waste from the treatment process; and

n) If the Minister reasonably believes that a waste has not been classified correctly in terms of sub regulation (2), he or she may require the waste generator to have the classification peer reviewed to confirm the classification.

Furthermore, Chapter 8 of the Regulations stipulates that unless otherwise directed by the Minister to ensure a better environmental outcome, or in response to an emergency so as to protect human health, property or the environment –

o) Waste generators must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Act prior to the disposal of the waste to landfill;

p) Waste generators must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Act; and

q) Waste managers disposing of waste to landfill must only do so in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7 (1) of the Act.

5.5 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT (NEMAQA)

The National Framework for achieving the NEM:AQA was published in the Government Gazette on the 11th of September 2007 (and amended in 2018). The National Framework is a medium- to long term plan on how to implement the NEM:AQA to ensure the objectives of the act are met. The National Framework states that aside from the various spheres of government responsibility towards good air quality, industry too has a responsibility not to impinge on everyone's right to air that is not harmful to health and well-being. Industries therefore should take reasonable measures to prevent such pollution degradation from occurring, continuing, or recurring. In terms of NEM:AQA, certain industries have further responsibilities, including:

- Comply with any relevant national standards for emissions from point, non-point or mobile sources in respect of substances or mixtures of substances identified by the Minister, Member of the Executive Council (MEC) or municipality.
- Comply with the measurement requirements of identified emissions from point, non-point or mobile sources and the form in which such measurements must be reported and the organs of state to whom such measurements must be reported.
- Comply with relevant emission standards in respect of controlled emitters if an activity undertaken by the industry and/or an appliance used by the industry is identified as a controlled emitter.
- Comply with any usage, manufacture or sale and/or emissions standards or prohibitions in respect of controlled fuels if such fuels are manufactured, sold or used by the industry.
- Comply with the Minister's requirement for the implementation of a pollution prevention plan in respect of a substance declared as a priority air pollutant.
- Comply with an Air Quality Officer's (AQOs) legal request to submit an Atmospheric Impact Report (AIR) in a prescribed form (if required).
- Take reasonable steps to prevent the emission of any offensive odour caused by any activity on their premises.
- Furthermore, industries identified as Listed Activities have further responsibilities, including:
    - Making application for an Atmospheric Emission License (AEL) and complying with its provisions.
    - Compliance with any minimum emission standards in respect of a substance or mixture of substances identified as resulting from a listed activity.
    - Designate an Emission Control Officer if required to do so.

5.5.1 NATIONAL MINIMUM EMISSION LIMITS

The Minister, in terms of Section 21 of the NEM:AQA, published a list of activities which result in atmospheric emissions and which are believed to have significant detrimental effects on the environment, human health and social welfare. The Listed Activities and Minimum National Emission Standards (MES) were first published on the 31st of March 2010 (Government Gazette No. 33064), with a revision of the schedule on the 22nd of November 2013 (Government Gazette No. 37054) and an amendment of certain sections and annexure A on the 31st of October 2018 (Government Gazette No. 42013). The project processes fall under Category 1: Combustion

Installations. Based on the nature of the operations and wording in the latest Listed Activities and Minimum National Emission Standards, the proposed project at the site triggers Subcategories 1.4 and 1.5 of the listed activities (Table 8):

- Gas Combustion Installations – Gas combustion used primarily for steam raising or electricity generation (more than 50-megawatt (MW) heat input per unit). MES subcategory 1.4 are applicable (Table 8) during normal operating conditions using natural gas.

Table 8: MES for Gas Combustion Installations

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 or greater than 50 MW heat input per unit based on the lower calorific value of the fuel used.	
Substance or mixture of substances		**mg/Nm^3 under normal conditions of 3% O_2, 273 K and 101.3 kPa**
Common Name	**Chemical Symbol**	**New plant**
Particulate matter (PM)	Not applicable	10
Sulfur dioxide	SO_2	400
Oxides of nitrogen	NO_x expressed as NO_2	50

Notes:

(a) The following special arrangement shall apply:

i. Reference conditions for gas turbines shall be 15% O_2, 273 K and 101.3 kPa; and

ii. Where co-feeding with waste materials with calorific value allowed in terms of the Waste Disposal Standards published in terms of the Waste Act, 2008 (Act No.59 of 2008) occurs, additional requirements under subcategory 1.6 shall apply. (This would not be applicable to the current project)

Subcategory 1.5: Reciprocating Engines		
Description	Liquid and gas fuel stationary engines used for electricity generation.	
Application	All installations with design capacity equal to or greater than 10 MW heat input per unit, based on the lower calorific value of the fuel used.	
Substance or mixture of substances		**mg/Nm^3 under normal conditions of 3% O_2, 273 K and 101.3 kPa**
Common Name	**Chemical Symbol**	**New plant**
Particulate matter (PM)	Not applicable	50
Oxides of nitrogen	NO_x expressed as NO_2	2000 (Liquefied fuels fired) 400 (Gas fired)

Sulfur dioxide	SO_2	1170 (Liquefied fuels fired)

5.5.2 ATMOSPHERIC EMISSION LICENSE (AEL) APPLICATION

The application for an AEL must include all sources of emission, not only those considered listed activities. In terms of the AEL application, the applicant should take into account the following sections of NEM:AQA:

37. *Application for atmospheric emission licences:*

(1) A person must apply for an AEL by lodging with the licencing authority of the area in which the listed activity is to be carried out, an application in the form required.

(2) An application for an AEL must be accompanied by –

(a) The prescribed processing fee; and

(b) Such documentation and information as may be required by the licencing authority.

38. Procedure for licence applications:

(1) The licencing authority –

(a) May, to the extent that is reasonable to do so, require the applicant, at the applicant's expense, to obtain and provide it by a given date with other information contained in or submitted in connection with the application;

(b) May conduct its own investigation on the likely effect of the proposed licence on air quality;

(c) May invite written comments from any organ of state which has an interest in the matter; and

(d) Must afford the applicant an opportunity to make representations on any adverse statements or objections to the application.

(2) Section 24 of the NEMA and section 22 of the Environmental Conservation Act apply to all applications for atmospheric emission licences, and both an applicant and the licencing authority must comply with those sections and any applicable notice issued or regulations made in relation to those sections.

(3) –

(a) An applicant must take appropriate steps to bring the application to the attention of relevant organs of state, interested persons and the public.

(b) Such steps must include the publication of a notice in at least two newspapers circulating the area in which the listed activity is applied for is or is to be carried out and must-

(i) Describe the nature and purpose of the licence applied for;

(ii) Give particulars of the listed activity, including the place where it is to be carried out;

(iii) State a reasonable period within which written representations on or objections to the application may be submitted and the address or place where it must be submitted; and

(iv) Contain such other particulars as the licencing authority may require.

46. Variation of provisional atmospheric emission licences and atmospheric emission licences

(1) A licensing authority may, by written notice to the holder of a provisional atmospheric emission licence or an atmospheric emission licence, vary the licence –

(a) if it is necessary or desirable to prevent deterioration of ambient air quality;

(b) if it is necessary or desirable for the purposes of achieving ambient air quality standards;

(c) if it is necessary or desirable to accommodate demands brought about by impacts on socioeconomic circumstances and it is in the public interest to meet those demands;

(d) at the written request of the holder of the licence;

(e) if it is transferred to another person in terms of section 44; or

(f) if it is reviewed in terms of section 45.

(2) The variation of a licence includes –

(a) the attaching of an additional condition or requirement to the licence;

(b) the substitution of a condition or requirement;

(c) the removal of a condition or requirement; or

(d) the amendment of a condition or requirement.

(3) If a licensing authority receives a request from the holder of a licence in terms of subsection (1)(d), the licensing authority must require the holder of the licence to take appropriate steps to bring the request to the attention of relevant organs of state, interested persons and the public if –

(a) the variation of the licence will authorise an increase in the environmental impact regulated by the licence;

(b) the variation of the licence will authorise an increase in atmospheric emissions; and

(c) the proposed variation has not, for any reason, been the subject of an authorisation in terms of any other legislation and public consultation.

(4) Steps in terms of subsection (3) must include the publication of a notice in at least two newspapers circulating in the area in which the listed activity authorised by the licence is, or will be, carried out –

(a) describing the nature and purpose of the request;

(b) giving particulars of the listed activity, including the place where it is or will be carried out;

(c) stating a reasonable period within which written representations on or objections to the request may be submitted, and the address or place where representations or objections must be submitted; and

(d) containing such other particulars as the licensing authority may require.

(5) Sections 38 and 40, read with the necessary changes as the context may require, apply to the variation of a licence.

5.5.3 ATMOSPHERIC IMPACT REPORT

According to NEM:AQA in terms of Section 30, an AQO may require the submission of an Atmospheric Impact Report (AIR) if:

- The Air Quality Officer reasonably suspects that a person has contravened or failed to comply with the AQA or any conditions of an AEL and that detrimental effects on the environment occurred or there was a contribution to the degradation in ambient air quality.
- A review of a provisional AEL or an AEL is undertaken in terms of Section 45 of NEM:AQA.

The format of the AIR is stipulated in the Regulations Prescribing the Format of the Atmospheric Impact Report, Government Gazette No. 36904, Notice Number 747 of 2013 (11 October 2013), it's amendment stipulated in Government Gazette No. 38633, No. R284 (2 April 2015). An AIR can be compiled prior to AEL application when plant design is finalised. An Air Quality Impact Assessment Report is being prepared as part of the EIA.

5.5.4 NATIONAL ATMOSPHERIC EMISSIONS REPORTING REGULATIONS

The National Atmospheric Emission Reporting Regulations (Government Gazette No. 38633) came into effect on 2 April 2015. The purpose of the regulations is to regulate the reporting of data and information from an identified point, non-point and mobile sources of atmospheric emissions to an internet-based National Atmospheric Emissions Inventory System (NAEIS). The NAEIS is a component of the South African Air Quality Information System (SAAQIS). Its objective is to provide all stakeholders with relevant, up to date and accurate information on South Africa's emissions profile for informed decision making.

Emission sources and data providers are classified according to groups. The project would be classified under Group A ("Listed activity published in terms of section 21(1) of the Act"). Emission reports from this group must be made in the format required for NAEIS and if applicable should be in accordance with the AEL or provisional AEL.

As per the regulations, the project and/or their data provider should register on the NAEIS system. Data providers must inform the relevant authority of changes if there are any:

- Change in registration details;
- Transfer of ownership; or
- Activities being discontinued.

A data provider must submit the required information for the preceding calendar year to the NAEIS by 31 March of each year. Records of data submitted must be kept for a period of 5 years and must be made available for inspection by the relevant authority.

The relevant authority must request, in writing, a data provider to verify the information submitted if the information is incomplete or incorrect. The data provider then has 60 days to verify the information. If the verified information is incorrect or incomplete the relevant authority must instruct a data provider, in writing, to submit supporting documentation prepared by an independent person. The relevant authority cannot be held liable for cost of the verification of data. A person guilty of an offence in terms of section 13 of these regulations is liable for penalties.

5.5.5 ATMOSPHERIC MODELLING REGULATIONS

Air dispersion modelling provides a cost-effective means for assessing the impact of air emission sources, the major focus of which is to determine compliance with the relevant ambient air quality standards. Dispersion modelling provides a versatile means of assessing various emission options for the management of emissions from existing or proposed installations. Regulations regarding Air Dispersion Modelling were promulgated in Government Gazette No. 37804 vol. 589; 11 July 2014, (Government Gazette, 2014) and recommend a suite of dispersion models to be applied for regulatory practices as well as guidance on modelling input requirements, protocols and procedures to be followed. The Regulations regarding Air Dispersion Modelling are applicable –

(a) in the development of an air quality management plan, as contemplated in Chapter 3 of the NEM:AQA;

(b) in the development of a priority area air quality management plan, as contemplated in Section 19 of the NEM:AQA;

(c) in the development of an AIR, as contemplated in Section 30 of the NEM:AQA; and,

(d) in the development of a specialist air quality impact assessment study, as contemplated in Chapter 5 of the NEM:AQA.

Three Levels of Assessment are defined in the Regulations. The three levels are:

- Level 1: where worst-case air quality impacts are assessed using simpler screening models
- Level 2: for assessment of air quality impacts as part of license application or amendment processes, where impacts are the greatest within a few kilometres downwind (less than 50 km)

- Level 3: require more sophisticated dispersion models (and corresponding input data, resources and model operator expertise) in situation:
    - where a detailed understanding of air quality impacts, in time and space, is required;
    - where it is important to account for causality effects, calms, non-linear plume trajectories, spatial variations in turbulent mixing, multiple source types & chemical transformations;
    - when conducting permitting and/or environmental assessment process for large industrial developments that have considerable social, economic and environmental consequences;
    - when evaluating air quality management approaches involving multi-source, multi-sector contributions from permitted and non-permitted sources in an air-shed; or,
    - when assessing contaminants resulting from non-linear processes (e.g. deposition, ground-level O3, particulate formation, visibility).

The first step in the dispersion modelling exercise requires a clear objective of the modelling exercise and thereby gives clear direction to the choice of the dispersion model most suited for the purpose. Accordingly, Level 2 or Level 3 would be appropriate for this study.

5.5.6 THE HIGHVELD PRIORITY AREA

The Highveld Airshed (HPA) was declared the second priority area by the minister at the end of 2007. This required that an Air Quality Management Plan for the area be developed. The plan includes the establishment of an emissions reduction strategies and intervention programmes based on the findings of a baseline characterisation of the area. The implication of this is that all contributing sources in the area will be assessed to determine the emission reduction targets to be achieved over the following few years.

The proposed project is located within the footprint demarcated as the HPA. The DFFE published the management plan for the HPA in September 2011. Included in this management plan are seven goals, each of which has a further list of objectives that have to be met. The goals for the Highveld Priority area are as follows:

- **Goal 1:** By 2015, organisational capacity in government is optimised to efficiently and effectively maintain, monitor and enforce compliance with ambient air quality standards
- **Goal 2:** By 2020, industrial emissions are equitably reduced to achieve compliance with ambient air quality standards and dustfall limit values
- **Goal 3:** By 2020, air quality in all low-income settlements is in full compliance with ambient air quality standards
- **Goal 4:** By 2020, all vehicles comply with the requirements of the National Vehicle Emission Strategy
- **Goal 5:** By 2020, a measurable increase in awareness and knowledge of air quality exists
- **Goal 6:** By 2020, biomass burning and agricultural emissions will be 30% less than current
- **Goal 7:** By 2020, emissions from waste management are 40% less than current

A draft of the second-generation air quality management plan for the HPA was published in August 2023. The proposed strategies to reduce the industrial emissions within the HPA were developed in line with the 2020 MES and are summarised below.

Table 9: HPA Air Quality Management Plan summary

Objectives	Key Activities/ Opportunities	Responsibility
Reduce emissions from industries	Compliance with the minimum emission standards and other atmospheric emission licence condition	Identified stakeholders in regulation 3(1)(a) and 3(1)(b).

Objectives	Key Activities/ Opportunities	Responsibility
	Assessment of compliance monitoring reports	Identified stakeholders in regulation 3(1)(d): DFFE, Provinces, Metros, Districts and Local municipalities
	Development and Implementation of emission reduction plans	Identified stakeholders in regulation 3(1)(a) and 3(1)(b).
	Monitor and enforce compliance	Identified stakeholders in regulation 3(1)(d): DFFE, Provinces, Metros, Districts and Local municipalities
	Identify opportunities and incentive schemes to support industries to implement air quality improvement initiatives.	Identified stakeholders in regulation 3(1)(d): DTIC, DFFE, Provinces, Metros, Districts and Local municipalities
	Establish incentive schemes for energy efficiency improvements and fuel switching that directly reduce air emissions.	Identified stakeholders in regulation 3(1)(d): DTIC, DFFE, Provinces, Metros, Districts and Local municipalities
Notes: DTIC – Department of Trade, Industry and Competition, DFFE – Department of Forestry, Fisheries and the Environment		

5.5.7 NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Criteria pollutants are considered those pollutants most commonly found in the atmosphere, that have proven detrimental health effects when inhaled and are regulated by ambient air quality criteria. South African NAAQS for SO2, nitrogen dioxide (NO2), PM10, CO, (O3), benzene (C6H6), and lead (Pb) were published on 13 March 2009. Standards for PM2.5 were published on 24 June 2012. All standards are listed in Table 10

Table 10: National Ambient Air Quality Standards for Criteria Pollutants.

Pollutant	Averaging Period	Limit Value (µg/m³)	Limit Value (ppb)	Frequency of Exceedance	Compliance Date
SO_2	10-minute	500	191	526	Currently enforceable
	1-hour	350	134	88	Currently enforceable
	24-hour	125	48	4	Currently enforceable
	1-year	50	19	-	Currently enforceable
NO_2	1-hour	200	106	88	Currently enforceable
	1-year	40	21	-	Currently enforceable
PM_{10}	24-hour	75	-	4	Currently enforceable
	1-year	40	-	-	Currently enforceable
$PM_{2.5}$	24-hour	40	-	4	1 Jan 2016 – 31 Dec 2029
		25	-	4	1 Jan 2030
	1-year	20	-	-	1 Jan 2016 – 31 Dec 2029

		15	-	-	1 Jan 2030
CO	1-hour	30 000	26 000	88	Currently enforceable
	8-hour	10 000	8 700	11	Currently enforceable
Benzene (C_6H_6)	1-year	5	1.6	-	Currently enforceable
Ozone (O_3)	8 hours (running)	120	61	11	Currently enforceable
Lead (Pb)	1-year	0.5	-	-	Currently enforceable

5.6 THE NATIONAL HERITAGE RESOURCES ACT (NHRA)

The National Heritage Resources Act (Act 25 of 1999 – NHRA) stipulates that cultural heritage resources may not be disturbed without authorisation from the relevant heritage authority. Section 34(1) of the NHRA states that, "*no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…*" The NHRA is utilised as the basis for the identification, evaluation and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through the NEMA, MPRDA and the Development Facilitation Act (FDA) legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorisations are granted for a development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impact Processes required by the NEMA.

The NEMA 23(2)(b) gives effect to the NHRA and states that an integrated environmental management plan should, "*…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*". A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken into account of in the EIA Regulations under the NEMA relates to the Specialist Report requirements (Appendix 6 of EIA Regulations 2014, as amended) which apply to Heritage Impact Assessments.

In accordance with the legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive and legally compatible Heritage Report is compiled.

5.7 THE NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT (NEMBA)

The National Environmental Management Biodiversity Act (Act No. 10 of 2004 – NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA as well as the protection of species and ecosystems that warrant national protection. Within the framework of this act, various regulations are promulgated which provide specific requirements and management measures relating to protecting threatened ecosystems, threatened or protected species as well as the control of alien and invasive species. A summary of these regulations is presented below.

The National List of Ecosystems that are Threatened and Need of Protection (GN 1002 of 2011) are promulgated under the NEMBA, and these Regulations provide for listing of threatened or protected ecosystems in one of the following categories:

- Critically Endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;
- Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;
- Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and
- Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

The proposed development is located within a brownfield development site and no Threatened Ecosystems in Need of Protection will be disrupted as a result of the proposed development. .

Further regulations published under the NEMBA are the threatened or protected Species Regulations (GN R 152 OF 2007) which aims to:

(a) further regulate the permit system set out in Chapter 7 of the Biodiversity Act insofar as that system applies to restricted activities involving specimens of listed threatened or protected species;

(b) provide for the registration of captive breeding operations, commercial exhibition facilities, game farms, nurseries, scientific institutions, sanctuaries and rehabilitation facilities and wildlife traders;

(c) provide for the regulation of the carrying out of a specific restricted activity, namely hunting;

(d) provide for the prohibition of specific restricted activities involving specific listed threatened or protected species;

(e) provide for the protection of wild populations of listed threatened species; and

(f) provide for the composition and operating procedure of the Scientific Authority.

The proposed development is located within a brownfield development site and no Threatened or Protected Species (TOPS) were noted during the Site Sensitivity Verification site visit.

The Alien and Invasive Species Lists are promulgated under the NEMBA with the aim of protecting the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;
- Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;
- Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and
- Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

During the initial site sensitivity verification study, AIP were identified by the EAP. The presence was confirmed by the ecologist and relevant measures have been incorporated into the EMPr. In giving effect to the above, the Alien and Invasive Species Regulations (GNR 1020 of 2020) provide for amongst others, the prevention of the spread or allowing the spread of, any specimen of a listed invasive species.

5.8 ENVIRONMENT CONSERVATION ACT (ECA)

The ECA (Act 73 of 1989) was, prior to the promulgation of the NEMA, the backbone of environmental legislation in South Africa. To date the majority of the ECA has been repealed by various other Acts, however Section 25 of the Act and the Noise Regulations (GN R. 154 of 1992) promulgated under this section are still in effect. These Regulations serve to control noise and general prohibitions relating to noise impact and nuisance.

In terms of section 25 of the ECA, the National Noise Control Regulations (GN R. 154 – NCRs) published in Government Gazette No. 13717 dated 10 January 1992, were promulgated. The NCRs were revised under GN R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Provincial noise control regulations have been promulgated in Gauteng, Free State and Western Cape Provinces.

The NCRs will need to be considered in relation to the potential noise that may be generated mainly during the construction phase of the proposed project. The two key aspects of the NCRs relate to disturbing noise and noise nuisance.

Section 4 of the Regulations prohibits a person from making, producing or causing a disturbing noise, or allowing it to be made produced or caused by any person, machine, device or apparatus or any combination thereof. A disturbing noise is defined in the Regulations as "*a noise level which exceeds the zone sound level or if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more*."

Section 5 of the NCRs in essence prohibits the creation of a noise nuisance. A noise nuisance is defined as "*any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person".* The South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these Regulations.

There are a few SANS relevant to noise from mines, industry and roads. They are:

- SANS 10103:2008 – 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004 – 'Calculating and predicting road traffic noise';
- SANS 10328:2008 – 'Methods for environmental noise impact assessments';
- SANS 10357:2004 – 'The calculation of sound propagation by the Concave method';
- SANS 10181:2003 – 'The Measurement of Noise Emitted by Road Vehicles when Stationary'; and
- SANS 10205:2003 – 'The Measurement of Noise Emitted by Motor Vehicles in Motion'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful per se.

5.9 THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT

The Spatial Planning and Land Use Management Act, No.16 of 2013, has been in effect since July 2015. Essentially SPLUMA applies to the governance of how land is used, which is significant for developers who are applying for land developments. The objectives of the act are to:

- provide for a uniform, effective and comprehensive system of spatial planning and land use management for the Republic;
- ensure that the system of spatial planning and land use management promotes social and economic inclusion;
- provide for development principles and norms and standards;

- provide for the sustainable and efficient use of land;
- provide for cooperative government and intergovernmental relations amongst the national, provincial and local spheres of government; and
- redress the imbalances of the past and ensure that there is equity in the application of spatial development planning and land use management systems.

The proposed site falls within an "Industrial and commercial focus zone" and the proposed development is a power producing CCGT power station (industrial facility), effectively being located within an appropriate land use zone. No SPLUMA application will be required for the new CCGT plant.

5.10 PROMOTION OF ADMISTRATIVE JUSTICE ACT 3 OF 2000

The Bill of Rights in the Constitution of the Republic of South Africa 1996 states that everyone has the right to administrative action that is legally recognised, reasonable, and procedurally just. The Promotion of Administrative Justice Act (PAJA) 3 of 2000 gives effect to this right. The PAJA applies to all decisions of all State organisations exercising public power or performing a public function in terms of any legislation that negatively affects the rights of any person. The Act prescribes what procedures an organ of State must follow when it takes decisions. If an organ of State implements a decision that impacts on an individual or community without giving them an opportunity to comment, the final decision will be illegal and may be set aside. The Promotion of Administrative Justice Act 3 of 2000 also forces State organisations to explain and give reasons for the manner in which they have arrived at their decisions and, if social issues were involved, and how these issues were considered in the decision-making process. The Promotion of Administrative Justice Act 3 of 2000 therefore protects the rights of communities and individuals to participate in decision-making processes, especially if these processes affect their daily lives. This EIA process gives effect to the PAJA.

5.11 THE NATIONAL ROAD TRAFFIC ACT

The National Road Traffic Regulations (1999) promulgated under Section 75 of the National Road Traffic Act (Act No. 93 of 1996) regulate the conveyance of abnormal loads and dangerous goods on public roads.

The National Road Traffic Act (1996) seeks to ensure that unintentional incidents are prevented and managed in a responsible way, and it makes persons accountable for their actions. Some of the requirements in the legislation include:

- Registration of operators: All dangerous goods operators who are operating vehicles whose gross vehicle mass is in excess of 3500 kilograms are required to register with the Department of Transport as dangerous goods operators.
- Driving licence: A special category D professional driving licence will be required. Signage on vehicles: All operators transporting dangerous goods will be required to identify their vehicles accordingly. This will include an orange diamond in front of the vehicle, placards on the sides and rear of the vehicle;
- Documentation: The driver of the vehicle will be required to carry at least 3 different documents, including a route plan, a transport emergency card and a document known as the dangerous goods declaration. The dangerous goods declaration will contain details of the consignor, consignee, the operator, the correct name of the product and the hazards associated with the chemical. The operator is also required to inform the emergency services situated along the routes which he will travel, what will be transported and the quantities so that appropriate measures will be taken to deal with an emergency;
- Responsibility of consignors and consignees: The legislation requires operators, consignors and consignees to take responsibility for their actions within each phase of the transport process. Each Party will be required by law to sign an operational agreement confirming the responsibility attached to them. In this way the responsible person could be held accountable in the event of an incident arising out of negligence.

It is understood that storage of emergency diesel will be undertaken at the Kelvin Power CCGT Station and other chemicals. Transportation of the dangerous goods (e.g. diesel and chemicals) will be undertaken via roads. Kelvin Power will need to ensure that all service providers abide by the provisions of the National Traffic Act.

5.12 HARZADOUS SUBSTANCES ACT

The Hazardous Substances Act (Act 15 of 1973) regulates the control of substances that may cause injury, or ill health, or death, due to their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. A license is required for an operation that stores, handles and sells Group I substances. The Act also prescribed the disposal of certain hazardous substances and their containers. Hazardous wastes temporarily stored on site will require disposal in line with the requirements of this Act.

5.13 DISASTER MANAGEMENT ACT

The Disaster Management Act 57 of 2002 makes provision for national, provincial, and municipal disasters. It requires disaster management frameworks on all three spheres of government. Each district municipality must establish a disaster management centre in consultation and partnership with local municipalities. The act spells out the duties and powers of a municipal disaster management centre, specifying that it must specialise in issues relevant to the municipal area and promote an integrated and coordinated approach to disaster management. It encourages a risk averse approach and the development of a municipal disaster management plan. The act identifies the responsibilities of the municipality in the event of a local disaster and requirements to declare a municipal state of disaster. It further sets out principles about funding of post-disaster recovery and rehabilitation. Kelvin Power must ensure that should any events that may impact municipal infrastructure or people's health occur they will swiftly notify the municipality of such to ensure it is handled accordingly.

5.14 OCCUPATIONAL HEALTH AND SAFETY ACT

The Occupational Health and Safety Act (Act 85 of 1993 - OHSA) provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith. Worker safety will form part of the contractor's safety requirements and be guided by the OHSA. This would entail a full health and safety file including but not limited to pre-mobilization medical assessments, work environment and task specific risk assessments and method statements etc. Once the plant is in operation worker safety will be covered by the Kelvin Power safety philosophy, risk assessments and Standard Operating Procedures which are all required to comply with the OHSA. Therefore safety of all personnel will be guided by overarching South African legislation.

The Major Hazard Installation Regulations (GNR 692 of 30 July 2001) are promulgated under the OHSA and apply to employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a major hazard installation or a quantity of a substance which may pose a risk that could affect the health and safety of employees and the public.

A "major hazard installation" means an installation-

a) where more than the prescribed quantity of any substance is or may be kept, whether permanently or temporarily; or

b) where any substance is produced, processed, used, handled or stored in such a form and quantity that it has the potential to cause a major incident;

MHI qualitative risk assessment has been undertaken to confirm whether the project or any of its components is/are defined as an MHI, and to inform the necessary risk mitigation.

5.15 BASIC CONDITIONS OF EMPLOYMENT ACT

The Basic Conditions of Employment Act (Act 75 of 1997) gives effect to the right to fair labour practices referred to in section 23(1) of the Constitution by establishing and making provision for the regulation of basic conditions of employment; and thereby to comply with the obligations of the Republic as a member state of the International Labour Organisation. The Basic Conditions of Employment Amendment Act, No 20 of 2013 was published and became effective on 1 September 2014. Kelvin Power will need to ensure that they are compliant to all provisions of this act.

5.16 LABOUR RELATIONS ACT

The Labour Relations Act (Act 66 of 1995) aims to promote economic development, social justice, labour peace and democracy in the workplace. It sets out to achieve this by fulfilling the primary objectives of the Act, which are to give effect to and regulate the fundamental rights conferred by section 27 of the Constitution, including the right to fair labour practices, to form and join trade unions and employer's organisations, to organise and bargain collectively, and to strike and lock out; to provide a framework for regulating the relationship between employees and their unions on the one hand, and employers and their organisations on the other hand. At the same time it also encourages employers and employees to regulate relations between themselves; and to promote orderly collective bargaining, collective bargaining at sectoral level, employee participation in decision-making in the workplace and the effective resolution of labour disputes. Kelvin Power will need to ensure that they are compliant to all provisions of this act.

5.17 EMPLOYMENT EQUITY ACT

The Employment Equity Act (Act 55 of 1998) promotes equity in the workplace, ensures that all employees receive equal opportunities and that employees are treated fairly by their employers. The law protects employees from unfair treatment and any form of discrimination. The law states that an employer may not discriminate against an employee directly or indirectly through employment policy or practice on the grounds of race, gender, pregnancy, marital status, family responsibility, ethnic or social origin, colour, sexual orientation, age, disability, religion, HIV status, conscience, belief, political opinion, culture, language, and birth.

The law aims to redress injustices of the past by implementing affirmative action measures. According to the legislation, it isn't unfair discrimination to promote affirmative action consistent with the Act or to prefer or exclude any person on the basis of an inherent job requirement. Kelvin Power will need to ensure that they are compliant to all provisions of this act.

5.18 PROMOTION OF EQUALITY AND PREVENTION OF UNFAIR DISCREMINATION

The Promotion of Equality and Prevention of Unfair Discrimination Act (Act 4 of 2000) gives expression to the right to equality. Section 8 stipulates that no person may be unfairly discriminated against on the grounds of gender, expressly including gender-based violence. Section 8 of the Act goes onto prohibit any limitation of women's access to social services, such as health or education, and the denial or systemic inequality of access to opportunities. Kelvin Power will need to ensure that they are compliant to all provisions of this act.

5.19 NATIONAL ENERGY ACT

The National Energy Act (Act 34 of 2008) provides to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors; to provide for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure; to provide measures for the furnishing of certain data and information regarding energy demand, supply and generation; to establish an institution to be responsible for promotion of efficient generation and consumption of energy and energy research; and to provide for all matters connected therewith. Importantly, the Department of Energy (DoE) is mandated to

provide for energy planning and measures for the furnishing of certain data and information regarding energy demand, supply and generation.

The objectives of this Act are to:

a) Ensure uninterrupted supply of energy to the Republic;

b) Promote diversity of supply of energy and its sources;

c) Facilitate effective management of energy demand and its conservation;

d) Promote energy research;

e) Promote appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy;

f) Ensure collection of data and information relating to energy supply, transportation and demand;

g) Provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development;

h) Provide for certain safety, health and environment matters that pertain to energy;

i) Facilitate energy access for improvement of the quality of life of the people of Republic;

j) Commercialise energy related technologies;

k) Ensure effective planning for energy supply, transportation and consumption; and

l) Contribute to sustainable development of South Africa s economy.

The Act provides for the establishment of the South African National Energy Development Institution (SANEDI), whose functions include:

Energy efficiency –

i. Undertake energy efficiency measures as directed by the Minister;

ii. Increase energy efficiency throughout the economy;

iii. Increase the gross domestic product per unit of energy consumed; and

iv. Optimise the utilisation of finite energy resources;

Energy research and development -

i. Direct, monitor, conduct and implement energy research and technology development in all fields of energy, other than nuclear energy;

ii. Promote energy research and technology innovation; and

iii. Provide for –

    a. training and development in the field of energy research and technology development;

    b. establishment and expansion of industries in the field of energy; and

    c. commercialisation of energy technologies resulting from energy research and development programmes;

iv. Register patents and intellectual property in its name resulting from its activities;

v. Issue licences to other persons for the use of its patents and intellectual property;

vi. Publish information concerning its objects and functions;

vii. Establish facilities for the collection and dissemination of information in connection with research, development and innovation;

viii. Undertake any other energy technology development related activity as directed by the Minister, with the concurrence of the Minister of Science and Technology;

ix. Promote relevant energy research through cooperation with any entity, institution or person equipped with the relevant skills and expertise within and outside the Republic;

x. Make grants to educational and scientific institutions in aid of research by their staff or for the establishment of facilities for such research;

xi. Promote the training of research workers by granting bursaries or grants in aid for research;

xii. Undertake the investigations or research that the Minister, after consultation with the Minister of Science and Technology, may assign to it; and

xiii. Advise the Minister and the Minister of Science and Technology on research in the field of energy technology.

Kelvin aims to produce electricity through the use of gas providing energy to be supplied to end users via the Eskom grid. The production of energy at the Kelvin CCGT plant will be subject to the conditions and requirements of this Act, and the gas production on the whole will contribute to the South African economy.

5.20 GAS ACT

The Gas Act (Act 48 of 2001) aims to promote the orderly development of the piped gas industry; to establish a national regulatory framework; to establish a National Gas Regulator as the custodian and enforcer of the national regulatory framework; and to provide for matters connected therewith. This Kelvin CCGT project may indirectly promote development piped gas. Section 15(1) of the Gas Act states that no person may without a licence issued by the Gas Regulator:

a) construct gas transmission, storage, distribution, liquefaction and re-gasification facilities or convert infrastructure into such facilities;

b) operate gas transmission, storage, distribution, liquefaction or re- gasification facilities; or

c) trade in gas.

Kelvin may require a licence from the Gas Regulator for the gas infrastructure that may be required on this CCGT Project.

5.21 NATIONAL GAS INFRASTRUCTURE PLAN

The gas infrastructure plan is intended to be a strategy for the development of the natural gas industry in South Africa. Government wishes to promote the gas industry based on its energy policy objectives as set out in the White Paper on Energy (1998). These include:

- Increasing access to affordable energy services;
- Improving energy governance;
- Stimulating economic activity;
- Managing energy-related environmental impacts;
- Securing security of supply through diversity of supply;
- Competition within and between energy carriers; and
- Promoting New Partnership for African Development (NEPAD) cross-border type projects.

It is noteworthy that a supply of gas will be required as fuel for the CCGT plant. The gas will be supplied to the CCGT through a short connection from an Sasol gas pipeline. Various stakeholders are being engaged for the

supply of gas. The proposed power generation plant is privately owned and will be in a position to supply energy to the grid through a PPA at competitive prices.

5.22 INTEGRATED RESOURCE PLAN

The Minister of Mineral Resources and Energy (Minister) published the current Integrated Resource Plan (IRP 2019) as GN 1360 of 18 October 2019 in Government Gazette No. 4278. The Determination provides for various energy sources to be procured from Independent Power Producers (IPPs) through one or more IPP Procurement Programmes as contemplated in the Electricity Regulations on New Generation Capacity, 2011. The plan aimed to balance a number of objectives, namely to ensure security of supply, to minimize cost of electricity, to minimize negative environmental impact (emissions) and to minimize water usage. The IRP 2019 makes provision for gas from year 2024.

A Draft IRP (2023) has been published for comment as necessitated by changing circumstances. The IRP continues to highlight South Africa's pursuit of a diversified energy mix that will provide security of supply while ensuring compliance with its emission reduction plan. The Draft IRP highlights that Gas to power technologies in the form of CCGT, Closed Cycle Gas Engine (CCGE) or Internal Combustion Engine (ICE) provide the flexibility required to complement renewable energy. South Africa looks to import gas whilst promoting exploration of gas locally and regionally to enable scaling up. It is noteworthy that the Draft IRP (2023) has not yet been promulgated.

5.23 GREEN HOUSE GAS AND CLIMATE CHANGE

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and ozone (O3) are the primary greenhouse gases in the earth's atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine and bromine containing substances, dealt with under the Montreal Protocol. Beside CO2, N2O and CH4, the Kyoto Protocol deals with the greenhouse gases sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (IPCC, 2007). Human activities since the beginning of the Industrial Revolution (taken as the year 1750) have produced a 40% increase in the atmospheric concentration of carbon dioxide, from 280 ppm in 1750 to 415 ppm in early September 2021 (NOAA, 2021). This increase of CO2 in the Earth's atmosphere has occurred despite the uptake of a large portion of the emissions by various natural "sinks" involved in the carbon cycle (NOAA, 2021). Anthropogenic CO2 emissions (i.e., emissions produced by human activities) come from combustion of fossil fuels, principally coal, oil, and natural gas, along with waste processing and decomposition, deforestation, soil erosion and animal agriculture (IPCC, 2007).

The IFC lists methods that countries and projects can reduce GHG impacts. These include carbon financing; improvement of energy efficiency; GHG sinks and reservoir protection and improvements; that environmentally friendly agriculture and forestry be encouraged; the increased use of renewable energy methods; implementation of carbon capture and sequestration methods; and improved waste management (recovery and use of methane emissions) as well as reducing GHG emissions from vehicle use and industrial, construction and energy production processes (IFC, 2007). Carbon financing may have much potential in developing countries as well as sustainable agriculture and forestry practices (IFC, 2012), and when supported by governments may be a way of reducing the country's GHG impacts, where projects receive carbon credits and financing for reducing GHG emissions and installing more environmentally friendly alternatives. Because different industries contribute various amounts of GHG emissions, the IFC performance standards suggests that for industrial processes the CO_2-equivalent (CO_2-e) emissions per year do not exceed 100 000 tonnes, this including direct (Scope 1) and indirect (Scope 2) sources (IFC, 2012).

5.23.1 INTERNATIONAL AGREEMENTS

In 1992, countries joined an international treaty, the United Nations Framework Convention on Climate Change, (UNFCCC) as a framework for international cooperation to combat climate change by limiting average global temperature increases and the resulting climate change, and coping with impacts that were, by then, inevitable.

By 1995, countries launched negotiations to strengthen the global response to climate change, and, two years later, adopted the Kyoto Protocol. The Kyoto Protocol legally binds developed country parties to emission reduction targets. The Protocol's first commitment period started in 2008 and ended in 2012. As agreed in Doha in 2012, the second commitment period began on 1 January 2013 and will end in 2020 (UNFCC, 2017) but due to lack of ratification has not come into force.

The Paris Agreement (2016) builds upon the Convention and – for the first time – brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2.0°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. Additionally, the agreement aims to strengthen the ability of countries to deal with the impacts of climate change. To reach these ambitious goals, appropriate financial flows, a new technology framework and an enhanced capacity building framework will be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives.

The Paris Agreement requires all Parties to put forward their best efforts through "nationally determined contributions" (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts.

In 2018, Parties took stock of the collective efforts in relation to progress towards the goals set in the Paris Agreement to inform the preparation of NDCs. There will also be a global stocktake every five years to assess the collective progress towards achieving the purpose of the Agreement and to inform further individual actions by Parties.

As of October 2022, 194 Parties of the 197 Parties to the UNFCCC Convention, including South Africa, had ratified the Paris Agreement. South Africa submitted its NDC to the UNFCCC on 25 September 2016 and an updated NDC in September 2021.

5.23.2 SOUTH AFRICAN NATIONAL CLIMATE CHANGE RESPONSE POLICY 2011

South Africa ratified the UNFCCC in August 1997 and acceded to the Kyoto protocol in 2002, with effect from 2005. However, since South Africa is an Annex 1 country it implies no binding commitment to cap or reduce GHG emissions. South Africa later also ratified the Paris Agreement (as signed on 22 April 2016) which although not bound to commit to a cap or reduce GHG emissions, pledged to reduce emissions by 34% below Business-As-Usual (BAU) emissions by 2020 and 42% below BAU by 2025. The proposed 2030 target range represents a 28% reduction in GHG emissions commitment from the original 2015 NDC targets. However, these original goals were ambitious and South Africa subsequently shifted from BAU-based targets for 2020 and 2025 in terms of the Cancun Agreement under the UNFCCC, to absolute GHG emissions targets under the Paris Agreement. This update demonstrates reducing the upper range of South Africa's targets by a more realistic 17% for 2025 and 28% for 2030, respectively.

The National Climate Change Response White Paper, passed by Cabinet in October 2011, stated that in responding to climate change, South Africa has two objectives: to manage the inevitable climate change impacts and to contribute to the global effort in stabilising GHG emissions at a level that avoids dangerous anthropogenic interference with the climate system. The White Paper proposes mitigation actions, especially a departure from coal-intensive electricity generation, be implemented in the short- and medium-term to match the GHG trajectory range. Peak GHG emissions are expected between 2020 and 2025 before a decade long plateau period and subsequent reductions in GHG emissions.

The White Paper also highlighted the co-benefit of reducing GHG emissions by improving air quality and reducing respiratory diseases by reducing ambient particulate matter, ozone, and sulphur dioxide concentrations to levels in compliance with the National Ambient Air Quality Standards (NAAQS) by 2020. To achieve these objectives, the Department of Forestry, Fisheries and Environment (DFFE) established a national GHG emissions inventory that reports through the South African Atmospheric Quality Information System (SAAQIS).

The draft Climate Change Bill was published for comment on the 8th of June 2018 and introduced to parliament on the 18th of February 2022 (B9-2022). The Bill is aligned with international policies guidelines and South Africa's NDC and aim to reduce GHG emissions as primary driver to anthropogenic climate change. The aim of the Bill is to achieve an effective climate change response through a long-term just transition to a low carbon economy that is climate resilient and allows for sustainable development of South Africa. When in force, the Bill will:

- Establish provincial and municipal forums on climate change which will be responsible for co-ordinating climate change response actions in each province.
- Strengthen the establishment of the Presidential Climate Change Coordinating Commission (4PC). Although, the 4PC has already been established and has been working for the Government since December 2020, its establishment only carries legal force after the Bill becomes an Act.
- Establish a National Adaptation Strategy to guide South Africa's adaptation to the impacts of climate change and develop adaptation scenarios which anticipate the likely impacts over the short, medium, and long term.
- Determine a national GHG emissions trajectory, which must be reviewed every five years, and which indicates an emissions reduction objective.
- Put in place a 5-yearly sectoral emission targets for identified sectors and sub-sectors that must be aligned with the national GHG emissions trajectory and include quantitative and qualitative GHG emission reduction goals.
- Bring into force the carbon budget allocation mechanism, which will be linked to the Carbon Tax Act, which will replace the current National Pollution Prevention Plan mechanism which is enforced under the National Environmental Management: Air Quality Act (NEM:AQA).

The Bill is nearing the end of its parliamentary process having been passed by the National Council of Provinces and been returned to the National Assembly for concurrence. It is likely to be enacted during the operational lifetime of the proposed project activities, if not before.

5.23.3 NATIONALLY DETERMINED CONTRIBUTION

The first South African NDC submission was completed in 2016. This was undertaken to comply with decision 1/CP.19 and 1/CP.20 of the Conference of the Parties to the UNFCC. An update of the first NDC was published submitted to the UNFCCC on 27 September 2021 in preparation for the 26th Conference of the Parties (held in Glasgow, Scotland in November 2021). This document describes South Africa's NDC on adaptation, mitigation and finance and investment necessities to undertake the resolutions with updated revisions to the adaptation goals and mitigation targets.

As part of the updated adaption portion the following goals have been assembled:

1. Goal 1: Enhance climate change adaptation governance and legal framework.
2. Goal 2: Develop an understanding of the impacts on South Africa of 1.5 and 2°C global warming and the underlying global emission pathways through geo-spatial mapping of the physical climate hazards, and adaptation needs in the context of strengthening the key sectors of the economy. This will provide the scientific basis for strengthening the national and provincial governments' readiness to respond to climate risk.
3. Goal 3: Implementation of National Climate Change Adaptation Strategy adaptation interventions for the period 2021 to 2030, where priority sectors have been identified as biodiversity and ecosystems;

water; health; energy; settlements (coastal, urban, rural); disaster risk reduction, transport infrastructure, mining, fisheries, forestry, and agriculture.

4. Goal 4: Mobilise funding for adaptation implementation through multilateral funding mechanisms.
5. Goal 5: Quantification and acknowledgement of the national adaptation and resilience efforts.

As part of the mitigation portion the following have been, or can be, implemented at National level:

- The approval of 79 (5 243 MW) renewable energy Independent Power Producer projects as part of a Renewable Energy Independent Power Producer Procurement Programme. An additional 6 300 MW is being deliberated.
- A "Green Climate Fund" has been created to back green economy initiatives. This fund will be increased in the future to sustain and improve successful initiatives.
- It is intended that by 2050 electricity will be decarbonised.
- Carbon Capture and Sequestration (or Carbon Capture and Storage) (CCS).
- To support the use of electric and hybrid electric vehicles.
- Reduction of emissions can be achieved through the use of energy efficient lighting; variable speed drives and efficient motors; energy efficient appliances; solar water heaters; electric and hybrid electric vehicles; solar photovoltaic (PV); wind power; CCS; and advanced bioenergy.
- Updated targets based on revised 100-year global warming potential (GWP) factors (published in the Annex to decision 18/CMA.1 of the Intergovernmental Panel on Climate Change's (IPCC) 5th assessment report) and based on exclusion of land sector emissions arising from natural disturbance. The updated NDC mitigation targets, consistent with South Africa's fair share, are presented in Table 11.

Table 11: South Africa's NCD mitigation targets.

Year	Target	Corresponding period
2025	South Africa's annual GHG emissions will be in a range between 398 - 510 Mt CO_2-e.	2021-2025
2030	South Africa's annual GHG emissions will be in a range between 398 - 440 Mt CO_2-e.	2026-2030

5.23.4 THE CARBON TAX ACT

The Carbon Tax Act gives effect to the polluter-pays-principle for large emitters and helps to ensure that firms and consumers take the negative adverse costs (externalities) into account in their future production, consumption and investment decisions. Firms are incentivized towards adopting cleaner technologies over the next decade and beyond.

The Government of South Africa has outlined its strong commitment to play its part in global efforts to mitigate Green House Gases (GHG) emissions as outlined in the National Climate Change Response Policy (NCCRP) of 2011 and the National Development Plan (NDP) of 2012. South Africa subsequently set its own domestic targets as outlined in the Nationally Determined Contribution (NDC), which was incorporated as the South African commitment in the Paris Agreement (convened by the United Nations Framework Convention on Climate Change (UNFCCC). South Africa ratified the Paris Agreement in November 2016. The carbon tax forms an integral part of ensuring that South Africa meets these targets. The carbon tax will initially only apply to scope 1 emitters in the first phase. The first phase will be from 1 June 2019 to 31 December 2022, and the second phase from 2023 to 2030.

The introduction of the carbon tax will also not have any impact on the price of electricity for the first phase. This will result in a relatively modest carbon tax rate ranging from R6 to R48 per tonne of CO_2 equivalent emitted, which is a relatively low tax rate to further provide current significant emitters time to transition their operations to cleaner technologies through investments in energy efficiency, renewables, and other low carbon measures.

A review of the impact of the tax will be conducted before the second phase, after at least three years of implementation of the tax, and will consider the progress made to reduce GHG emissions in line with our NDC Commitments. Any person, company or entity who undertakes an activity (above a certain threshold) and is responsible for the release of GHG emissions is required to report on their emissions to the DFFE by the 31 March each year and pay tax on those emissions by July each year. Kelvin is to ensure they comply with the Act as the proposed development entails the generation of emissions from the power plant.

5.23.5 THE NATIONAL GREEN HOUSE GASES EMISSION REPORTING REGULATIONS, 2017

The following six Green House Gases (GHGs) were declared as priority air pollutants in South Africa:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF_6)

National GHG Emission Reporting Regulations (Government Gazette No. 40762 of 3 April 2017), as amended (General Notice 994 in Government Notice 43712 of 11 September 2020), were published by the DFFE. A person identified as a data provider in terms regulation 4(1) of these regulations, must register their facilities using the online South African Greenhouse Gas Reporting System (SAGERS) (https://ghgreporting-public.environment.gov.za/GHGlanding/). Once registered the data provider must submit a GHG emissions inventory, activity data and report in the required format given under Annexure 3 of these regulations on an annual basis. All data must be provided annually, by the 31 March of the following year. Based on the EAPs preliminary assessment, the proposed CCGT plant will trigger Annexure A listed activities. Kelvin Power will need to quantify and report on the proposed plant's GHG emissions by the 31 March of each year.

5.23.6 GREEN HOUSE GAS INVENTORIES

5.23.6.1 **NATIONAL GHG EMMISIONS INVENTORY**

South Africa is a GHG contributor and is undertaking steps to mitigate and adapt to the changing climate. DFFE is categorised as the lead climate change institution and is required to coordinate and manage climate related information such as development of mitigation, monitoring, adaption and evaluation strategies (DFFE, 2022a). This includes the establishment and updating of the National GHG Inventory. The National Greenhouse Gas Improvement Programme (GHGIP) has been initiated; it includes sector specific targets to improve methodology and emission factors used for the different sectors as well as the availability of data.

The 2020 National GHG Inventory was prepared using the 2006 IPCC Guidelines (IPCC, 2006). According to the draft 8th National GHG Inventory Report to the UNFCCC (DFFE, 2021), the total GHG emissions in 2020 were estimated at approximately 478.634 million metric tonnes CO2-e (excluding Forestry and Other Land Use (FOLU)). This was a 1% increase from the 2000 total GHG emissions (excluding FOLU). FOLU is estimated to be a net carbon sink which reduces the 2020 GHG emissions to 445.566 million metric tonnes CO2-e. The assessment (excluding FOLU) showed the main sector contributing to GHG emissions in 2020 to be the energy industry, contributing 79.4 % to the total GHG emissions (excluding FOLU), this increased by 2.4% from 2000.

5.23.6.2 **GHG EMMISIONS INVENTORY FOR THE SECTOR**

The proposed project would be categorised in the energy category for both the global GHG inventory and for the national GHG inventory. According to the World Resources Institute – CAIT Climate Data Explorer the 2020 global GHG emissions from the energy category were approximately 937 000 Gt CO_2-e; 74% of the total GHG emissions (including Land-Use Change and Forestry (LUCF)). The South African energy sector contributed 11.9 Gt CO_2-e, ~1.3% of the global emissions from the energy sector in 2020.

5.23.6.3 DRAFT NATIONAL GUIDELINE OF CLIMATE CHANGE IN DEVELOPMENT APPLICATIONS, JUNE 2021

The DFFE published (on 25 June 2021) a notice under the NEMA requesting public comment on the Draft National Guideline for the consideration of climate change implications in applications for environmental authorisation, atmospheric emission licences and waste management licences.

The Draft National Guideline has been developed to support the inclusion of climate change considerations into the Environmental Impact Assessment (EIA) process, and to create a consistent approach for such incorporation, which will help proponents to assess:

- How a proposed development will likely exacerbate climate change;
- The impact of a development on features (natural and built) that are crucial for climate change adaptation and resilience; and,
- The sustainability of a development in the context of climate change projection.

The Guideline puts forward "a consistent approach in providing interested and affected parties (for example, proponents, EAPs and specialists) with the minimum requirements to consider when undertaking a climate change assessment, which forms part of an application for environmental authorisation, an atmospheric emissions licence, and/or waste management licence".

One of the impact requirements for a climate change assessment is an estimation of the GHG emissions, direct and indirect (including upstream GHG emissions) that will be released into the atmosphere annually throughout the impact related to the activity. This implies that scope 1, 2 and 3 will need to be quantified.

The comment period for amendments to the draft guideline has now closed but the final guideline has not yet been published. As far as possible the guideline has been followed in the preparation of this climate change impact assessment in support of environmental authorisation.

The above draft regulations will be considered during the undertaking of this EIA assessment.

5.24 THE GAUTENG ENVIRONMENTAL MANAGEMENT FRAMEWORK

The Gauteng Department of Agriculture and Rural Development and Environment (GDARDE) has developed an Environmental Management Framework Tool to streamline the requirements for an Environmental Impact Assessment (EIA) and reduce the need for the undertaking of EIA requirements, a reduction in timeframes for approvals and as a contribution towards reducing the cost of doing business in Gauteng. In this tool, several NEMA listed activities are excluded from the requirement to obtain an EA. Government Notice 164 in Government Gazette No. 41473 of 2 March 2018 presents a list of activities that are excluded from the need to obtain an Environmental Authorisation as they occur within Zones 1 and 5 of the Gauteng Provincial Environmental Management Framework (GPEMF).

Table 12: Gauteng Provincial Environmental Management Framework Zones

ZONE	INTENTION
Zone 1: Urban development zone	The intention with this zone is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development, in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas.
Zone 2: High control zone (within the urban development zone)	This zone is sensitive to development activities. Only conservation should be allowed in this zone. Related tourism and recreation activities must be accommodated in areas surrounding this zone

Zone 3: High control zone (outside the urban development zone)	This zone is sensitive to development activities and in several cases also have specific values that need to be protected. Conservation and related tourism and recreation activities should dominate development in this zone.
Zone 4: Normal control zone	**Intention** This zone is dominated by agricultural uses outside the urban development zone. Agricultural and rural development that support agriculture should be promoted
Zone 5: Industrial and large commercial focus zone Intention	The intention with Zone 5 is to streamline non-polluting industrial and large-scale commercial (warehouses etc.) activities in areas that are already used for such purposes and areas that are severely degraded but in proximity to required infrastructure.

The Kelvin power station plant site was found to fall within Zone 5 of the GPEMF (Figure 9). Various EIA Activities are excluded under the GPEMF (Listing Notice 2, Activity 4 and 9). DFFE however advised that the activities that fall under the Gauteng EMF zone 5 must still be included as part of the application for the CCGT, therefore these activities have been included in the EA application and in Section 4 of this report.

5.25 THE GAUTENG POLLUTION BUFFER ZONES

The GDARD's Gauteng Buffer Zone Guideline was initially developed in 2002 and reviewed in 2006. GDARD has undertaken to revise the guideline to determine its effectiveness, relevance and applicability to the current operating environment in the province. The guideline was developed to ensure that pollution buffer areas are created between the pollution sources and the nearest human settlements. Over the years of using the buffer zone guideline, GDARD has realized that due to the constantly changing landscape in the province, as influenced by factors such as development pressure and technological changes, the sole reliance on just the buffer areas as stipulated in the authorisations, permits and licenses to protect the receiving environment from the effects of pollution, needs to be periodically enhanced. The department (GDARD) is continuously adopting the approach of integrated management of the buffer zones inclusive of stakeholders such as the municipalities and the industries.

GDARD is the responsible authority for issuing environmental authorisations in the Gauteng Province where relevant. The department has reviewed guidelines for Pollution Buffer Zones with an intention to provide direction on how to respond to the development applications that require pollution buffers due to their proximity to industrial and other land uses that may have a deleterious health effect on people. The purpose of this guideline is to ensure that the residents of the Gauteng province are protected from the emissions from pollution generators. Care should be taken in the placement of incompatible land uses with an emphasis on mitigation measures that will be implemented; this should not be a norm, but a consideration on a case by case basis.

Industries and other pollution sources identified in Gauteng were classified based on the department 's brief and the release or potential for the release of harmful effluent or emissions and associated nuisance factors like noise. The classification is made on the basis of the nature and level of pollution or potential release of effluents or emissions associated with particular industrial areas. Industrial areas with pollution risks that can have potentially serious health effects on a large scale have been placed in Category 1. Industrial areas with pollution risks that may cause minor health effects or with activities that result in nuisance rather than actual health impacts were placed in Category 2. Industrial areas that pose little or no health impacts and that may result in a nuisance on a localized scale have been placed in Category 3. A review of the scope of the proposed development, the spatial location and GDARD's Gauteng Buffer Zone Guideline found that the proposed Kelvin CCGT powerplant plant in Kempton Park falls within Category 1. Category 1 industries have a best-case scenario buffer: of 1500m and worst-case buffer of 750m. It is however, noteworthy that the proposed development is located within an area classified in the GPEMF as a Zone 5 Industrial area. Provisions will be made in the EMPr to ensure the control of pollution as a result of the proposed development.

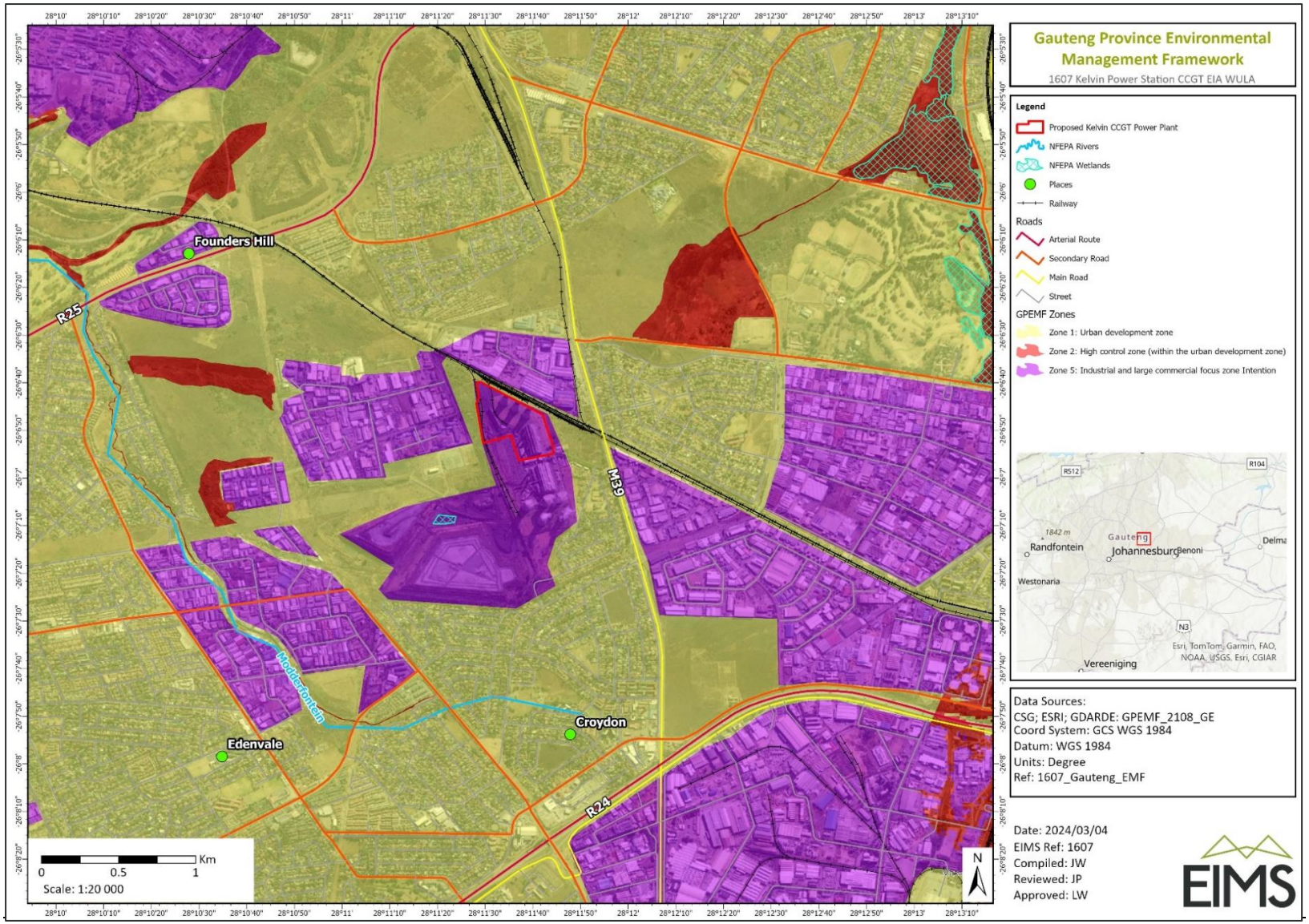

Figure 9: Map Illustrating Proposed Kelvin Power CCGT Plant within the GPEMF.

5.26 CITY OF EKURHULENI INTEGRATED DEVELOPMENT PLAN (IDP)

The City of Ekurhuleni 2022/23 – 2026/27 Integrated Development Plan (IDP) was approved in 2022 and reviewed for implementation in the 2023/24 financial year. The following priorities have been put in place by the City of Ekurhuleni:

- Ensure that every community has access to reliable, clean, running water, that is safe to drink and to prepare food; modernise water management and the detection of water leaks; and prevent untreated wastewater contaminating the environment, homes, streets, and sidewalks within the municipality.
- Ensure there is a hygienic environment to live and play delivered through effective waste collection and rubbish disposal to protect the environment and the health of residents; comply with environmental legislation; and ensure working landfill sites; and the implementation of recycling programmes.
- Give residents back their power by helping to reduce their vulnerability to Eskom load shedding and eradicate ESKOM supply areas; and enhance access to reliable, affordable, and sustainable electricity; incentivise pre-paid electricity systems and private electricity generation.
- Reclaim public spaces currently taken over by lawlessness, litter, and neglect so that they may be places for all residents to enjoy once again.
- Invest in safe, reliable, and affordable public transport, and well-maintained roads; and work to eradicate irrational national taxes and tolls on roads affecting municipal areas.
- Develop a holistic infrastructure strategy which combines the imperatives of an increased spend on PPE maintenance, infrastructure renewal and measures to safeguard infrastructure from vandalism and theft.
- Be tough on crime and tougher on the causes of crime by investing in localised law enforcement and tackling the local conditions which give rise to crime in the first place.
- Focus first on getting the basics right as the foundation to bringing in investment and jobs to the local economy. Beyond that the parties to this agreement are committed to improving the business environment by making it easier to do business within the municipality.
- Collaborate for transparent sustainable housing by increasing the scale of housing delivered through private initiative, diversifying housing options, and ensuring more people own their homes and receive their valid title deeds.
- Adopt a holistic approach to keeping communities in good health by ensuring that all departments work together to minimise the risks which lead to poor health, to respond effectively to health emergencies, and to achieve overall positive health outcomes.
- Govern in the interests of the people by eliminating corruption, adopting best practices in good governance, and ensuring the resilience of communities through effective disaster risk management.
- Support devolution of power to the lowest effective level within the constitutional and legislative framework; and ensure the effective functioning of ward committees by providing adequate administrative support.
- Promote, where it is deemed appropriate by a competent feasibility study, the establishment of sub-Councils in Metropolitan local governments.
- Audit and review the municipality's organogram and staff complement, including a review as envisioned by Section 4(3)a of the Regulations of the Municipal Structures Act, including remuneration levels; ensure the appointment of fit-for-purpose officials and the review of salary scales before filling vacant posts, where this is indicated by the review; and implement consequence management procedures for the transgression of laws and regulations, or non-performance.

- As per legislation municipal services should be run in a cost reflective manner, where possible we will avoid above-inflation increases in tariffs, rates and taxes, where unavoidable, this shall be adequately explained to the public.

- As per legislation municipal services should be run in a cost reflective manner, where possible we will avoid above-inflation increases in tariffs, rates and taxes, where unavoidable, this shall be adequately explained to the public.

- Be cognisant that illegal immigration and failures to document legal immigrants are issues that impact local governments and requires this coalition government to develop a holistic strategy to respond to these challenges. Any action in relation to illegal immigrants must adhere to the provisions of the South African Constitution, South African law, precepts of international law, the basic tenets of human compassion and decency, and avoid the promotion of xenophobia.

The proposed Kelvin project relates to the development of a CCGT plant within the City of Ekurhuleni and will be required to comply with the IDP.

In addition to the relevant district or local plans, there exists various international guidelines or standards that have relevance to this project and application, and these are described below.

5.27 NATIONAL AND INTERNATIONAL STANDARDS

National and international industry standards aimed at sustainable development and social justice specifically have become abundant in the last decade. Many industries use these standards as indicators for best practice. The discussion below highlights only a few of these standards.

5.27.1 ISO 26000:2010/SANS 26000:2010

Performance standards have long been a voluntary tool used by industry to achieve certain outcomes. The first standard on social responsibility, ISO 26000 was published on 1 November 2010 (ISO, 2010). It was developed using a multi-stakeholder approach involving experts from more than 90 countries and 40 international or broadly based regional organisations involved in different aspects of social responsibility (ISO, 2010).

The South African Bureau of Standards (SABS), a statutory body that is mandated to develop, promote, and maintain South African National Standards (SABS, [sa]) adopted the ISO 26000 Standard as a South African National Standard (SANS) 26000:2010.

Social responsibility is defined in the standard as the responsibility of an organisation for the impacts of its decisions and activities on society and the environment, through transparent and ethical behaviour that contributes to sustainable development, including health and welfare of society; takes into account the expectations of the stakeholders; complies with applicable law and is consistent with international behaviour norms, and is integrated throughout the organisation and practiced in its relationships (ISO, 2010).

The document identifies seven principles for social responsibility and seven core subjects that should be addressed by organisations. The seven principles for social responsibility are accountability, transparency, ethical behaviour, respect for stakeholder interests, respect for the rule of law, respect for international norms of behaviour and respect for human rights (ISO, 2010). The core subjects that should be addressed include organisational governance, human rights, labour practices, environment, fair operating practices, consumer issues and community involvement and development (ISO, 2010). Economic aspects, health and safety and the value chain are dealt with throughout the seven core subjects, and gender issues are considered.

ISO 26000 is a good introduction to what social responsibility is and what measures should be taken to move towards being a more socially responsible company. It deals with equity issues and can encourage social development initiatives by companies through activities such as social investment projects, employment creation, skills development, and income creation.

5.27.2 IFC PERFORMANCE STANDARDS

The IFC is an international financial institution that offers investment, advisory, and asset management services to encourage private sector development in developing countries.

The IFC's stated aim is to create opportunities for people to escape poverty and achieve better living standards by mobilizing financial resources for private enterprise, promoting accessible and competitive markets, supporting businesses and other private sector entities, and creating jobs and delivering necessary services to those who are poverty-stricken or otherwise vulnerable. Since 2009, the IFC has focused on a set of development goals that supported projects are expected to target. Its goals are to increase sustainable agriculture opportunities, improve health and education, increase access to financing for microfinance and business clients, advance infrastructure, help small businesses grow revenues, and invest in climate health.

The IFC's Sustainability Framework articulates the Corporation's strategic commitment to sustainable development and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. IFC's Access to Information Policy reflects IFC's commitment to transparency and good governance on its operations and outlines the Corporation's institutional disclosure obligations regarding its investment and advisory services. The Performance Standards (PSs) are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the PSs to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation to achieve its overall development objectives. The PSs are often also be applied by other financial institutions and therefore these PSs are discussed in Table 13 in terms of the applicability of the various PSs to this project as a benchmark for sustainable development.

Table 13: IFC Performance Standards applicability to this project.

Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	
Overview	Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.
Objectives	➢ To identify and evaluate environmental and social risks and impacts of the project. ➢ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. ➢ To promote improved environmental and social performance of clients through the effective use of management systems. ➢ To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. ➢ To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

Aspects	1.1	• Policy	**Consideration of PS1 to this project:** The South African NEMA EIA Regulations are specifically geared towards ensuring that a projects environmental and social risks and impacts are identified and assessed in order to put forward suitable impact management actions and outcomes for final decision making by the Competent Authority. This PS has been considered in the compilation of this EIA Report where the environmental and social risks and impacts will be identified. This will culminate in the development of an EMPr containing the relevant mitigation measures which are aimed at limiting the final significance of each identified impact. Throughout the EIA application process, stakeholder engagement will be undertaken in accordance with the NEMA EIA Regulations to solicit input from I&APs and ongoing stakeholder engagement and communication will be ongoing during the lifecycle of the project.
	1.2	• Identification of Risks and Impacts	
	1.3	• Management Programmes	
	1.4	• Organisational Capacity and Competency	
	1.5	• Emergency Preparedness and Response	
	1.6	• Monitoring and Review	
	1.7	• Stakeholder Engagement	
	1.8	• External Communication and Grievance Mechanism	
	1.9	• Ongoing Reporting to Affected Communities	
Performance Standard 2: Labour and Working Conditions;			
Overview	Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers.		
Objectives	➢ To promote the fair treatment, non-discrimination, and equal opportunity of workers. ➢ To establish, maintain, and improve the worker-management relationship. ➢ To promote compliance with national employment and labour laws. ➢ To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. ➢ To promote safe and healthy working conditions, and the health of workers. ➢ To avoid the use of forced labour.		
Aspects	2.1	• Working Conditions and Management of Worker Relationship • Human Resources Policy and Management	**Consideration of PS2 to this project:** This project will require temporary as well as permanent workers during the various project phases. In terms of South African labour legislation (OHSA), it will be obligatory on Kelvin Power including all sub-contractors to ensure that workers operate in a safe working

		• Working Conditions and terms of Engagement • Workers organisation • Non- Discrimination and Equal Opportunity • Retrenchment • Grievance Mechanism	environment and that employment contracts are fair and reasonable.
	2.2	• Protecting the Workforce • Child Labour • Forced Labour	
	2.3	• Occupational health and Safety	
	2.4	• Workers Engaged by Third Parties	
	2.5	• Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention			
Overview	Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of GHG threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.		
Objectives	➢ To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. ➢ To promote more sustainable use of resources, including energy and water. ➢ To reduce project related GHG emissions.		
Aspects	3.1	• Policy Resource Efficiency • Greenhouse Gases • Water Consumption	**<u>Consideration of PS3 to this project:</u>** The various pollution sources and associated impacts of this project have been identified and will be further assessed in the EIA phase. A Climate Change Assessment will be undertaken to quantify the GHG emissions. An Air Quality Assessment will be undertaken to identify any air pollutants and sensitive receptors and suggest
	3.2	• Pollution Prevention • Air Emissions • Stormwater	

		• Waste Management • Hazardous Materials Management • Pesticide use and Management	mitigation measures and management objectives where required. Water efficiency through the treatment and reuse of effluent water will be undertaken. Management actions for general and hazardous waste, pesticide use and management, etc. will be identified and included in the EMPr (to be developed in the upcoming EIA Phase of this application).
Performance Standard 4: Community Health, Safety, and Security			
Overview	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.		
Objectives	➢ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. ➢ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.		
Aspects	4.1	• Community Health and Safety • Infrastructure and Equipment Design and Safety • Hazardous Materials Management and Safety • Ecosystem Services • Community Exposure to Disease • Emergency Preparedness and Response	**<u>Consideration of PS4 to this project:</u>** The aspects included in this PS will be considered in this application and mitigation measures will be included in the EMPr. Specialist studies will identify and assess the potential health and safety impacts on surrounding communities and include the Social Impact Assessment as well as the MHI risk assessments.
	4.2	• Security Personnel	
Performance Standard 5: Land Acquisition and Involuntary Resettlement			
Overview	Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.		
Objectives	➢ To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs.		

	➢ To avoid forced eviction. ➢ To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. ➢ To improve, or restore, the livelihoods and standards of living of displaced persons. ➢ To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.		
Aspects	5.1	• Displacement • Physical Displacement • Economic Displacement • Private Sector Responsibilities under Government Managed Resettlement	**<u>Consideration of PS5 to this project:</u>** The proposed project will be undertaken on a property owned by Kelvin Power and is not anticipated to result in physical and economic displacement of any private landowners. However, the impact of physical or economic displacement caused by this project on private landowners will be assessed during the course of this EIA process. Through consultation with affected landowners, suitable mitigation measures will be identified to avoid and/or minimise displacement. It has been noted that land claims have been lodged on the parent farm on which Kelvin Power sits and all reasonable measures will be undertaken to identify the portions of land subjected to land claims and consultations with the land claimants as part of the stakeholder engagement.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			
Overview	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
Objectives	➢ To protect and conserve biodiversity. ➢ To maintain the benefits from ecosystem services. ➢ To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
Aspects	6.1	• Protection and Conservation of Biodiversity	**<u>Consideration of PS6 to this project:</u>** Due to the nature of the proposed development being a brownfield development, it is not anticipated to pose any threats to biodiversity. A terrestrial biodiversity compliance statement will be undertaken as part of this process by a suitably qualified ecologist. Alien and invasive species will be controlled throughout the lifecycle of the project through the implementation of an alien and invasive management plan.

<table>
<tr><th colspan="4">Performance Standard 7: Indigenous People</th></tr>
<tr><td>Overview</td><td colspan="3">Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.</td></tr>
<tr><td>Objectives</td><td colspan="3">➢ To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
➢ To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
➢ To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
➢ To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
➢ To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
➢ To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.</td></tr>
<tr><td rowspan="2">Aspects</td><td>7.1</td><td>• General
• Avoidance of Adverse Impacts
• Participation and Consent</td><td rowspan="2"><u>Consideration of PS7 to this project:</u>
As per IFC Guidance Note 7, in this Performance Standard, the term "Indigenous Peoples" is used in a generic sense to refer to a distinct social and cultural group possessing the following characteristics in varying degrees:
• Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
• Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
• Customary cultural, economic, social, or political institutions that are separate from those of the mainstream society or culture; or
• A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.
With due consideration of the above accepted definition in IFC Guidance Note 7 and as per the international instruments under the United Nations (UN) Human Rights Conventions, no indigenous peoples are present within the study area and therefore PS7 is not triggered by this</td></tr>
<tr><td>7.2</td><td>• Circumstances Requiring Free, Prior, and Informed Consent
• Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use
• Critical Cultural Heritage
• Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use</td></tr>
</table>

	7.3	• Mitigation and Development Benefits	proposed development and no further assessment in this regard is required.
	7.4	• Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues	
Performance Standard 8: Cultural Heritage			
Overview	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations.		
Objectives	➢ To protect cultural heritage from the adverse impacts of project activities and support its preservation. ➢ To promote the equitable sharing of benefits from the use of cultural heritage.		
Aspects	8.1	• Protection of Cultural Heritage in Project Design and Execution	**Consideration of PS8 to this project:** A previous heritage assessment was already completed for the decommissioning project in 2021 on the same site. The only heritage aspects relate to the historic structures at the site. It is possible that exemption from the requirements of a full HIA will be granted by SAHRA for the CCGT project, and an exemption letter is planned to be submitted to SAHRA in this regard. If exemption is not granted then an HIA will be undertaken.

5.28 WORLD BANK (WB) AND INTERNATIONAL FINANCE CORPORATION (IFC) GUIDELINES

5.28.1 WB ENVIRONMENTAL HEALTH AND SAFETY GUIDELINE FOR THERMAL POWER PLANTS

The EHS Guidelines for Thermal Power Plants include information relevant to combustion processes fuelled by gaseous, liquid and solid fossil fuels and biomass and designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of the fuel type (except for solid waste which is covered under a separate Guideline for Waste Management Facilities), with a total rated heat input capacity above 50 Megawatt thermal input (MWth) on Higher Heating Value (HHV) basis. It applies to boilers, reciprocating engines, and combustion turbines in new and existing facilities. The key issues identified for gas facilities related to environmental issues, occupational health and safety issues, and community health and safety issues.

The following environmental issues should be considered as part of a comprehensive assessment and management program that addresses project-specific risks and potential impacts. Potential environmental issues associated with thermal power plant projects primarily include the following:

- Air emissions;
- Energy efficiency and Greenhouse Gas emissions;
- Water consumption and aquatic habitat alteration;
- Effluents;

- Solid wastes;
- Hazardous materials and oil; and
- Noise

Occupational health and safety issues associated with gas facilities operations include the following:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards;
- Fire and explosion hazards;
- Chemical hazards; and
- Dust

5.28.2 IFC ENVIRONMENTAL NOISE GUIDELINE

The IFC General Environmental Health and Safety Guidelines on noise address impacts of noise beyond the property boundary of the facility under consideration and provides noise level guidelines. The IFC states that noise impacts should not exceed the levels presented in Table 14, or result in a maximum increase above background levels of 3 dBA at the nearest receptor location off-site (IFC, 2007). For a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level is not detectable. Δ = 3 dBA is therefore a useful significance indicator for a noise impact.

It is further important to note that the IFC noise level guidelines for residential, institutional and educational receptors correspond with the SANS 10103 guidelines for urban districts.

Table 14: IFC noise level guidelines.

Area	One Hour LAeq (dBA) 07:00 to 22:00	One Hour LAeq (dBA) 22:00 to 07:00
Industrial receptors	70	70
Residential, institutional and educational receptors	55	45

6 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

In South Africa, an Environmental Impact Assessment ("EIA") is required for various types of activities and projects to ensure that their potential environmental and social impacts are properly assessed and mitigated. The legal and other triggers for an EIA in South Africa are primarily outlined in the NEMA and associated regulations.

NEMA includes a list of activities that are classified as "listed activities" and if a project meets the criteria outlined in this list, it triggers the need for an EIA. In this regard Kelvin wishes to establish a CCGT power plant at the previous coal fired A-station power plant located in farm Zuurfontein 33 remainder of portion 391, and remainder of portion 82. and a short connection to the Sasol gas pipeline The proposed development covers an area of 15 hectares (ha).

As the result of the need for an EIA, a need and desirability assessment is also required. This is a critical assessment that ensures development projects are conducted in an environmentally responsible and sustainable manner. Specific factors that require consideration are listed in the Guideline on Need and Desirability published by DFFE and updated in 2017.

Generally, a need and desirability analysis establishes a well-defined framework for decision-making, facilitating the evaluation of whether a proposed project should proceed while considering its socio-economic and environmental desirability. Additionally, the need and desirability analysis encompass public engagement, delineating the involvement of stakeholders, including affected communities and environmental organisations, ensuring their perspectives are considered throughout the EIA process. Moreover, this assessment fosters transparency and accountability by elucidating the project's objectives, rationale, and potential impacts, thereby enabling both the public and authorities to hold project proponents accountable. Furthermore, it ensures alignment with South Africa's rigorous environmental laws and policies, verifying that projects conform to these frameworks and promoting compliance. The need and desirability analysis also initiates risk assessments and encourages the exploration of alternative project designs or locations, emphasising environmental and sustainability goals. Finally, it prompts the consideration of cumulative impacts, which is vital for assessing the long-term sustainability of development in each region.

Below are key points to evaluate in need and desirability analysis and these constitute the foundation of the analysis for this Kelvin Power CCGT project:

1. Alternative Solutions: The need and desirability analysis should explore and evaluate alternative economic solutions to address the identified need. This might include considering different project designs, technologies, or approaches that could achieve the same economic objectives with lower environmental or social impacts. (Given the urgency of global warming and its contribution to negative climate change, this factor is probably top of mind for most stakeholders and is listed as the first consideration).
2. Economic Justification: The need and desirability analysis should provide a clear and robust economic justification for the proposed project. This justification should outline the economic benefits and contributions the project is expected to make to the local and national economy. It needs to include factors such as job creation, increased tax revenue, economic growth, and contributions to GDP.
3. Market Demand: The need and desirability analysis should assess the market demand for the project's outputs or services. It should demonstrate that there is a legitimate need for the project within the local or regional economy and that it will meet this demand efficiently.
4. Cost-Benefit Analysis: Consideration of economic desirability involves conducting a cost-benefit analysis. This analysis compares the anticipated costs of the project to the expected economic benefits, considering both direct and indirect impacts. It aims to determine whether the project's benefits outweigh its costs.
5. Sustainability and Long-Term Viability: Economic desirability should not be limited to short-term gains. The need and desirability analysis should also assess the project's long-term economic viability and

sustainability, considering factors like ongoing operational costs, revenue projections, and potential risks.

6. Job Creation and Skills Development: If relevant, the need and desirability analysis should discuss the potential for job creation and skills development associated with the project. This can be an essential economic benefit, especially in areas with high unemployment rates.
7. Local and Regional Benefits: The need and desirability analysis should highlight how the project will benefit the local and regional economy. This might include discussions of supply chain impacts, local procurement commitments, and initiatives to support local businesses.
8. Compliance with Economic Policies: Ensure that the project aligns with South Africa's economic policies and development strategies. This includes considering national and regional economic development plans and objectives.
9. Consultation with Stakeholders: Engage with relevant stakeholders, including local communities, government agencies, and economic experts, to gather input and feedback on the economic need and desirability of the project.
10. Address the specific questions that should be engaged as listed in the Guideline on Need and Desirability published by the DFFE in 2017.

In summary, the need and desirability analysis should provide a thorough and evidence-based assessment of why the proposed project is economically necessary and desirable. It should consider economic benefits, costs, alternatives, and long-term sustainability to inform decision-making within the framework of South African EIA requirements.

6.1 NEED AND DESIRABILITY STATEMENT

South Africa has been faced with a number of issues impacting electricity generation and production over the most recent years. These include, but are not limited to:

- Financial crisis faced by Eskom;
- Aging electricity generation infrastructure;
- Lack of new generation capacity;
- Policy and regulation uncertainties;
- High coal energy dependency; and
- Renewable Energy Integration.

These have resulted in the implementation of loadshedding[3] across South Africa at varying levels. The proposed CCGT development will allow for the generation of up to 600 MW of electricity to be put on to the electricity grid. It is further noteworthy that the proposed project will not eradicate loadshedding but can be used as a tool to assist in the reduction loadshedding intensity by the installation of more generation capacity (of up to 600 MW). The needs and desirability of the proposed Kelvin Power CCGT Plant are described below.

The proposed CCGT plant development will assist Kelvin Power, whose business is to generate and sell electricity to produce power as it is noteworthy that the coal fired A-station stopped producing electricity in 2012 and is undergoing a decommissioning process. The development of the CCGT plant thus provides Kelvin Power with an opportunity to successfully continue with their business mandate whilst taking into consideration the known impacts of coal fired power stations.

Below listed are some of the identified need and desirability statements for the proposed development,

[3] Load shedding is an energy utility's method of reducing demand on the energy generation system by temporarily switching off the distribution of energy to certain geographical areas.

Loadshedding Mitigation:

- Reliable Power Supply: CCGT plants notably offer stable and consistent power generation, reducing the risk of load shedding and ensuring a reliable electricity supply to meet the growing demand during peak-hours.
- A CCGT plant has quick start-up times and flexibility in adjusting power output make meaning the newly proposed CCGT plant will be well-suited to handle sudden changes in demand and emergencies, minimizing the impact of load shedding and will be ideal for peaking.

Energy Security:

- Adding CCGT capacity diversifies the energy mix, reducing reliance on a single energy source and enhancing overall energy security. South Africa is currently heavily reliant on coal as a source of electricity, Kelvin Power's propose CCGT power plant will enhance Kelvin Power's ability to continue producing power for supply into the grid network whilst also ensuring that gas is being added into the energy mix.
- The proposed Kelvin CCGT power plant will assist with the grid strengthening for South Africa, ensuring a robust and resilient power system that can withstand disruptions and unforeseen challenges. Although the proposed development entails 600 MW of capacity, it is notable that it alone cannot provide a substantial grid strengthening for the South African electricity grid but when evaluated holistically, Eskom is continuously aiming to strengthen the South African grid through various projects including construction of transmission lines, to assist with grid integration of electricity produced as a result Renewable Energy Independent Power Producer (REIPP) programme. The proposed CCGT is intended to be utilised during peak-hours to support the higher demand of electricity during peak hours (early morning and evening especially during winter months) when generation from renewable sources in low and/or intermittent.

Economic Advantages:

- CCGT power plants are considered highly efficient with relatively lower operating costs, contributing to a more cost-effective energy production model.
- Job Creation: The construction and operation of the Kelvin Power CCGT plant will create employment opportunities (more opportunities will be created during the construction period and relatively fewer employees will be required during the operational phases of the project). The proposed Kelvin Power CCGT plant is anticipated to contribute to local economy.

Environmental Considerations:

- CCGT plants produce lower emissions compared to traditional coal-fired plants, the construction of the Kelvin Power CCGT plant will allow for Kelvin Power to align with global efforts to mitigate climate change and improve air quality whilst continuing to provide electricity.
- Sustainable Energy Transition: Investing in CCGT technology represents a step towards a more sustainable and environmentally friendly energy mix, aligning with international goals and commitments (adopted nationally). The 2023 Draft IRP provides for gas to power technologies such as CCGT as this technology has been identified to provide the flexibility required to complement renewable energy sources.
- A preliminary impact assessment has been undertaken with the identified negative impacts having a low – medium final significance post mitigation. However, a high negative final significance was allocated for the project in terms of climate change impacts. However, this negative impact is mitigated by a CCGT being available flexibly 24/7 to support the intermittent generation from renewables. and will be required to comply with the MES. .No environmental fatal flaws that prevent the proposed development from proceeding were identified by the EAP and the appointed specialists during the EIA

phase of the development, provided that mitigation measures and management measures are implemented.

International Competitiveness:

- Establishing modern, reliable and efficient power infrastructure will enhance South Africa's chances of securing foreign investments, supporting economic growth and competitiveness on the global stage.
- Adopting CCGT technology aligns South Africa with global energy standards and positions the country as a forward-thinking player in the international energy landscape.

6.2 NEED AND DESIRABILITY ANALYSIS

The needs and desirability analysis component of the Guideline on Need and Desirability published by DFFE in 2014 and updated in 2017 includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.). Table 15 present the needs and desirability analysis undertaken for the project by answering the questions as presented in Section 4 of the DFFE Need and Desirability Guideline. This analysis has been revisited and revised in this EIA report based on specialist assessments and, development plans.

Table 15: Need and Desirability Analysis

Ref No.	Question	Answer
1	**Securing ecological sustainable development and use of natural resources**	
1.1	How were the ecological integrity considerations taken into account in terms of: Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities.	A number of specialist studies will inform this application and environmental impact assessment and include amongst others: • Air Quality and GHG Assessment • Noise Impact Assessment • Terrestrial Ecology and Biodiversity Compliance Statement • Soils and Hydropedology Compliance Statement • Socio-economic Impact Assessment • Major Hazardous Installation – Qualitative Risk Assessment The above studies will assist in identifying any Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets and Ecological drivers of the ecosystem. Notwithstanding the fact that the proposed development is to be located on a brownfield site, where sensitive species or ecosystem drivers are identified, relevant mitigation measures shall be put forward to prevent or minimise the impacts.
1.2	How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	The proposed project is located on a brownfield site. The proposed project is to be developed at the previous coal fired Kelvin Power plant that is undergoing decommissioning. Due to the nature of this development being a brown field development it is not anticipated to cause any significant impacts or harm to biological diversity. An impact assessment is included in section 10 of this EIA Report. Furthermore, specialist assessments and compliance statements have been undertaken to inform mitigation measures that can be applied to reduce the final significance of identified impacts to any sensitive receptors and enhance positive impacts. Refer to Appendix F for the specialist studies. Existing and future alien and invasive species will be controlled which will enhance the opportunities for indigenous and beneficial species in the environment.
1.3	How will this development pollute and / or degrade the biophysical environment? What measures were explored to either avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	

Ref No.	Question	Answer
1.4	What waste will be generated by this development? What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	Due to the nature of this development being a CCGT plant, it is not anticipated that a large volume of waste will be generated. However, the following waste types are anticipated to be generated during the construction and operation phases of the proposed CCGT power plant: • General office waste; • Industrial Waste • Gas turbine air intake filters (typically replaced annually); • Ion exchange resins (typically replaced at 5 year intervals); • Used Reverse Osmosis membranes (Potentially); • Separated oil / sludge from oil / water separators / lubricating oil; • Oil and/or chemical containers; and • Municipal Solid Waste Some construction and decommissioning waste can be expected to be generated during the construction phase of the project. All of the above-mentioned wastes are to be stored in suitable containers and within a designated waste storage area and removed from site by an appropriately qualified waste removal contractor for disposal at a appropriately licensed facilities.
1.5	How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	A previous heritage assessment was already completed for the decommissioning project in 2021 on the same site. The only heritage aspects relate to the historic structures at the site. It is possible that exemption from the requirements of a full HIA will be granted by SAHRA for the CCGT project, and an exemption letter is planned to be submitted to SAHRA in this regard. If exemption is not granted then an HIA will be undertaken.
1.6	How will this project use and / or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored	It is acknowledged that the proposed CCGT power plant will utilise a non-renewable gas resource. However, it is noteworthy that gas is considered to be cleaner than other fossil fuels such as coal which is currently the predominant fuel source for energy generation in South Africa. Furthermore, gas to power can

Ref No.	Question	Answer
	to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	complement the transition to renewable power while reducing the reliance on coal to power in the short to medium term.
1.7	How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	The proposed development is on a brownfield site and will not pose any significant risk to terrestrial biodiversity and ecology. A specialist assessment and compliance statement will be undertaken during the EIA phase to confirm this. The development of a CCGT plant at the Kelvin power station will contribute to the strengthening of the South African power supply through an additional 600MW to the grid which will be added to the Eskom grid. The proposed development will contribute to the country's economy directly and indirectly whilst complementing the transition to renewable power while reducing the reliance on coal to power in the short to medium term.
1.7.1	Does the proposed project exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)?	The proposed project will generate electricity through a non-renewable resource (gas). The proposed project will provide an opportunity for South Africa to move away from dirtier energy (coal) while transitioning to a more renewable energy source. This can be translated into a "reduced dirty resource dependency".
1.7.2	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used?	The generation of power from gas provides an opportunity for the reduction of reliance from coal (a dirtier natural resource) for electricity generation in South Africa whilst enabling the transition to more renewable sources of electricity. The type of CCGT plant selected will be one of the most efficient available thus making optimum use of the natural resource being consumed (natural gas). This ensures reduced emissions in the immediate to medium term. An assessment of the impact of this Kelvin CCGT Project has been undertaken and has been compared to the No-Go alternative which is described in Section 10.2.5.
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The location, type and scale of the proposed development promotes a reduced dependency on from coal resources which are considered a dirtier natural resource and is currently not available in the immediate vicinity of the Kelvin power station. Coal has been transported via locomotives and in the more recent periods via trucks. The proposed project will receive gas through a connection to an existing gas pipeline thus also reducing downstream pollution and dependency on fuel

Ref No.	Question	Answer
		intensive transportation. As such, this project should not be viewed in isolation in terms of resources but in a holistic manner both nationally and globally.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts:	
1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	In order to prevent repetition, the reader is directed to the assumptions and limitations presented in Section 13.
1.8.2	What is the level of risk associated with the limits of current knowledge?	The level of risk is considered low. The use of natural gas in power generation is a mature technology which is well understood.
1.8.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	A Major Hazard Installation Risk Assessment in addition to the other specialist studies indicated above form part of this EIA process in order to identify areas of high sensitivity and even no-go areas. In this manner, a risk-averse and cautious approach can be more fully realised in future project planning.
1.9	**How will the ecological impacts resulting from this development impact on people's environmental right in terms following?**	
1.9.1	Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	The following specialists have been appointed to inform this EIA process: • Air Quality Impact Assessment • Climate Change Impact Assessment • Terrestrial Ecology Compliance Statement • Soils and Land Capability Compliance Statement • Noise Impact Assessment • Socio-economic Impact Assessment • Heritage Impact Assessment (if required by SAHRA) – An exemption letter has been prepared and submitted. • Major Hazardous Installation Risk Assessment.
1.9.2	Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	

Ref No.	Question	Answer
		This team of specialists will assist in identifying relevant avoidance mechanisms for negative impacts as a first priority and where not possible, suitable mitigation measures will be put forward to minimize the impacts. The specialists will similarly identify measures to enhance positive impacts where possible or at least prevent a reduction of positive impacts as far as possible.
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	The proposed development is located on the previous coal powered A-Station plant that is currently undergoing a decommissioning process. The proposed CCGT power plant is to be located on a site that was being used for the generation of power and will cause minimal changes to the environment as it relates to a continued power generation land use. The construction phase of the development will likely result in a disturbance of the surrounding land-uses as opposed to the operational phases of the development. The relevant specialists have assessed these impacts on livelihoods, loss of heritage site, opportunity costs, etc to avoid or minimise these impacts as far as possible.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	The overall impact on the ecological integrity objectives or targets or considerations of the area has been assessed, refer to section 10 for the detailed Impact assessment.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	As part of the scoping phase, suitable alternatives were considered and are finalised in this EIA phase and due consideration of alternatives has been completed. Refer to Section 7 for the project alternatives.
1.13	Describe the positive and negative cumulative ecological / biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Refer to Section 10 of this report for the impact assessment.
2	**Promoting justifiable economic and social development**	
2.1	**What is the socio-economic context of the area, based on, amongst other considerations, the following:**	

Ref No.	Question	Answer
2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks or policies applicable to the area,	Details of the IDP for the City of Ekurhuleni has been included in Section 5.26. The City of Ekurhuleni seeks to reduce the vulnerability of its residents from Eskom loadshedding. The proposed development produces an opportunity for the reduction of loadshedding as it is to ensure an additional 600 MW capacity on the grid. The project is seen as a continuation of the currently existing land use as the proposed CCGT power plant is to be developed on the previously coal powered A-station power plant currently undergoing a decommissioning process. Furthermore the CCGT plant in located with the GEMF zone 5 earmarked for industrial developments.
2.1.2	Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	
2.1.3	Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	
2.1.4	Municipal Economic Development Strategy ("LED Strategy").	
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	This project will result in positive socio-economic impacts in the local, regional and national economy. Refer to the impact assessment in Section 10 in this report.
2.2.1	Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	An estimate of 200 temporary skilled and 500 temporary unskilled jobs will be created during construction. 50 unskilled and 50 skilled permanent jobs are anticipated for operations at this stage. Where possible, existing local labour will be utilised. Labourers will mostly be sourced from the surrounding area. This will create opportunities for local economic development in the area.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	The baseline receiving environment is presented in Section 9. The impact of this project on the physical, psychological, developmental, cultural and social needs and interests of the relevant communities has been updated in this EIA report, refer to Section 10 for the detailed impact assessment.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	An environmental impact assessment is being undertaken to identify the positive and negative impacts to ultimately determine the short- and long-term impacts from a social and economic perspective. Once the EIA phase assessment has been concluded, this question can be answered in more detail.

Ref No.	Question	Answer
2.5	**In terms of location, describe how the placement of the proposed development will:**	
2.5.1	Result in the creation of residential and employment opportunities in close proximity to or integrated with each other.	It is unlikely that this project will result in the creation of residential opportunities however the project is will result in limited employment opportunities, especially during its construction phase. The proposed development is located in close proximity to existing residential areas and it is highly unlikely that it will result in residential opportunities and/or impact the current pedestrian transport situation. This project will reduce the need of transportation of goods (coal) which has been transported to site via trucks as gas will be transported to site via Sasol pipeline infrastructure.
2.5.2	Reduce the need for transport of people and goods.	
2.5.3	Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms of public transport),	
2.5.4	Compliment other uses in the area,	This project is a continuation of the current power generation activities on site. Although the A-station is currently undergoing a decommissioning process the B-station is still operational and this development will supplement power generation activities within the property. Furthermore, the Kelvin Power Station is located within / or in close proximity to an industrial area although some residential areas exist in the adjacent land parcels.
2.5.5	Be in line with the planning for the area.	Refer to item 2.1.1 of this table (above).
2.5.6	For urban related development, make use of underutilised land available with the urban edge.	Not applicable. The proposed project is a brownfield development.
2.5.7	Optimise the use of existing resources and infrastructure,	The proposed project is a brownfield development located at the existing Kelvin power station, where the previously coal fired A-station was situated and as such will utilise currently existing infrastructure such as the Diepsloot wastewater pipeline connections, Rand Water potable water pipeline connection, existing Sasol gas pipeline (will require a short connection to the plant) etc. As such the proposed project will utilise existing infrastructure as far as possible. It is to be further noted that the proposed plant will utilise treated waste water from Diepsloot for cooling presenting an opportunity for usage of recycled water and reduced reliance on potable water supply. Additional water may be sourced from Randwater or on -site boreholes. The project will also make optimum use of the
2.5.8	Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	

Ref No.	Question	Answer
		existing Eskom transmission lines by requiring only short additional transmission lines.
2.5.9	Discourage "urban sprawl" and contribute to compaction / densification.	This project is a brownfield development in located in an area currently used for the production of electricity and is within an urban setting, surrounded by light industries and residential areas. It is thus understood that this project will not contribute to “urban sprawl”.
2.5.10	Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	Refer to items 2.5.7 – 2.5.9 of this table (above).
2.5.11	Encourage environmentally sustainable land development practices and processes	This project will have a minimal impact on the current land uses in the application area as it is a brownfield development and a continuation of the current power production activities.
2.5.12	Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	This Kelvin CCGT project aims to make use of the existing water pipeline infrastructure, existing Sasol gas pipeline infrastructure and will be located within close proximity to the Sebenza Substation/Eskom transmission lines reducing the need for construction of distribution infrastructure. Furthermore, the proposed development is located in a property with on going power generation and as such will not lead to unintended changes of its immediate surroundings.
2.5.13	The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential).	As mentioned in 2.5.11 above, this project will not sterilise existing land uses and therefore it will in fact result in higher economic returns as the CCGT plant will produce more power (up to 600MW) which will be integrated into the national grid and will assist in the curbing of loadshedding.
2.5.14	Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	A Social Impact Assessment will be undertaken to determine the impact of this project on existing socio-cultural and heritage sites and the results of this assessment has been presented in this EIA. Heritage Impact Assessment Exemption has been applied for as an HIA was undertaken for the same application area as part of the Station A decommissioning application and this project will be required to comply with the mitigation measures proposed in that HIA.

Ref No.	Question	Answer
2.5.15	In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	It is not anticipated that this project will have an impact the existing settlements in the area. However a Socio-economic Impact Assessment was conducted, refer to Section 10 for details on the socio-economic impacts identified and recommendations put forward by the Social Specialist.
2.6	**How was a risk-averse and cautious approach applied in terms of socio-economic impacts:**	
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Refer to Section 13 of this report. It is worth noting that the supplier of gas has not been identified yet. The assumption is that the supply of gas will be stable and long term.
2.6.2	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The level of risk is considered low as the project is not expected to have far reaching negative impacts on socio-economic conditions.
2.6.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Where uncertainties exist, the approach was taken to assume the worst-case scenario for impact planning purposes.
2.7	**How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:**	
2.7.1	Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	The positive and negative socio-economic impacts have been identified and mitigation measures have been put in place to minimise, manage and remedy negative impacts where avoidance is not possible. Refer to Section 10 for details on socio-economic impacts and proposed mitigation.
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the	

Ref No.	Question	Answer
	development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	The potential impact on existing land uses has been identified and an assessment of this impact as well as mitigation measures have been put forward to prevent undue negative impacts in this regard.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	This application includes an assessment of the projects impacts on the environmental health and safety through various specialist studies including Air Quality Impact Assessment, Major Hazardous Installation Risk Assessment and Climate Change and GHG specialist assessments. The results of these assessment are presented in Section 10 of this report.
2.13	**What measures were taken to:**	
2.13.1	Ensure the participation of all interested and affected parties.	

Ref No.	Question	Answer
2.13.2	Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	Notwithstanding the detailed description of the stakeholder consultation process included in Section 8 of this report, the consultation process has been undertaken in 2 languages (English and isiZulu). To date, the public participation process that has been undertaken includes, but is not limited to: • Placement of 16 A1 site notice boards were place at the entrance to the site and various surrounding areas; • Notification letters were sent to various pre-identified Interested and Affected Parties (I&APs) via email, post, fax and SMS; • 2 Newspaper adverts were places on the Bedfordview and Edenvale News and Kempton Express Newspapers with adequate circulation within the project area; • A notice was placed in the Gauteng Provincial Gazette. • A Public Open Day was held at the Kelvin Estate on Kelvin Estate Club House (Kelvin Estate Club House, Cnr Starling & Cape Wagtail Street, Kelvin Estate, Spartan) on the 3rd of April 2024 from 16:00 to 19:00. I&APs were able to attend the session at any time during the 3-hour timeslot. Furthermore, public meetings will be undertaken during the EIA phase consultation during which any additional consultation requirements of the I&APs will be identified and addressed where necessary.
2.13.3	Ensure participation by vulnerable and disadvantaged persons,	
2.13.4	Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	
2.13.5	Ensure openness and transparency, and access to information in terms of the process,	
2.13.6	Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7	Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted?	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	
2.15	What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the	Workers will be educated on a regular basis as to the environmental and safety risks that may occur within their work environment. Furthermore, adequate measures will be undertaken to ensure that the appropriate personal protective equipment is issued to workers based on the areas that they work and the requirements of their job. Their right to refuse work (if considered dangerous) will

Ref No.	Question	Answer
	work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	be included in the education programme. Work in hazardous areas will be regulated by a "permit to work" system.
2.16	**Describe how the development will impact on job creation in terms of, amongst other aspects:**	
2.16.1	The number of temporary versus permanent jobs that will be created.	An estimate of 200 temporary skilled and 500 temporary unskilled jobs will be created during construction. 50 unskilled and 50 skilled permanent jobs are anticipated for operations at this stage. Where possible, existing local labour will be utilised. Labourers will mostly be sourced from the surrounding area.
2.16.2	Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area).	
2.16.3	The distance from where labourers will have to travel.	
2.16.4	The location of jobs opportunities versus the location of impacts.	
2.16.5	The opportunity costs in terms of job creation.	
2.17	**What measures were taken to ensure:**	
2.17.1	That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.	The Scoping and EIA Process requires governmental departments to communicate regarding any application. In addition, all relevant departments are notified at various phases of the project by the EAP and any feedback received from government departments is considered where relevant. Should any conflicts of interest between organs or state be identified, these will be resolved through appropriate channels.
2.17.2	That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures.	
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Environmental attributes that may be impacted by this project have been identified and where relevant, specialist input will be solicited to ensure that a rigorous impact assessment process is undertaken. Where positive impacts on the interests of the public have been identified (e.g. job creation, impact on existing land use, etc.), mitigation measures are put forward to enhance positive impacts and similarly, mitigation measures will be put forward to reduce negative impacts.

Ref No.	Question	Answer
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	At this scoping phase, only preliminary mitigation is put forward. On completion of the specialist assessments and public consultation process in the EIA phase, the mitigation measures will be adjusted where necessary to ensure that they are realistic and implementable to achieve the intended outcomes.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	This aspect will be further explored in this EIA phase and findings thereof presented in the EIA Report and EMPr.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Refer to Section 7 wherein a description of the identified alternatives is provided as well as the preliminary process followed to identify which alternatives to assess further in the EIA phase.
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to the impact assessment and mitigation measures in Section 10 of this Report.

7 PROJECT ALTERNATIVES

In accordance with the principles stipulated in NEMA it is required that various alternatives be investigated when considering a development which may impact significantly on the environment, in order to implement the best practical environmental option. This means that the options will be assessed in such a manner that the alternative which has the most benefit or causes the least environmental damage to the natural environment is chosen. This option also needs to be of such a nature that the capital and social cost incurred will be of an acceptable nature to society. Biophysical and socio-economic aspects are considered when investigating alternatives.

- Property on which or location where it is proposed to undertake the activity;
- Type of activity to be undertaken;
- Scheduling alternatives;
- Design or layout of the activity;
- Technology to be used in the activity;
- The option of not implementing the activity (No-go alternative)

For the purposes of this project, the identification of alternatives was a key aspect of the success of the environmental Scoping Phase. All reasonable and feasible alternatives were identified and screened to determine the most suitable alternatives. There are, however, some significant constraints that have to be considered when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which will be discussed as part of the evaluation of the alternatives for this project. Alternatives can typically be identified according to:

- Location alternatives (including design and layout);
- Process alternatives;
- Technology alternatives; and
- Activity alternatives (including the No-Go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. As mentioned in Section 6 of this EIA Report, the need for the proposed project includes the following key drivers:

- Loadshedding Mitigation: The CCGT plant offers stable, consistent, flexible, state of the art, power generation technology available 24/7 and quick adaptability to demand changes, reducing the risk of load shedding.
- Energy Security: Adding CCGT capacity diversifies the energy mix, reducing reliance on coal and enhancing energy security, contributing to a more resilient power system.
- Economic Advantages: The CCGT plant provides efficient, cost-effective energy production and creates employment opportunities, benefiting the local economy.
- Environmental Considerations: The CCGT plant produces lower emissions compared to coal-fired plants and supports a sustainable energy transition.
- International Competitiveness: Establishing modern CCGT infrastructure enhances the reliability of the electricity network which thus enhances South Africa's attractiveness for foreign investment and aligns with global energy standards.

In this section the various alternatives considered are described and their advantages and disadvantages are presented where applicable. Furthermore, the feasibility of the considered alternatives, from both a technical as well as environmental perspective, is determined and the result thereof are the alternatives that have been investigated further in the EIA phase, towards the selection of preferred alternatives. Essentially, alternatives represent different means of meeting the general purpose and need of the proposed project through the identification of the most appropriate and feasible method of development, all of which are discussed below.

Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process (DEAT; 2004). Incremental alternatives typically arise during the EIA or design process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives.

7.1 LOCATION OR PROPERTY ALTERNATIVES

Location alternatives are normally a major consideration when developing a new facility to assess the various benefits and impacts of the proposed site. However, in this case the proposed new CCGT Plant can be constructed within land already designated suitable for Power Plant generation and furthermore can piggyback onto existing approved systems negating many of the approvals needed for a virgin land development. Kelvin Power made the strategic decision to locate the proposed CCGT development in the City of Ekurhuleni within the Gauteng Province where Kelvin owns the property on which the development is proposed. The property currently has an existing operational power plant, Kelvin B station and a decommissioned plant, Kelvin A station. The property has existing spatial area to accommodate the individual components of the proposed developments (e.g. the location of the CCGT and associated infrastructure within the study.

Kelvin owns the remainder of portion 391 (RE/391) of farm Zuurfontein (33) on which the proposed development is proposed. The proposed CCGT plant is to be located where the coal fired A-station, currently undergoing a decommissioning process, is located as this property was previously used for power generation and is continuously generating power with the currently operational B-station. As such, no alternative properties were considered for this development. Furthermore, the proposed site is located within the South African load centre where demand for power is at its highest thus negating the need for extensive transmission line infrastructure that would be required to evacuate the power to Gauteng should the plant be located remote from the load centre.

7.2 ACTIVITY ALTERNATIVES

These are sometimes referred to as project alternatives, although the term activity can be used in a broad sense to embrace policies, plans and programmes as well as projects. Consideration of such alternatives requires a change in the nature of the proposed activity. This would entail a process where a different project is proposed instead of the power generating plant. Kelvin is a company in the power generating industry, whose main business is power generation and as such no alternative activities were identified and evaluated.

7.3 SCHEDULING ALTERNATIVES

Scheduling alternatives are sometimes known as sequencing or phasing alternatives. In this case an activity may comprise several components, which can be scheduled in a different order or at different times and as such produce different impacts. The project is being considered at this time in response to a Request for Proposals from the DMRE for gas fired power generation. No scheduling alternatives were identified for this project.

7.4 DESIGN AND LAYOUT ALTERNATIVES

Design and layout alternatives ensure the consideration of different design and spatial configurations of the proposed development within a specific location, in order to enhance the positive impacts and to reduce the negative impacts. During the prefeasibility studies a layout alternatives analysis was undertaken for the proposed CCGT plant. The layout alternative analysis took into consideration two main factors, namely, available land and equipment layout.

The assessment for the optimum location for the proposed development considered many aspects such as the decommissioning and demolition of the A-station infrastructure including the three cooling towers and location of existing servitudes, environmental, social, health and safety aspects and requirements both during construction and operational activities, as well as the need for temporary laydown areas, traffic, access and egress and optimisation and utilisation of existing infrastructure. The area coloured in dark green below was assessed as the optimum location for siting the CCGT facility. An overview of the available land assessment is represented in Figure 10 (WSP, 2023) below.

Figure 10: Available land analysis (WSP, 2023)

It was noted that the decommissioning of the A-station building including stacks could potentially take longer than the targeted construction start date of the proposed CCGT plant due to removal of asbestos in A-station. As such the A-station building area has ben considered unavailable land and will be avoided by the layout, thus locating the proposed CCGT plant at the location on which the A-station cooling towers, workshop, coal store and conveyor belts, East and West wagon tipplers track hopper and weigh bridge sites that are undergoing decommissioning/demolition activities as part of the redevelopment programme. The identified available land (shaded green in Figure 10) was considered for the placement of the plant. Following consideration of the various layout designs being proposed i.e., demolition, construction, commissioning, operational, maintenance, environmental, social, health and safety as well as access during these phases. Having identified the optimum configuration for CCGT plant layout, additional cognisance was considered for the placement of cooling towers downstream of prevailing winds, minor adjustments to the substation and evacuation transmission line's location, as well as the proximity of gas turbine and cooling tower to neighbours. See layout mapping below. Kindly refer to Figure 4 for a map showing the CCGT layout map.

A short powerline connection of approximately 250m of overhead transmission lines will be required to connect the proposed CCGT plant to the electricity transmission and distribution grid infrastructure. The proposed powerline start, midpoint and endpoint coordinates are listed in Section 2 above.

A connection to the Sasol gas pipeline infrastructure will be required. The gas pipeline is expected to follow the existing Kelvin Power servitudes into the proposed plant. The proposed gas pipeline start, midpoint and endpoint coordinates are listed in Section 2 above.

7.5 TECHONOLOGY ALTERNATIVES

The selection of the technology to be adopted for the proposed power generation facility has considered the available technological and equipment alternatives. This report considers various technology alternatives that can be utilised for the generation of power at the Kelvin power plant. The purpose of considering such alternatives is to include the option of achieving the same goal by using a different method or process. Various system technologies and turbine options.

7.5.1 SYSTEM TECHNOLOGY ALTERNATIVES

A gas turbine is a type of internal combustion engine that can convert natural gas or other fuel gas into mechanical rotational energy which drives a generator that produces electrical energy. Two (2) types of technologies are currently in place for power generating gas turbines, namely, Open Cycle Gas Turbines (OCGT) and Combined Cycle Gas Turbines (CCGT). Both options are discussed further below.

7.5.1.1 **OPEN CYCLE GAS TURBINES (OCGT)**

OCGTs are described in International Association of Oil & Gas Producers (IOGP) (2022) as the simplest application of gas combustion for power/electricity generation. OCGTs consist of only a gas turbine and do not recover any waste heat released during the combustion process. OCGTs are thus deemed as less efficient compared to technologies that utilises the extra heat for heating or extra power production. IOGP (2022) highlights that due to the decreased efficiency of an OCGT turbine, more fuel is required per unit power output. The use of OCGT turbines therefore tends to result in increased GHG emissions.

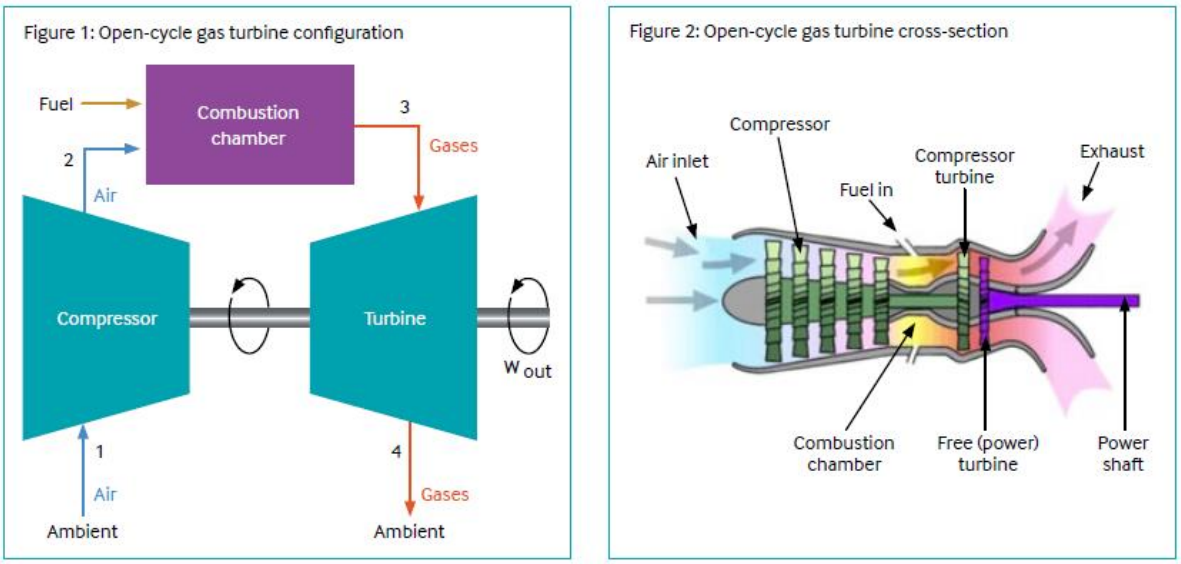

Figure 11: OCGT configuration (Left) OCGT cross section (Right) (Source: IOGP, 2022)

7.5.1.2 **COMBINED CYCLE GAS TURBINE**

CCGT power plants refer to a gas turbine system with an additional component known as a heat recovery steam generator (HRSG) for cogeneration. IOGP (2022) defines cogeneration as a process where waste heat recovered from the gas turbine exhaust to power a steam engine for the generation of power. CCGT are noted to be more efficient than OCGTs as they can produce more power from less fuel, thus contributing to lower GHG emissions per unit of power produced. The European Commission (2009) highlights that electricity production efficiencies varies according to the to the fuel and technology, however, cogeneration in CCGTs can have 85% total efficiency for electricity where some of the steam is used for process or district heating purposes. Refer to Figure 12 for a schematic flow diagram and configuration drawing of a typical CCGT.

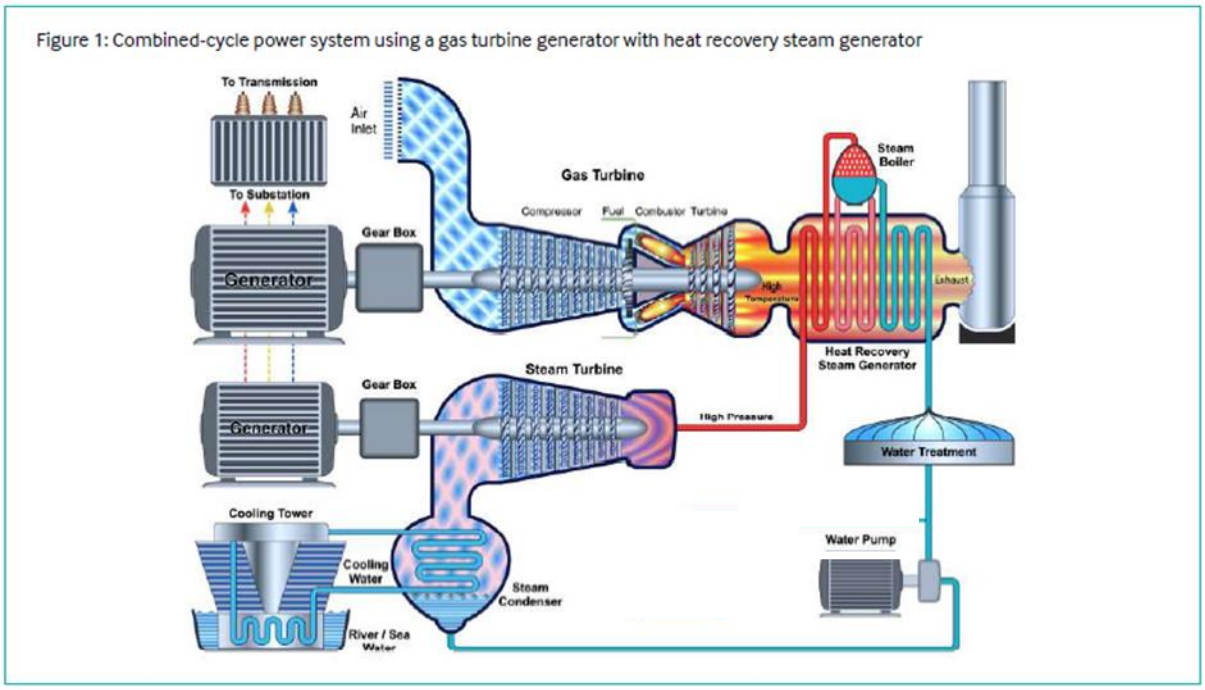

Figure 12: CCGT schematic drawing (Source: IOGT, 2022)

7.5.2 TURBINE OPTIONS

Gas turbine technologies are typically classified by letter designation to identify their technologies which is differentiated by the by volumetric air flow, its compressor pressure ratio, and most importantly the turbine inlet firing temperature (Zachary, 2008 cited in Mondol and Carr, 2017).Mondol and Carr (2017) further add that progression in turbine technologies has been noted with D and E class engines dominating in the 1980's, F-class engines in the 1990's and the more advanced GT class (G, H and J) being the most recently developed engine types. The various engine types generally have varying firing temperatures, cooling technologies and materials with the more recently developed engines being able to reach higher firing temperatures and having been noted to be more efficient technologies, kindly refer to Figure 13 below for a progression of gas turbine technologies and efficiencies.

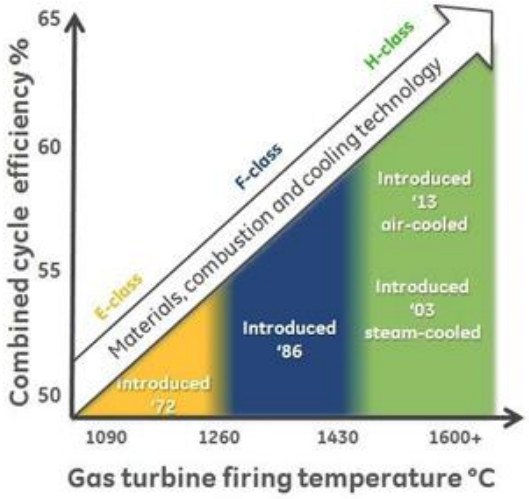

Figure 13: Progression of Gas Turbine Technologies and Efficiencies (Source: Vanderfort *et al.*, 2016)

A pre-feasibility study was undertaken for the development of a gas power plant with a power output of up to 600 MW. Various gas turbine technologies and configurations were considered. The gas turbine technologies

that were considered included the F, H and J class gas turbines. A recommendation on the type of engine to be utilised for the CCGT was made based on high power outputs and efficiency.

7.5.3 COOLING TECHNOLOGIES

Cooling methods in a CCGT power plant are critical for managing the heat generated during power production. The choice of cooling technology can significantly impact the plant's efficiency, water usage, and environmental footprint. Three options were investigated for the Kelvin CCGT power plant, namely, Wet Cooling, Dry Cooling and Mechanical Cooling (preferred alternative). These cooling technologies are discussed in the subsequent subsections.

7.5.3.1 **WET COOLING**

Wet cooling systems are the most common due to their high efficiency in heat transfer. These systems use water to absorb heat from the plant's exhaust steam in the condenser. The heat is transferred to the water, which then evaporates, dissipating heat into the atmosphere. This process typically involves cooling towers, where water is sprayed over fill material to increase the surface area for evaporation. As the water evaporates, it cools the remaining water, which is then recirculated through the system. The main advantages of wet cooling are its efficiency and lower capital costs compared to other methods. However, it consumes large quantities of water, making it less suitable for water-scarce areas, and can have environmental impacts such as thermal pollution in local water bodies.

7.5.3.2 **DRY COOLING**

Dry cooling systems, in contrast, do not use water for heat dissipation. Instead, they rely on air to cool the steam or hot air from the turbines. These systems use large air-cooled heat exchangers or condensers to dissipate heat directly into the atmosphere. The absence of water usage makes dry cooling ideal for regions where water is scarce, and it reduces environmental impacts like thermal pollution. However, dry cooling is less efficient than wet cooling, particularly in hot climates, because air has a lower heat capacity than water. Additionally, dry cooling systems generally involve higher capital and maintenance costs.

7.5.3.3 **MECHANICAL COOLING (PREFERRED)**

Mechanical cooling refers to systems that use mechanical devices like fans or pumps to circulate cooling fluids or air to dissipate heat. Both wet and dry cooling systems can incorporate mechanical cooling components to enhance their performance. For instance, cooling towers with mechanical draft use large fans to increase airflow over the water in wet cooling systems, enhancing evaporation and cooling. In dry cooling systems, air-cooled heat exchangers with fans blow air over the working fluid to facilitate heat removal. Mechanical cooling systems offer greater control and flexibility, allowing for adjustments based on operational needs. However, they consume additional energy to operate fans and pumps, slightly reducing overall plant efficiency and potentially generating noise, which may require mitigation measures. Mechanical cooling also uses less water than wet cooling.

The proposed Kelvin CCGT power plant cooling towers will be fitted with fans to increase airflow over the water cooling systems.

7.6 NO-GO ALTERNATIVE

The "No Go" or "No Action" alternative refers to the alternative of not undertaking the proposed project at all. This alternative would imply that the current status quo without the proposed Kelvin Power CCGT plant project would remain (i.e. current land use only). It is important to note that the No Go alternative is the baseline against which all other alternatives and the development proposal are assessed.

When considering the No Go alternative, the impacts (both positive and negative) associated with any other specific alternative, or the current project proposal would not occur and in effect the impacts of the No Go alternative are therefore inadvertently assessed by assessing the other alternatives (i.e. the change caused by the project from baseline current conditions). The proposed development is located on the previous A-station coal fired plant that is currently undergoing decommissioning, not constructing the proposed CCGT plant would

mean that this land would have to be rehabilitated and left vacant. The proposed development is located on a Zone 5 GPEMF zone surrounded by residential and industrial land uses, not implementing the proposed development would mean that the current land use of the property would not be continued with. It is further noteworthy that all identified positive and negative impacts associated with the proposed project would not occur.

7.7 ALTERNATIVE ASSESSMENT

Various alternatives were described in the scoping report, and many of these have been scoped out of the EIA assessment. Table 16 in this section describes the advantages and disadvantages of the alternatives identified in scoping. The alternatives are compared to each other as well as with the No-Go alternative. The significance rating of identified impacts for each alternative is listed in terms of their significance, duration, probability, reversibility and chance to cause irreplaceable loss in Section 10.2. Table 16 further details which alternatives have been assessed in this EIA report.

Table 16: Alternatives assessment.

Alternative Category	Alternative	Alternative Description Summary	Advantages	Disadvantages/ Risks	Assessed in this EIA
Location Alternatives	No specific feasible or desirable location alternatives were identified.				**No**
Activity Alternatives	It is not deemed reasonable or practical to assess any other type of activities. Kelvin Power is a power generating company whose main business is to generate electricity. The development of a CCGT is identified as the only feasible activity through the applicant's pre-feasibility assessments.				**No**
Scheduling Alternatives	No scheduling alternatives were identified for this project. The DMRE Gas RfP has defined dates for which the generation plant should be available to produce energy.				**No**
Layout Alternatives	A layout has been developed and assessed as part of the EIA report. No on-site sensitivities have been identified in the EIA phase which could affect the layout / footprint.				**Yes**
Technology Alternatives	System Tech 1 – Open Cycle Gas Turbine	The use of an OCGT for the generation of electricity.	The construction of an OCGT plant is less costly.	• High fuel consumption for relatively lower output electricity; and • Higher GHG emissions • Lower electricity generation efficiency.	**No**
	System Tech 2 – Closed Cycle Gas Turbine	The use of an CCGT for the generation of electricity.	• CCGTs are more efficient as they can produce more electricity from less fuel. • Recover waste heat through the HRSG to be used for cogeneration. • Higher electricity generation efficiency. • Lower GHG emissions. • Continuously improved technology	The relative cost of buying a CCGT and constructing a plant is high.	**Yes**

Alternative Category	Alternative	Alternative Description Summary	Advantages	Disadvantages/ Risks	Assessed in this EIA
	Turbine Alternatives	Various gas turbine technologies and configurations were considered. The gas turbine technologies that were considered included the F, H and J class gas turbines as these plants have the highest gas to power conversion efficiencies.			**No**
	Cooling Tech 1- Wet Cooling	Wet cooling systems use water to absorb heat from the plant's exhaust steam in the condenser. The process involves the transfer of heat from the steam to water, which is then evaporated, dissipating heat to the atmosphere.	• Wet cooling provides a high rate of heat removal, allowing the plant to operate more efficiently. • Generally, wet cooling systems are less expensive to install than dry cooling systems.	• Wet cooling consumes large quantities of water, which can be a concern in water-scarce areas. • The discharge of warm water and water vapor (plume) can impact local ecosystems and contribute to water body thermal pollution.	**No**
	Cooling Tech 2 - Dry Cooling	Dry cooling systems use large air-cooled heat exchangers or condensers to dissipate heat directly to the atmosphere.	• Ideal for regions where water is scarce, as they require little to no water for operation. • Eliminates water consumption and minimizes thermal pollution.	• Dry cooling systems are less efficient than wet cooling because air has a lower heat capacity than water, especially in hot climates. • The initial installation and maintenance costs of dry cooling systems are typically higher.	**No**
	Cooling Tech 3 - Mechanical Cooling	A cooling systems that uses mechanical devices like fans or pumps to circulate cooling fluids or air to dissipate heat. Both wet and dry cooling systems can involve mechanical cooling components.	• Uses large fans to increase airflow over the water in wet cooling systems, enhancing evaporation and cooling. • In dry cooling systems, large fans blow air over heat exchangers to cool the working fluid.	• Mechanical systems can boost the cooling process, particularly in adverse conditions where natural airflows or evaporation rates are insufficient. • Control and Flexibility: Offers greater control over cooling rates and can be adjusted to respond to varying operational needs.	**Yes**

Alternative Category	Alternative	Alternative Description Summary	Advantages	Disadvantages/ Risks	Assessed in this EIA
No-Go Alternative	No-Go	The proposed activity will not take place on-site and the site will remain unutilized.	No environmental impacts as a result of the CCGT plant project.	• No benefits with respect to job creation and also no indirect socio-economic benefits created. • Inefficient use of an already disturbed, available space. • No additional power generation capacity.	**Yes**

8 STAKEHOLDER ENGAGEMENT

The Public Participation Process (PPP) is a requirement of several pieces of South African legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their opinions are taken into account, and a record included in the reports submitted to relevant authorities. The process aims to ensure that all stakeholders are provided an opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises in order to ensure and promote:

- Compliance with international best practise options;
- Compliance with national legislation;
- Establish and manage relationships with key stakeholder groups; and
- Encourage involvement and participation in the environmental study and authorisation / approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Provide an opportunity for I&APs to obtain clear, accurate and comprehensible information about the proposed activity, its alternatives or the decision and the environmental impacts thereof;
- Provide I&APs with an opportunity to indicate their viewpoints, issues and concerns regarding the activity, alternatives and / or the decision;
- Provide I&APs with the opportunity to suggest ways of avoiding, reducing or mitigating negative impacts of an activity and enhancing positive impacts;
- Enable the applicant to incorporate the needs, preferences and values of I&APs into the activity;
- Provide opportunities to avoid and resolve disputes and reconcile conflicting interests;
- Enhance transparency and accountability in decision-making;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and / or prevent environmental impacts associated with the project.

The PPP for this project has been undertaken in accordance with the requirements of the NEMA, as well as in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project.

8.1 LEGAL COMPLIANCE

The PPP must comply with several important sets of legislation that require public participation as part of an application for authorisation or approval, namely:

- The National Environmental Management Act (Act No. 107 of 1998 – NEMA);
- The National Water Act (Act No. 36 of 1998).

Adherence to the requirements of the above-mentioned Acts will allow for an Integrated PPP to be conducted, and in so doing, satisfy the requirement for public participation referenced in the Acts. The details of the Integrated PPP followed are provided below.

8.2 GENERAL APPROACH TO PUBLIC PARTICIPATION

The PPP has been undertaken in accordance with the requirements of the NEMA (and the NWA where applicable) as well as in line with the principles of Integrated Environmental Management (IEM). IEM implies an

open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project.

8.3 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

The I&AP databases compiled for various past environmental authorisation processes in the vicinity of the proposed facility have been utilised towards compiling a pre-notification register of key I&APs to be notified of the Environmental Authorisation Applicatio-

8.3.1 LIST OF AUTHORITIES IDENTIFIED AND NOTIFIED

The following Government Authorities were notified of the proposed project:

- City of Ekurhuleni Metropolitan Municipality
- City of Johannesburg Metropolitan Municipality
- City Power
- Department of Employment & Labour
- Department of Public Works, Roads and Transport (DPWR) (National)
- Department of Road and Transport
- Eskom Holdings SOC Limited
- Gauteng Department of Agriculture, Rural Development and Environment
- Gauteng Department of Co-operative Governance and Traditional Affairs
- Gauteng Department of Economic Development
- Gauteng Department of Human Settlements
- Gauteng Department of Roads and Transport
- Gauteng Department of Social Development
- Gauteng Provincial Government
- Gauteng Provincial Government - Department of Community Safety
- Gauteng Provincial Government - Department of Health
- Gauteng Provincial Government - Department of Infrastructure Development
- Gauteng Provincial Government - Department of Roads and Transport
- Gauteng Provincial Government - Department of Sport, Arts, Culture and Recreation
- Gauteng Tourism Authority
- Gauteng Wetland Forum
- National Department Of Agriculture, Land Reform And Rural Development
- National Department of Forestry, Fisheries and Environment (DFFE)
- National Department of Human Settlements
- National Department of Mineral Resources & Energy (DMRE)
- National Department of Tourism
- National Department of Transport
- National Department of Water and Sanitation (DWS)
- National Energy Regulator of South Africa (NERSA)
- National House of Traditional Leaders
- Petroleum Agency SA
- PetroSA
- Presidential Climate Commission
- Provincial Heritage Resources Authority Gauteng (PHRAG)
- Rand Water
- South African Civil Aviation Authority

- South African Heritage Resource Agency (SAHRA)
- South African National Parks
- South African National Road Agency (SANRAL)
- Transnet
- Ward councillors

8.3.2 OTHER KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

The following key stakeholders have been identified and notified of the proposed project:

- African Conservation Trust
- AfriForum
- Air Traffic and Navigation Service (ATNS)
- Airports Company South Africa (ACSA)
- BirdLife South Africa
- Botanical Society
- Centre for Environmental Rights (CER)
- Conservation South Africa (CSA)
- Council for Geoscience (CGS)
- Earth Life Africa
- Endangered Wildlife Trust (EWT)
- The Green Connection
- Federation of Sustainable Environment (FSE)
- Gautrain Management Agency
- Kelvin Estate Club House
- Kelvin Homeowners Association
- Kelvin Power Station
- Kempton Park Golf Club
- Modderfontein Reserve
- Natural Justice
- Sasol
- South African National Biodiversity Institute
- Wildlife and Environment Society of South Africa (WESSA)

8.4 INITIAL NOTIFICATION OF I&APS

The PPP commenced on the 14th of February 2024 with an initial call to register notification. Notification during this initial consultation was given in the manner described below.

8.4.1 REGISTERED LETTERS, FAXES AND EMAILS

Notification letters in English and isiZulu were distributed to pre-identified I&APs through either faxes, registered letters and/or emails.

The notification documents included the following information:

- List of anticipated activities to be authorised;
- Sufficient detail of the proposed development to enable I&APs to assess/surmise what impact the development will have on them or on the use of their land;
- The purpose of the proposed project;
- Details of the application processes associated with proposed activities;
- Details of the affected properties (including a locality map);
- Details of the South African environmental legislation that must be adhered to;

Proof of the registered letters, emails and facsimiles that were distributed during the initial notification and call to register period are attached in Appendix C.

8.4.2 SITE NOTICES AND POSTERS

Sixteen (16) A1 Correx site notices and one (1) A3 poster (in English and isiZulu) were placed at 17 locations along, and surrounding the perimeter of the proposed project study area on the 14th of February 2024. The on-site notices included the following information:

- Project name;
- Applicant name;
- Project location;
- Map of proposed project area;
- Project description;
- Legislative requirements; and
- Relevant EIMS contact person for the project.

Please refer to Appendix C. for proof of site notice and poster placement.

8.4.3 NEWSPAPER ADVERTISEMENTS

Advertisements describing the proposed project and EIA process were placed in the Bedfordview and Edenvale News Newspaper (in English) with circulation in the vicinity of the study area on the 21st of February 2024, as well as the Kempton Express Newspaper (in English and isiZulu) with circulation in the vicinity of the study area on the 22nd of February 2024. Notices (in English and isiZulu) describing the proposed project and EIA process were placed in the Gauteng Provincial Government Gazette with publication on the 6th of March 2024. The newspaper adverts included the following information:

- Project name;
- Applicant name;
- Project location;
- Nature of the activity;
- Legislative requirements; and
- Relevant EIMS contact person for the project.

8.5 NOTIFICATION OF AVAILABILITY OF SCOPING REPORT

Notification (in English and isiZulu) regarding the availability of the Draft Scoping Report and associated appendices was provided to pre-identified and registered I&APs through either email, fax, and/or registered mail where contacts are available. The notification included details regarding where a hard copy of the report could be accessed. Contact details for I&APs to contact if they required any assistance accessing the information or require copies of the report.

The Scoping Report was made available for public review from 16 March 2024 – 17 April 2024, for a period of 30 days at the following venues/platforms:

- Kempton Park Library; and
- Electronic copies were available on the EIMS website (www.eims.co.za/public-participation/).

8.5.1 PUBLIC OPEN DAY

A Public Open Day was held at the Kelvin Estate Club House (Kelvin Estate Club House, Cnr Starling & Cape Wagtail Street, Kelvin Estate, Spartan) on the 3rd of April 2024 from 16:00 to 19:00. I&APs were able to attend the session at any time during the 3-hour timeslot.

Open Day Sessions differ from public meetings in the sense that they do not include any formal presentation. By excluding a formal presentation, more time was allocated to allowing I&APs to engage with the project essentially allowing for a finer evaluation of the project.

All I&APs were asked to sign an attendance register upon entering the hall. Walkthrough tours were conducted during the session where I&APs were guided through various Posters placed around the hall. The facilitators present at the Public Open Day captured comments using comment booklets. I&APs were also provided A4 copies of the posters and comment sheets to fill out should they wish to leave written comments with the facilitators at the Public Open Day.

The Posters included the following information:

- Project name;
- Project description;
- Project alternatives;
- Overview of the Scoping and EIA process;
- Project location;
- Map of proposed project area and Preliminary Layout Map;
- Description of the Baseline Environment;
- Preliminary Impact Assessment;
- Plan of Study for EIA;
- Description of the proposed Public Participation Process and information on how to submit comments;
- Relevant EIMS contact person for the project.

8.6 NOTIFICATION OF AVAILABILITY OF EIA REPORT

Notification regarding the availability of this EIA Report for public review will be given in the following manner:

- Registered letters with details on where the EIA Report is available from, as well as the duration of the public review comment period, will be distributed to registered I&APs (which includes key stakeholders, affected and surrounding landowners, and registered occupiers) where postal addresses are available and no alternative contact details have been provided;
- Facsimile notifications with information similar to that in the registered letter described above, will be distributed to all registered I&APs; and
- Email notifications with a letter attachment containing the information described above were also distributed to all registered I&APs.
- SMS notifications with information on where the EIA report is available public review and the duration of the review period and/or where further information can be accessed will be distributed to registered I&APs.

The EIA Report will be made available for review for a period of 30 days at the following venues:

- Kempton Park Library; and

- Electronic copies were available on the EIMS website (www.eims.co.za/public-participation/). Should I&APs have difficulties accessing the reports due to data constraints alternative arrangements will be made to assist with accessing the report.

8.7 ISSUES AND REPONSES

Issues raised to date have been addressed in a transparent manner and the full details such as the comment received, the name of the I&AP who commented, the issue raised and the main aspect of the raised issue, as well as the response provided to the I&AP included in the Public Participation Report (Appendix C). A summary of comments received to date is presented below. Refer to the Public Participation Report in Appendix C for details of comments received.

To date the following comments have been received:

- I&AP registrations.
- Requests to be deregistered from the I&AP Database.
- General requests for more information regarding the project.
- Declared interest from nearby residents in the risk assessment and mitigation factors; the health of the stream and catchment; potential impacts on business and the surroundings.
- Comments from I&APs that attended the Public Open Day on the 3rd of April are recorded in the Public Open Day Record – please refer to Appendix C7 for more details.
- An I&AP stated that they have a business that is on a nearby property (within a few hundred meters of the Kelvin Power Station) and that they have 12 full time employees on the premises with several vehicles that use the roads around the Power Station. The I&AP stated that they have comments regarding the project and asked if they should wait for the Public Open Day to voice their comments. The I&AP was informed that they were welcome to provide their comments prior to the Open Day. The I&AP later attended the Public Open Day. Please refer to the Public Open Day Record (Appendix C7) for more details.
    - The above-mentioned I&AP provided comments on the Draft Scoping Report regarding the fact that they have been a nearby property and business owner for 25 years and that they have grown used to the look of the cooling towers and large brick buildings which house the boilers and turbines. They stated that the structures are an integral part of the heritage of the area and requested that they be preserved, if possible. The I&AP mentioned that large industrial buildings can be re-purposed (as has been done in South Africa and globally), while still retaining their look and character, and often look better than before. The I&AP requested that the EIA look at ways to achieve their request. The I&AP was informed that the decommissioning of the A-Station site (the current proposed location of the CCGT plant) was approved in a separate, previous application. The I&AP was referred to the various ways in which site location and layout alternatives were addressed and informed that there is limited opportunity to avoid the removal of the A-Station cooling towers. However, the I&AP was informed that the B-Station towers will remain for a limited time. The I&AP was referred to the previous decommissioning application which undertook a heritage study in which the heritage specialist gave recommendations to mitigate the impacts of the decommissioning and proposed demolition of the A-Station and to preserve the history of Kelvin Power Station and historical electrical power generation.
- Request for shapefiles/KMZ files, locality map and application from Rand Water.
- Confirmation from Rand Water that Rand Water is not affected by the proposal.

- Acknowledgement from the Department of Water and Sanitation (DWS) of receipt of the initial notification.
- Department of Agriculture, Land Reform & Rural Development (DALRRD):
    - Office of the Regional Land Claims Commission – Gauteng Province provided a letter regarding land claims on the property Zuurfontein 33 IR, lodged between 2014 and 2016. Further investigation was undertaken to verify whether there are any existing land claims on the application area's property, portion 391 R/E of Zuurfontein Farm 33-IR. DALRRD indicated that the land claims are on the entire farm (Zuurfontein 33 IR), the claims were submitted by different claimants, and that the exact portion of the farm cannot be determined as the Commission is currently interdicted by the Constitutional Court judgement to not process any claims lodged between 2014 and 2016. DALRRD could not provide claimants' contact details without their consent and indicated that the land claims are lodged against the state and not the land owners. DALRRD stated that under the interdict by the constitutional court, the commission is not allowed to do anything that may be considered as processing the claims on the property since they were lodged between 2014 and 2016.
    - Request from DALRRD for motivation, sketch plan, locality map, title deed and other supporting documentation for the department to process the application. EIMS clarified that the purpose of the notification to DALRRD was not to make an application with DALRRD, rather to inform of the project and provide an opportunity to participate in the Public Participation Process.
- Requests from Eskom to be informed regarding the progress of the application and for KMZ files of the proposed development area.
- Enquiry from Transnet Freight Rail about whether the proposed project would affect Transnet's railway infrastructure. Transnet Freight Rail were provided with KMZ files of the development area and a locality map and were asked to confirm whether Transnet's railway infrastructure would be affected. EIMS has not yet received a response.
- Request from Transnet Pipelines for the Background Information Document.
- Confirmation from Transnet Pipelines that the proposed project does not affect Transnet Pipelines.
- Request from the Ward Councillor and Chair of the Kelvin Homeowner's Association that a presentation be held for the residents to explain the project. An Open Day was held on the 3rd of April 2024.
- Requests for more information about the project:
    - General/ further information about the project
    - Enquiries as to whether the power station belongs to Johannesburg and if there are any benefits for anyone else from the development.
    - Stated interest in the health of the stream and catchment.
    - Enquiries for clarity on what the proposed development means for residents and how they are affected.
    - Enquiries on the potential impact that the proposed development would have on business and the surroundings.
- Job applications/ enquiries regarding opportunities for work.
- Request from SANRAL for a locality map and GPS co-ordinates pertaining to the application.
- DFFE Directorate – Biodiversity Conservation:

- Acknowledgement of receipt of the Draft Scoping Report availability and Public Open Day notification; assigned case officers and requested shapefiles of the development footprints; requested that all Public Participation Process documents related to Biodiversity EIA review and other Biodiversity EIA queries be submitted to the Directorate: Biodiversity Conservation.
- Comments on the Draft Scoping Report were provided stating that the Directorate: Biodiversity Conservation does not have any objection to the Draft Scoping Report and the Plan of Study for EIA. The Directorate: Biodiversity Conservation stated that it is essential that impacts on sensitive and highly localised habitats are minimized or avoided all together to ensure the continued persistence of ecosystems and that national conservation targets are achieved. They stated that the EIA report must comply with the procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5) (A) and (H) and 44 of the National Environmental Management Act, 1998. The comments were acknowledged and the Directorate: Biodiversity Conservation was informed that the EIA report will comply with the procedures for assessment for reporting on the identified environmental themes as per their requirements.

- Acknowledgement from the DWS of receipt of the Draft Scoping Report and Public Open Day notification.
- Request from the City of Ekurhuleni Environmental Resources and Waste Management Department (Compliance Division) for a hardcopy and soft copy (USB) of the report to be sent to their offices. The Draft Scoping Report was couriered to the specified address.
- Request from the South African Heritage Resources Agency (SAHRA) for an application to be made. An application was made and SAHRA were notified. EIMS followed up on the status of the application, SAHRA confirmed that the Case Officer was still in the process of being reviewed and that comments will be provided from SAHRA as soon as possible. To date, no comments have been received from SAHRA regarding the project.
- Communication from an I&AP that they would not be able to attend the Public Open Day and requested the presentation materials and meeting minutes. The I&AP was provided a copy of the posters that were to be used at the Open Day and the comments and responses record was sent to the I&AP once they were available.
- Request from the City of Ekurhuleni Health District to be registered as an I&AP.
- Request from the South African Civil Aviation Authority (SACAA) for an application to be made. SACAA was informed that the applicant will be informed of the request from SACAA and that an application will be made, if required, by the applicant prior to commencement.
- Comments on the Draft Scoping Report were provided by the Department of Forestry, Fisheries and the Environment (DFFE) regarding information that must be included in the Final Scoping Report. Please refer to Appendix C9 and C10 for more detail of the comments received and the response provided.
- Comments on the Draft Scoping Report were provided by LEAP enviro on behalf of JT Group. For more detail on the comments received and response provided, please refer to Appendix C9 and C10. A summary of the comments is provided below:
    - The I&AP stated that the proposal is contradicting the commitment of South Africa to move towards clean energy and away from fossil fuel – stating that the development of new fossil fuel plants may be allowed but should be questioned if it is in contravention of the government's commitment to clean energy.
    - The provisions of the Gauteng Pollution Buffer Zones Guideline (March 2017) must be taken into account in the submission and must consider the prescribed distance that any polluting facility must be located from any residential areas.

- The I&AP stated that the residential areas have been there for many years and have been subject to the polluting impacts of the Kelvin Power Station for the same period and that “two wrongs do not make a right”.
- The baseline, ambient air quality studies must be provided, and the current and potential health-related impacts must be indicated. The air quality must look at the historic and future impacts as well.
- Detailed assessments must be provided of human, bird, and animal impacts as well as potential water and soil pollution.
- The I&AP stated that research has been conducted and proven that power plants cannot be located inside built-up areas, the potential pollution cannot be mitigated adequately and that the risks to all life forms is too high.
- The I&AP stated that the Environmental health specialist must be appointed on the specialist team and that it is not sufficient to only investigate the aspects that were identified in the Background Information Document.
- The I&AP commented that the operational aspects and the storage of large quantities of gas on the premises or the transportation of gas via pipelines or tankers cannot be overshadowed by the construction of the plant. The I&AP stated that the movement corridors and storage facilities must be investigated and the impact assessment cannot be restricted to the site alone; the source of the gas must be provided and the potential impacts at the source must be investigated.
- The I&AP provided the following comments regarding specialist studies: The Air Quality Assessment must include health impacts; request for the brief that will be provided to the specialist for the Socio-economic Assessment; the Climate Change study must include carbon emissions and the carbon tax that will be paid by the installation; the Noise Assessment must include health impacts; asked if the facility will be located on an existing industrial site and requested the DFFE screening results regarding the Heritage (including palaeontology) Assessment; accepted the Major Hazard Installation (MHI) Assessment.
- The I&AP stated that the technology that will be used must be provided as well as facilities that have been successfully operating with the same technology – along with the associated audit reports of those facilities as proof of the claims for the technology proposed for the project.
- The I&AP provided research from Harvard and requested feedback on each fact and claim in the report and how the proposed plant will address potentially similar results from the operations. The report included the following main topics:
    - Potential impacts of using natural gas fuel (CO_2, NOx emissions, methane, Particulate Matter, SOx, CO, formaldehyde, ammonia, non-methane hydrocarbons, Ozone).
    - Health consequences of exposure to pollutants such as ammonia, NOx, PM2.5, that is released from burning gas, such as increased early mortality rates and respiratory illnesses.
    - Concerns and health concerns of stationary emissions sources.
    - Socioeconomic inequalities.
    - Impacts on the Environment and Wildlife through the various stages of construction, operation and maintenance, and decommissioning.

- History of incidents at gas plants that had impacts on human health and the environment, mostly due to explosions and fires.

- Request from Natural Justice to be registered as an I&AP.
- Request from LEAP enviro for their client (JT Group) to be put in contact with Kelvin management regarding the possibility of linking the Kelvin Power Station CCGT project with a possible development of solar panels on their client's land.
- Request from SANBI to be deregistered from the list of I&APs for the project.
- Enquiry from a researcher regarding an upcoming EIA and whether the Kelvin CCGT Power Station project has had any appeals to the EIA being approved by the competent authority and if the project had received any negative attention. The I&AP was informed that the project is still on-going and in the EIA phase, therefore, no appeals have been made. The I&AP was directed to the Draft Scoping Report for further information.

Kindly refer to Appendix C for the detailed PPR and table of correspondence.

9 ENVIRONMENTAL ATTRIBUTES AND BASELINE ENVIRONMENT

This section of the EIA Report provides a description of the environment that may be affected by the proposed CCGT project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed project have been described. Baseline information sourced from various spatial datasets and information from the specialist team utilised to prepare the environmental attributes baseline below.

9.1 RAINFALL AND TEMPERATURE AND AIR QUALITY

Period and diurnal wind roses drawn from the South African Weather Service (SAWS) OR Tambo meteorological station data are shown in Figure 14. During the period January 2020 to December 2022, the dominant wind field was from the north-western sector. Calm conditions occurred 2% of the time. The predominant wind direction for day- and night-time conditions was from the northwest and north respectively.

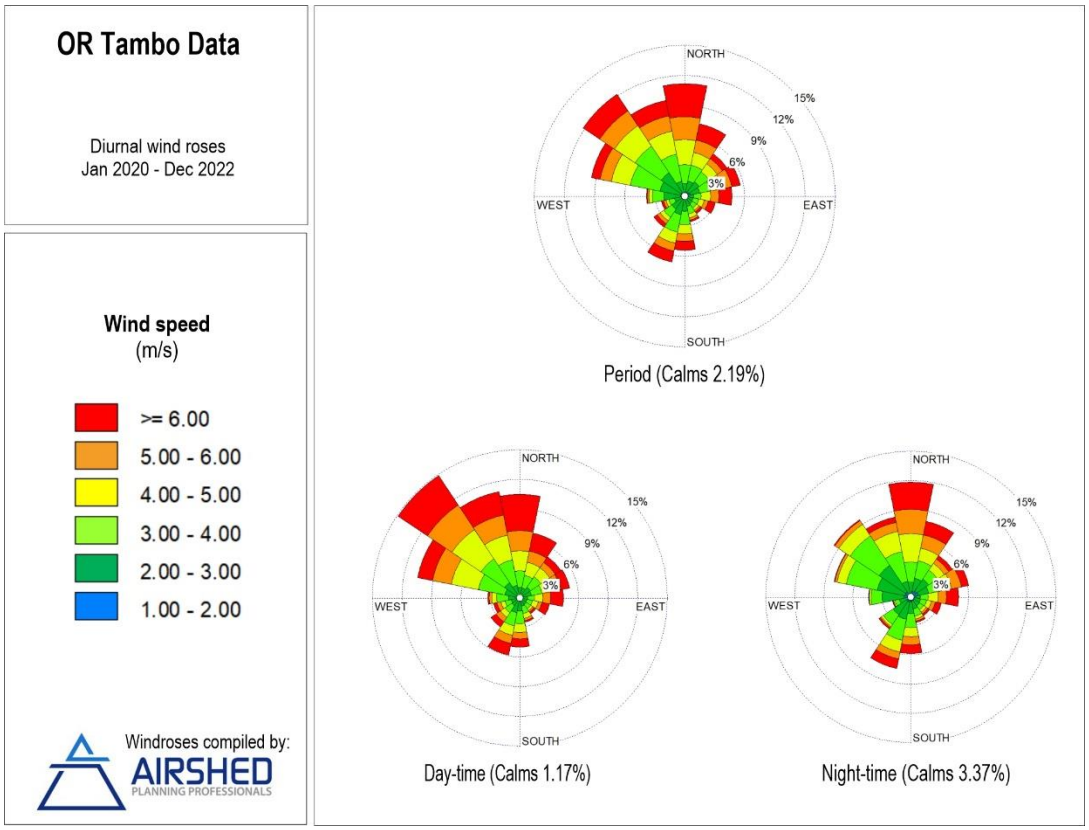

Figure 14: Period average, daytime and night-time wind roses (measured data; January 2020 to December 2022; SAWS OR Tambo meteorological station)

Monthly mean, maximum and minimum temperatures are given in Table 17. Diurnal temperature variability is presented in Figure 15. Average monthly temperatures ranged between 10.6°C and 19.7°C. During the day, temperatures increase to reach maximum at about 15:00 in the late afternoon. Ambient air temperature decreases to reach a minimum at between 05:00 and 06:00, i.e., just before sunrise.

Table 17: Monthly average temperature summary (OR Tambo meteorological station for the period January 2020 to December 2022)

Hourly Minimum, Hourly Maximum and Monthly Average Temperatures (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	15.8	15.4	14.3	12.1	9.1	6.0	6.0	8.2	11.7	14.1	14.8	15.5

Hourly Minimum, Hourly Maximum and Monthly Average Temperatures (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	19.7	19.5	18.3	16.0	13.8	10.6	10.9	13.3	17.7	19.0	18.9	19.2
Maximum	23.9	23.7	22.6	20.6	19.1	16.1	16.6	19.2	24.0	24.4	23.2	23.6

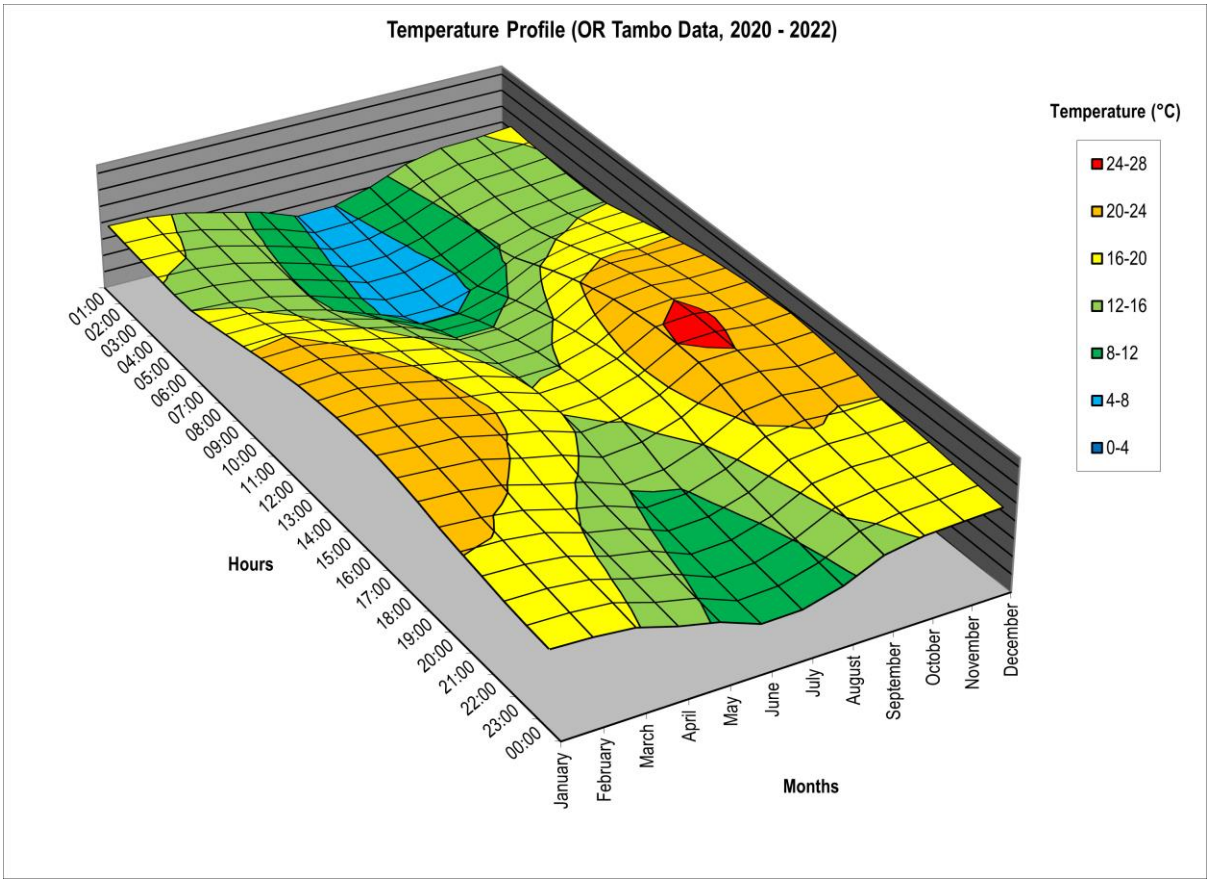

Figure 15: Diurnal temperature profile (OR Tambo meteorological station for the period January 2020 to December 2022)

Air Quality Monitoring Stations (AQMS) within the study area include Buccleugh AQMS (~11.5 km northwest of the project) and Alexandra AQMS (~7.8 km west of the project) both owned by the City of Johannesburg and Bedfordview AQMS (~8.8 km southwest of the project) owned by the Ekurhuleni Metropolitan Municipality. Potential sensitive receptors within 5 km from the project include residential areas, i.e., Esther Park, Edleen, Cresslawn, Kelvin Estate, Croydon, Eden Glen and Illiondale. Residential areas within 10 km from the project site include Edenvale, Kempton Park, and Lethabong (Figure 16). The list of hospitals and schools within the study area is provided in Table 18.

Table 18: Location of Air Quality Monitoring Stations (AQMS), hospitals and schools within the study area

ID	UTM WGS84 (35S)		Name	Distance from project centre (m)
	Easting	Northing		
AQMS				
1	611016	7111989	Alexandra AQMS	8 312
2	609936	7118870	Buccleugh AQMS	12 092
3	613234	7104036	Bedfordview AQMS	9 389

ID	UTM WGS84 (35S)		Name	Distance from project centre (m)
	Easting	Northing		
			Hospitals	
4	624862	7102933	Advanced East Rand Day Hospital	9 976
5	623594	7112000	Arwyp Medical Centre	4 374
6	623070	7116306	Birchleigh Clinic	6 345
7	622101	7116267	Birchmed Day Hospital	5 786
8	612993	7115449	Busamed Modderfontein Private Hospital Orthopaedic & Oncology Centre	7 593
9	612872	7109642	Edenvale Hospital	6 608
10	623539	7112561	Ekurhuleni Surgiklin Day Hospital	4 458
11	619019	7102272	Knights Chest Hospital	8 941
12	612076	7102809	Life Bedford Gardens Hospital - Emergency Unit	11 073
13	612190	7102722	Life Bedford Gardens Private Hospital - Medical Ward	11 066
14	617028	7104065	Life Roseacres Hospital	7 494
15	623313	7111960	Marymount Hospital	4 091
16	609544	7106167	Netcare Linksfield Hospital	10 974
			Schools	
17	624359	7114148	Aston Manor Primary School	5 858
18	613050	7103178	Bedfordview Academy	10 171
19	612812	7102223	Bedfordview High School	11 079
20	613966	7103999	Bedfordview Primary School	8 964
21	622415	7106840	Benoni Secondary School	5 370
22	609736	7111223	Bovet Primary School	9 555
23	614264	7105711	Crawford International - Bedfordview	7 450
24	620686	7111104	Cresslawn Primary School	1 398
25	617734	7108045	Curro Edenvale High School	3 527
26	624026	7113206	Destiny Independent School Kempton Park	5 138
27	614632	7108111	Dowerglen High School	5 595
28	615265	7106627	Dunvegan Primary School	6 100
29	610891	7112912	East Bank High School	8 571
30	615684	7108937	Eastleigh Primary School	4 264
31	617640	7108732	Edenglen High School	2 977
32	614783	7107361	Edenvale High School	5 928
33	619831	7113255	Edleen Primary	2 116
34	626139	7103620	Eduvu - Remedial School / Academy	10 221
35	609376	7111753	Ekukhanyisweni Primary School	9 930
36	612979	7102665	Elandspark School	10 622
37	616012	7118999	Gideon Rambuwani Primary School	8 452
38	623732	7117645	Hoërskool Birchleigh	7 819
39	621615	7115369	Hoërskool Jeugland	4 765
40	614505	7101949	Hoërskool Primrose	10 424
41	615778	7107158	Holy Rosary School for Girls	5 362
42	610500	7112467	Ikage Primary School	8 881
43	609526	7111117	Inkanyezi Waldorf Centre	9 766
44	616591	7110033	Jacaranda Academy	2 945
45	623609	7113318	Kempton Park Primary School	4 805
46	611247	7112919	Kwabhekilanga Secondary School	8 224
47	623238	7116981	Laerskool Birchleigh	6 992
48	620801	7113420	Laerskool Edleen	2 678
49	623724	7110930	Laerskool Kempton Park FSS	4 441
50	623673	7112744	Laerskool Kreft	4 643

ID	UTM WGS84 (35S)		Name	Distance from project centre (m)
	Easting	Northing		
51	624700	7115735	Laerskool Kruinsig	7 052
52	620920	7114905	Laerskool Van Riebeeckpark	4 039
53	627936	7103441	Laerskool Westwood	11 622
54	610800	7112802	M.C. Weiler Primary School	8 640
55	616321	7120101	Maphutha Secondary School	9 375
56	624876	7115967	Maranatha Christian School	7 337
57	625053	7101750	Martin Primary School	11 075
58	617148	7120125	Mayibuye Primary School - New	9 170
59	614406	7119337	Midrend Primary School	9 484
60	622540	7107594	Moduopo Primary School	4 860
61	614622	7111838	Nobel Primary School	4 711
62	622479	7117114	Norkem Park Primary School	6 710
63	610097	7111410	Pholosho Primary School	9 197
64	618406	7118236	Phomolong Secondary School	7 083
65	615908	7113541	Pinnacle College Founders Hill	4 109
66	614408	7102517	Primrose Hill Primary School	9 969
67	616195	7103186	Primrose Primary School	8 599
68	614540	7101933	Primrose Technical High School	10 422
69	611524	7103025	Reddam House Bedfordview	11 284
70	622888	7109793	Rhodesfield High School	3 865
71	622678	7112774	Sir Pierre van Reyneveld High School	3 730
72	611780	7112738	Skeen Primary School	7 665
73	613624	7104762	St Benedict's College	8 584
74	613703	7104351	St Benedict's Junior Preparatory School	8 846
75	615706	7108363	Success College Primary	4 578
76	627902	7105597	Summerfields Primary School	10 278
77	617239	7104746	Sunnyridge Primary School.	6 781
78	614919	7120295	Taal-Net Midrand School	10 083
79	624414	7112252	Taalnet Primary & High School Kempton Park	5 228
80	618745	7120880	Tembisa West Secondary School	9 687
81	622421	7120743	Thuthuka Primary School	10 035
82	619570	7114484	Westside Primary School	3 287
83	621920	7103141	Wit Deep Primary School	8 485
84	625874	7105122	Woodlands International College	8 965
85	612872	7101800	Wychwood Primary School	11 390

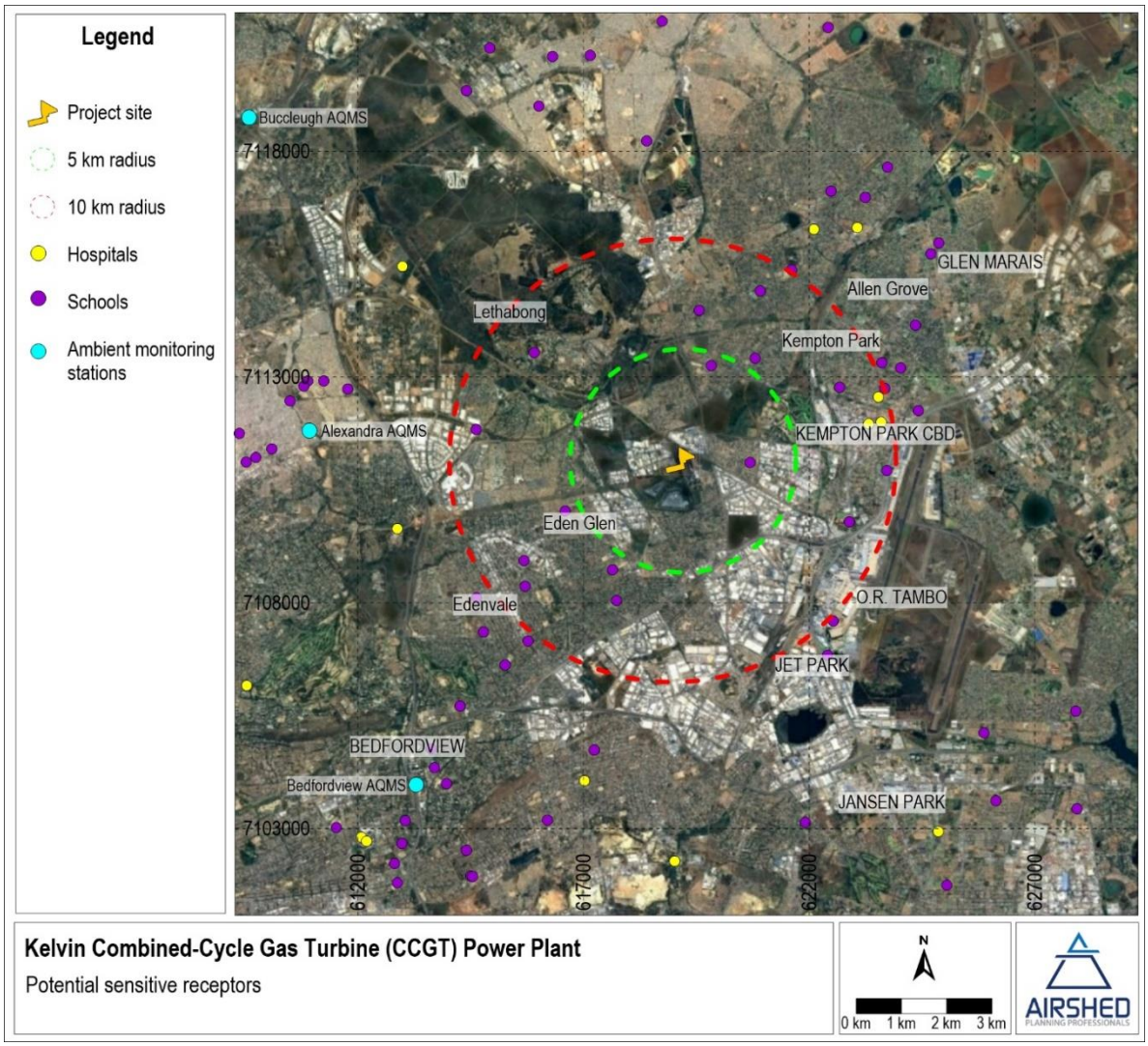

Figure 16: Potential sensitive receptors within the study area.

A summary of the measured ambient air quality data for the period 2023 from the Buccleugh AQMS, Alexandra AQMS and Bedfordview AQMS is provided in Table 19. Data availability for the pollutants measured at Alexandra AQMS was more than 80%. The data availability for the pollutants measured at Buccleugh AQMS was less than 55% with availability at Bedfordview AQMS being less than 20%. Non-compliance of the daily and annual NAAQS for PM10 and PM2.5 were recorded for the period 2023 at the Alexandra AQMS.

Table 19: Summary of the ambient measurements at the AQMS within the study area for the period 2023[(a)(b)]

AQMS	Data Availability	Hourly			Daily			Annual Average	No of recorded hourly exceedances	No of recorded daily exceedances
		Maximum	99th Percentile	50th Percentile	Maximum	99th Percentile	50th Percentile			
SO_2 (µg/m³)										
Criteria		*350 µg/m³*			*125 µg/m³*			*50 µg/m³*	*88 hours per year*	*4 days per year*
Alexandra	87%	268.2	78.8	7.2	59.6	44.4	8.9	12.0	0	0
Buccleugh	56%	233.2	57.4	6.2	43.3	23.0	4.2	10.0	0	0
Bedfordview	13%	193.3	107.5	19.2	67.6	59.6	23.2	25.6	0	0
O_3 (µg/m³)										

AQMS	Data Availability	Hourly			Daily			Annual Average	No of recorded hourly exceedances	No of recorded daily exceedances
		Maximum	99th Percentile	50th Percentile	Maximum	99th Percentile	50th Percentile			
Criteria		*120 µg/m³*							*11 periods per year*	
Buccleugh	55%	139.5	108.4	28.6					**23**	
CO (µg/m³)										
Criteria		*30 000 µg/m³*			*10 000 µg/m³*				*88 hours per year*	*11 periods per year*
Buccleugh	46%	9 229.0	2 942.5	503.8	3 487.0	2 585.7	570.2		0	0
Bedfordview	12%	3 182.3	2 327.6	576.4	2 430.3	1 959.3	639.0		0	0
PM_{10} (µg/m³)										
Criteria					*75 µg/m³*			*40 µg/m³*		*4 days per year*
Alexandra	83%				179.5	**132.1**	54.5	**46.4**		**102**
Buccleugh	47%				131.4	66.0	27.2	28.9		2
Bedfordview	17%				68.5	68.4	39.8	41.5		0
$PM_{2.5}$ (µg/m³)										
Criteria					*40 µg/m³*			*20 µg/m³*		*4 days per year*
Alexandra	84%				118.1	**82.9**	28.2	**22.8**		**100**
Buccleugh	14%				42.1	40.1	17.2	19.2		2
Bedfordview	17%				38.5	38.5	21.7	21.9		0

Notes:

(a) Red text denotes less than 80% data availability

(b) Bold text denotes exceedance of the NAAQS

9.2 CLIMATE

Climate change metrics focus on temperature; the number of very hot days (where temperatures exceed 35°C); rainfall and extreme rainfall events (more than 20 mm in 24 hours). The baseline (1961 to 1990) annual averages for these metrics were accessed for the area near the project site from the South Africa 'Green Book' (CSIR, 2019). The metrics include three percentiles[1] (10th, 50th, and 90th) as an indication of the variability within the measured data set.

Baseline annual average temperature was in the range 15.57°C (10th percentile) and 15.81°C (90th percentile) (Figure 19) with the number of very hot days varying between 0.12 (10th percentile) and 0.84 (90th percentile) days per year (Figure 20). The range between the 10th and 90th percentiles is 832.92 mm and 916.83 mm (Figure 21). Extreme rainfall days varied between 8.89 (10th percentile) and 9.94 (90th percentile) days per year (Figure 22).

Recent change in climatic conditions near the project site were accessed from MeteoBlue a weather forecasting platform developed at the University of Basel, Switzerland and based on models of National Oceanic and Atmospheric Administration (NOAA) or National Centres for Environmental Prediction (NCEP). The data sets also include historical climate data tracking changes in climate by referencing ERA5, the fifth generation ECMWF (European Centre for Medium-Range Weather Forecasts) atmospheric reanalysis of the global climate, for the

[1] A percentile is a statistical measure to indicate the value below which a given percentage of observations in a group of observations falls. For example, the 90th percentile is the value below which 90% of the observations fall. The 10th percentile is the value below which 10% of the observations fall.

period between 1979 to 2021, with a spatial resolution of 30 km. Based on a point selected over the project site, an increasing trend in the annual average temperatures have been observed from 15.3°C in 1979 to 16.7°C in 2023 (Figure 17). The lower part the graph shows the so-called warming stripes. Each coloured stripe represents the average temperature for a year - blue for colder and red for warmer years. The change in rainfall over the same period (1979 – 2023) displays a slight decreasing trend from 807.5 mm in 1979 to 720.1 mm in 2023 (Figure 18), where the difference from long-term average for each year in the data set is visualised by the stripes in the lower panel of Figure 18 brown stripes indicate lower than average rainfall and green stripes above average rainfall).

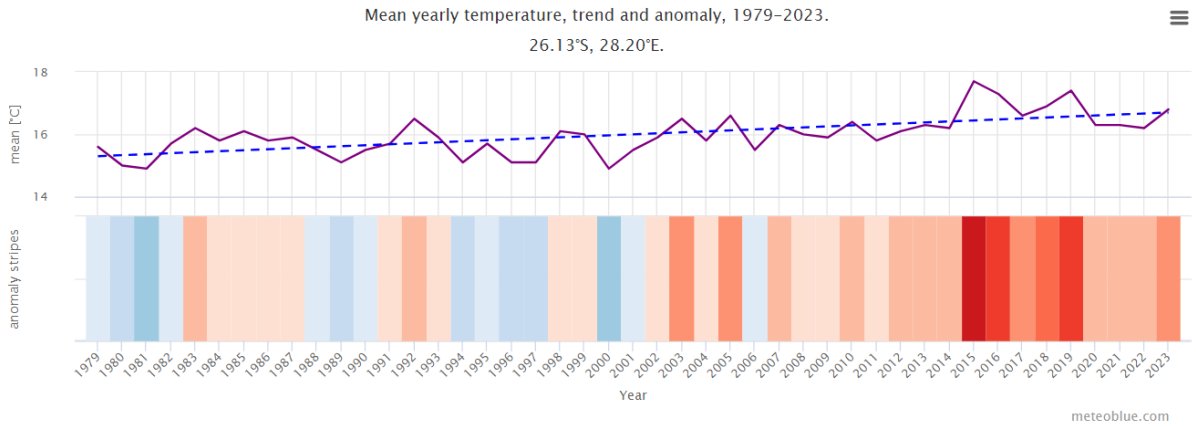

Figure 17: Annual average temperature (top panel) and temperature anomaly (lower panel) between 1979 and 2023 (meteoblue AG, 2024)

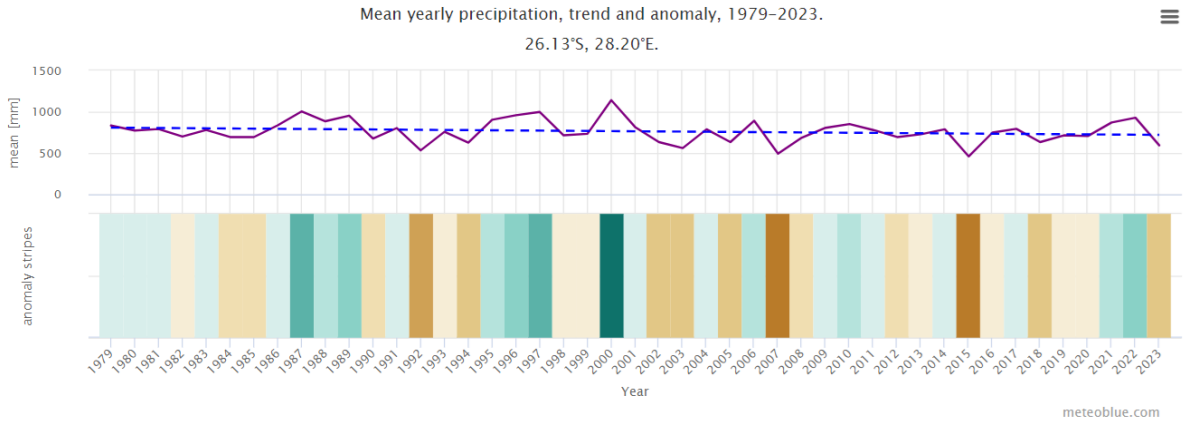

Figure 18: Annual average rainfall (top panel) and rainfall anomaly (lower panel) between 1979 and 2023 (meteoblue AG, 2024)

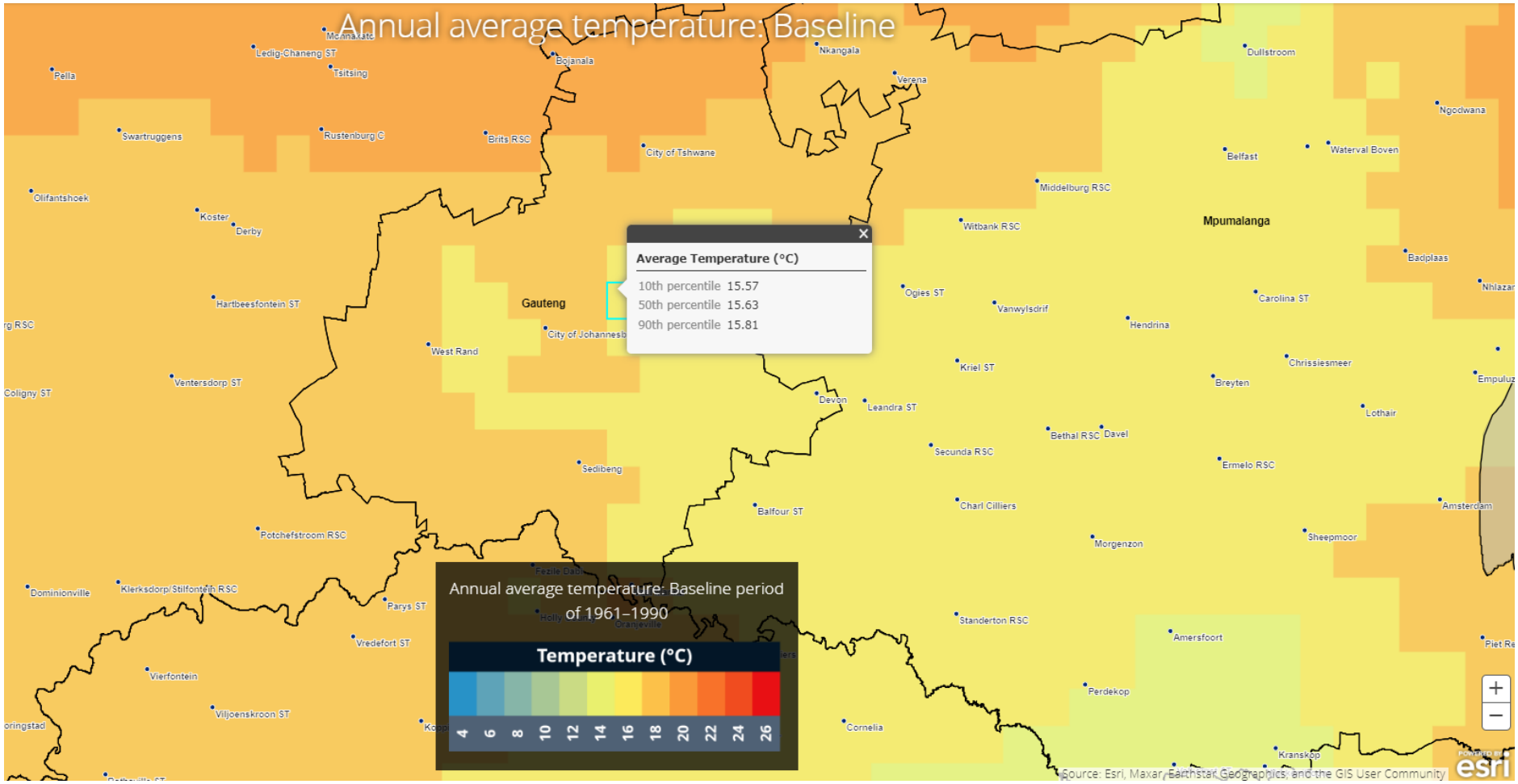

Figure 19: Baseline (1961 to 1990) annual average temperature for the project area (CSIR, 2019)

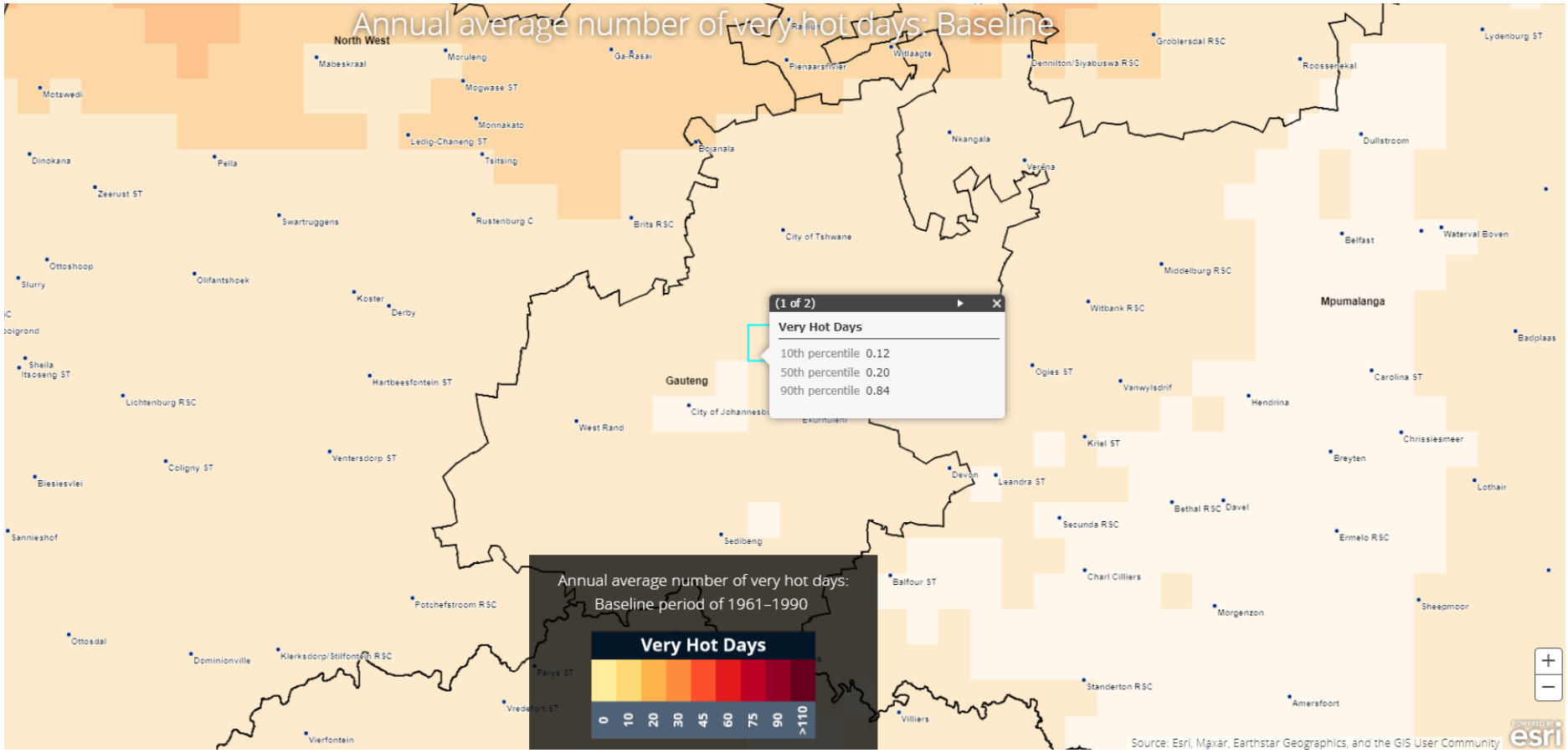

Figure 20: Baseline (1961 to 1990) number of very hot days (>35°C) annually for the project area (CSIR, 2019)

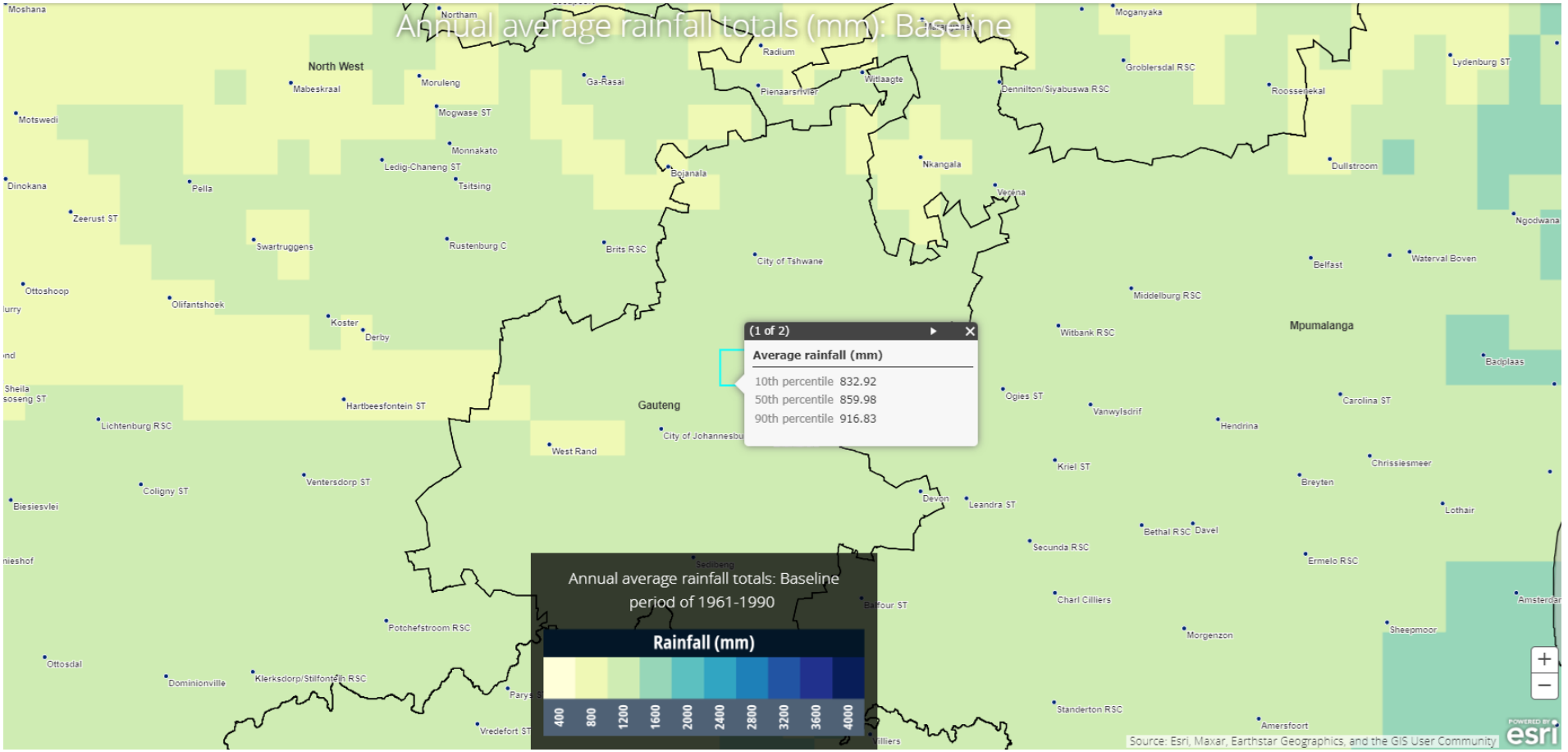

Figure 21: Baseline (1961 to 1990) annual average rainfall for the project area (CSIR, 2019)

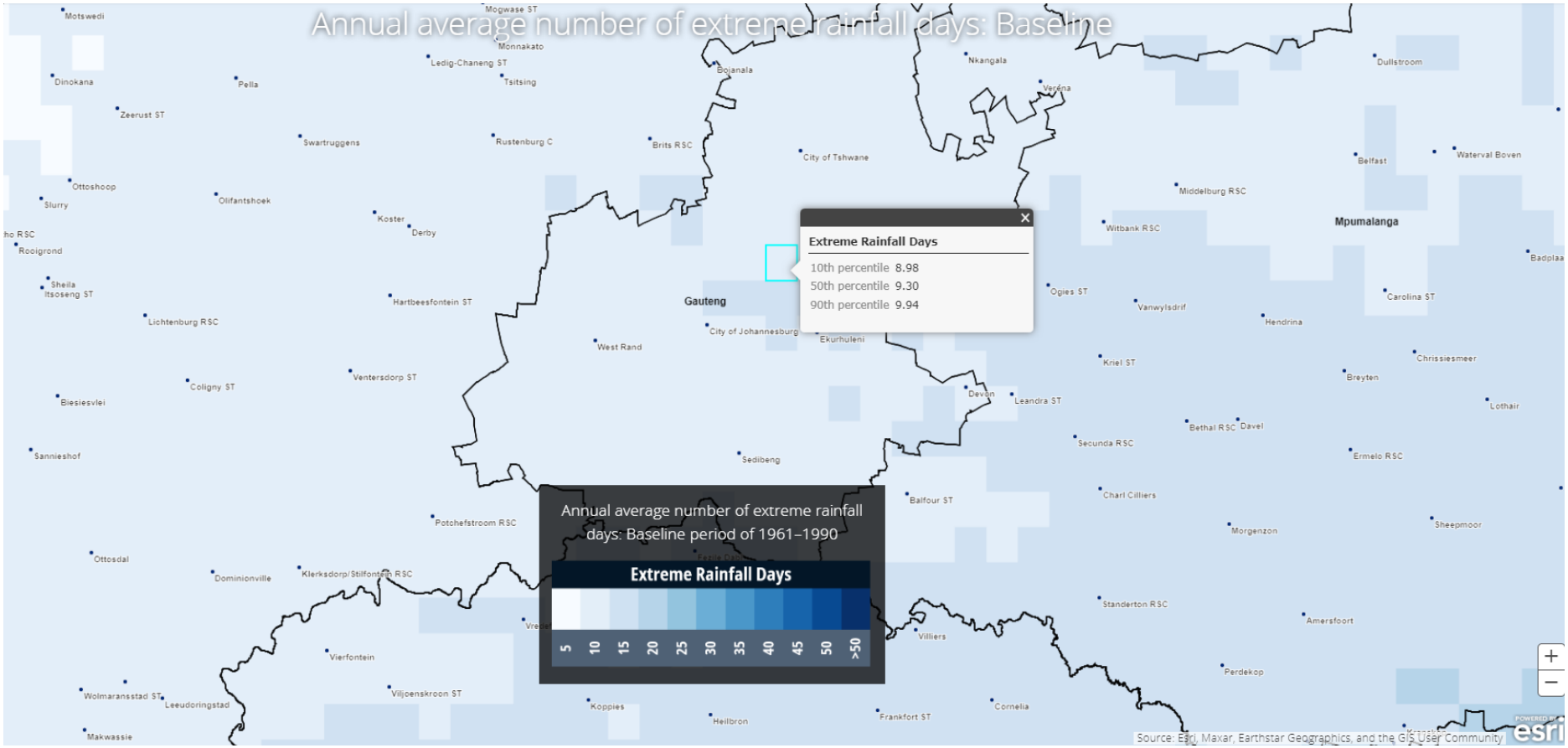

Figure 22: Baseline (1961 to 1990) annual average number of extreme rainfall days (>20 mm in <24 hours) for the project area (CSIR, 2019)

9.3 BASELINE NOISE ENVIRONMENT

Survey sites were selected after careful consideration of future activities, accessibility, potential noise sensitive receptors, and safety restrictions. A total of 5 survey sites was selected for the survey conducted in February 2024. The locations of the survey sites, with coordinates, are provided in Table 20 .

Table 20: Location of the noise survey sites.

Site	Latitude	Longitude
1	26.105364°S	28.190997°E
2	26.111805°S	28.189483°E
3	26.114337°S	28.199879°E
4	26.124442°S	28.193131°E
5	26.116567°S	28.196581°E

The first noise survey campaign was undertaken on the 5th and 6th of February 2024. The survey results are summarised in Table 21 and visually presented in Figure 23 (day-time results) and Figure 24 (night-time results).

The acoustic climate in the area is mainly influenced by birds, insects, traffic, community and industrial activity. Day-time noise survey results indicate that the acoustic climate in the study area indicate levels typical of sub-urban districts (Site 3 and Site 4), urban districts (Site 1) and urban district with business premises or main road (Site 2 and Site 5). Night-time noise survey results indicate that the acoustic climate in the study area indicate levels typical of urban district with business premises or main road (Site 1, Site 2, Site 3 and Site 4), and industrial districts (Site 5). The IFC noise guidelines for residential areas are exceeded at Site 5 for day-time and Site 1, Site 3, Site 4 and Site 5 for night-time.

The main meteorological parameters affecting the propagation of noise include wind speed, wind direction and temperature. These along with other parameters such as relative humidity, air pressure, solar radiation and cloud cover affect the stability of the atmosphere and the ability of the atmosphere to absorb sound energy.

Wind speed increases with altitude. This results in the ‘bending’ of the path of sound to ‘focus’ it on the downwind side and creating a ‘shadow’ on the upwind side of the source. Depending on the wind speed, the downwind level may increase by a few dB but the upwind level can drop by more than 20 dB (Brüel & Kjær Sound & Vibration Measurement A/S, 2000). It should be noted that at wind speeds of more than 5 m/s, ambient noise levels are mostly dominated by wind generated noise.

Meteorological data from the OR Tambo SAWS meteorological station, for the period 2020 to 2022, was used for the baseline assessment. The measured data set indicates wind flow primarily from the northwestern sector. During the day the predominant wind direction is from the west-northwest with the predominant wind direction during the night from the north. On average, noise impacts are expected to be more notable to the southeast during the day and to the south during the night. Temperature gradients in the atmosphere create effects that are uniform in all directions from a source. On a sunny day with no wind, temperature decreases with altitude and creates a ‘shadowing’ effect for sounds. On a clear night, temperatures may increase with altitude thereby ‘focusing’ sound on the ground surface. Noise impacts are therefore generally more notable during the night.

Noise reduction caused by a barrier (i.e., natural terrain, installed acoustic barrier, building) feature depends on two factors namely the path difference of a sound wave as it travels over the barrier compared with direct transmission to the receiver and the frequency content of the noise (Brüel & Kjær Sound & Vibration Measurement A/S, 2000). Sound reflected by the ground interferes with the directly propagated sound. The effect of the ground is different for acoustically hard (e.g., concrete or water), soft (e.g., grass, trees or vegetation) and mixed surfaces. Ground attenuation is often calculated in frequency bands to take into account the frequency content of the noise source and the type of ground between the source and the receiver (Brüel & Kjær Sound & Vibration Measurement A/S, 2000). Based on observations made during the visit to site, ground cover was found to be acoustically hard.

Table 21: Project baseline environmental noise survey results summary

Sampling point	Visual and acoustic observations	General weather conditions	Time of day	Start date and time	Duration	L_{AFmax} (dBA)	L_{AFmin} (dBA)	L_{Aeq} (dBA)	L_{AIeq} (dBA)	L_{A90} (dBA)	Ct	L_{Aeq} (dBA) for Comparison to IFC Noise Level Guidelines[(a)]	IFC Noise Level Guidelines (dBA)
Site 1	Survey site located at the residential area of Esther Park. Noise sources include birds, dogs, community activity and vehicles.	Winds of 4 m/s (S); 29°C; 34% humidity; 75% cloud cover	Day	2024/02/05 18:08	00:20:13	79.4	36.9	56.1	51.7	39.6	0.0	**55.3**	55
		Winds of 1 m/s (S); 25°C; 34% humidity; 10% cloud cover	Day	2024/02/06 20:22	00:20:13	75.2	41.8	54.3	51.5	49.9	0.0		
		Winds of 3 m/s (SSE); 18°C; 77% humidity; 10% cloud cover	Night	2024/02/05 23:53	00:20:04	62.5	38.2	51.4	59.0	47.7	0.0	**51.0**	45
		No wind; 23°C; 40% humidity; 0% cloud cover	Night	2024/02/06 22:03	00:20:07	69.2	34.9	50.5	51.8	38.6	0.0		
Site 2 (industrial site)	Survey site located at the Sebenza industrial area west of the Kelvin Power Station, ~6m from the Lovato Road. Noise sources include birds, insects, dogs, community activity,	Winds of 4 m/s (S); 27°C; 39% humidity; 75% cloud cover	Day	2024/02/05 18:35	00:20:10	81.9	43.6	59.7	70.3	46.8	0.0	60.6	70
		Winds of 1 m/s (W); 29°C; 28% humidity; 10% cloud cover	Day	2024/02/06 18:09	00:20:01	79.7	40.6	61.4	50.0	44.0	0.0		
		Winds of 2 m/s (S); 19°C; 65% humidity; 30% cloud cover	Night	2024/02/05 23:25	00:20:08	67.0	46.4	50.9	64.9	48.1	0.0	51.0	70
		Winds of 0.4 m/s (S); 22°C; 42% humidity; 0% cloud cover	Night	2024/02/06 22:35	00:20:02	81.8	41.1	51.0	51.5	43.0	0.0		

Sampling point	Visual and acoustic observations	General weather conditions	Time of day	Start date and time	Duration	L_{AFmax} (dBA)	L_{AFmin} (dBA)	L_{Aeq} (dBA)	L_{Aleq} (dBA)	L_{A90} (dBA)	Ct	L_{Aeq} (dBA) for Comparison to IFC Noise Level Guidelines[a]	IFC Noise Level Guidelines (dBA)
	vehicles and Gautrain.												
Site 3	Survey site located at the residential area of Cresslawn. Noise sources include insects, dogs, music, community activity, air traffic and vehicles. Vehicles from the M39 and the Kelvin Power Station were audible throughout the survey.	Winds of 4 m/s (SE); 26°C; 39% humidity; 75% cloud cover	Day	2024/02/05 19:02	00:20:04	75.4	43.4	53.6	51.4	46.0	0.0	52.4	55
		Winds of 1 m/s (S); 27°C; 31% humidity; 0% cloud cover	Day	2024/02/06 19:24	00:20:01	74.6	42.9	50.7	58.6	45.4	0.0		
		No wind; 22°C; 52% humidity; 20% cloud cover	Night	2024/02/05 22:00	00:20:03	69.9	43.2	49.7	56.7	45.1	0.0	**48.7**	45
		No wind; 22°C; 42% humidity; 0% cloud cover	Night	2024/02/06 23:03	00:20:02	57.9	41.4	47.5	50.5	43.9	0.0		
Site 4	Survey site located at the residential area of Croydon, ~2m from	Winds of 3 m/s (SE); 25°C; 44% humidity; 75% cloud cover	Day	2024/02/05 19:30	00:18:10	73.5	42.3	52.1	53.6	44.6	0.0	52.3	55
		Winds of 1 m/s (W); 28°C; 29% humidity; 0% cloud cover	Day	2024/02/06 18:56	00:20:01	73.9	38.9	52.4	51.5	41.8	0.0		

Sampling point	Visual and acoustic observations	General weather conditions	Time of day	Start date and time	Duration	L_{AFmax} (dBA)	L_{AFmin} (dBA)	L_{Aeq} (dBA)	L_{Aleq} (dBA)	L_{A90} (dBA)	Ct	L_{Aeq} (dBA) for Comparison to IFC Noise Level Guidelines[(a)]	IFC Noise Level Guidelines (dBA)
	Toermalyn Road. Noise sources include insects, dogs and vehicles.	No wind; 21°C; 60% humidity; 10% cloud cover	Night	2024/02/05 22:28	00:20:05	73.9	35.3	46.9	53.1	37.3	0.0	**48.0**	45
		No wind; 19°C; 59% humidity; 0% cloud cover	Night	2024/02/06 23:30	00:20:04	68.4	36.2	48.8	55.4	39.1	0.0		
Site 5	Survey site located to the east of the Kelvin Power Station. Noise sources include insects, Kelvin Power Station cooling towers and boiler house.	Winds of 4 m/s (N); 22°C; 50% humidity; 75% cloud cover	Day	2024/02/05 21:32	00:20:04	66.7	58.3	60.1	60.2	59.1	0.0	**60.2**	55
		Winds of 1 m/s (SW); 26°C; 33% humidity; 0% cloud cover	Day	2024/02/06 19:53	00:20:00	66.0	57.9	60.3	63.6	59.1	0.0		
		Winds of 2 m/s (S); 21°C; 56% humidity; 10% cloud cover	Night	2024/02/05 22:58	00:20:07	66.3	56.5	58.8	61.3	57.6	0.0	**59.4**	45
		Winds of 0.4 m/s (SW); 22°C; 42% humidity; 0% cloud cover	Night	2024/02/06 23:57	00:20:35	67.6	58.0	59.9	62.3	58.9	0.0		

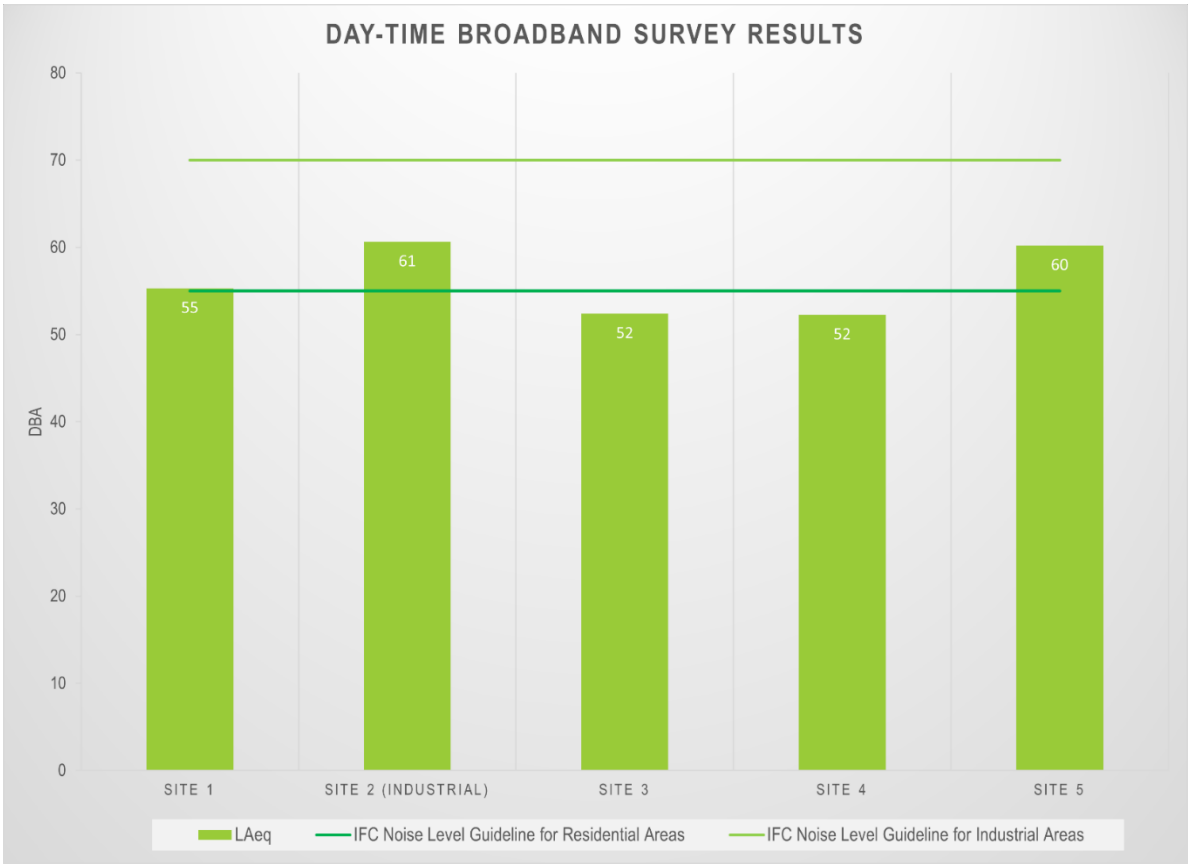

Figure 23: Day-time broadband survey results

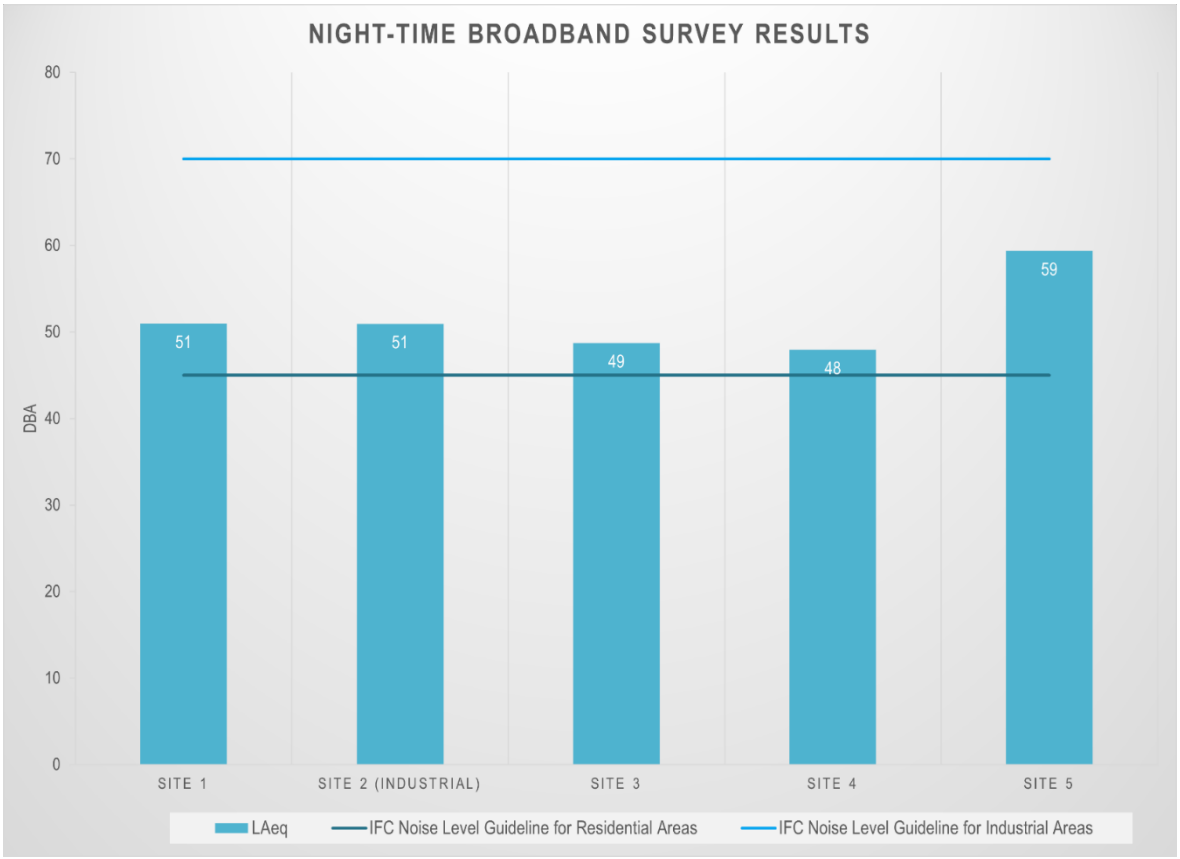

Figure 24: Night-time broadband survey results

9.4 TOPOGRAPHY AND GEOLOGY

A topography map for the study area is provided in Figure 25. The site area gently slopes from east to west with a mean altitude of approximately 1670 mamsl. In terms of geology the site is underlain mostly by granodiorite and mafic and ultramafic rocks (Figure 26).

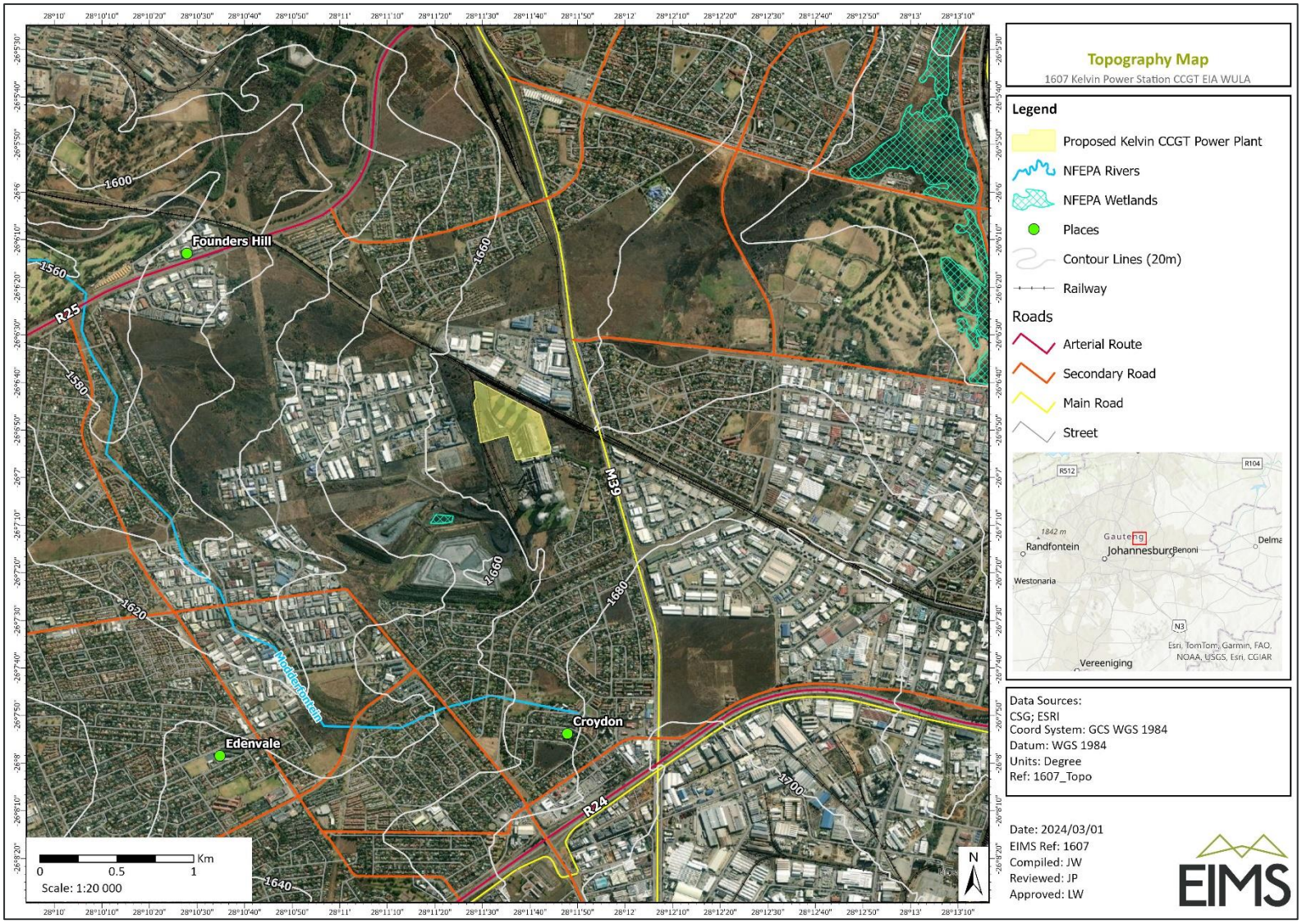

Figure 25: Topography map

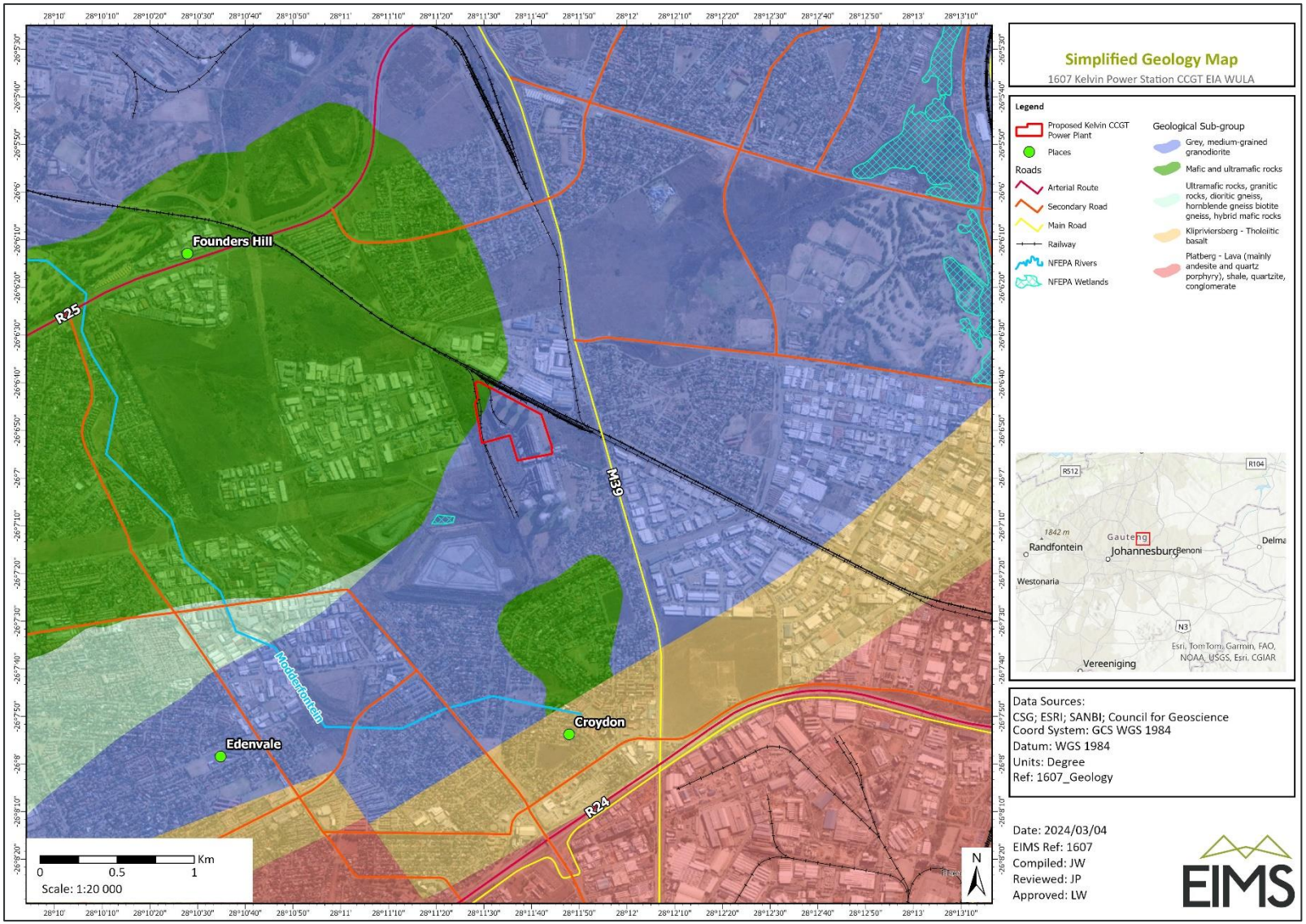

Figure 26: Geology Map

9.5 SOIL AND LAND CAPABILITY

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area falls within the Ab 11 land type (see Figure 27). The Ab 11 land type mainly consists of Hutton, Willowbrook and Rensburg soil forms according to the Soil classification working group, (1991), with the occurrence of other soils within the landscape. The Hb land type are characterised by red-yellow apedal, freely drained soils; red, dystrophic and/or mesotrophic. The land terrain units for the featured Ab 11 land type are illustrated in Figure 28 with the expected soils listed in Table 22. Refer to Figure 36 for a simplified soil map.

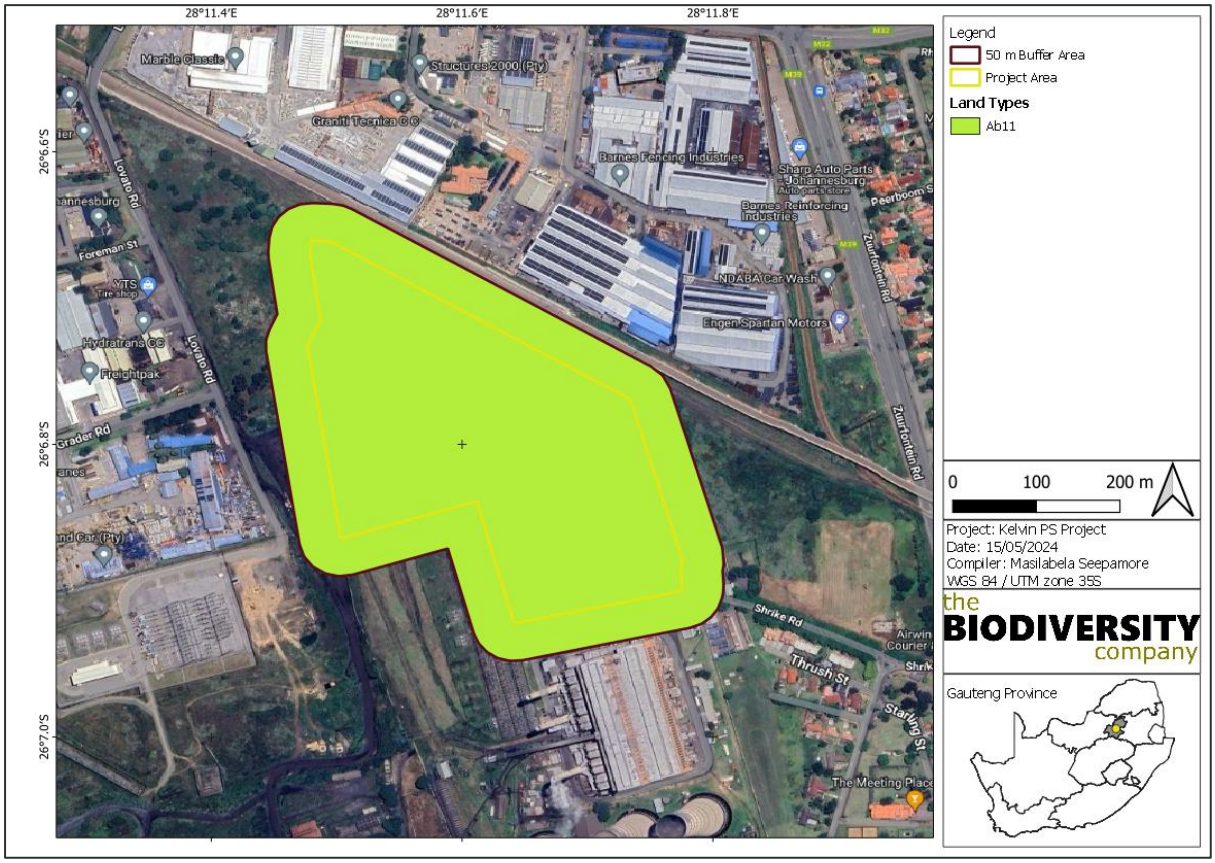

Figure 27: Map showing land types associated with the project area

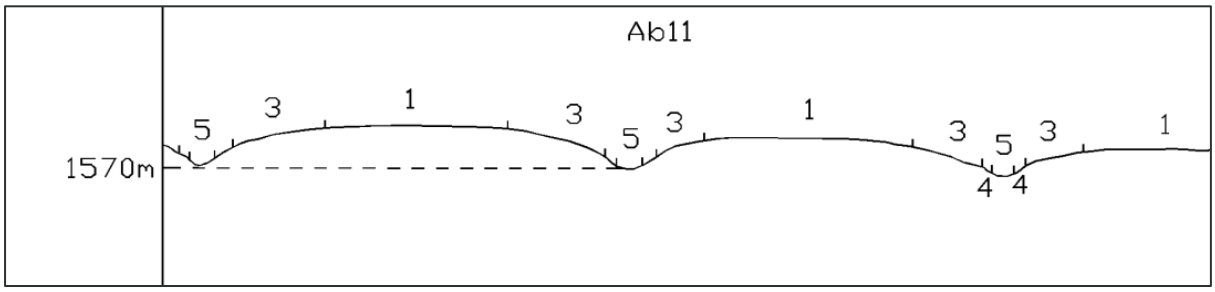

Figure 28: Illustration of land type Ab 11 terrain units (Land Type Survey Staff, 1972 - 2006)

Table 22: Soils expected at the respective terrain units within the Ab 11 land type (Land Type Survey Staff, 1972 - 2006)

Terrain units							
1 (45%)		3 (45%)		4 (5%)		5 (5%)	
Hutton	80%	Hutton	65%	Hutton	40%	Willowbrook, Rensburg	50%
Shortlands	10%	Shortlands	10%	Valsrivier	20%	Bonheim	20%

Terrain units							
1 (45%)		3 (45%)		4 (5%)		5 (5%)	
Bainsvlei	5%	Bainsvlei	10%	Bainsvlei	15%	Valsrivier	20%
Bare Rocks	5%	Bonheim	5%	Bonheim	15%	Westleigh	10%
		Westleigh	5%	Westleigh	10%		
		Bare Rocks	5%				

The slope percentage of the proposed project area has been calculated and is illustrated in Figure 29. Most of the project area is characterised by a slope percentage ranging between 0 to 10% with some irregularities in areas with slopes between 10 to 25%. This illustration indicates a mostly non-uniform topography with occurrence of some steep sloping being present.

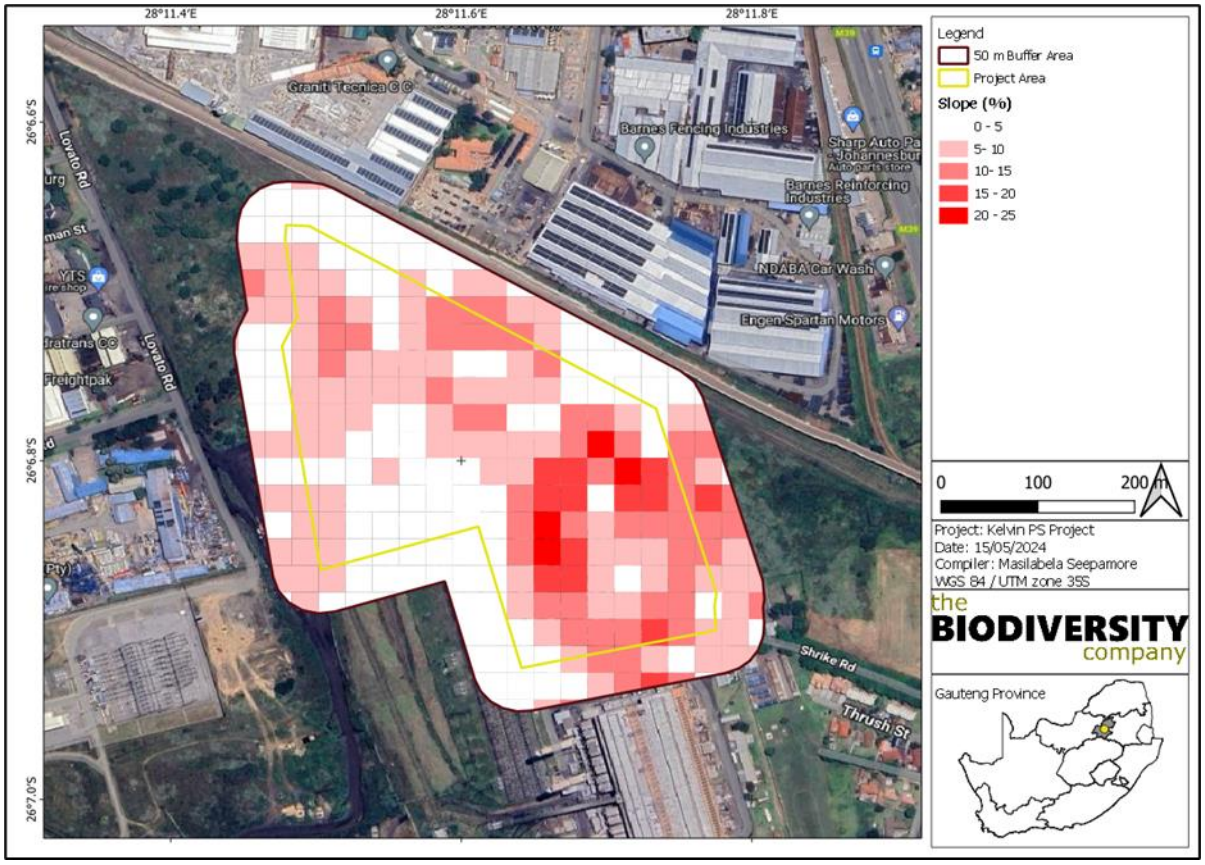

Figure 29: Slope percentage map

The three representative soil forms that were identified within the 50 m buffer area include the Nkonkoni, Glenrosa and Witbank soil forms. The proposed project area is dominated by the Witbank and Glenrosa soil forms and with Nkonkoni soil form being the least dominant soil form within the 50 m buffer area (see Figure 30). The study area falls predominately on shallow red apedal soil which are mostly covered by transported anthropogenic materials. The different soil forms identified within the proposed project area, as well as the current land uses are illustrated in Figure 31 and Figure 32, respectively.

The most sensitive soil form identified within the proposed project area, with a moderate suitability for crop production is the Nkonkoni soil form. The Nkonkoni soil form consists of an orthic topsoil horizon on top of a red apedal horizon underlain with a lithic horizon below. The soil is characterised with a moderate suitability for crop production due to its good drainage, aeration and inherent fertility. However, the presence of a shallow lithic horizon may impede root development and decrease the total soil water storage capacity which is critical for crop production under rainfed conditions.

Other less sensitive soil forms identified within the project area include Glenrosa and Witbank soil forms. The Glenrosa soil form consists with an orthic topsoil horizon on top of a lithic horizon below. The Witbank soil form consists of transported technosols mainly anthropogenic material covering natural soil. These soils are considered to have a lower suitability for crop production due to their restrictive limitations which include impermeable subsoil horizon of a fractured rock and occurrence of various elements at high concentrations that can be toxic for majority of important agronomic crops, which are found within the transported anthropogenic materials.

The most sensitive land capability of the above-mentioned soils has been determined to be class “IV”, and the other less sensitive soils were determined to be of class “VI” and “VIII.” The land capability class “IV” is characterised with severe limitations with a low arable potential and is mostly suitable for long term leys. The land capability class “VI” is characterised by limitations that preclude cultivation, and is mostly suitable for veld, pasture, and afforestation. Lastly, the land capability class “VIII” is characterised with extremely severe limitations, non-arable and is mostly suitable for wildlife. A climate capability of level 8 has been assigned to the proposed project area given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. By using the determined land capability for the most sensitive soils and the determined climate capability, a land potential of “L6” was calculated for the most sensitive land capability class. The land potential level for the less sensitive soil forms was calculated to be “L7” and “L8”. The areas associated with the “L6”, “L7” and “L8” land potential are considered to be non-arable.

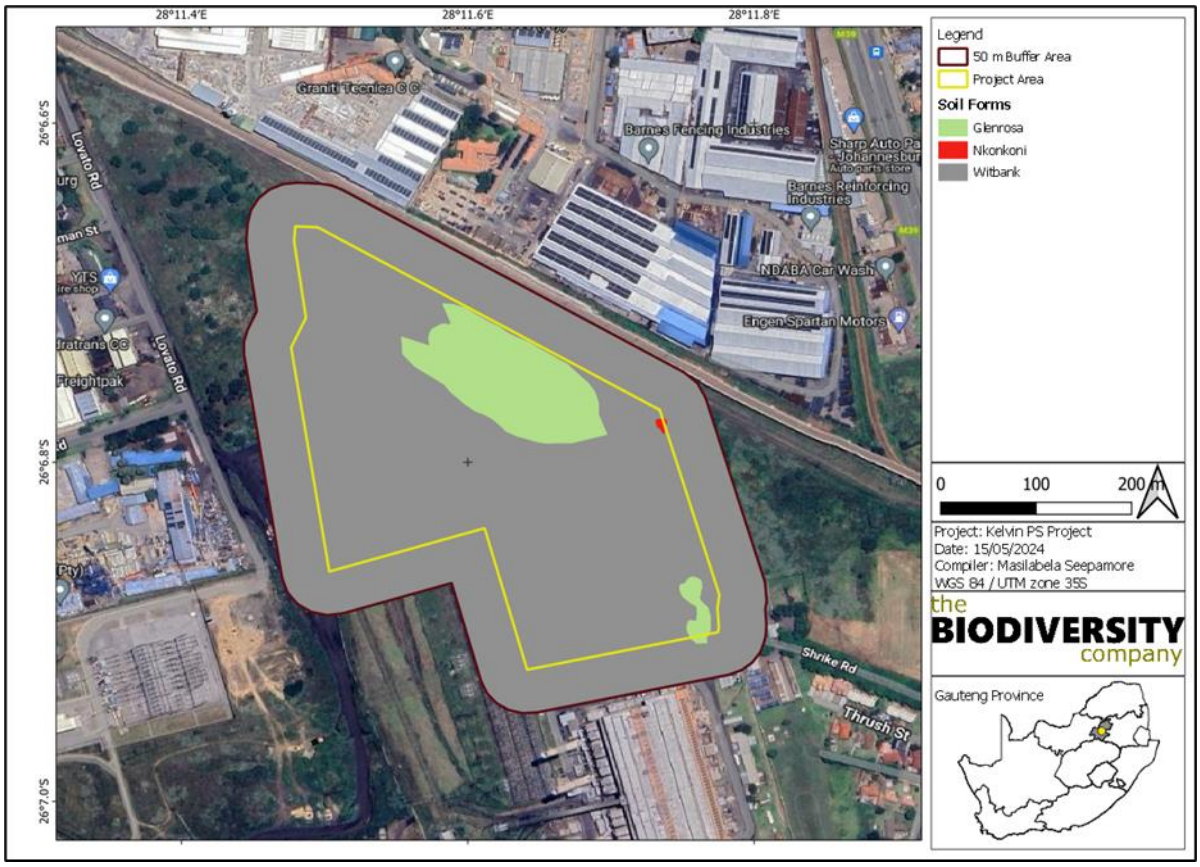

Figure 30: Soil forms found within the proposed project area

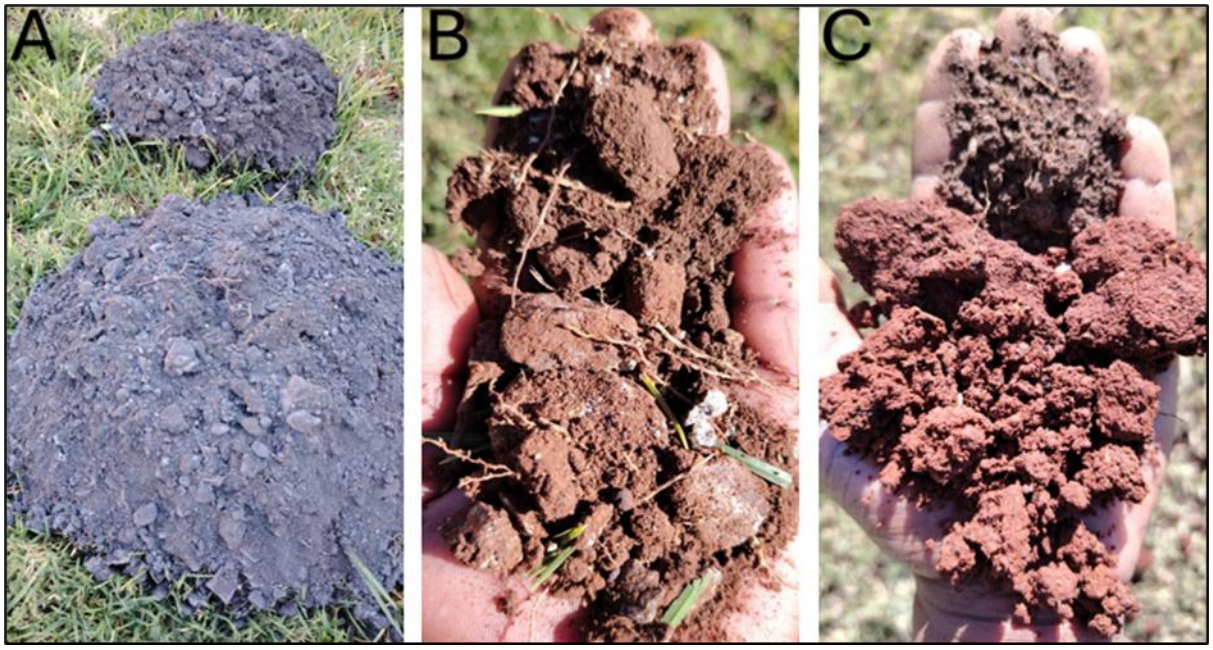

Figure 31: Diagnostic soil horizons identified on-site: A) Witbank Technosols; B) Glenrosa soil form; and C) Nkonkoni soil form.

Figure 32: Different land uses identified within the 50 m buffer area; A) & B) Kelvin PowerStation Infrastructure; and C) & D) occurrence of anthropogenic material on top and within the soil.

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which seven potential land capability classes are located within the proposed Kelvin Power's CCGT development area;

- Land Capability 9 to 10 (Moderate High Sensitivity); and
- Land Capability 11 to 15 (High to Very High Sensitivity).

The land capability dataset (DAFF, 2017) indicates a dominant land capability category expected throughout the project focus area which falls under "Moderate High" sensitivity category, with few isolated "High to Very High" category (see Figure 33).

Considering the soil properties, agricultural potential as well as the current land use of the proposed development area, the soil specialist concluded that the site has a “Low” agricultural sensitivity. Based on the confirmed sensitivities, the overall sensitivity of the proposed project area is also categorized as “Low” (refer to Figure 34 and Figure 35).

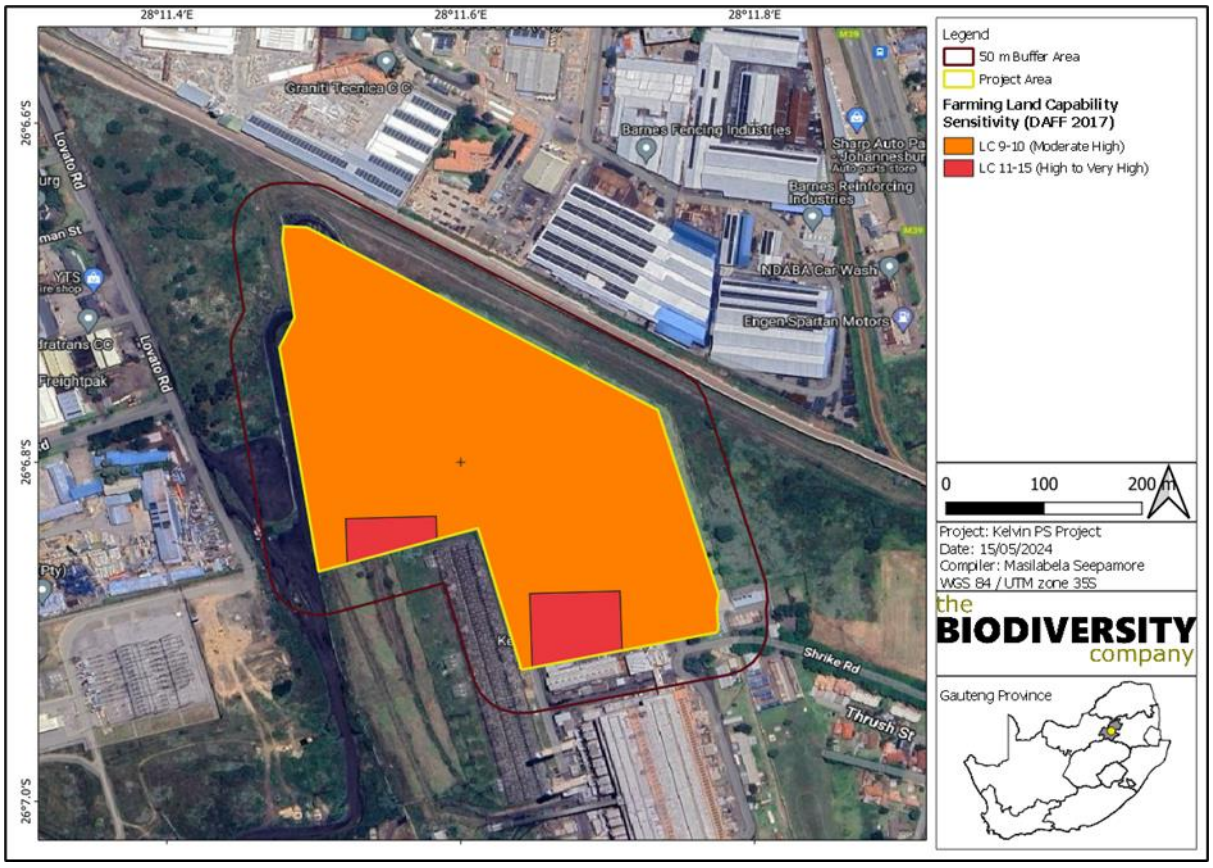

Figure 33: Land Capability Sensitivity (DAFF, 2017)

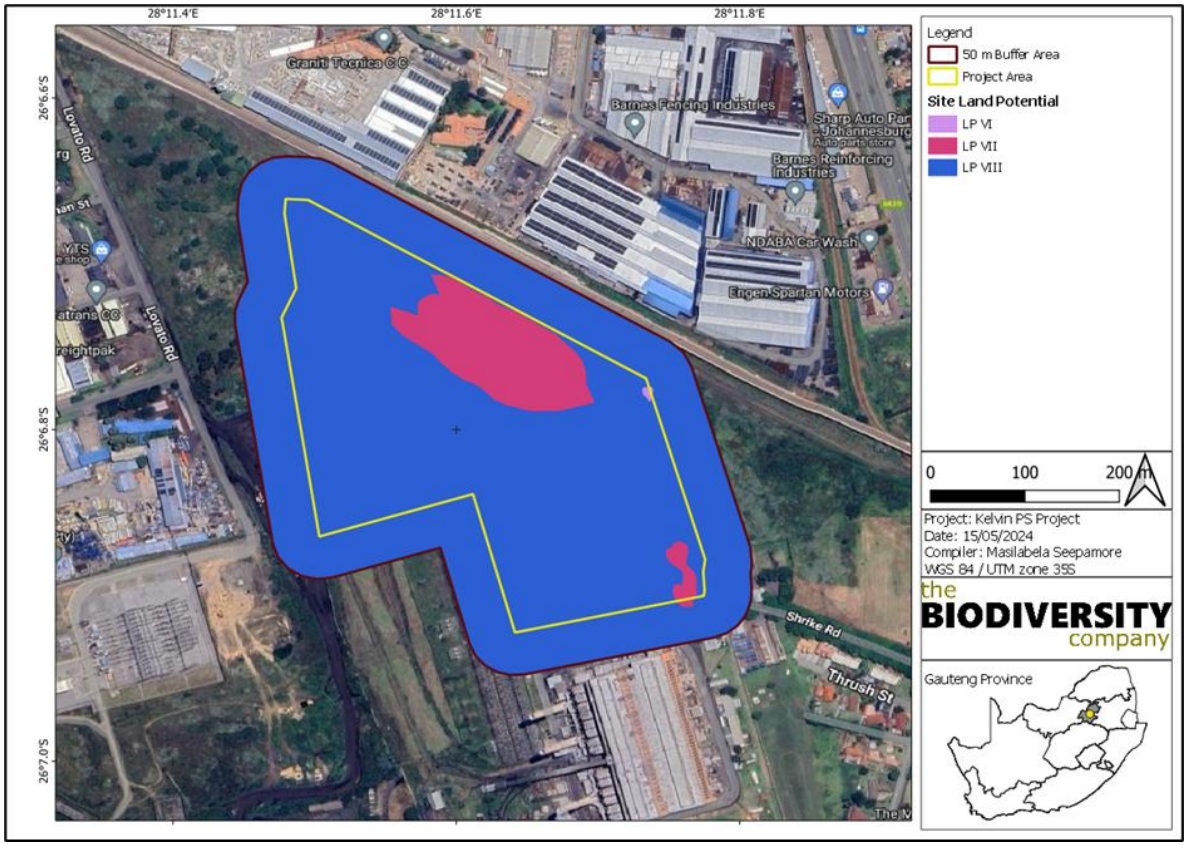

Figure 34: Specialist determined land potential.

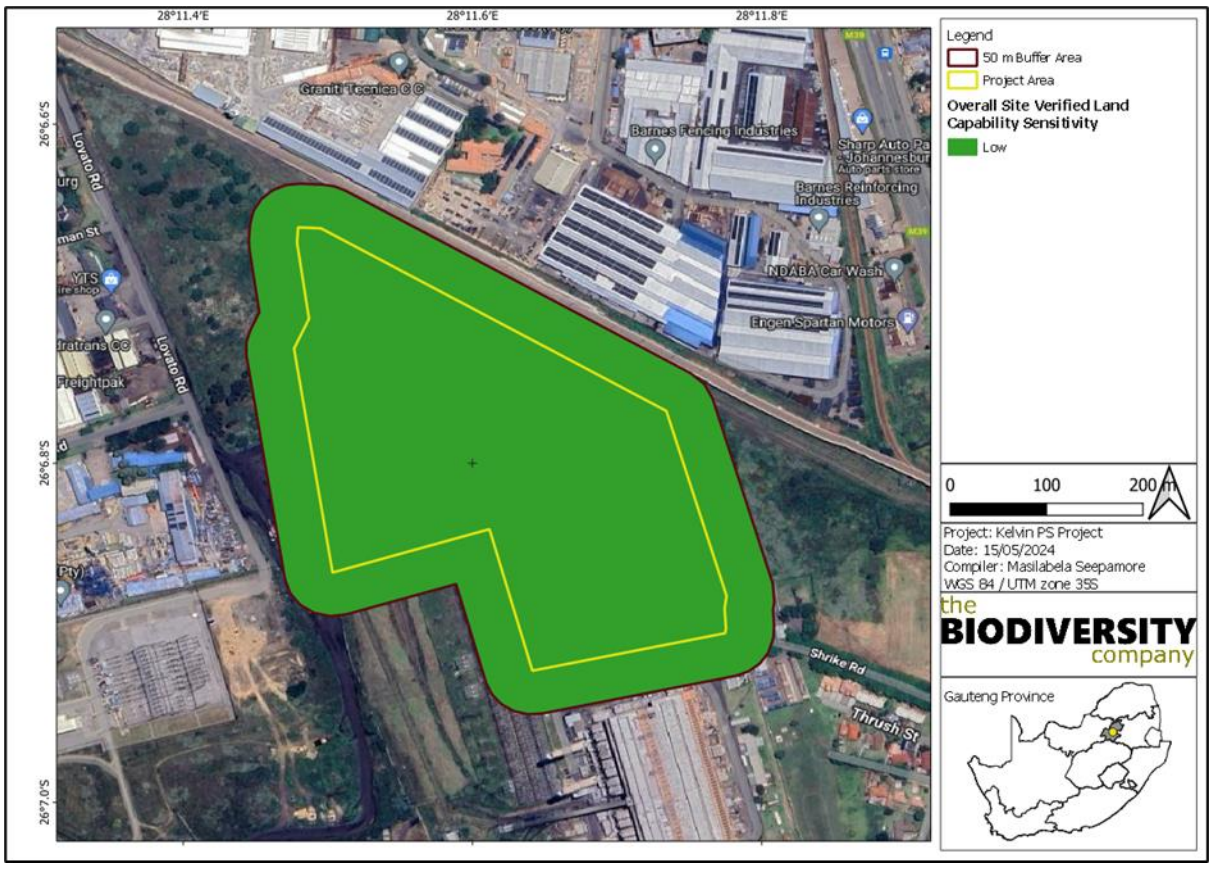

Figure 35: Overall site verified land capability sensitivity

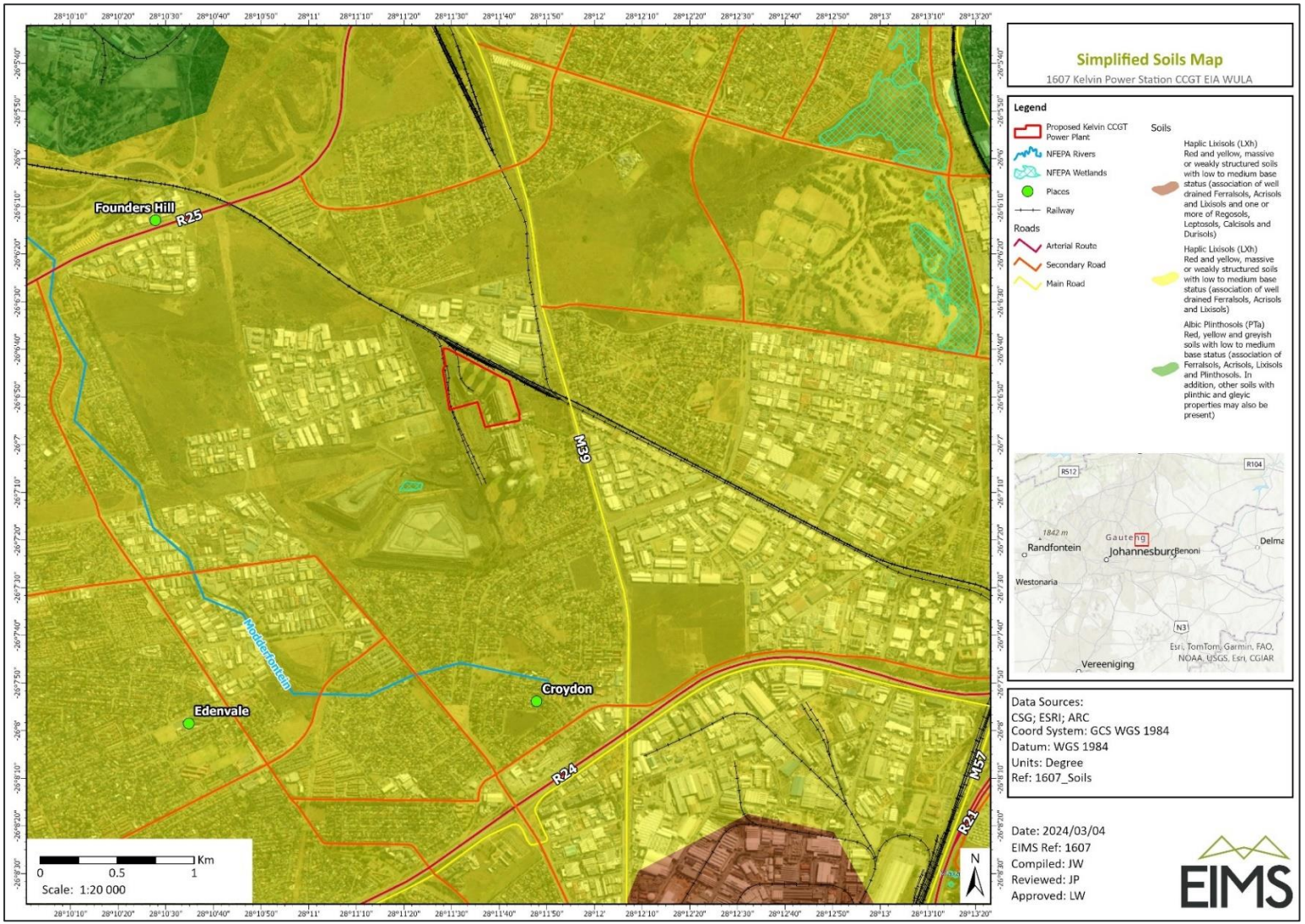

Figure 36: Soils map

9.6 CULTURAL AND HERITAGE RESOURCES

The Kelvin Power Station consists of two independent Stations, namely A-Station and B -Station, with related infrastructure. The original natural and historical landscape has been completely altered over the years since the Power Station was developed and had been in use, and as a result, if any significant cultural heritage (archaeological and/or historical) sites, features or material did exist here in the past it would have been completely destroyed or extensively disturbed as a result. Some of the structures and material related to the Power Station (and in this case A-Station) is however older than 60 years of age and has some cultural heritage (historical) significance. The site proposed for the CCGT plant is the old A-Station site for which approval for decommissioning of the stie has already been obtained, which included a heritage assessment.

Much of the machinery and technology associated with A-Station, even if out of date and obsolete, forms part of this history and the way electrical power was generated in the past. This needs to be preserved in some form after the A-Station has been finally decommissioned and demolished. It however has to be noted here that although B Station is slightly younger than A-Station, a large part of the original Kelvin Power Station will be left intact and therefore be preserved as part of the landscape.

9.7 SURFACE WATER

The Kelvin site is situated on the boundary of two quaternary catchments, A21C and A21A, with 97% of the site in quaternary catchment A21C, the Jukskei River catchment. An unnamed tributary drains north-west for approximately 1.1km to confluence with the Modderfonteinspruit from the catchment of the ash dams where effluent is discharged. The Modderfonteinspruit confluences with the Jukskei River which drains in a north westerly direction and confluences with the Crocodile River approximately 35 km downstream. The station is situated within an industrial area, however it is also close to a number of residential areas. In addition, there are large areas of Alexandra, located downstream, where it is understood that informal use of water from the Jukskei River occurs. A-station, the area now proposed for the CCGT plant, is located in an area where there are no water resources that would be directly affected by runoff. Drainage from this section is currently via stormwater drains that drain directly to Main Channel which ultimately discharges to Modderfonteinspruit. Kelvin has implemented a surface water monitoring programme that includes daily monitoring of the effluent and weekly monitoring at the effluent discharge point into the unnamed tributary as well as at points up and downstream of this in the Modderfonteinspruit.

The station is situated within an industrial area, however it is also close to a number of residential areas. In addition, there are large areas of Alexandra, located downstream, where it is understood that informal use of water from the Jukskei River occurs. Catchment A21C is 75 961 ha and the part of the Kelvin site contributing to this catchment is 154.7 ha (or 0.2%) and Catchment A21A is 48 189 ha and the portion of the Kelvin site contributing to this catchment is 5.4 ha (or 0.01%). The site is at an elevation of between 1620 and 1680 mamsl with a gentle slope of approximately 0.03 (3% or 3 meters of elevation for every 100m).

The site falls within Integrated Unit of Analysis, IUA 1: Upper Crocodile/ Hennops/ Hartbeespoort, upstream of Hartbeespoort Dam and Resource Units 1.1 (Upper Hennops and Rietvlei Rivers to inflow of Rietvlei Dam, and dolomite aquifer systems) and 1.7 (Jukskei, Klein Jukskei and Modderfonteinspruit). This IUA has been classified as a Class III river. In respect of the classification of rivers, this means that it is a river that is highly used and configuration of ecological categories of that water resource are highly altered from the predevelopment condition. Refer to Figure 37 for a surface water map of the area.

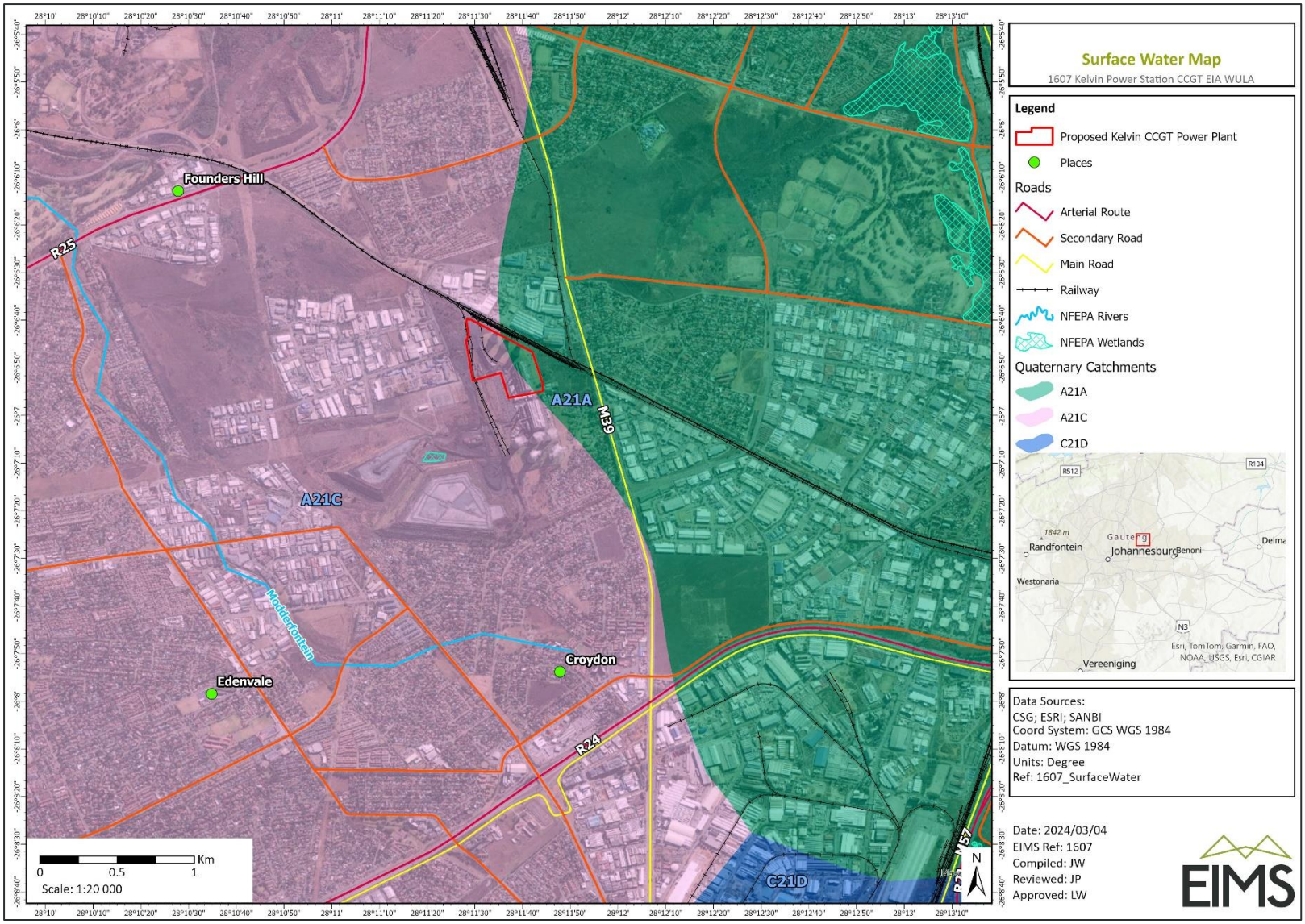

Figure 37: Surface Water features in the study area

9.8 TERRESTRIAL BIODIVERSITY AND VEGETATION

The proposed Kelvin Power Station CCGT plant is located at the existing Kelvin Power property, a brownfield site. Very little natural vegetation is present at the site. The site falls within an area of Carltonville Dolomite Grassland. The site's terrestrial biodiversity was assessed by TBC and the specialist report is included as Appendix F. The baseline terrestrial biodiversity (flora and fauna findings are presented in the subsequent subsections.

9.8.1 ECOLOGICALLY IMPORTANT LANDSCAPE FEATURES

The following features describe the general area and habitat, this assessment is based on spatial data that was available from various sources such as the provincial environmental authority and SANBI. The findings of the desktop analysis into sensitive areas and the relevance to this project are listed in

Desktop Information Considered	Relevant/Irrelevant
Ecosystem Threat Status	Relevant – Located within a 'Least Concern' Ecosystem
Ecosystem Protection Level	Relevant - located within a 'Poorly Protected' Ecosystem
Provincial Conservation Plan	Irrelevant – does not intersect with any CBAs and ESAs
SAPAD & SACAD	Irrelevant – Does not overlap any Protected Areas and Conservation Areas. The site is located approximately 30 km from the Magaliesberg Biosphere Reserve 'Transition' and 'Buffer' zones, approximately 30 km from the Blesbokspruit Ramsar Site and approximately 7 km from the Pamula Park Private Nature Reserve.
Gauteng Ridges	Irrelevant - Does not fall within range of any Gauteng Ridges.
National Protected Areas Expansion Strategy	Irrelevant - Does not overlap with Priority Focus Areas
Important Bird & Biodiversity Areas (IBA)	Relevant - Located approximately 30 km from the Magaliesberg IBA
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Irrelevant - Neither the project area nor the 500 m regulated area overlaps with any wetlands or rivers
National Freshwater Priority Area	Irrelevant - Neither the project area nor the 500 m regulated area overlap with any NFEPA wetlands or rivers

9.8.2 THE NATIONAL BIODIVERSITY ASSESSMENT

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the DEA (now the DFFE) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period. The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level which are discussed in more detail in the sub-sections below.

9.8.2.1 **ECOSYSTEMS THREAT STATUS**

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological

condition. The application area was superimposed on the terrestrial ecosystem threat status (Figure 38). According to the spatial dataset the proposed development overlaps with a LC ecosystem.

9.8.2.2 ECOSYSTEM PROTECTION LEVEL

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act. The application area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 38). The application area overlaps with a “Poorly Protected” Ecosystem.

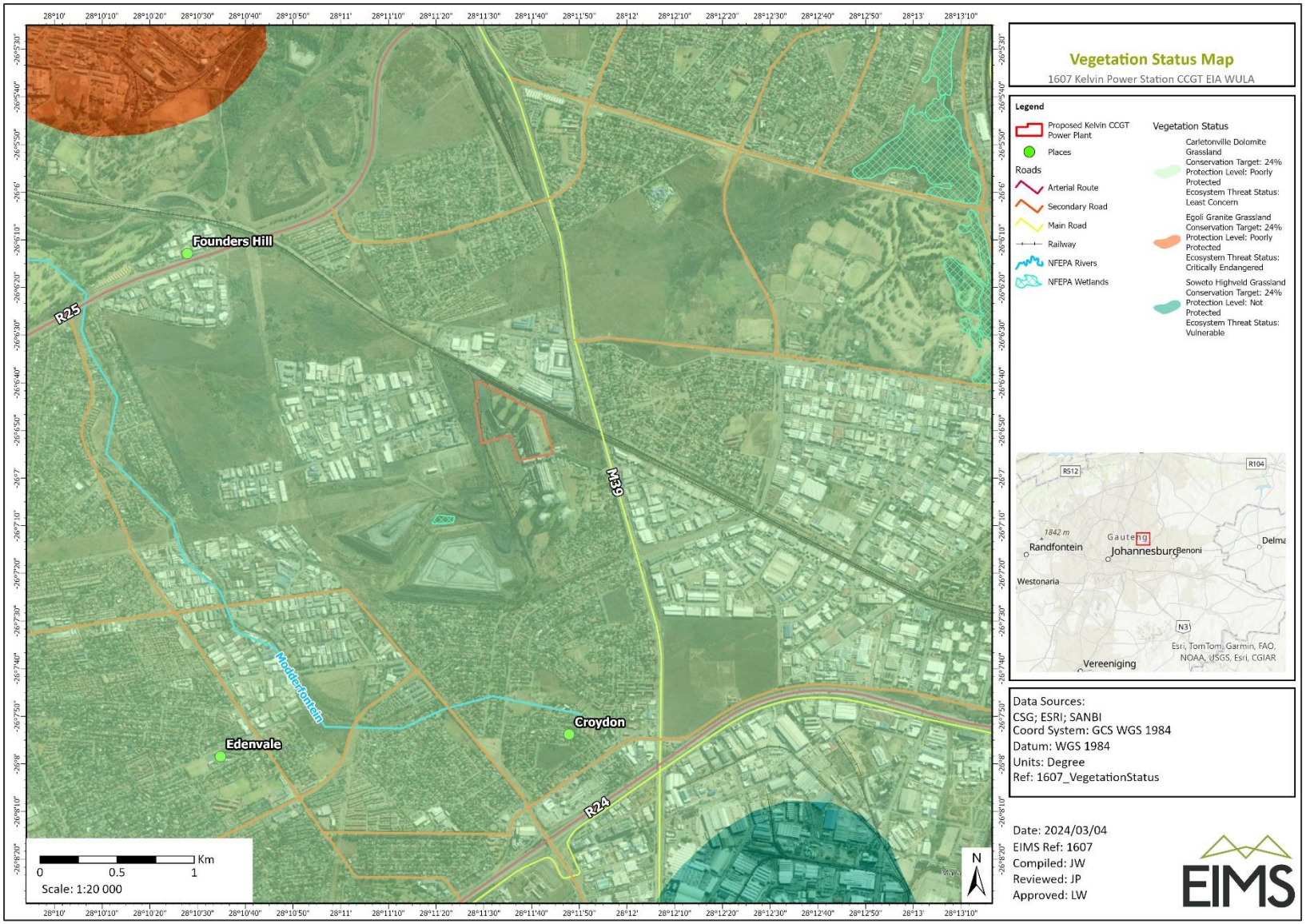

Figure 38: Vegetation map of the study area

9.8.3 HABITAT ASSESSMENT AND SITE ECOLOGICAL IMPORTANCE

A field survey was conducted by the terrestrial ecologist to assess the site's biodiversity compositions and its ecological importance. The findings of the field survey are presented below.

9.8.3.1 **HABITAT ASSESSMENT**

One (1) habitat type was identified on site, namely Modified habitat type. Refer to Figure 39 for a map showing the delineated habitat. This habitat unit includes all areas that maintain little to no native vegetation and/or where anthropogenic activity has substantially modified an area's primary ecological functions and species composition. Within the project area, these areas are comprised of the entrance area consisting of a gate and guard house, roads, parking lots – together with retired coal power station infrastructure such as cooling towers and various non-operational buildings. These areas include very few, if any, indigenous species and are associated with alien and invasive plant species. The terrestrial ecologist concluded that no fauna or flora Species of Conservation Concern (SCC) were observed nor expected during the field survey.

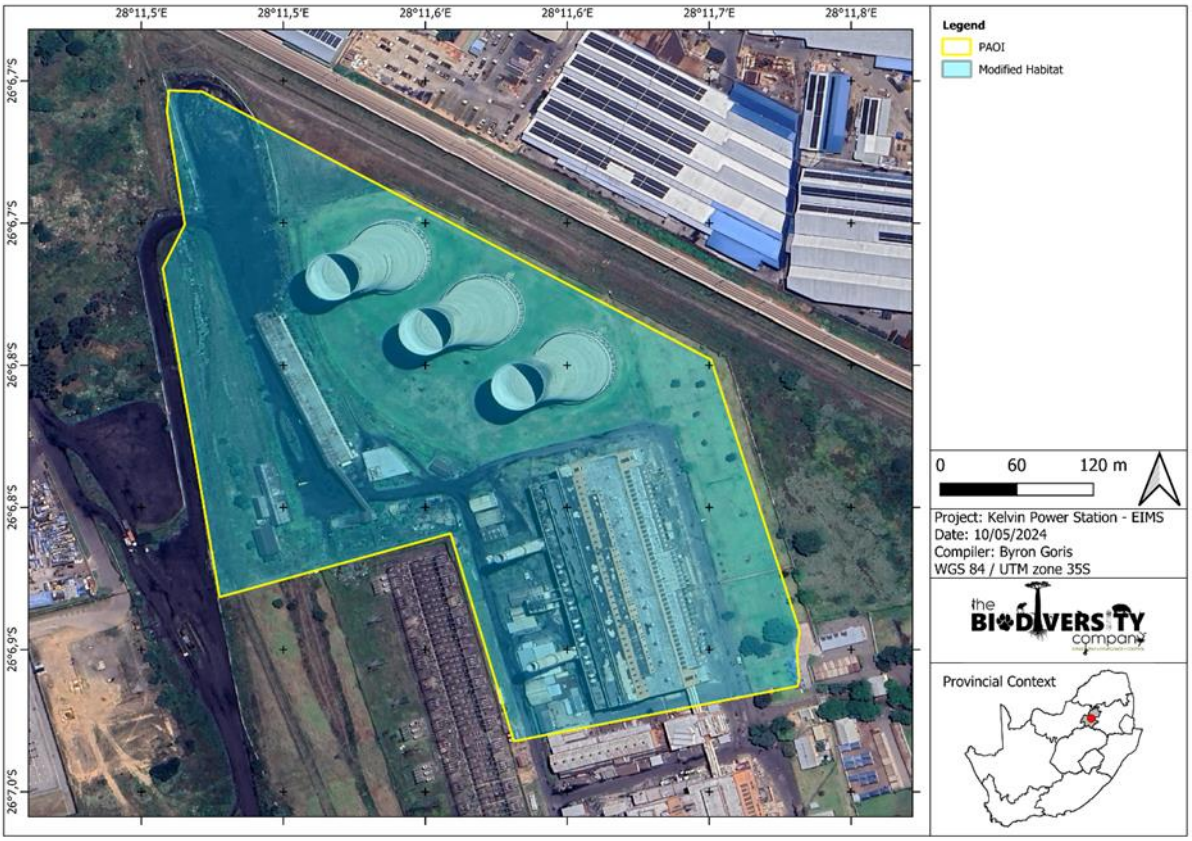

Figure 39: Habitat identified within the proposed project area

9.8.3.2 **SITE ECOLOGICAL IMPORTANCE**

The completion of a Terrestrial Ecology Assessment/compliance statement has led to the disputing of the "Very High" Terrestrial biodiversity theme, "Medium" plant species theme, and "High" animal species theme identified / allocated by the National Environmental Screening Tool.

The Terrestrial Ecologist has concluded following a field survey that the proposed site area exists in a heavily transformed and polluted state with high levels of anthropogenic disturbance and has therefore lost substantial ecosystem functionality but can be considered to exist as part of an urban ecosystem. The vegetation was also noted to be heavily transformed with high numbers of alien and invasive plants. Nearby vegetated areas have also had historic transformation and ongoing disturbance, unlikely to serve as suitable habitats for indigenous fauna. The Terrestrial Ecologist has thus assigned a "Low" Animal Theme sensitivity and "Very Low "sensitivities for the Plant Theme and Terrestrial Theme. The project area has been assigned an overall Site Ecological importance of "Very Low". Refer to Figure 40 for the projects' Site Ecological Importance/sensitivity. Refer to

Table 23 for the Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities.

Table 23: Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities.

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

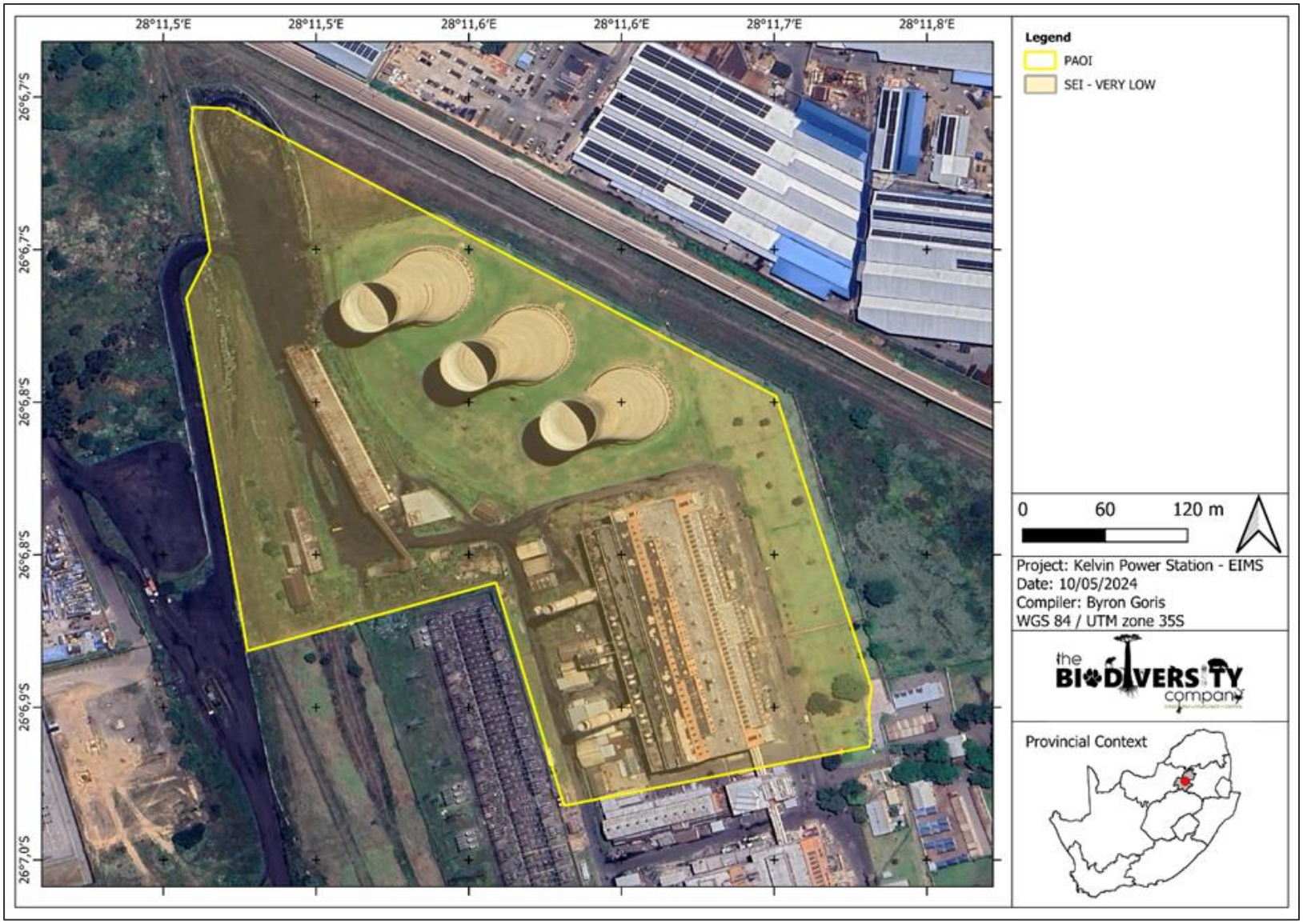

Figure 40: Overall Site Terrestrial Biodiversity Sensitivity (TBC, 2024)

9.9 CIVIL AVIATION

The proposed Kelvin Gas to Power project is in close proximity to OR Tambo International Airport (5km east of project site), Rand Airport (15km southwest of project site), and Grand Central airport (15km north of project site).

As agreed at the meeting with ATNS on 24 June 2024, an obstacle assessment would need to be completed **prior to construction** commencing, once all detailed designs are completed and once it is clear exactly where the infrastructure will be located. It is not possible to commence with the obstacle evaluation assessment until final exact stack positions are known. Mitigation measures are incorporated in the project EMPr in this regard to ensure Kelvin Power complete the relevant obstacle assessment for the CCGT project prior to construction commencing. Refer to Appendix F for the Civil Aviation compliance statement including comments received from SACAA and ATNS.

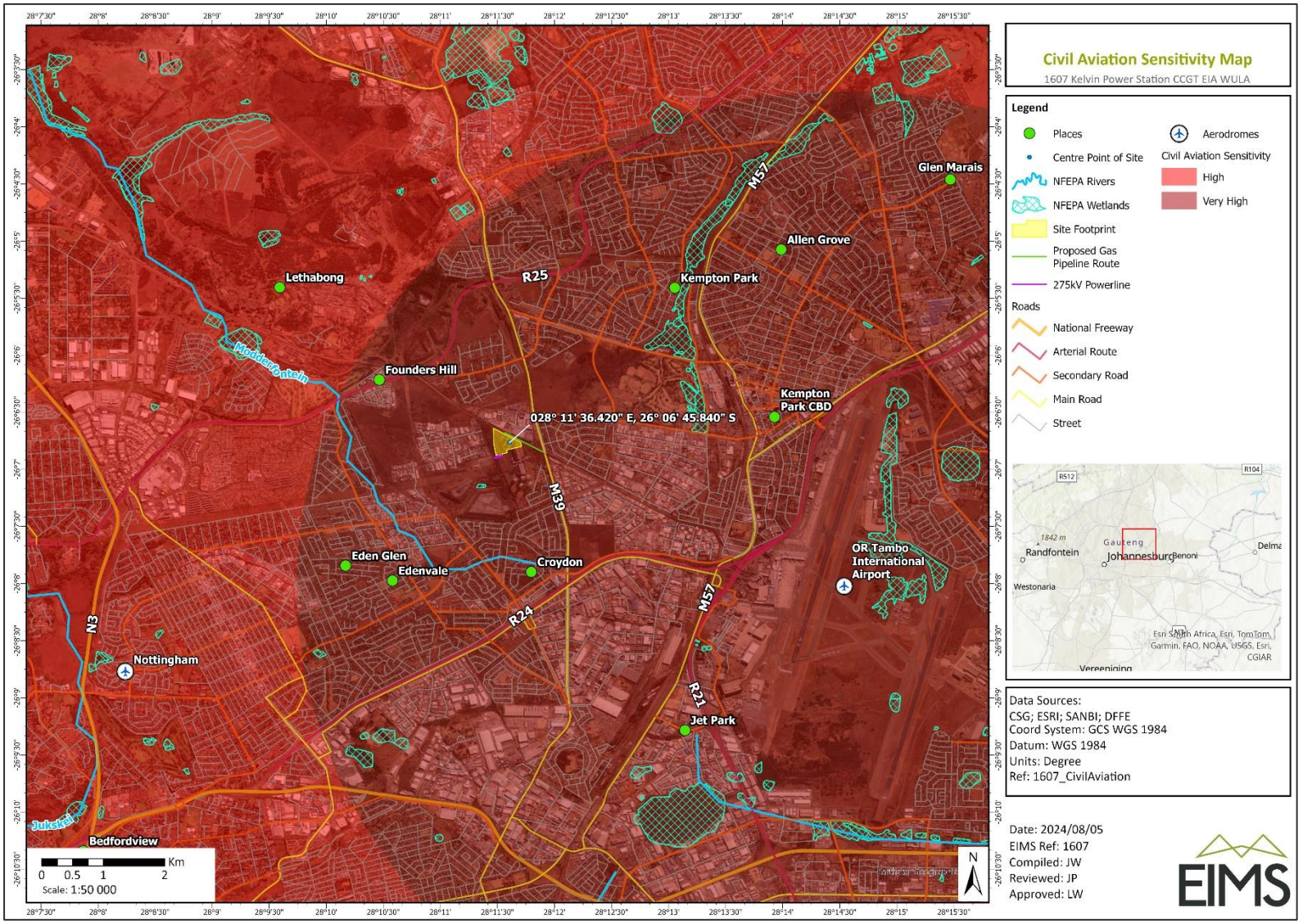

Figure 41: Map showing the proposed development footprint overlaid on the civil aviation sensitivity map generated by the screening tool

9.10 SOCIAL AND DEMOGRAPHICS

The proposed site for the project is located in Ward 17 of the City of Ekurhuleni Metropolitan Municipality that is located in the Gauteng Province. Wards 18 and 104 of the City of Ekurhuleni Metropolitan Municipality and Ward 32 of the City of Johannesburg are in close proximity of the site.

The City of Ekurhuleni Metropolitan Municipality is located in the Gauteng Province and covers an extensive area from Germiston in the west and Nigel and Springs in the east. It is one of the most densely populated areas on both the province and the country (www.municipalities.co.za). The area accounts for nearly a quarter of Gauteng's economy. The municipal area consists of 112 wards. Cities and towns in the municipal area includes Alberton, Bedfordview, Benoni, Birchleigh, Boksburg, Brakpan, Clayville, Daveyton, Dunnottar, Edenvale, Geduld, Germiston, Kathlehong, Kempton Park, Kwa-Thema, Machenzieville, Nigel, Olifantsfontein, Springs, Tembisa, Tokoza, Vosloorus and Vorsterkroon. The municipality covers an area of 1 975km2 and the main economic sectors are Manufacturing, Finance and Business services, Community services, Trade, Transport, Construction, Electricity, and Mining.

CoE is home to the largest airport in South Africa. Ekurhuleni is Gauteng's first aerotropolis. This is a metropolis with an airport at its centre. O.R. Tambo International Airport has two terminals handling domestic and international flights. Terminal A handles international traffic and Terminal B domestic flights. The airport services airlines from all five continents and plays a vital role in serving the local, regional, intra-, and inter-continental air transport needs of South Africa and sub-Saharan Africa. It is the biggest and busiest airport in Africa.

According to the Census 2022, the population of South Africa is approximately 62 million and has shown an increase of about 19.8% since 2011. The household density for the country is estimated on approximately 3.48 people per household, indicating an average household size of 3-4 people for most households, which is down from the 2011 average household size of 3.58 people per household. Smaller household sizes are in general associated with higher levels of urbanisation.

The greatest increase in population since 2011 has been in the Ekurhuleni MM (Table 24). The increase in population on provincial, regional, and local level was higher than on national level, except in the City of Johannesburg MM. Population density refers to the number of people per square kilometre and the population density on a national level has increased from 42.45 people per km2 in 2011 to 50.81 people per km2 in 2022. In the study area the population density has increased since 2011 with the highest density in the City of Johannesburg MM.

Table 24: Population density and growth estimates (sources: Census 2011, Census 2022)

Area	Size in km^2	Population 2011	Population 2022	Population density 2011	Population density 2022	Growth in population (%)
Gauteng Province	18,178	12,272 263	15,099,422	675.12	830.64	23.04
Ekurhuleni MM	1,976	3,178 470	4,066,691	1,608.54	2,058.04	27.94
City of Johannesburg MM	1,643	4,434,631	4,803.262	2,699.11	2,923.47	8.31

The number of households in the study area has increased on all levels (Table 25). The proportionate increase in households were greater than the increase in population on all levels and exceeded the growth in households of 12.3% on a national level. The average household size has shown a decrease on all levels, which means there are more households, but with less members.

Table 25: Household sizes and growth estimates (sources: Census 2011, Census 2022)

Area	Households 2011	Households 2022	Average household size 2011	Average household size 2022	Growth in households (%)
Gauteng Province	3,908,826	5,318,665	3.14	2.84	36.07
Ekurhuleni MM	1,015,398	1,421,003	3.13	2.86	39.95

Area	Households 2011	Households 2022	Average household size 2011	Average household size 2022	Growth in households (%)
City of Johannesburg	1,434,715	1,841,917	3.09	2.61	28.38

The total dependency ratio is used to measure the pressure on the productive population and refer to the proportion of dependents per 100 working-age population. As the ratio increases, there may be an increased burden on the productive part of the population to maintain the upbringing and pensions of the economically dependent. A high dependency ratio can cause serious problems for a country as the largest proportion of a government's expenditure is on health, social grants and education that are most used by the old and young population.

Census 2022 shows that since 2011 the dependency ratios have decreased on all levels, with the highest total dependency ratio in the Ekurhuleni MM (Table 26). The decrease is most likely due to an increase in people of working age and a decrease in Youth. The same trend applies to the youth and employment dependency ratios. Employed dependency ratio refers to the proportion of people dependent on the people who are employed, and not only those of working age. The aged dependency ratio showed an increase in all areas since 2011. Census 2022 has not yet released employment data to enable calculation of the employment dependency ratios for comparative purposes.

Table 26: Dependency ratios (source: Census 2011, Census 2022).

Area	Total dependency	Youth dependency	Aged dependency	Employed dependency*
Gauteng	**38,97**	**32,94**	**6,03**	**63,60**
Gauteng '22	**38,86**	**31,30**	**7,55**	
Ekurhuleni MM	***39,44***	***33,89***	***5,55***	***64,55***
Ekurhuleni MM '22	***37,31***	***30,38***	***6,93***	
Ward 17	33,18	26,27	6,91	48,15
Ward 18	38,61	25,81	12,80	45,55
Ward 104	38,56	30,26	8,31	48,11
City of Johannesburg MM	***37,62***	***31,92***	***5,69***	***61,75***
City of Johannesburg MM '22	***36,82***	***30,01***	***6,82***	
Ward 32	38,24	33,32	4,92	47,74

* Employment data for Census 2022 not yet released

Poverty is a complex issue that manifests itself in economic, social, and political ways and to define poverty by a unidimensional measure such as income or expenditure would be an oversimplification of the matter. Poor people themselves describe their experience of poverty as multidimensional. The South African Multidimensional Poverty Index (SAMPI) (Statistics South Africa, 2014) assess poverty on the dimensions of health, education, standard of living and economic activity using the indicators child mortality, years of schooling, school attendance, fuel for heating, lighting, and cooking, water access, sanitation, dwelling type, asset ownership and unemployment.

The poverty headcount refers to the proportion of households that can be defined as multi-dimensionally poor by using the SAMPI's poverty cut-offs (Statistics South Africa, 2014). The poverty headcount has increased in the Ekurhuleni MM between 2011 and 2016 (Table 27), indicating an increase in the number of multi-dimensionally poor households in the Ekurhuleni MM. Census 2022 has not yet released data on poverty.

The intensity of poverty experienced refers to the average proportion of indicators in which poor households are deprived (Statistics South Africa, 2014). The intensity of poverty has increased on all levels. The intensity of poverty and the poverty headcount is used to calculate the SAMPI score. A higher score indicates a very poor community that is deprived on many indicators. The SAMPI score on a local level has increased significantly between 2011 and 2016. It is anticipated that the scores would have increased even more since 2016 due to the aftermath of the Covid-19 pandemic.

Table 27: Poverty and SAMPI scores (sources: Census 2011 and Community Survey 2016).

Area	Poverty headcount 2011 (%)	Poverty intensity 2011 (%)	SAMPI 2011	Poverty headcount 2016 (%)	Poverty intensity 2016 (%)	SAMPI 2016
Gauteng Province	4,8	43,8	0,021	4,6	44,1	0,020
Ekurhuleni MM	6,4	44,5	0,028	6,6	44,7	0,030
City of Johannesburg MM	3,7	43,3	0,016	3,5	44,1	0,015

9.10.1 POPULATION COMPOSITION, AGE, GENDER AND HOME LANGUAGE

On provincial and municipal level, the majority of the population belong to the Black population group (Figure 42), but on a ward level the profile is heterogeneous. In Ward 18 of the Ekurhuleni MM the majority of the people belonged to the White population group in 2011.

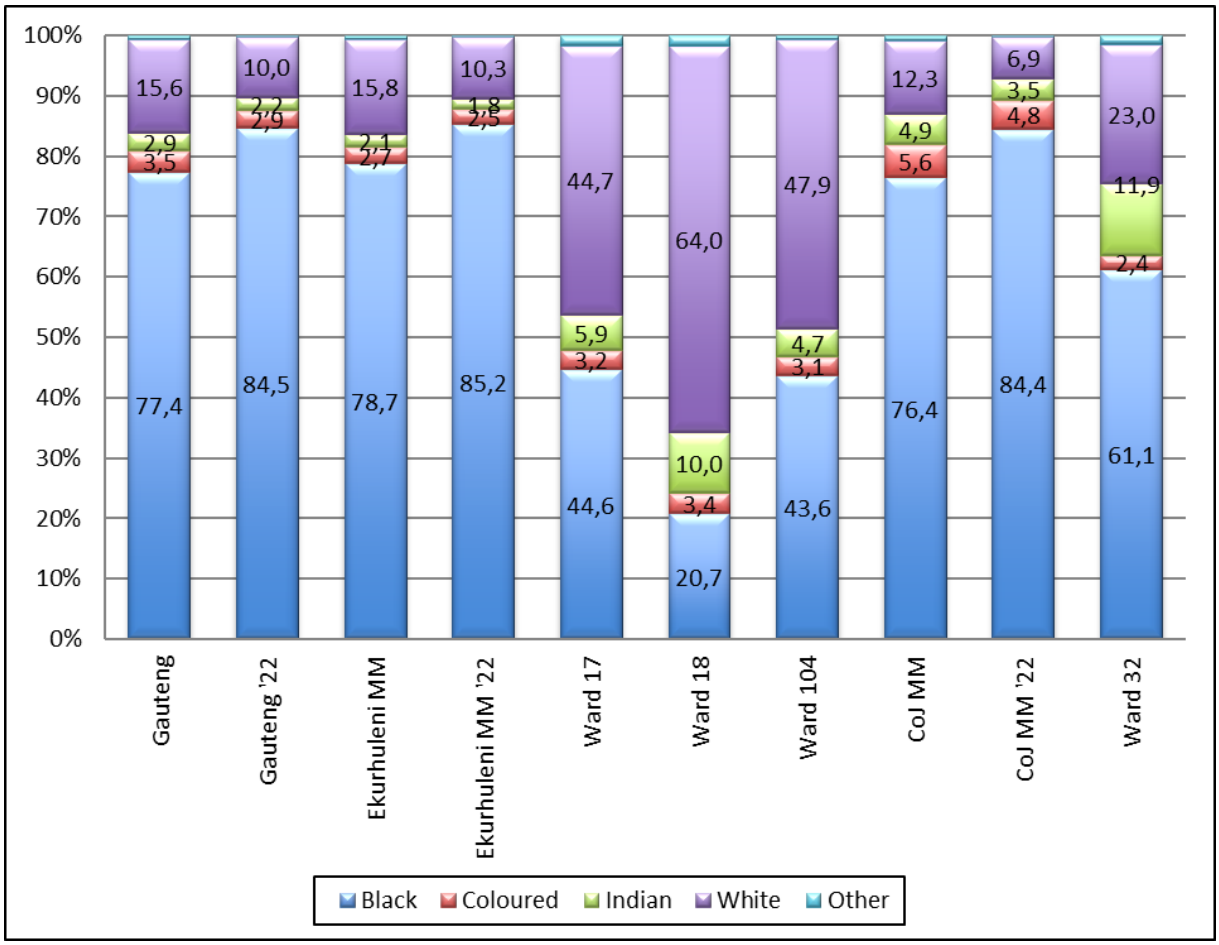

Figure 42: Population distribution (shown in percentage, source: Census 2011, Census 2022)

The average age is very similar on municipal and provincial level (Table 28), with a slightly lower average age in the Ekurhuleni MM. Ward 18 of the Ekurhuleni MM had the highest average age in 2011. Census 2022 shows that the average age has increased slightly on all levels, indicating less Youth and more people of working age.

Table 28: Average age (source: Census 2011, Census 2022).

Area	Average Age (in years) - 2011	Average Age (in years) - 2022
Gauteng	29,31	30,97
Ekurhuleni MM	28,97	30,88
Ward 17	31,25	
Ward 18	35,03	

Area	Average Age (in years) - 2011	Average Age (in years) - 2022
Ward 104	31,76	
City of Johannesburg MM	29,20	30,79
Ward 32	28,49	

The age distribution of the areas under investigation shows an increase on all levels in the population aged 35 - 64 years (Figure 43).

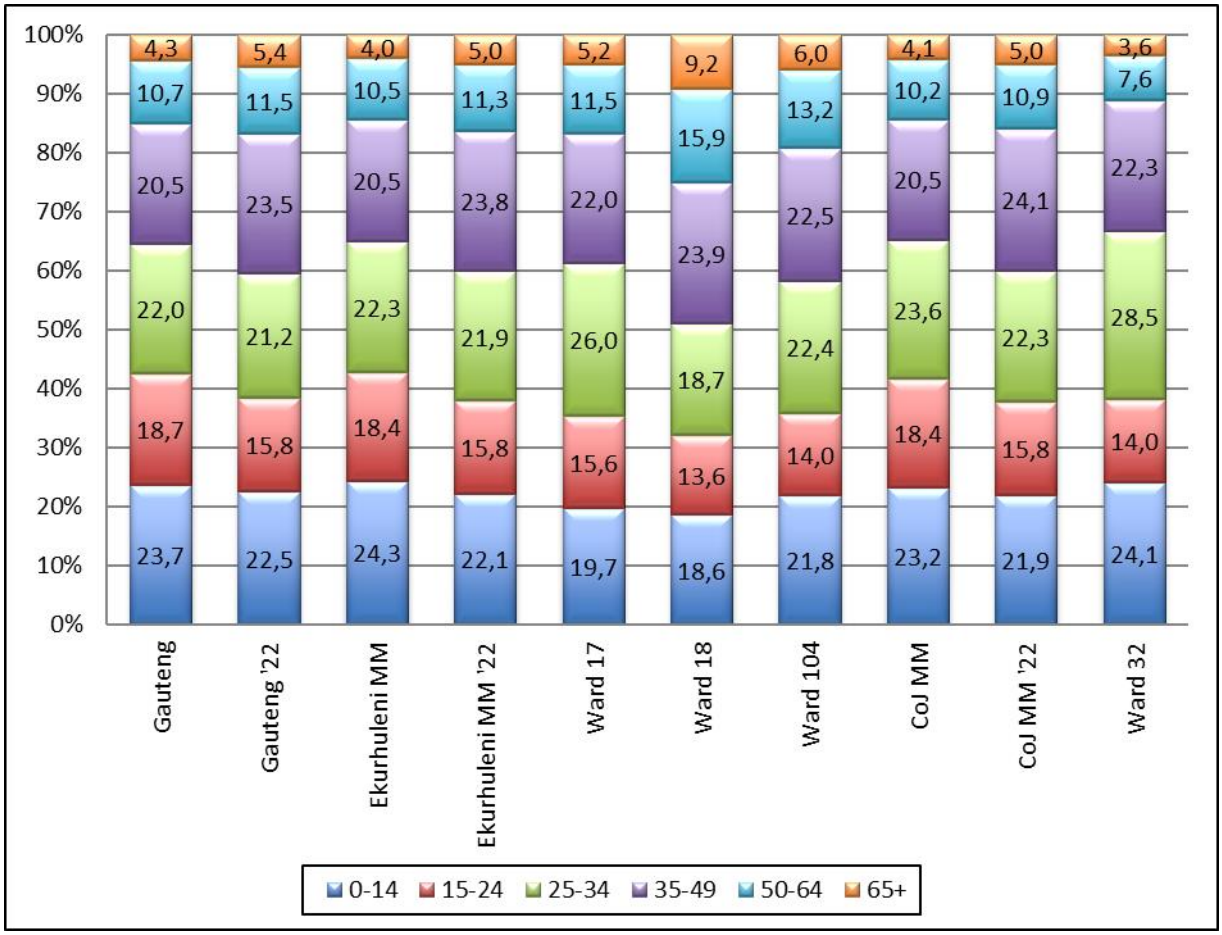

Figure 43: Age distribution (shown in percentage, source: Census 2011, Census 2022)

9.10.2 GENDER DISTRIBUTION

The gender distribution on provincial and municipal level is more or less equal (Figure 44), but in Wards 17 and 18 of the Ekurhuleni MM there is a slight bias towards females.

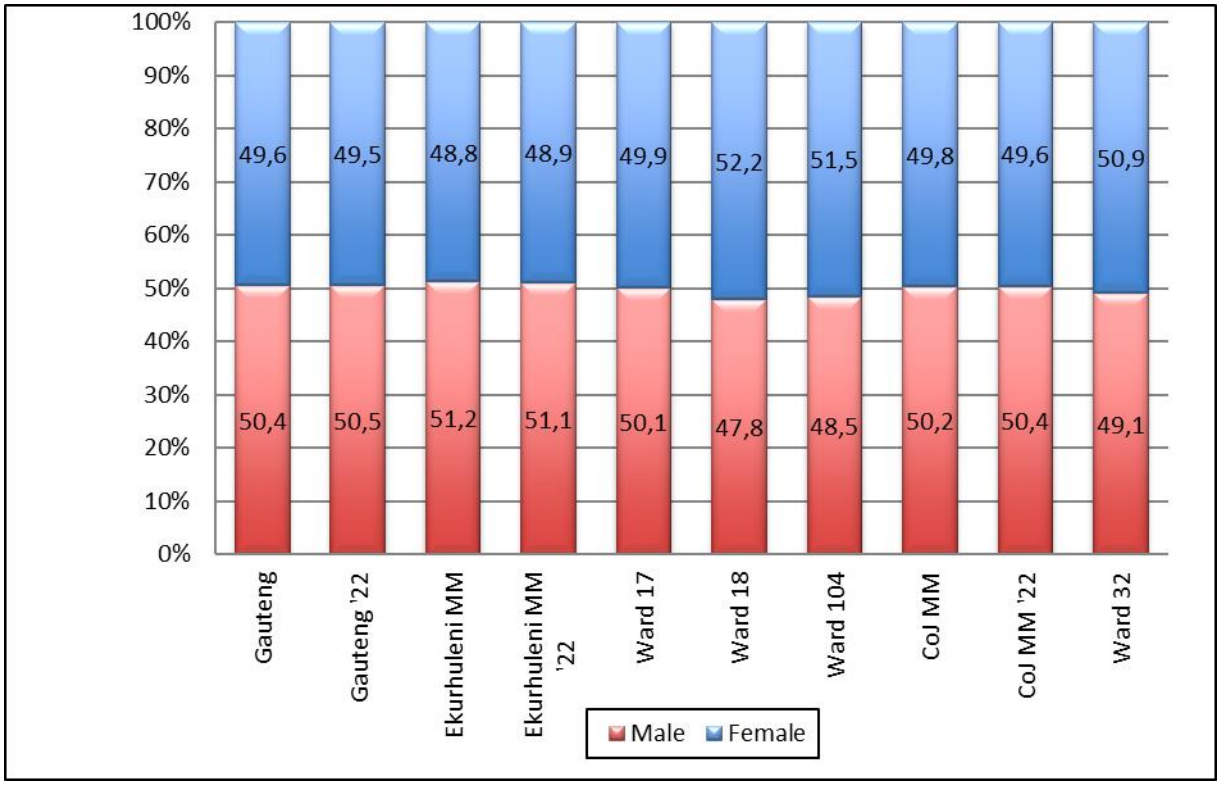

Figure 44: Sex distribution (shown in percentage, source: Census 2011, Census 2022)

9.10.3 LANGUAGE

The language profiles on provincial, municipal and ward level are varied (Figure 45) In Wards 17 and 18 of the Ekurhuleni MM and Ward 104 of the City of Johannesburg MM the highest proportion of people indicated English as their home language. Home language should be taken into consideration when communicating with the local communities and based on the profile of the area communication should take place in English.

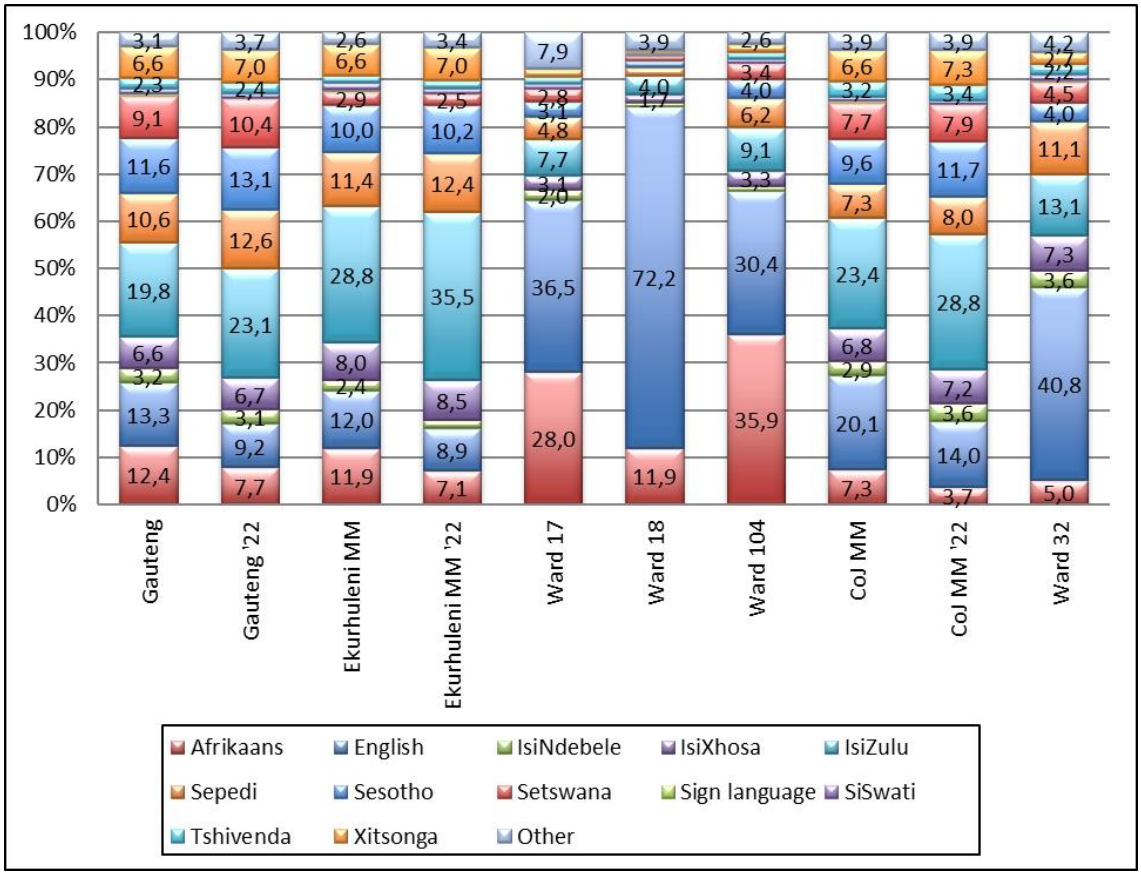

Figure 45: Language distribution (shown in percentage, source: Census 2011, Census 2022)

9.10.4 EDUCATION

Figure 46 shows the education profiles for the areas under investigation for those aged 20 years or older. The proportion of people that completed Grade 12 on provincial and municipal level has increased between 2011 and 2022, while the proportion of people who completed education higher than Grade 12 has decreased.

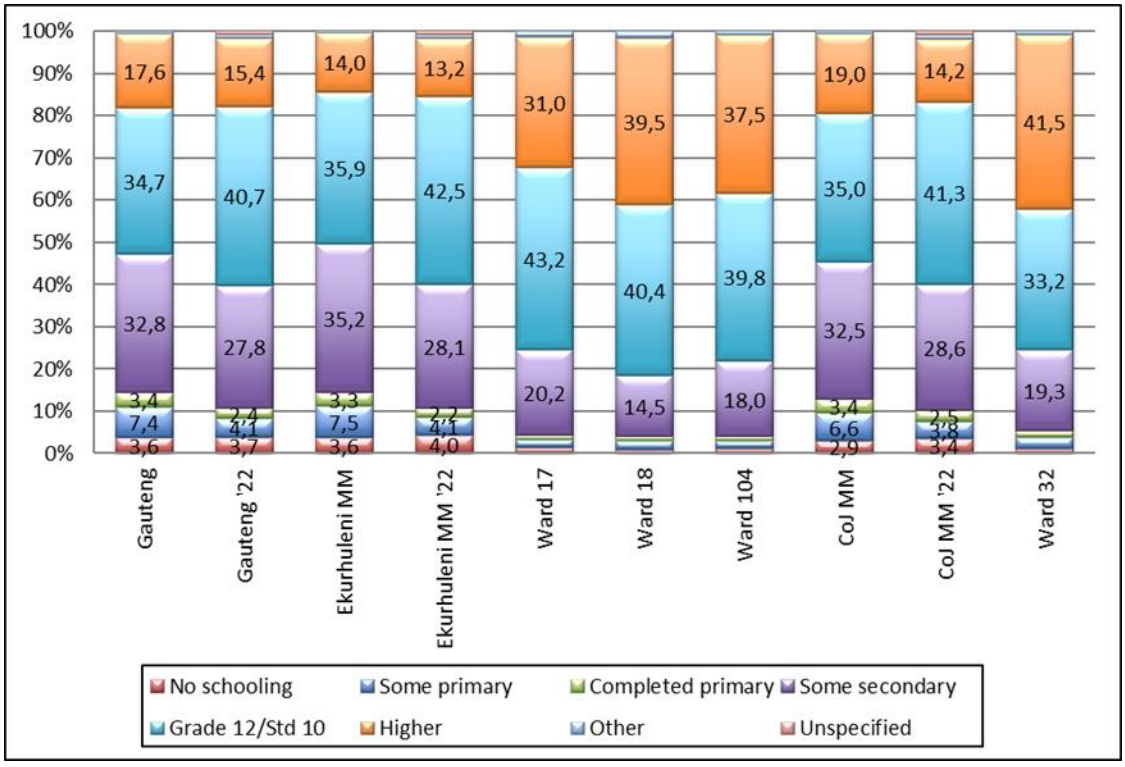

Figure 46: Education profiles (those aged 20 years or older, shown in percentage, source: Census 2011, Census 2022)

9.10.5 EMPLOYMENT

Census 2022 has not yet released employment data. Census 2011 shows relatively high levels of employment in the area, with the highest proportions of employed people in Ward 18 of the Ekurhuleni MM (Figure 47). It must be noted that these proportions might have decreased since 2011 due to the impact of Covid 19 pandemic and the continual loadshedding implemented by Eskom. The majority of the employed people in the areas under investigation work in the formal sector (Figure 48).

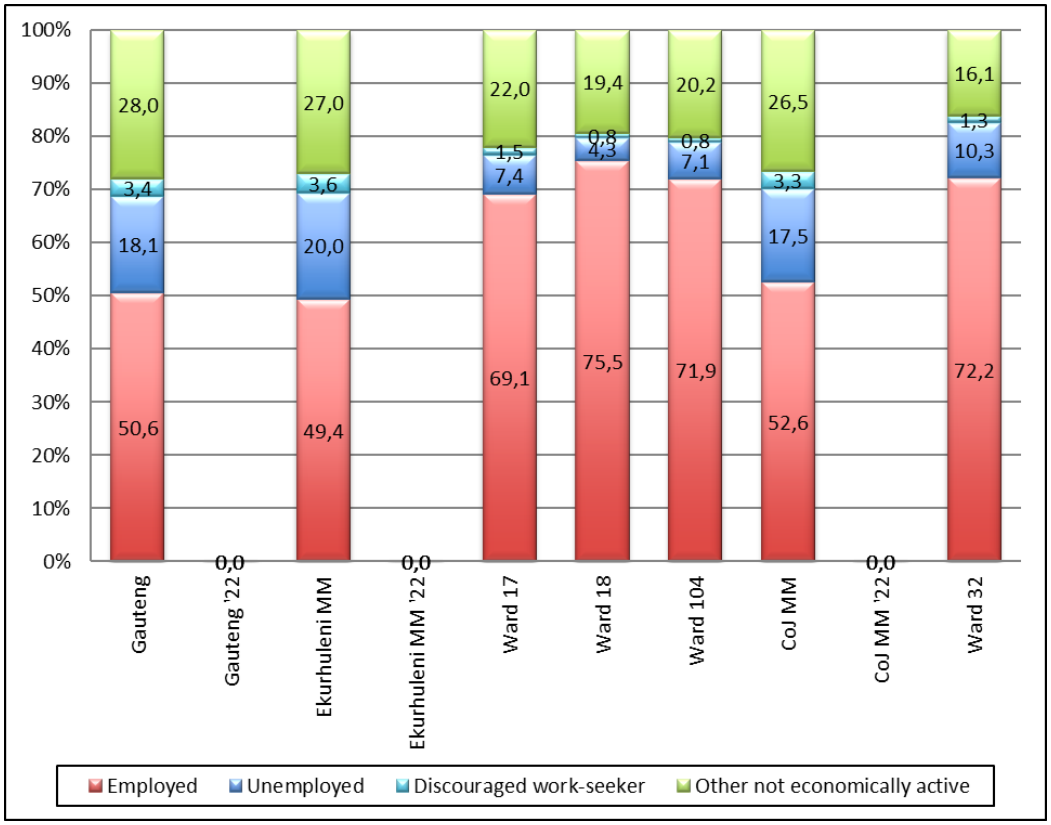

Figure 47: Labour status (those aged between 15 - 65 years, shown in percentage, source: Census 2011)

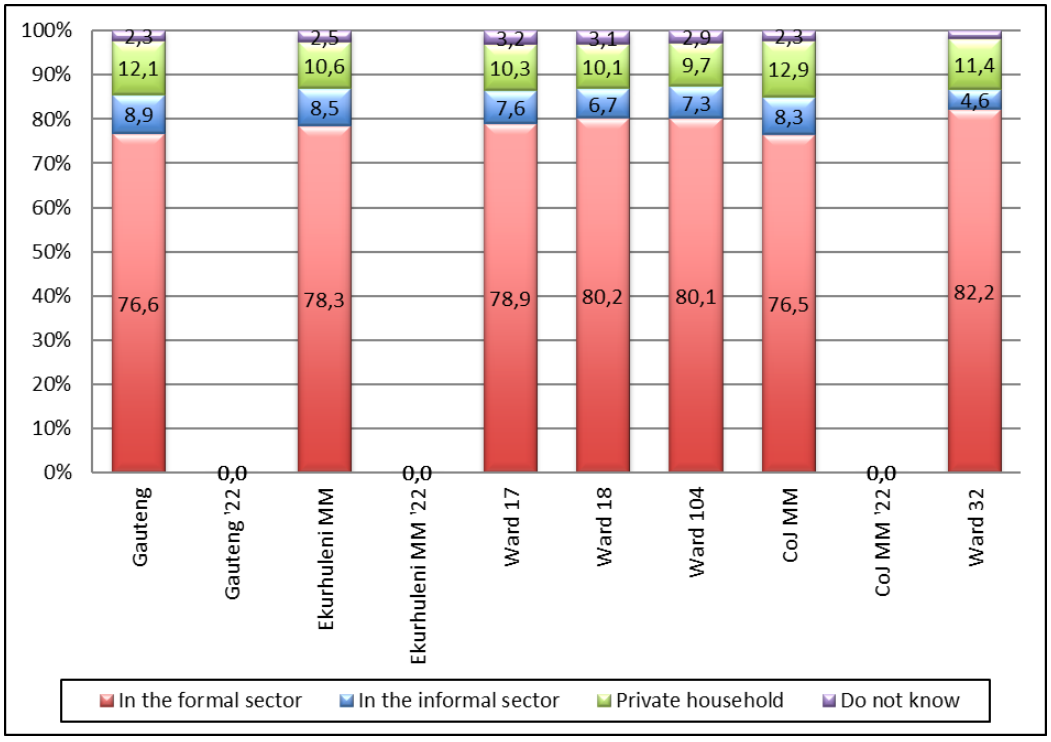

Figure 48: Employment sector (those aged between 15 - 65 years, shown in percentage, source: Census 2011)

9.10.6 HOUSEHOLD INCOME

Census 2022 has not yet released data on household income. In 2011 Ward 17 of the Ekurhuleni had the highest proportion of households (18.37%) with an average household income of R19 600 or less (Figure 49). Statistics South Africa (2022) has calculated the Food Poverty Line (FPL) as R663 per capita per month for 2022 where the FPL is the Rand value below which individuals are unable to purchase or consume enough food to supply them with the minimum per-capita-per-day energy requirement for good health. The FPL is one of three poverty lines, the others being the upper bound poverty line (UBPL) and the lower bound poverty line (LBPL). The LBPL and UBPL both include a non-food component. Individuals at the LBPL do not have enough resources to consumer or purchase both adequate food and non-food items and are forced to sacrifice food to obtain essential non-food items, while individuals at the UBPL can purchase both adequate food and non-food items. The LBPL was R945 per capita per month in 2022 and the UBPL R1 417 per capita per month respectively. In 2011 a household with four members needed an annual household income of approximately R17 000 to be just above the FPL.

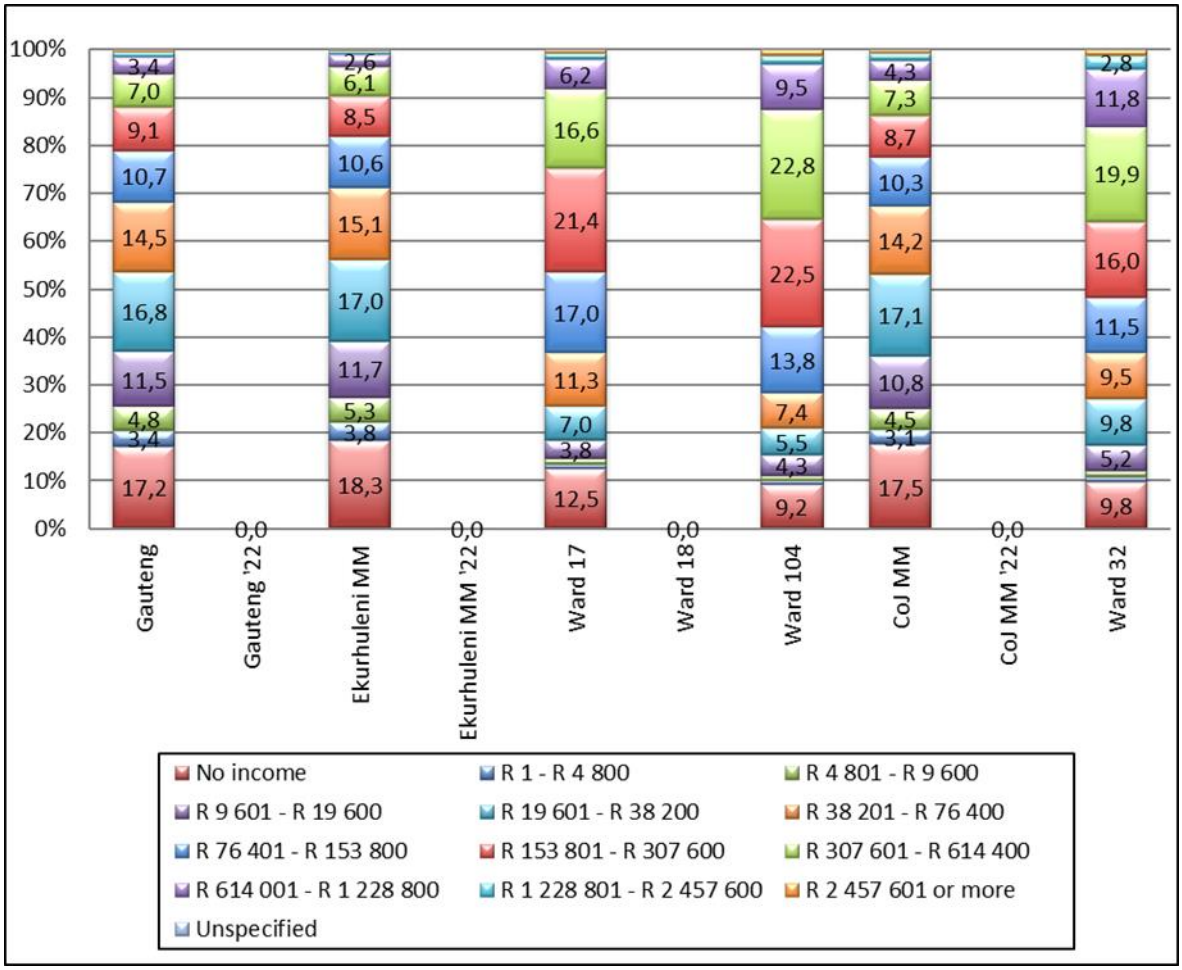

Figure 49: Annual household income (shown in percentage, source: Census 2011)

9.10.7 HOUSING

Census 2022 released limited data related to housing. Census 2011 shows that on a ward level all the households live in areas classified urban. Most households live in formal residential areas (Figure 50), with the highest proportion of households (6.8%) living in commercial areas in Ward 17 of the Ekurhuleni MM.

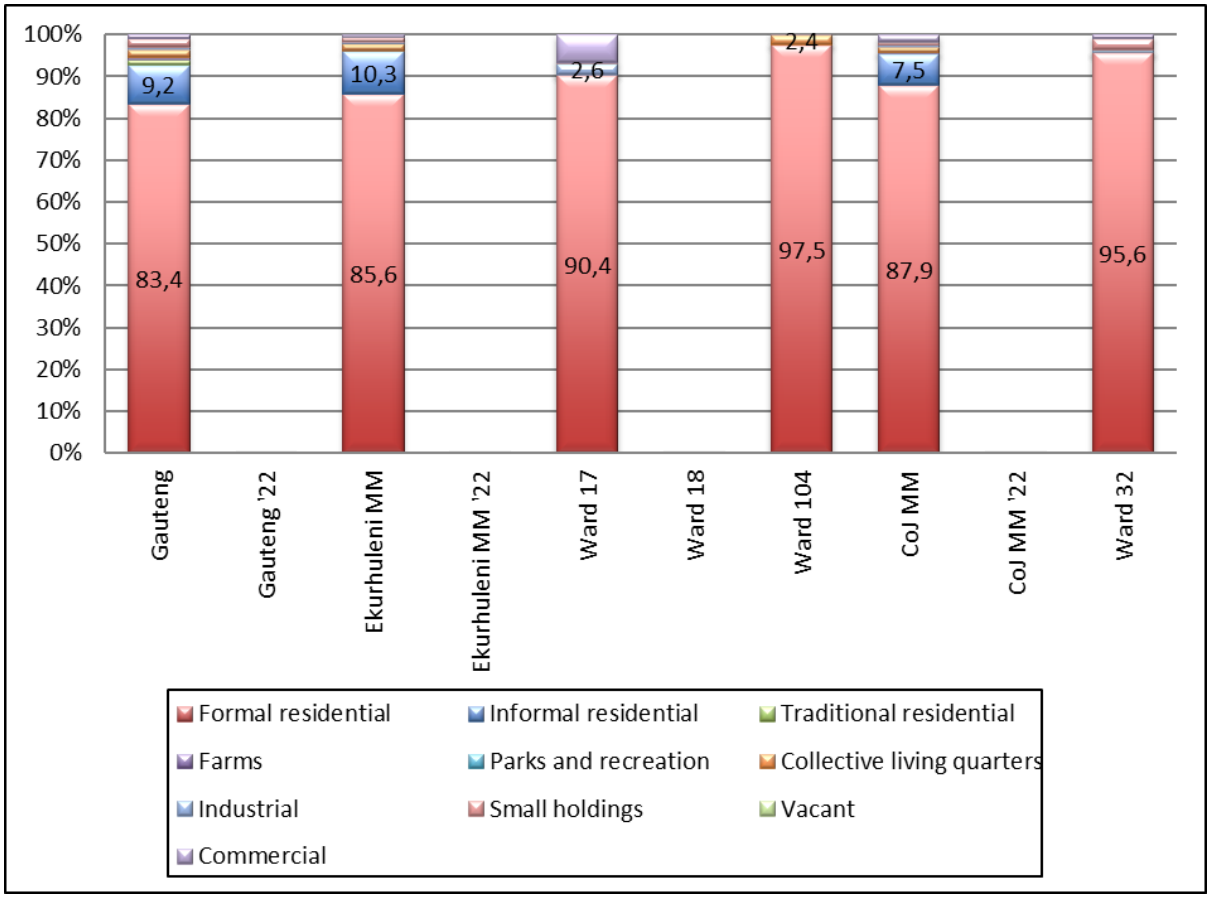

Figure 50: Enumeration area types (persons, shown in percentage, source: Census 2011)

Most of the dwellings in the area are houses or brick/concrete block structures that are on a separate yard, stand or farm (Figure 51). Ward 17 of the Ekurhuleni MM had a high proportion of households living in informal dwellings while Wards 18 and 104 of the Ekurhuleni MM and Ward 32 of the City of Johannesburg MM had high proportions of households living in townhouse complexes. Census 2022 indicates that proportion of households living in formal dwellings have increased since 2011.

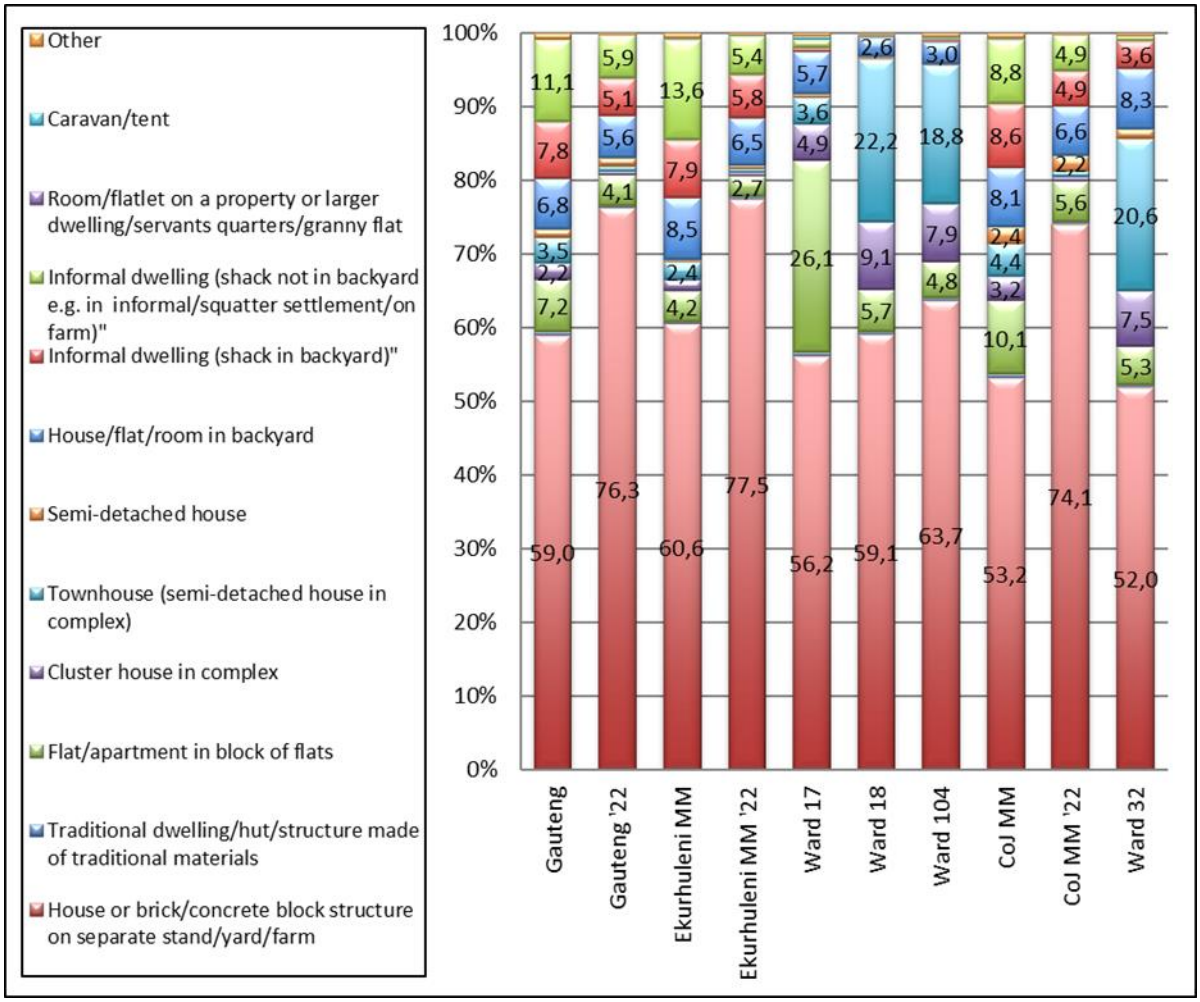

Figure 51: Dwelling types (shown in percentage, source: Census 2011, Census 2022)

In Ward 17 of the Ekurhuleni MM and Ward 32 of the City of Johannesburg MM most households in 2011 indicated that they rent their dwellings, while in Wards 18 and 104 of the Ekurhuleni MM most households indicated that they own their dwellings but had not paid it off in full yet. Census 2022 shows an increase of households renting their dwellings. In 2011 most households consisting of one to two members. Census 2022 shows a decrease in households consisting of one to two members since 2011.

9.10.8 ACCESS TO WATER AND SANITATION

Census 2022 shows that the proportion of households that has access to water from a local or a regional water scheme (Figure 52) has increased since 2011. More than 90% of households get their water from a local or regional water scheme.

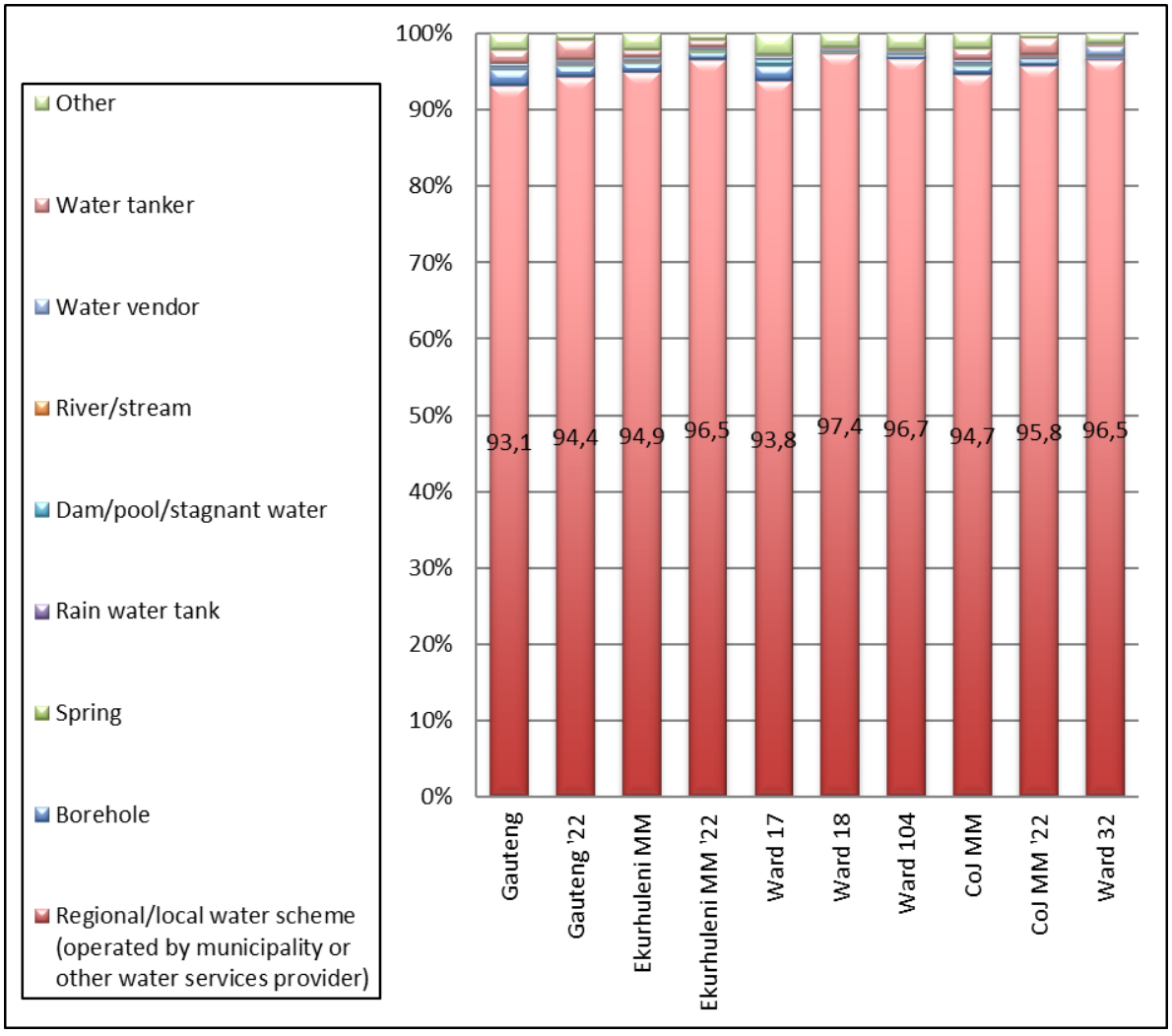

Figure 52: Water source (shown in percentage, source: Census 2011, Census 2022)

Access to piped water, electricity and sanitation relate to the domain of Living Environment Deprivation as identified by Noble et al (2006). Census 2011 shows on a ward level most households have access to piped water inside their dwellings, with the lowest incidence in Ward 32 of the City of Johannesburg MM (Figure 53). Census 2022 shows that access to piped water inside the dwelling has increased since 2011.

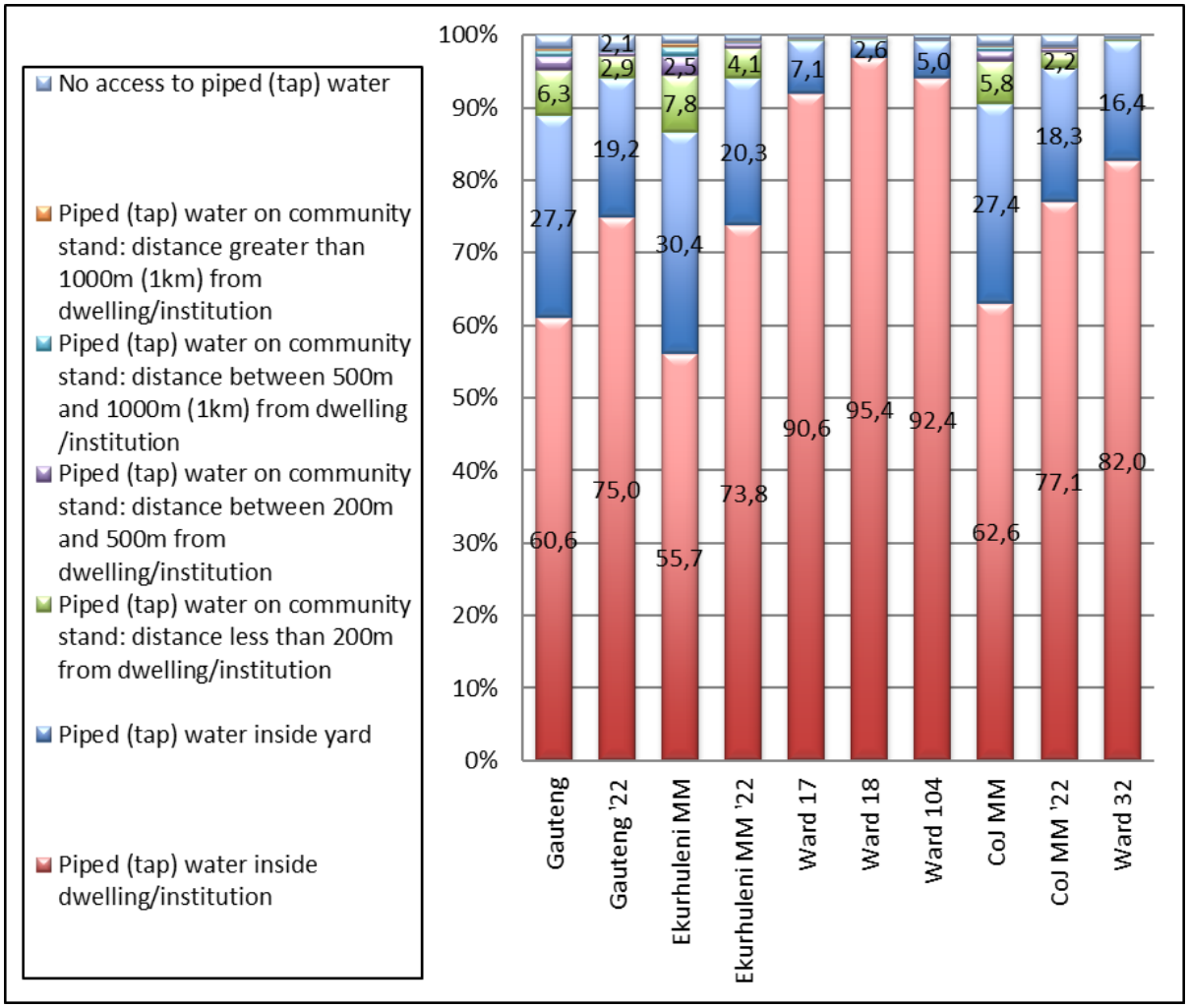

Figure 53: Piped water (shown in percentage, source: Census 2011, Census 2022)

Census 2011 shows that on a ward level most households have access to flush toilets that are connected to a sewerage system (Figure 54). Census 2022 shows a great increase in access to flush toilets connected to a sewerage system on provincial, district and local level.

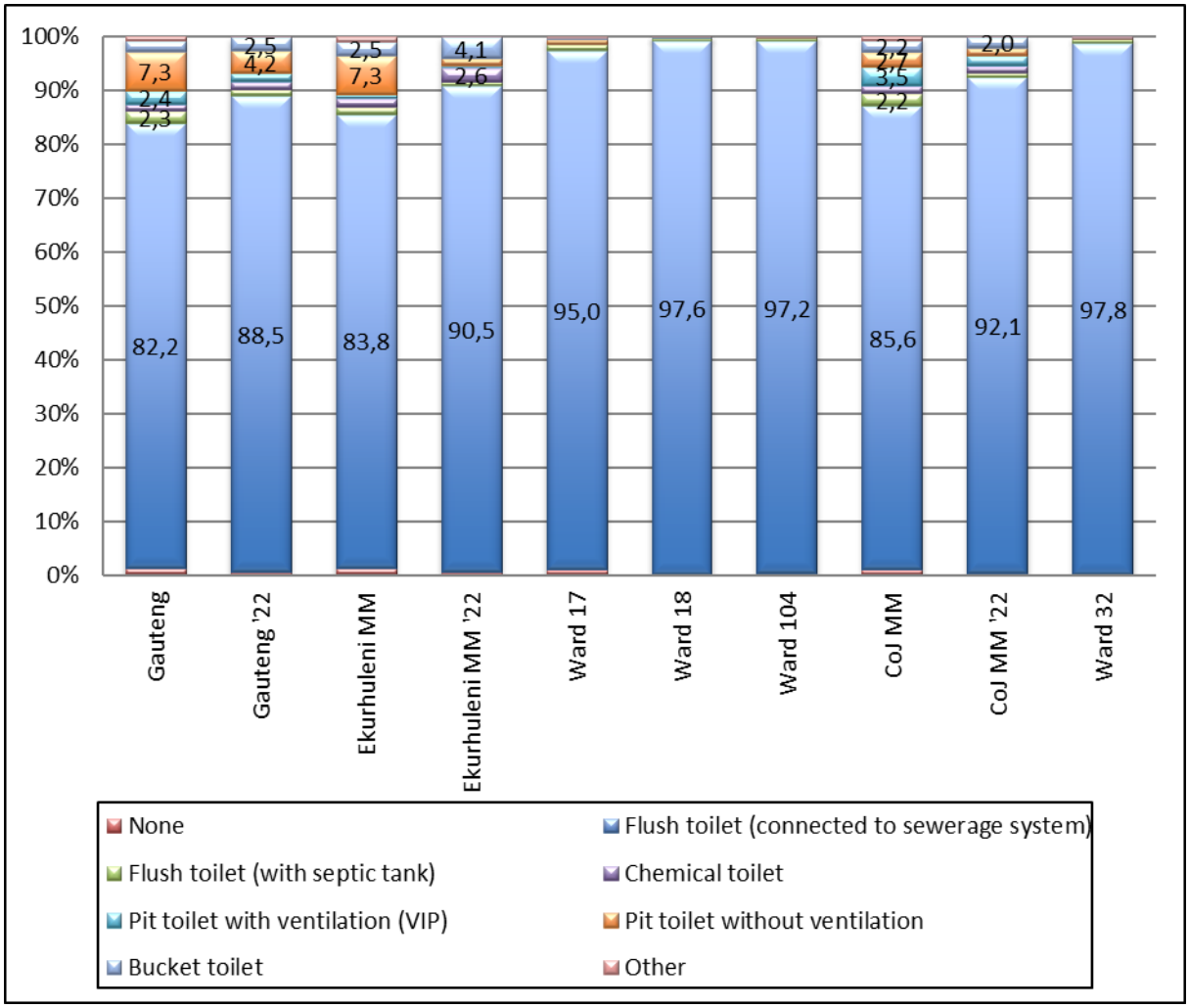

Figure 54: Sanitation (shown in percentage, source: Census 2011, Census 2022)

9.10.9 ENERGY

Electricity is seen as the preferred lighting source (Noble *et al*, 2006) and the lack thereof should thus be considered a deprivation. Even though electricity as an energy source may be available, the choice of energy for cooking may be dependent on other factors such as cost. More than 90% of households on a ward level had access to electricity as energy source for lighting in 2011. Candles are the second most used source of energy for lighting. Census 2022 shows that the proportion of households with access to electricity as an energy source for lighting has increased since 2011 on provincial, district and local level (Figure 55).

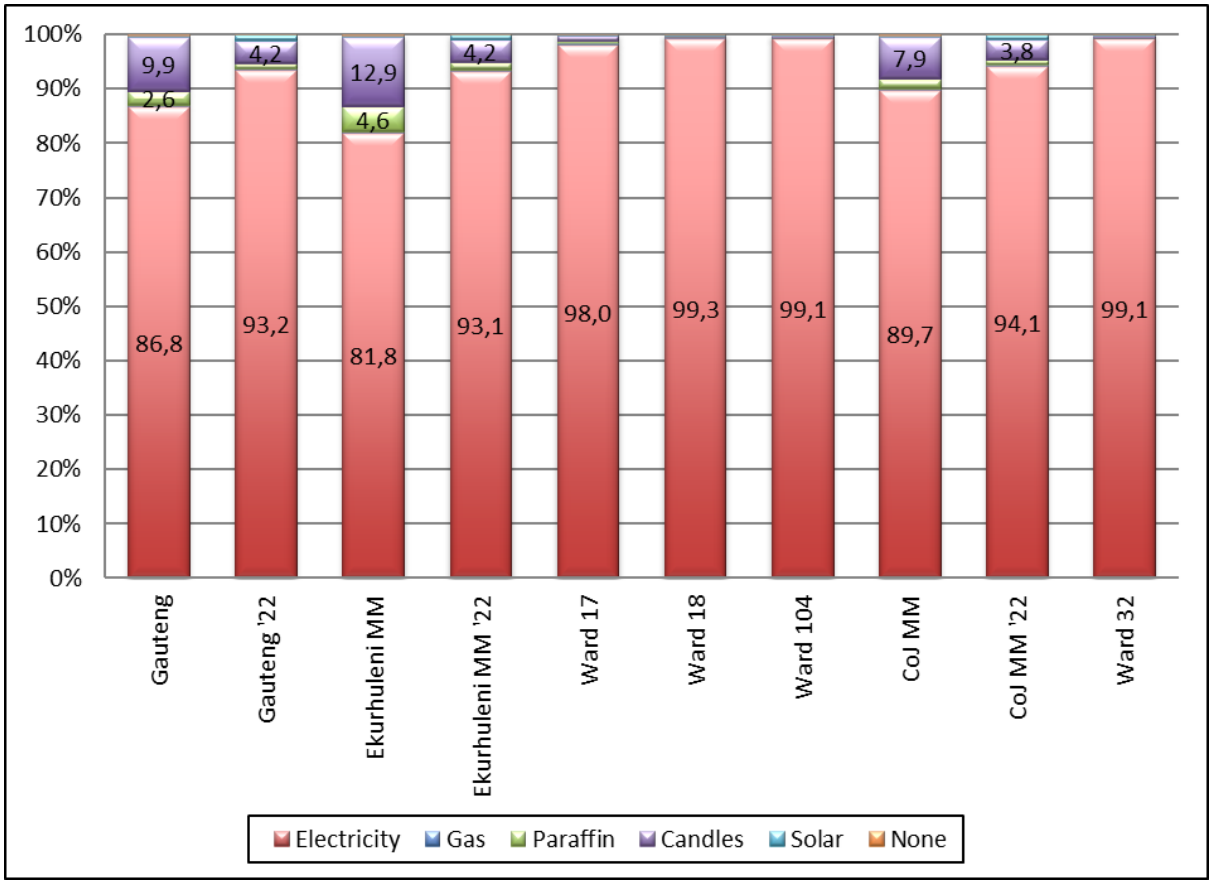

Figure 55: Energy source for lighting (shown in percentage, source: Census 2011, Census 2022)

10 ENVIRONMENTAL IMPACT ASSESSMENT

This section aims to identify and assess all potential environmental impacts associated with the proposed CCGT facility. This impact assessment will be used to guide the identification and selection of preferred alternatives, and management and mitigation measures, applicable to the proposed activities. **Three (3) EMPRs have been prepared for this project, the main EMPr attached as Appendix G1 for the CCGT power plant and two (2) Generic EMPs are included for the power evacuation powerlines and the Gas Pipeline. Refer to Appendices G1 G2 and G3** based on inputs from the Environmental Assessment Practitioner (EAP), public consultation, and specialist assessments during the EIA phase of the project. The associated EMPs identified appropriate mitigation mechanisms for avoidance, minimisation and / or management of the negative impacts and enhancement of the positive impacts.

10.1 PROCEDURE

The impact significance rating methodology, as presented herein and utilised for all EIMS Impact Assessment Projects, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. The ER is determined for the pre- and post-mitigation scenario. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives.

10.1.1 DETERMINATION OF ENVIRONMENTAL RISK

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) * N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 29 below.

Table 29: Criteria for Determining Impact Consequence.

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary)
	3	Local (i.e. the area within 5 km of the site)
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)

Duration	1	Immediate (<1 year)
	2	Short term (1-5 years)
	3	Medium term (6-15 years)
	4	Long term (15-65 years), the impact will cease after the operational life span of the project)
	5	Permanent (>65 years), no mitigation measure of natural process will reduce the impact after construction)
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way, moderate improvement for +ve impacts)
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease, high improvement for +ve impacts)
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts)
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact.

Once the C has been determined, the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 30.

Table 30: Probability Scoring.

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur), -

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \; x \; P$$

Table 31: Determination of Environmental Risk.

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Probability				

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 4.

Table 32: Environmental Risk Scores.

ER Score	Description
<9	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
≥9 ≤17	Medium (i.e. where the impact could have a significant environmental risk/ reward),
>17	High (i.e. where the impact will have a significant environmental risk/ reward).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

10.1.2 IMPACT PRIORITISATION

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 33: Criteria for Determining Prioritisation.

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.

	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 5. The impact priority is therefore determined as follows:

$$\boldsymbol{Priority = CI + LR}$$

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 1.5 (Refer to Table 34).

Table 34: Determination of Prioritisation Factor.

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a factor of 0.5, if all the priority attributes are high (i.e. if an impact comes out with a high medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 35: Final Environmental Significance Rating.

Significance Rating	Description
<-17	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
≥-17, ≤-9	Medium negative (i.e. where the impact could influence the decision to develop in the area).

Significance Rating	Description
>-9, < 0	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
>0, <9	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥9, ≤17	Medium positive (i.e. where the impact could influence the decision to develop in the area).
>17	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

10.2 IDENTIFICATION AND ASSESSMENT OF IMPACTS

Potential environmental impacts were identified during the Scoping phase and have been assessed in this EIA report. It should be noted that this EIA report will be made available to I&AP's for review and comment and all comments and responses will be included in the final EIA report to be submitted to the DFFE for adjudication. Potential environmental impacts were identified during the scoping process. These impacts were identified by the EAP, the appointed specialists, and updated where relevant based on public input.

Without proper mitigation measures and continual environmental management, most of the identified impacts may potentially become cumulative, affecting areas outside of their originally identified zone of impact. The potential cumulative impacts have been identified, evaluated, and mitigation measures suggested and have been updated during this EIA phase. When considering cumulative impacts, it is vitally important to bear in mind the scale at which different impacts occur. There is potential for a cumulative effect at a broad scale, as well as finer scale effects occurring in the area surrounding the activity. The main impacts which have a cumulative effect on a regional scale are related to the transportation vectors that they act upon. At a finer scale, there are also impacts that have the potential to result in a cumulative effect, although due to the smaller scale at which these operate, the significance of the cumulative impact is lower in the broader context.

10.2.1 PLANNING PHASE IMPACTS

10.2.1.1 **IMPACTS ON EXISTING INFRASTRUCTURE AND SERVICES**

During the planning phase, existing infrastructure and services in and around the proposed location for the CCGT could be impacted on by the proposed activities. Construction could lead to the deterioration of existing infrastructure such as road surface deterioration and traffic congestion . Overuse or pollution of water sources within the study area could negatively effect on surrounding land users. The significance of the impact is rated as medium negative before and after mitigation due to the social impacts associated with it.

(i) Mitigation measures

- Kelvin should compile and implement a traffic safety plan in accordance with recommendations from the traffic specialist. This plan should form part of the Health and Safety requirements for all contractors. Appropriate road signage must be used at the entry and exit points to the site. Signalmen should be used where appropriate to warn other road users of slow moving or reversing construction

traffic. Although Kelvin cannot take responsibility for all road users, they should include road safety toolbox talks..

- Communicate with surrounding land users to help identify existing infrastructure and services within the area.

(ii) Cumulative Impacts

- Deterioration of existing infrastructure or obstruction of existing services during construction could impact on surrounding land users within the vicinity of the proposed CCGT plant.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss on existing infrastructure or services are foreseen as a result of the proposed activity. If existing infrastructure is damaged or services hindered, it will incur a cost to the applicant.

10.2.1.2 IMPACTS DUE TO COMMUNICATION INEFFICIENCY

Communication is important as to notify I&APs about the proposed project and activities. It will give them clarity on how their livelihoods or businesses could possibly be impacted on by the proposed activities. It is noteworthy that the communities around Kelvin Power Station and the proposed site have been living close to a power station for a long time as such, they are familiar with the operation of a coal fired power station. However, they are not familiar with the operation of a CCGT plant and have fears about the safety aspects of gas. Furthermore, communities may have concerns about crime during the construction phase due to the movements of construction workers, which will make it easier for opportunistic criminals to enter the area. Open and clear communication will allow I&APs to comment on any queries or concerns that they might have. Communication will also allow the local community of possible vacancies. If communication is not transparent it could lead to uninformed decisions by the applicant, uprisings by an unhappy community. The impact significance is rated as being medium negative before mitigation, but low negative if the mitigation measures are applied.

(i) Mitigation measures

- Kelvin must develop a stakeholder engagement strategy specific to the CCGT plant.
- Kelvin must continue to implement their grievance mechanism and ensure that it is community friendly. Kelvin must continue to address and keep record of community grievances. Kelvin must continue to keep a grievance register. It is important to have documented evidence of community/power station interactions. This will assist Kelvin to track the issues, and the community to see what actions the power station has taken.

(ii) Cumulative Impacts

- Non-transparent communication could lead to bad decision making which might affect livelihoods in the surrounding community.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of communication inefficiency during the planning phase.

10.2.2 CONSTRUCTION PHASE IMPACTS

10.2.2.1 AIR QUALITY IMPACTS DURING CONSTRUCTION

It should be noted that current baseline operations (Station B) will have ceased by the time proposed project operations commence. Thus, impacts for proposed operations consist of project activities only. The scales used for the isopleth plots in this section has different levels and colours to that of baseline as the concentrations are much lower and not comparable to baseline operations.

The main impacts to be expected during the construction phase arise from the movement of construction vehicles, the excavation of material and the handling of excavated material during the construction activities. The engines of construction vehicles have internal combustion related emissions, while dust is generated by the

movement of material and entrainment from roads by vehicle movement. The magnitude of the impact will depend on

- The volume and nature of material to be removed during site clearing, the rate at which it is removed, the distance to disposal, the vehicle type used and the ultimate disposal of the cover material.
- The location, size and nature of temporary and permanent stockpiles.
- The delivery mode of construction material and plant components to site

Construction was given to occur for 10-hours per day (equivalent to 50 hours per week) from Monday to Friday and for a period between 36 and 42 months. All potential mitigation options are discussed in the relevant sections below.

(i) Mitigation measures

- Debris handling: Wet suppression (hourly watering recommended).
- Truck transport and road dust entrainment:
    - Wet suppression (hourly watering recommended) or chemical stabilization of unpaved roads.
    - Wheel washing station to be installed at the exit point to minimise spread of construction material onto neighbouring roads
    - Haul trucks to be restricted to specified haul roads using the most direct route.
    - Reduction of unnecessary traffic.
    - Construction vehicles transporting loose materials must be covered with tarpaulin to minimise dispersion of construction material during transportation.
    - Strict on-site speed control (i.e. 20 km/hr for haul trucks)
- Materials storage, handling and transfer operations: Wet suppression where feasible, possibly using continuous sprays in the dry season

The impacts on air quality were thus calculated to have a Low significance during construction.

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of air quality impacts during construction.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of dust generation during construction.

10.2.2.2 **NOISE GENERATION**

Noise impacts during construction phase are anticipated to occur during day-time hours only. Noise will be generated during the construction phase as a result of construction vehicles and heavy machinery working on-site. Noise levels due to project construction activities are predicted to be within the Gauteng Noise Control Regulations of 60 dBA and the proposed Environmental Noise Standards at all residential NSRs within the study area. For a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level is not detectable. According to SANS 10103 (2008); the predicted increase in noise levels from the current baseline due to proposed project construction activities only is expected to result in “no” reaction. Refer to Figure 56 for the day-time noise simulation anticipated from construction activities.

The impact significance is rated as low negative before and after mitigation, as the proposed activities will take place within the Kelvin Power Station area where which is already subject to existing noises from the existing power generation processes. Potential sensitive receptors within the project area, include residential areas, i.e. Esther Park, Edleen, Cresslawn, Croydon, Illiondale, and Edenvale.

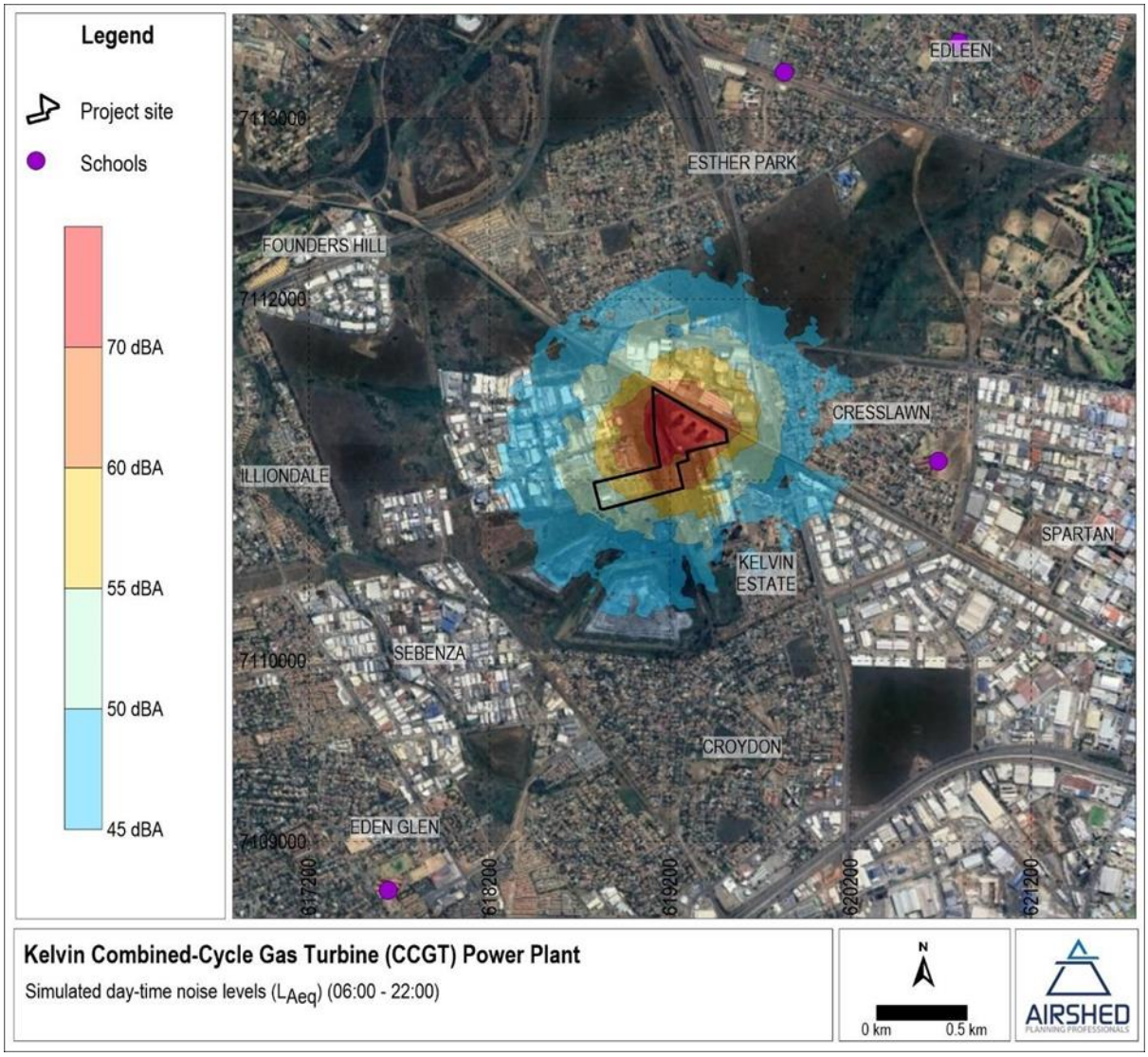

Figure 56: Day-time noise simulation for construction activities only.

(i) Mitigation measures

It should be noted that not all mitigation measures are to be implemented, but should the need arise the mitigation measures as discussed in this section can be considered.

- Regular and effective maintenance of equipment are essential to noise control. Increases in equipment noise are often indicative of eminent mechanical failure. Also, sound reducing equipment/materials can lose effectiveness before failure and can be identified by visual inspection.
- Unless it is an emergency situation, non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.
- Complaints register, including the procedure which governs how complaints are received, managed and responses given (refer to Section 6.2), must be implemented, and maintained.

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of noise during the construction phase.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of noise during the construction phase.

10.2.2.3 IMPACT ON HEALTH AND SAFETY

During construction, a substantial amount of earthworks will be required at the site in order to level the ground for the positioning of the plant. These activities will result in the generation of dust, which will affect people working or living in close proximity to the site. Construction workers will also be exposed to health and safety risks on site and these risks must be addressed during construction, by compliance with required health and safety procedures and standards, particularly the Occupational Health and Safety Act 85 of 1993, and associated Construction Regulations promulgated in terms thereof.

(i) Mitigation measures

- Compliance with required health and safety procedures and standards. The project will comply with all applicable South African legislation in terms of health and safety, and worker rights, which will include access to workmans compensation for loss of income resulting from an onsite incident.
- The project will provide of Personal Protective Equipment (PPE), training and monitoring as well as ongoing safety checks and safety audits.
- Contractors should wear some form of identification that will make them easily recognizable as representatives from Kelvin Power Station. KPS should liaise with the community police forums to draft an action plan against potential crime.
- Workers will be provided with primary health care and basic first aid at construction worksites.

(ii) Cumulative Impacts

- No cumulative health and safety impacts are expected on during the construction phase.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected during the construction phase.

10.2.2.4 CLIMATE CHANGE IMPACTS

During its construction phase the project will emit Greenhouse Gasses (GHGs). The estimated GHG emissions quantities for construction of 5 853 t CO_2e direct emissions and 7 355 t CO_2e indirect emissions due to construction activities. The project's construction phase GHG contributions amount to 0.001% of the remaining South African annual GHG budget. The impact of the project on climate change was assessed to have a **very low** negative risk rating for the construction phase.

(i) Mitigation measures

- Maintenance of equipment.
- The project will be required to report carbon dioxide equivalent (CO2e) emissions annually via the NAEIS (applicable to operation).

(ii) Cumulative Impacts

- Climate change impacts will be cumulative with other GHG emissions for other projects in the region and in the country .

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of climate change impacts during construction.

10.2.2.5 IMPACT ON SOIL

The impact on soil during construction is considered to be low negative before and after mitigation. The location of the site is within the existing Kelvin Power Station area and is almost entirely surrounded by existing infrastructure. Therefore it is not feasible for the site to be used for agricultural purposes while the power station is still in operation.

(i) Mitigation measures

- All servicing/ maintenance of construction vehicles that could cause harm to the environment must be done off-site. No servicing of construction vehicles is allowed on site, except for minor repairs to prevent further environmental pollution or damage.
- All working fronts must be provided with a spill containment kit to contain and collect spills.
- Any evidence of erosion, scouring, sedimentation, and/or undercutting must be rectified and rehabilitated immediately.
- If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.
- A detailed Stormwater Management Plan (SWMP) needs to be prepared.
- Land clearing and preparation may only be undertaken immediately prior to construction activities and within authorised areas.
- Adequate stormwater drainage and management is required to prevent soil erosion.

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of impact on soil during the construction phase.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of impact on soil during the construction phase.

10.2.2.6 **IMPACT ON TERRESTRIAL BIODIVERSITY**

The project area has been transformed/disturbed from its original state by the current power plant operations. The project area is a brownfields site and is not located within any sensitive CBA or ESA areas. Sensitive species of plants and animals are unlikely to occur within in the project area. There is minimal vegetation in the area almost none of the vegetation is in a natural state. No species of conservation concern were identified on site by the Terrestrial biodiversity specialist. However, impacts on terrestrial biodiversity during construction were identified by the specialist were on flora and fauna, and terrestrial ecology. These include soil compaction and erosion, dust pollution, chemical spills, dust deposition, introduction of invasive species, clearing of remaining vegetation, dust deposition and introduction invasive species. The overall impact on terrestrial biodiversity was deemed to be very low by the specialist.

(i) Mitigation measures

- All personnel and contractors are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof.
- A qualified environmental control officer must be on site when activities begin. A site walk through must be performed by a suitably qualified ecologist prior to any activities taking place and any SSC or protected species should be noted. Specific attention should be given to the five (5) medium sensitivity mammal species, and one (1) high sensitivity avifaunal species (Grass Owl) noted in the screening tool. All six species are not easily located in the context of a short one-day site visit but are also unlikely to occur in the heavily disturbed PAOI irrespective. In situations where these species are observed and must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.
- Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of potential protected species to be aware of that are known to occur in the local area - including their identification, conservation status and importance, biology, habitat

requirements and management requirements in line with the Environmental Authorisation and within the EMPr. Although these species are unlikely, they may still occasionally frequent the area.

- Laydown and construction preparation activities (such as cement mixing, temporary toilets, etc.) must be limited to already Modified areas and should take up the smallest footprint possible.
- Dust Pollution: Ongoing construction activities generate dust that can impact surrounding terrestrial habitats by settling on the ground and altering the microhabitats for soil organisms.
- Chemical Spills: The use of construction materials and machinery poses a risk of chemical spills, which can contaminate the soil and affect both soil quality and the organisms that depend on it.
- It is recommended that areas to be developed/disturbed be specifically demarcated so that during the construction/activity phase, only the demarcated areas be impacted upon.
- Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should not be fragmented or disturbed further if possible.
- All vehicles and personnel must make use of existing roads and walking paths as far as possible, especially construction/operational vehicles.
- To manage heat emissions from a gas turbine power plant, the installation of green roofs and vegetative buffer zones is recommended. These measures, along with the use of reflective materials and heat recovery systems, help to reduce ambient temperature, stabilize soil conditions, and improve local vegetation health. Regular monitoring and stakeholder engagement ensure the effectiveness and adaptability of these strategies.
- The clearing of indigenous vegetation must be minimized where possible. Clearing of AIP vegetation, which dominated the project area, is advocated. All activities must be restricted to within the authorized areas.
- Materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas.

(ii) Cumulative Impacts

- No cumulative impacts are expected on flora and fauna during the construction phase.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected during the construction phase.

10.2.2.7 **IMPACT ON TRAFFIC**

During construction there is unlikely to be material impacts to the existing road traffic networks for the site. Construction transport related to the large power station components could result in a number of traffic related issues. Impacts associated with abnormal loads and construction employees are not considered significant for the project.

(i) Mitigation measures

- Kelvin should compile and implement a traffic safety plan in accordance with recommendations from the traffic specialist. This plan should form part of the Health and Safety requirements for all contractors. Appropriate road signage must be used at the entry and exit points to the site. Although Kelvin cannot take responsibility for all road users, they should include road safety toolbox talks.
- relevant permits prior to transporting heavy equipment to the site.

- The appointed contractor must liaise closely with the relevant traffic authorities regarding the movement of 'abnormal vehicles' and must adhere to traffic authorities' procedures for 'abnormal vehicle' movement.
- Heavy vehicles should travel during off peak times and should be clearly marked. Relevant mitigation proposed in the biophysical studies should be adhered to.

(ii) Cumulative Impacts

- Traffic impacts will be cumulative with existing traffic in the affected areas during the construction phase.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected due to traffic related impacts.

10.2.2.8 IMPACT ON HERITAGE AND PALAEONTOLOGICAL RESOURCES

Impact significance on heritage and palaeontological resources during construction were identified as being low negative before and after mitigation. The site is located within an area of low palaeontological sensitvitiy. An archaeological assessment was undertaken in 2021 which covers the area under investigation for the CCGT. A number of known cultural heritage (archaeological and historical) sites exist in the larger geographical area within which the study area falls. The only site of cultural heritage (archaeological and/or historical) origin or significance identified during the 2021 assessment in the study area was the Power Station and related infrastructure itself.

(i) Mitigation measures

- If unearthed, under no circumstances shall any heritage, archaeological or paleontological artefact/ feature be removed, destroyed or interfered with by anyone on the site, unless such removal has been authorised by the heritage authorities.
- Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or paleontological artefacts as set out in the NHRA (Act No 25 of 1999) Section 51 (1).
- Implement a "chance find" protocol.

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of impacts on heritage and palaeontological resources during construction.

(iii) Irreplaceable loss of Resources

- Although unlikely, if any palaeontological resources are unearthed and destroyed, it will be irreplaceable.

10.2.2.9 SOCIAL IMPACTS

Employment creation was identified as having a medium positive impact significance before and after mitigation during the construction phase. Other social impacts identified during construction phaser relate to concerns about crime, traffic related impacts and environmental nuisance with a negative medium final significance. These are attributed to the potential influx of contractors, construction vehicles and employees.. Although certain aspects of the construction of the proposed plant are technically specialised, there remain opportunities for local contractors to become involved in components of construction, which are less plant-specific. The use of local contractors increases the number of employment opportunities for local people during the construction phase. Approximately 500 temporary job opportunities are to be created during the construction phase of the project. The project would also aid in preventing power outages in the region and the country by adding to the power generation capacity in the country. An impact associated with an influx of jobseekers is the potential for social tension, and increased competition for employment. The distribution of employment opportunities

between locals and in-migrants often leads to tension and conflict, especially when locals perceive the migrants to be taking their jobs. Other social impacts include:

- Opportunities for local contractors.
- Increased potential for Corporate Social Investment.
- Potential health impacts.
- Increased spread of HIV/AIDS.
- Cleaner energy.

(i) Mitigation measures

- Kelvin should put measures in place to ensure the most effective local employment strategy. The strategy must include women and vulnerable people.
- Kelvin should ensure a fair number of secondary economic opportunities are given to local contractors. A percentage of goods as determined by Kelvin and the relevant stakeholders must also be procured locally. Services and goods must be procured locally as far as reasonably possible.
- All contractors and employees need to wear photo identification cards. Vehicles should be marked as construction vehicles and should have logos clearly exhibited. Entry and exit points of the site should be controlled.
- Kelvin should compile and implement a traffic safety plan in accordance with recommendations from the traffic specialist. This plan should form part of the Health and Safety requirements for all contractors. Appropriate road signage must be used at the entry and exit points to the site. Although Kelvin cannot take responsibility for all road users, they should include road safety toolbox talks.
- Develop a pamphlet that describes the new technology, any safety issues and risks and how the risks are managed. Distribute to surrounding communities through existing channels such as WhatsApp groups and Home Owners Associations.
- The proponent should manage expectations and there should be a central place, such as the entrance of the Kelvin Power Station, where people can submit their applications, or an e-mail address or WhatsApp number where people could submit their queries to. This could form part of a grievance mechanism where people could submit any issues regarding the development, especially in the construction phase.
- Utilise existing community structures if available, to act as a communication link between the local community and the applicant for informing the local community of job opportunities and informing the Applicant of possible contractors in the local community.
- No alcohol and drugs policy during working time or at times that will affect ability to work.
- Implement a random drug / alcohol testing policy at the worksite entrance at the start of the workday
- Disciplinary measures for infringement of the Code and company rules. If workers are found to be in contravention of the Code of Conduct, which they signed at the commencement of their contract, they will face disciplinary procedures that could result in dismissal.
- Develop and implement an HIV/AIDS policy awareness raising for all workers directly related to the Project.

(ii) Cumulative Impacts

- Social impacts would be cumulative with the existing social impacts in the region.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected.

10.2.2.10 **WASTE MANAGEMENT IMPACTS**

Waste management impacts were rated as having a medium negative significance before and after mitigation. Domestic waste, construction waste and sewage are all waste types that need to be considered during construction.

(i) Mitigation measures

- The Contractor should inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities.
- No waste releases into the environment should be permitted.
- The toilets shall be of a neat construction and shall be provided with doors and locks and shall be secured to prevent them from falling over.
- The contractor shall always supply toilet paper at all toilets. Toilet paper dispensers shall be provided in all toilets.
- A dedicated waste collection and storage facility must be prepared, and this should be emptied and collected wastes disposed of on a regular basis. Wastes must be disposed of at suitably licensed waste disposal facilities.
- Contaminated water, must be prevented from entering the local environment (soil and water), adequately stored in protected and where necessary bunded areas, and disposed of at a suitably licensed disposal facility.
- All cooling water from the CCGT power plant must be treated to meet the standards stipulated in the relevant Water Use License (WUL) or General Authorisation before being discharged into the environment. The treatment process should include appropriate filtration, chemical neutralization, and temperature regulation to ensure compliance with regulatory water quality parameters, such as pH, temperature, dissolved oxygen, and contaminant levels. Regular audits and maintenance of the treatment facilities should be conducted to ensure consistent compliance.
- A comprehensive water quality monitoring program must be established to continuously assess the quality of cooling water both before and after treatment, as well as at the discharge point into the environment. Monitoring should include parameters specified in the WUL or General Authorisation, such as pH, temperature, dissolved oxygen, and specific contaminants. The results should be recorded and reported to the relevant authorities regularly, and any deviations from compliance should trigger immediate corrective actions.
- Vermin / weatherproof bins must be provided in enough numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overfilling and other associated nuisances.
- Each active site must be checked daily to ensure that the site is free from litter and unnecessary wastes.
- Hazardous substances, if applicable, must be stored in a secure location, isolated from direct contact with the soils and covered where necessary.
- No waste is to be left on site whether it is biodegradable or not. Unutilised materials are to be removed once construction has ended.

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of waste management impacts during decommissioning.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of waste management impacts during decommissioning.

10.2.3 OPERATIONAL PHASE IMPACTS

10.2.3.1 **AIR QUALITY IMPACTS**

It should be noted that current baseline operations (Station B) will have ceased by the time proposed project operations commence. Thus, impacts for proposed operations consist of project activities only. The scales used for the isopleth plots in this section has different levels and colours to that of baseline as the concentrations are much lower and not comparable to baseline operations.

Air quality impacts for the operational phase considered pollutants such as NO_x, SO_2, and particulates was modelled and assessed by the Air Quality Specialist. In order to protect human health, air quality standards have been established and emissions below these standards are considered to have a negligible impact on the health of communities. There are a number of sensitive receptors in close proximity to the site. The findings of the assessment indicated that The project will need an AEL. The AEL will stipulate the conditions that will need to be complied with in order to operate. Conditions will include the limits and measurements of emissions. The facility will need to ensure sufficient mitigation measures are in place in order to meet the stipulated MES.

The impact on air quality is was calculated to have a low negative risk rating.

(i) Mitigation measures

- The project will need an AEL. The AEL will stipulate the conditions that will need to be complied with in order to operate. Conditions will include the limits and measurements of emissions. The facility will need to ensure sufficient mitigation measures are in place in order to meet the stipulated MES.

(ii) Cumulative Impacts

- Considering that at the time of commissioning of the proposed Kelvin Power CCGT operations at the B-Station will have ceased, it is unlikely that the project will result in spatial and temporal change.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of air quality impacts during operation.

10.2.3.2 **CLIMATE CHANGE IMPACTS**

Gaseous pollutants released from the combustion of fuel is the main source of GHGs from the project. The release of GHG includes mainly carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. During its operational phase the project will emit Greenhouse Gasses (GHGs). The estimated GHG emissions quantities for operations will be 19 210 749 t CO_2e (direct) and 3 872 961 t CO_2e (indirect). The project's operational GHG contributions amount to 0.33% of the remaining South African annual GHG budget. The impact of the project on climate change was assessed to have a **high** negative risk rating.

(i) Mitigation measures

- The project will be required to report carbon dioxide equivalent (CO2e) emissions annually via the NAEIS.
- Implement a Leak Detection and Repair program that includes regular inspections of all equipment and pipelines to identify fugitive gas emissions.
- Conduct routine acoustic leak detection surveys along pipelines and at critical points within the CCGT plant to identify potential leaks.
- Establish a monitoring schedule that includes frequent inspections of high-risk areas, such as compressor stations, valve stations, and turbine seals.
- If a leak is detected, it must be documented and immediately rectified using appropriate repair methods to prevent further emissions.

- Ensure that all detected leaks are repaired within a specified time frame , and re-inspect the area post-repair to confirm that the leak has been fully resolved.
- Maintain detailed records of all monitoring activities, detected leaks, and repair actions for reporting to regulatory authorities.

(ii) Cumulative Impacts

- Climate change impacts will be cumulative with other GHG emissions for other projects in the region and in the country.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of climate change impacts during operation.

10.2.3.3 **NOISE IMPACTS**

The project is required for Eskom's daily peaks, where the morning peaks occur between 6am and 9am, and evening peaks between 5pm and 7pm. The assessment of noise for operational activities is therefore limited to day-time only. The plant is designed for hot starts and black starts. Hot starts and black starts may be required under emergency conditions and do not form part of normal operations for the project. The plant is, however, required to run the diesel generators once a month for an hour for testing. Two scenarios were therefore assessed:

- Scenario 1: Normal operating conditions; and,
- Scenario 2: Normal operating conditions as well as the diesel generators running for an hour.

Noise levels due to project operations (under normal operating conditions) are predicted to be within the Gauteng Noise Control Regulations of 60 dBA and proposed day-time Environmental Noise Standards for all residential NSRs within the study area. According to SANS 10103 (2008); the predicted increase in noise levels from the current baseline due to proposed project operations only is expected to result in "little" reaction with sporadic complaints at the following NSRs :

- Industrial area to directly north of the project site (day-time); and,
- Industrial area to directly west of the project site (day-time).

The 1992 Noise Control Regulations defines a "disturbing noise" as a noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more. The increase in noise levels from baseline due to project operations does not exceed 7 dBA at any NSR surrounding the project. The noise impact significance pre- and post mitigation is thus medium negative.

(i) Mitigation measures

The measures discussed in this below are measures typically applicable to industrial sites and are considered good practice by the IFC (2007) and British Standard BSI (2014). It should be noted that not all mitigation measures are to be implemented, but should the need arise the mitigation measures as discussed in this section can be considered.

- Controlling noise at source:
    - Unless it is an emergency situation, non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.
    - Complaints register, including the procedure which governs how complaints are received, managed and responses given, must be implemented, and maintained.
- Specification and Equipment Design:

- Equipment to be employed should be reviewed to ensure the quietest available technology is used. Equipment with lower sound power levels must be selected in such instances and vendors/contractors should be required to guarantee optimised equipment design noise levels.

- Enclosures/Noise Attenuation:
    - As far as is practically possible, sources of significant noise should be enclosed. The extent of enclosure will depend on the nature of the machine and their ventilation requirements. Generators, pumps and blowers are examples of such equipment.
    - It should be noted that the effectiveness of partial enclosures and screens can be reduced if used incorrectly, e.g. noise should be directed into a partial enclosure and not out of it, there should not be any reflecting surfaces such as parked vehicles opposite the open end of a noise enclosure.
    - The enclosures should provide noise attenuation to ensure that the noise levels are 85 dBA at a distance of 1 m from the equipment.
- Use and Siting of Equipment and Noise Sources:
    - Machines and mobile equipment used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily. This will reduce noise and conserve energy.
    - Acoustic covers of engines should be kept closed when in use or idling.
    - Doors to generators should be kept closed when in use.
- Maintenance:
    - Regular and effective maintenance of equipment are essential to noise control. Increases in equipment noise are often indicative of eminent mechanical failure. Also, sound reducing equipment/materials can lose effectiveness before failure and can be identified by visual inspection.
- Monitoring:
    - It is suggested that noise monitoring be undertaken during the first three months of the operations to verify and validate the modelling results from the noise study and if necessary adjust mitigation measures.
    - Following the three months noise monitoring, should noise related complaints be received short term ambient noise measurements, at the complainant, should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions. The investigation of complaints should include an investigation into equipment or machinery that likely result or resulted in noise levels annoying to the community. This could be achieved with source noise measurements.

    The following procedure should be adopted for all noise surveys (for complaints):

        - Any surveys should be designed and conducted by a trained specialist.
        - Sampling should be carried out using a Type 1 SLM that meets all appropriate IEC standards and is subject to annual calibration by an accredited laboratory.
        - The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session.

- Samples sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples, representative of the day- and night-time acoustic environment should be taken.
- The following acoustic indices should be recoded and reported: LAeq (T), statistical noise level LA90, LAFmin and LAFmax, octave band or 3rd octave band frequency spectra.
- The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface.
- Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet.
- A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic environment of each site.

(ii) Cumulative Impacts

- Noise impacts will be cumulative with the existing noise from the surrounding industrial areas and power station.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of noise impacts during operation.

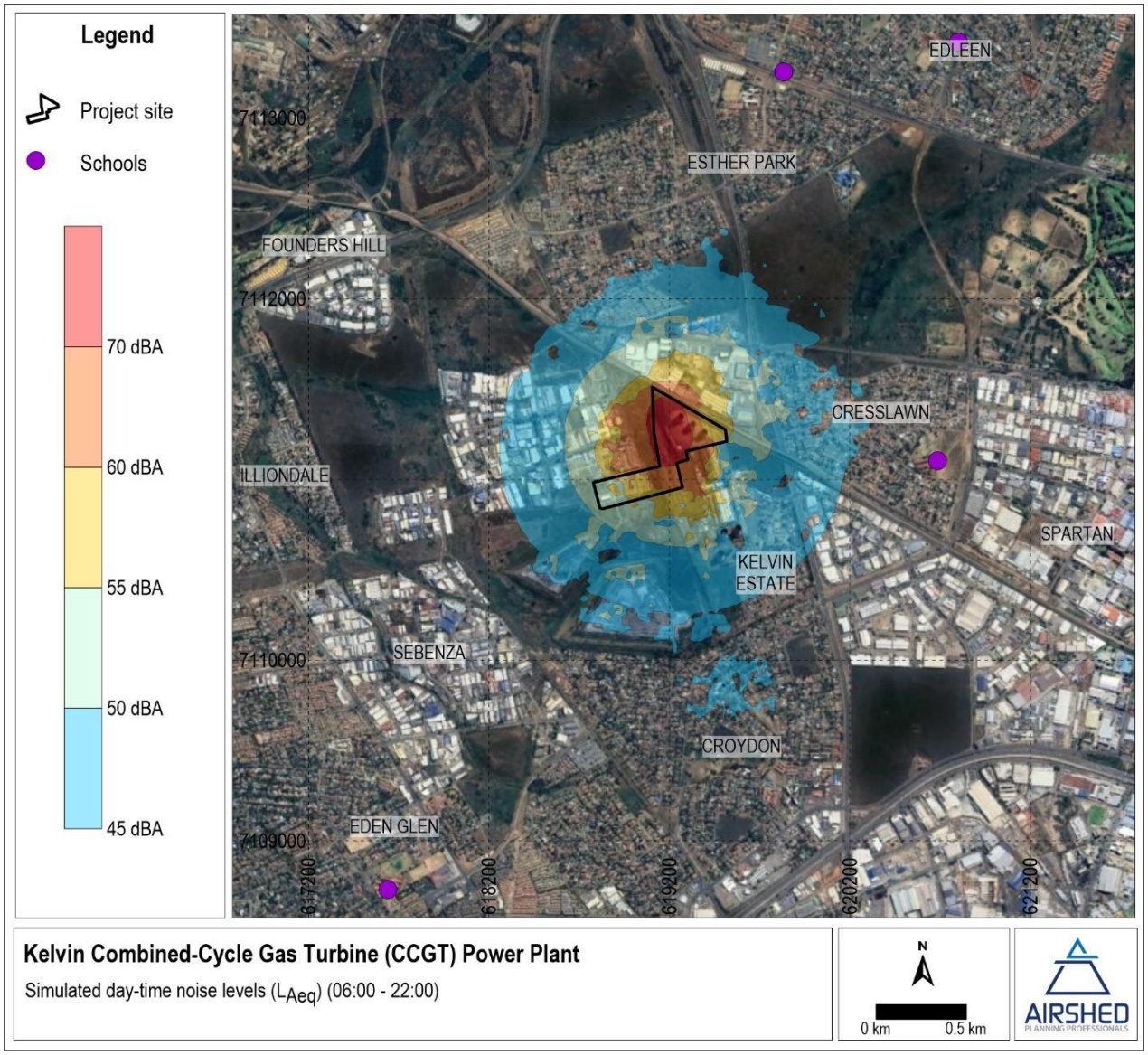

Figure 57: Simulated day-time noise levels due to proposed project operations only (Scenario 1 - Normal operating conditions)

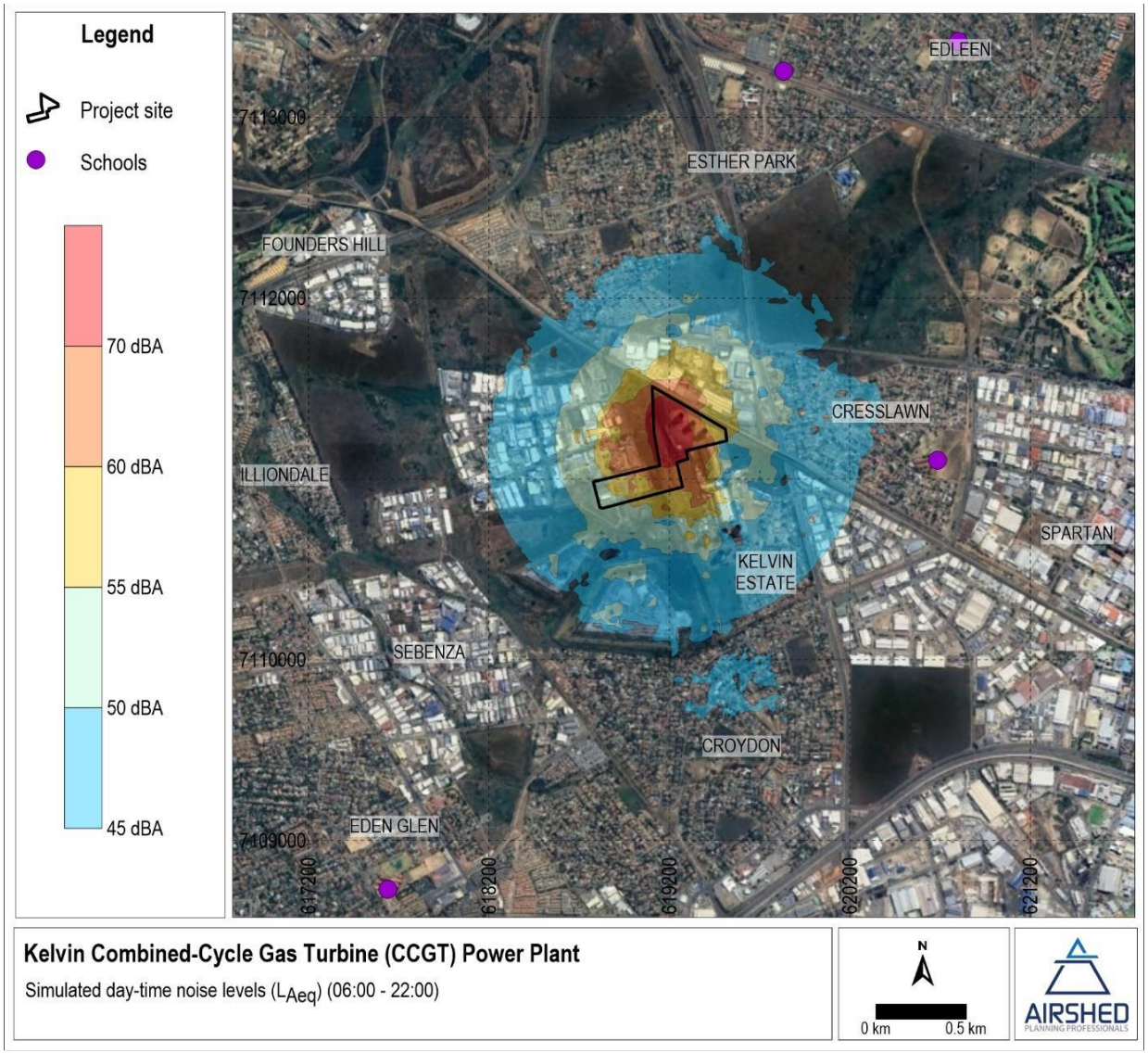

Figure 58: Simulated day-time noise levels due to proposed project operations only (Scenario 2 - Normal operating conditions as well as the diesel generators running for an hour)

10.2.3.4 IMPACT ON HEALTH AND SAFETY (GAS PIPELINE, AMMONIA STORAGE AND HYDROGEN INSTALLATIONS)

The Impact on health and safety during the operation phase was identified as being low negative before and after mitigation. All employees need to be subject to a safe and healthy working environment and the power station already has existing health and safety protocols in place, however, preventive measures such as maintenance procedures to prevent the occurrence of a catastrophic loss of containment from corrosion, fire and gas detection and firewater systems to prevent escalation as well as strict control of ignition sources and other measures, which may be required according to standards such as those prescribed by the South African National Standards system.

(i) Mitigation measures

- Kelvin shall ensure that reasonable measures are taken to ensure the safety of all site staff, including induction training for all employees and visitors.
- All staff and sub-contractors must be informed about any community concerns, especially during the construction phase. Toolbox talks can be used for this. Speed limits on the road to the site must be enforced. People that do not adhere to the speed limits shall receive the appropriate disciplinary action.
- Kelvin shall provide appropriate Personal Protective Equipment (PPE) to employees wherever required and in accordance with the risks associated with their activities.
- Kelvin shall undertake safety audits to ensure compliance with the Occupational Health and Safety Act (Act No. 85 of 1993) and associated regulations
- Kelvin shall implement a safety reporting procedure to ensure that all accidents and incidents (safety and environmental) are recorded and reported to the power station manager and EO.
- Any containers in which hazardous substances (e.g. fuel, paints, solvents) are stored shall be clearly marked as to the contents therein (in accordance with OHSA regulations).
- Kelvin must complete a detailed in the MHI study once the detailed design of the plant has been finalized.
- An MHI risk assessment that must be completed in accordance with the MHI regulations basing such a risk assessment on the final design and including engineering mitigation.
- Kelvin should prepare and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment
- Complete a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.
- Kelvin should ensure full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm.

(ii) Cumulative Impacts

The cumulative impact of all installations (gas pipeline, ammonia storage and hydrogen) was considered in the quantitative risk assessment with the worst case scenario being loss of containment of ammonia scenario – leading to a release of toxic airborne plumes. The cumulative impact was assessed to have a low negative final significance.

Mitigation would include reduction of ammonia or substitution for a less toxic component emergency response arrangements and systems, such as alarms to allow for personnel to muster in case of emergency, and

cooperation with emergency responders. Preventive measures would include design, installation according to the vendor requirements. Even with mitigation, there may be residual risk of occurrence due to failures in protection systems and break-down in procedures and documented systems.

(iii) Irreplaceable loss of Resources

- Irreplaceable loss of resources was noted to be, in the worst case scenario, loss of human life.

10.2.3.5 **VISUAL IMPACT**

The facility may be visible from several existing roads in the area. The closest residential areas are located 0,5 km away and the facility is expected to be visible from these areas. The facility is located within the power station and is surrounded by existing infrastructure therefore the overall visual impact of the proposed CCGT plants holds a low overall visual impact. The CCGT plant will also be replacing coal power plant infrastructure already in place at the A-Site, which is to be demolished prior to construction of the CCGT plant. When taking this into account the visual impact associated with the new CCGT plant would be negligible.

(i) Mitigation measures

- To reduce the visual impact of the plant in the operational phase, plant buildings and structures should be painted with colours that are not visually intrusive.
- Light fixtures must be installed that provide precisely directed illumination to reduce light “spillage” beyond the immediate surrounds of the power plant and avoid high pole top security lighting along the periphery of the site.
- The Contractor will be required to landscape certain areas requiring rehabilitation.

(ii) Cumulative Impacts

- Visual impacts will be cumulative with existing visual impacts from the power station.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is anticipated as a result of social impacts.

10.2.3.6 **SOCIAL IMPACTS**

The proposed CCGT Power Plant was assessed by the Socio-economic specialist. Social impacts identified include environmental impacts with social dimensions such as nuisance from air, noise and pollution of the catchment downstream; positive economic impacts from employment, infrastructure and/road damage from trucks; community perceptions of the project and health concerns. Socio-economic impacts were assessed to have a low-medium negative final significance whilst the impacts with a positive nature had a medium to high positive final significance.

(i) Mitigation measures

- Kelvin must develop a stakeholder engagement strategy specific to the CCGT plant
- Kelvin must continue to implement their grievance mechanism and ensure that it is community friendly. Kelvin must continue to address and keep record of community grievances. Kelvin must continue to keep a grievance register. It is important to have documented evidence of community/power station interactions. This will assist Kelvin to track the issues, and the community to see what actions the power station has taken.
- The relevant specialists will provide scientific mitigation measures for the dust and noise issues. From a social perspective it is important to continue to communicate the mitigation, monitoring and management measures to the affected parties.
- Kelvin should put measures in place to ensure the most effective local employment strategy. The strategy must include women and vulnerable people.

- Kelvin should ensure a fair number of secondary economic opportunities are given to local contractors. A percentage of goods as determined by Kelvin and the relevant stakeholders must also be procured locally. Services and goods must be procured locally as far as reasonably possible.

- All contractors and employees need to wear photo identification cards. Vehicles should be marked as construction vehicles and should have logos clearly exhibited. Entry and exit points of the site should be controlled.

- Kelvin should compile and implement a traffic safety plan in accordance with recommendations from the traffic specialist. This plan should form part of the Health and Safety requirements for all contractors. Appropriate road signage must be used at the entry and exit points to the site. Although Kelvin cannot take responsibility for all road users, they should include road safety toolbox talks.

(ii) Cumulative Impacts

- Given that Kelvin Power Station is an existing power station and that the CCGT plant will be constructed on the footprint of the previous Kelvin A site area, it must be considered that many of the impacts are existing impacts. When considering existing impacts, the complexity of the social environment must be contemplated. The activities taking place in the area surrounding the project site has also caused a number of impacts. From a social perspective it is not possible to pinpoint which percentage of any given impact result from a specific activity or proponent. For example, agricultural, tourism and mining activities may cause an influx of people into an area due to the possibility of employment creation. It is not possible to say, for example, that 30% of people moving into the area looked for an agricultural job, 60% for a mining job and 10% for a tourism job. It is possible to say that all these industries contributed to the honeypot effect (project-induced in-migration where people move to the project site in search of work or economic opportunities that arise from the project) that compounded unemployment in the area. Kelvin Power Station and its activities are not the only responsible party for the existing social impacts in the area, but the power station does contribute greatly to these impacts and will continue to do so through the life of the power station. The importance of perceptions of the public should not be under-estimated. Something perceived as a social impact should be dealt with as if it is a social impact, because the affected party experience it as an impact.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is anticipated as a result of social impacts.

10.2.3.7 **GENERATION OF ELECTRICITY**

The project will generate approximately 600MW of electricity. The proposed project involves diversification of electricity production fuel sources, improved efficiency in electricity production and a decrease in the quantity of fossil fuel burned and GHG emissions when compared to coal fired power generation. This is in line with Government's commitment to reduce the country's emissions and provide much-needed additional electricity and can therefore be seen as making a contribution to improving the sustainability of development in South Africa and reduce load-shedding.

(i) Mitigation measures

- None required

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of electricity generation.

(iii) Irreplaceable loss of Resources.

- No irreplaceable loss of resources is expected due to electricity generation.

10.2.3.8 **WASTE MANAGEMENT IMPACTS**

Waste management impacts were rated as having a low negative significance before and after mitigation. Hazardous wastes, Domestic waste and sewage are waste types that need to be considered during operation. Very little waste material is generated by a gas fired CCGT plant. Waste would generally fall into the following categories:

- Used gas turbine air intake filters (typically replaced annually);
- Used ion exchange resins (typically replaced at 5 year intervals);
- Used Reverse Osmosis membranes (if an RO plant is used);
- Separated oil / sludge from oil / water separators;
- Used lubricating oil;
- Treated effluent/wastewater
- Used oil or chemical containers; and
- General office waste.

(i) Mitigation measures

- No unauthorised waste releases into the environment should be permitted.
- A dedicated waste collection and storage facility must be prepared, and this should be emptied and collected wastes disposed of on a regular basis. Wastes must be disposed of at suitably licensed waste disposal facilities.
- Contaminated water, and effluents must be prevented from entering the local environment (soil and water), adequately stored in protected and where necessary bunded areas, and disposed of at a suitably licensed disposal facility.
- Treated effluent to be discharged into the Modderfontein spruit at the licensed discharge point
- Vermin / weatherproof bins must be provided in enough numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overfilling and other associated nuisances.
- Each active area must be checked daily to ensure that the site is free from litter and unnecessary wastes.
- Fuel storage tanks and permanent fuel storage tanks must be bunded (110% of total capacity of storage tank) in order to contain any possible spills and to prevent any infiltration of fuel into the ground.
- Hazardous substances must be stored in a secure location, isolated from direct contact with the soils and covered where necessary.

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of waste management impacts during production.

(iii) Irreplaceable loss of Resources.

- No irreplaceable loss of resources is expected as a result of waste management impacts during production.

10.2.3.9 **STORMWATER IMPACTS**

Stormwater runoff after a rainfall event needs to be managed on site. This impacted was rated as medium negative before mitigation and low negative after mitigation.

(i) Mitigation measures

- A detailed SWMP needs to be prepared.

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of stormwater during operations.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of stormwater during production.

10.2.3.10 **IMPACT ON TERRESTRIAL BIODIVERSITY**

Operation of the CCGT could have impacts on terrestrial biodiversity. Soil contamination, heat emissions, noise, light pollution, collision risks and air pollution. The overall significance of these impacts is considered to be of medium to low significance because the area has been altered from its original state however the project can still affect species in the surrounding area.

(i) Mitigation measures

- To manage heat emissions from a gas turbine power plant, the installation of green roofs and vegetative buffer zones is recommended. These measures, along with the use of reflective materials and heat recovery systems, help to reduce ambient temperature, stabilize soil conditions, and improve local vegetation health. Regular monitoring and stakeholder engagement ensure the effectiveness and adaptability of these strategies.
- The clearing of indigenous vegetation must be minimized where possible. Clearing of AIP vegetation, which dominated the project area, is advocated. All activities must be restricted to within the authorized areas.
- Materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by alien invasive plant species. All grazing mammals must be kept out of the areas that have recently been re-planted, however these animals are highly unlikely to occur within this project area.
- A habitat rehabilitation plan must be implemented, and areas of bare ground must be revegetated with species indigenous to the region. This must also apply to areas below the panels.
- A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site.
    - Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.
    - No servicing of equipment on site unless necessary.
    - All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.
    - Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.
    - Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem.

- All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.

- It must be made an offence for any staff member to remove any indigenous plant species from the project area or bring any alien species in. This is to prevent the spread of exotic or alien species or the illegal collection of plants.
- A fire management plan needs to be compiled and implemented to restrict the impact fire would have on the surrounding areas.
- The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.
- Noise must be reduced where possible in the early evenings and at night to minimise possible disturbances to reptile species and nocturnal mammals and avifauna (birds). This would be relative the phase of operation and based on respective regulations for the site locality.
- According to the Gauteng Noise Control Regulations and the standards set by SANS 10103:2008, noise levels in industrial areas should not exceed 70 dBA during the day and 60 dBA at night, but further information should be obtained relative to this specific project (https://www.eares.co.za/noise-pollution-what-are-acceptable-noise-levels-and-noise-limits-in-south-africa/) **(The recommendation has been noted by the EAP, the mitigation measures in relation to noise have been put forward by the Noise specialist)**
- No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.
- Outside lighting should be limited where possible, and designed to minimise impacts on fauna, particularly nocturnal birds which may frequent the area. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.
- Any holes/deep excavations must be demarked and, where possible, properly covered temporarily to ensure that no small fauna species fall in. Holes must be subsequently inspected daily for trapped fauna, prior to backfilling.
- An Alien Invasive Plant (AIP) Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition.
- The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths.
- A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.

(ii) Cumulative Impacts

- No cumulative impacts are expected on flora and fauna during the operations phase.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of biodiversity resources is expected during operations.

10.2.4 DECOMMISSIONING PHASE IMPACTS

Please note that the holder of the Environmental Authorisation (EA), if granted, will have to apply for a separate EA for the decommissioning phase as required under Listing Notice 1, Activity 31 of the NEMA as amended. This will necessitate the need to reassess and consider the below mentioned, and any additionally identified impacts at such time when decommissioning is considered. A detailed decommissioning and rehabilitation plan must be developed prior to decommissioning the CCGT gas fired power plant and associated infrastructure. This plan should include, but not be limited to, management of socio-economic aspects such as employment loss, removal, re-use and recycling of materials and vegetative rehabilitation to prevent erosion.

10.2.4.1 **AIR QUALITY IMPACTS**

The nature of emissions from decommissioning activities is highly variable in terms of temporal and spatial distribution and is also transient. Fugitive dust emissions are mostly generated by decommissioning and rehabilitation activities. Some gas emissions are anticipated during the decommissioning phase due vehicle entrainment and tailpipe emissions from vehicles utilised during the closure phase. Simulations of the decommissioning and closure phases were not included in the current study.

(i) Mitigation measures

- As per Section 10.2.2.1 above (construction phase dust generation)

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of dust generation during construction.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of dust generation during decommissioning.

10.2.4.2 **NOISE GENERATION**

Noise will be generated during the decommissioning phase as a result of vehicles working on-site. Noise relating to the decommissioning phase of this project can be described as a nuisance rather than having environmental or health implications. The impact significance is rated as low negative before and after mitigation, as the proposed activities will take place within the power station area, which is subject to existing noises from power station activities. Potential sensitive receptors within the project area, include residential areas, i.e. Esther Park, Edleen, Cresslawn, Croydon, Illiondale, and Edenvale.

(i) Mitigation measures

- As per section 10.2.2.2 above (construction phase noise generation).

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of noise during the decommissioning phase.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of noise during the decommissioning phase.

10.2.4.3 **WASTE MANAGEMENT IMPACTS**

Waste management impacts were rated as having a low negative significance before and after mitigation. Domestic waste, construction waste and sewage are all waste types that need to be considered during decommissioning.

(i) Mitigation measures

- As per Section 10.2.4.3 above (construction phase waste management impacts).

(ii) Cumulative Impacts

- No cumulative impacts are expected as a result of waste management impacts during decommissioning.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of waste management impacts during decommissioning.

10.2.4.4 **CLIMATE CHANGE IMPACTS**

During its decommissioning phase the project will emit Greenhouse Gasses (GHGs), the quantities of which will be estimated during the decommissioning impact assessment of the project.

(i) Mitigation measures

- Relevant mitigation measures shall be determined during the decommissioning phase EIA as there is not enough detail to assess the climate change impacts from decommissioning activities.

(ii) Cumulative Impacts

- Climate change impacts will be cumulative with other GHG emissions for other projects in the region and in the country.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of climate change impacts during decommissioning.

10.2.4.5 **JOB LOSSES**

As a result of the facilities closing down and being decommissioned, employees that worked during the production phase of this project no longer be able to hold their working position at the facility. This impact was rated with a medium negative significance before and after the mitigation.

(i) Mitigation measures

- Ensure contributions are made for employees to the Unemployment Insurance Fund (UIF).

(ii) Cumulative Impacts

- Employees that had a position at the facility will have to go without a working income until they can find another position.
- Contribution to unemployment within the local municipality due to decommissioning.

(iii) Irreplaceable loss of Resources

- No irreplaceable loss of resources is expected as a result of job losses during decommissioning.

10.2.5 NO-GO ALTERNATIVE

The no-go alternative option means ‘do nothing’ or the option of not undertaking the proposed CCGT plant project or any of its activities, consequently leading to the continuation of the current land-use, which is leaving the location as open space within the power plant area. As such, the ‘do nothing’ alternative or keeping the current status quo of an empty open space with no activities occurring on-site also provides the baseline against which the impacts of all other alternatives were compared. The no-go alternative would also mean the potential positive impacts associated with electricity generation and job creation would not be realized.

10.2.6 OVERALL PREFERRED ALTERNATIVE

Layout alternatives are the only reasonable alternatives considered for the proposed project. A single preferred layout was assessed, assessment for the optimum location for the proposed development considered many aspects such as the decommissioning and demolition of the A-station infrastructure including the three cooling towers and location of existing servitudes, environmental, social, health and safety aspects and requirements

both during construction and operational activities, as well as the need for temporary laydown areas, traffic, access and egress and optimisation and utilisation of existing infrastructure. Various specialists assessed the proposed site for potential sensitive environmental features and noted the site to be of low sensitivity with no specific features of high sensitivity or requiring avoidance. This was deemed sufficient by the EAP and no requirements for other layout alternatives was raised. As such, this alternative presents the preferred layout alternative (Alternative 1).

10.2.7 ENVIRONMENTAL IMPACT STATEMENT

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. Based on the nature and extent of the proposed project, the limited level of disturbance predicted as a result of the Kelvin CCGT Power Plant development, the findings of the specialist studies, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team and the EAP that the significance levels of the majority of identified negative impacts can generally be reduced to an acceptable level by implementing the recommended mitigation measures and the project should be authorized on condition that the below recommended conditions are included in the decision and that compliance with the EMPr must be strictly adhered to.

10.2.8 CUMULATIVE IMPACT STATEMENT

Without proper mitigation measures and continual environmental management, most of the identified impacts may potentially become cumulative, affecting areas outside of their originally identified zone of impact. The potential cumulative impacts have been identified, evaluated, and mitigation measures suggested and have been updated during the investigation.

When considering cumulative impacts, it is important to bear in mind the scale at which different impacts occur. There is potential for a cumulative effect at a broad scale, such as regional deterioration of air quality, as well as finer scale effects occurring in the area surrounding the activity. The main impacts which have a cumulative effect on the project regional scale were noted to be social, visual, noise, climate change and air quality and MHI impacts. Although some cumulative impacts are hard to quantify, however, MHI cumulative impacts, were noted to have a low negative significance.

It has been further noted that within the 30km radius of the proposed project, the impacts of the proposed development will be cumulative with PV projects as identified by the Screening tool. The closest PV facility development to the project area is the proposed PV installation at OR Tambo International Airport. Refer to Figure 59 for map showing Renewable Energy Developments within 30km of the proposed development area.

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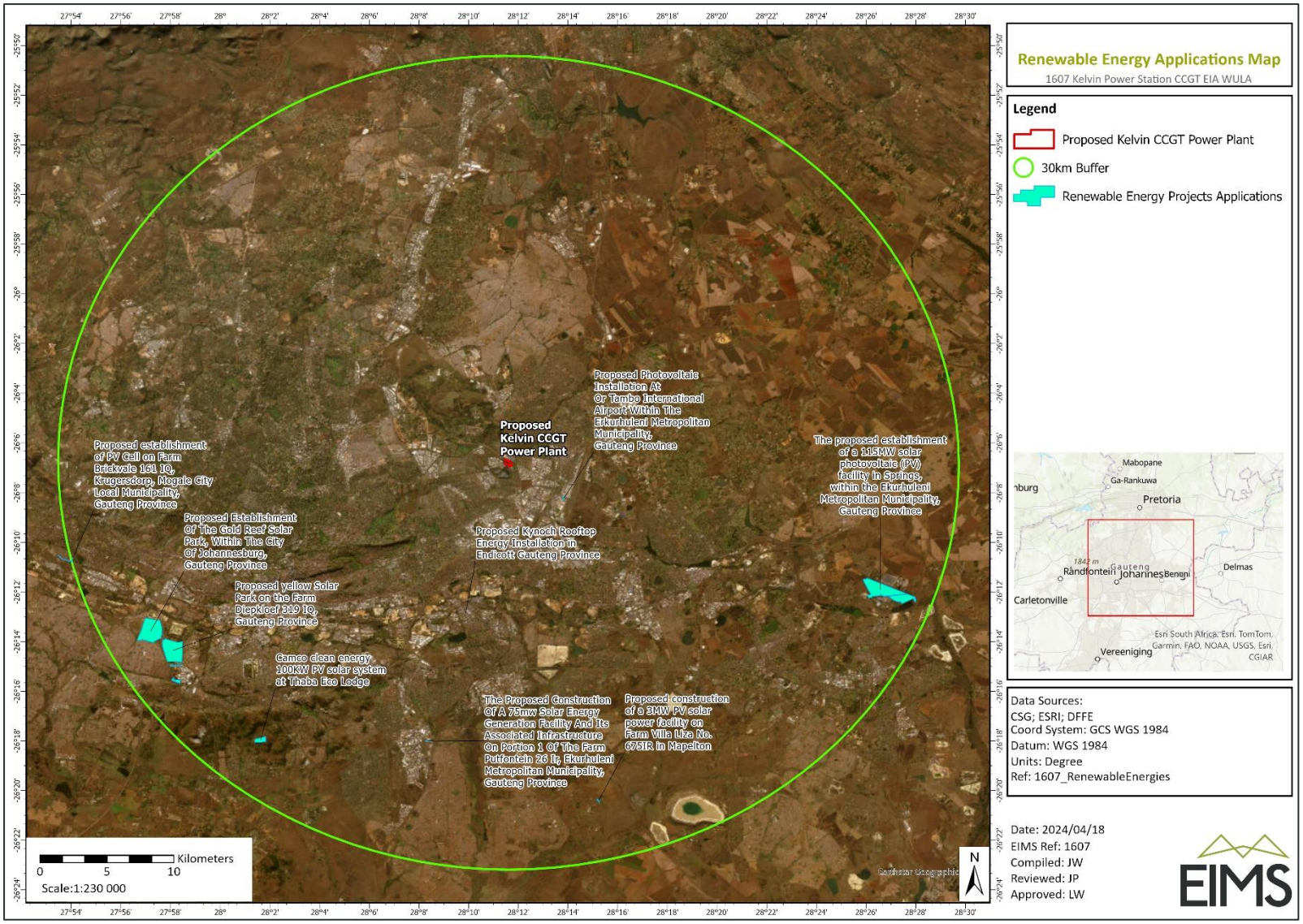

Figure 59: Renewable Energy applications within 30km of the site.

10.3 SUMMARY OF IMPACTS

A summary of all the identified impacts, their associated phase, as well as their impact calculations and significance are presented in Table 36 below.

Table 36: Identified preliminary impacts

IMPACT DESCRIPTION			Pre-Mitigation							Post Mitigation								Priority Factor Criteria			
Impact	Alternative	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Soil Compaction and Erosion: Movement of heavy machinery and construction activities can lead to soil compaction, reducing permeability and aeration, and increasing the risk of erosion. This can affect the regeneration of indigenous plants and overall soil fertility.	Alternative 1	Construction	-1	2	3	3	3	4	-11	-1	1	3	2	1	3	-5.25	Medium	2	2	1.25	-6.5625
Dust Pollution: Ongoing construction activities generate dust that can impact surrounding terrestrial habitats by settling on the ground and altering the microhabitats for soil organisms.	Alternative 1	Construction	-1	3	3	4	3	5	-16.25	-1	2	3	3	3	4	-11	Medium	2	2	1.25	-13.75
Chemical Spills: The use of construction materials and machinery poses a risk of chemical spills, which can contaminate the soil and affect both soil quality and the organisms that depend on it.	Alternative 1	Construction	-1	3	3	4	3	4	-13	-1	2	3	3	3	3	-8.25	Medium	2	2	1.25	-10.3125
Noise Pollution: Construction noise can disrupt local fauna, particularly during critical periods such as breeding seasons. Persistent noise may lead to longer-term displacement of any sensitive species.	Alternative 1	Construction	-1	3	3	4	2	4	-12	-1	3	3	3	2	3	-8.25	Medium	1	1	1.00	-8.25
Vehicle and Machinery Impact: Increased vehicular and machinery movement poses a risk of direct harm to wildlife and can lead to the creation of barriers to animal movement, particularly affecting small and less mobile species.	Alternative 1	Construction	-1	2	3	4	2	3	-8.25	-1	2	3	3	2	3	-7.5	Medium	1	1	1.00	-7.5
Anthropogenic Activity: Continuous human presence and activity can deter fauna from returning to or settling in the area, particularly impacting species sensitive to human disturbance.	Alternative 1	Construction	-1	2	3	4	3	3	-9	-1	2	3	3	3	2	-5.5	Medium	1	1	1.00	-5.5
Waste Generation: Construction waste, if not managed properly, can lead to pollution and ingestion hazards for wildlife, including small mammals and birds that might forage in the area.	Alternative 1	Construction	-1	2	3	4	3	3	-9	-1	2	3	3	3	3	-8.25	Medium	2	2	1.25	-10.3125
Clearing of Remaining Vegetation: Additional clearing may be necessary for construction, further reducing local biodiversity and impacting any surviving indigenous plants.	Alternative 1	Construction	-1	2	3	2	2	3	-6.75	-1	1	2	1	1	2	-2.5	Medium	1	1	1.00	-2.5
Dust Deposition: Dust from construction can continue to impact surrounding plant communities by settling on leaves, thereby inhibiting photosynthesis and growth.	Alternative 1	Construction	-1	3	3	4	3	3	-9.75	-1	2	3	3	3	3	-8.25	Medium	2	1	1.13	-9.28125
Introduction of Invasive Species: Construction activities can facilitate the spread of invasive plant species, which can outcompete and displace indigenous vegetation, further altering the local ecosystem.	Alternative 1	Construction	-1	3	3	4	3	3	-9.75	-1	2	3	3	2	2	-5	Medium	2	2	1.25	-6.25
Soil Contamination: Continuous operation can lead to small, cumulative spills of hydrocarbons and other chemicals that can seep into the soil, potentially affecting soil health and microorganism populations.	Alternative 1	Operation	-1	3	4	3	4	4	-14	-1	2	3	2	3	3	-7.5	Medium	2	2	1.25	-9.375
Heat Emissions: The heat released from the plant can alter the local microclimate, affecting soil temperature and potentially influencing local vegetation growth and soil-dwelling organisms.	Alternative 1	Operation	-1	3	4	3	3	4	-13	-1	3	3	2	2	3	-7.5	Medium	2	1	1.13	-8.4375
Noise Pollution: Ongoing operation of the power station generates noise, which can disrupt local wildlife. Persistent noise can interfere with communication, breeding, and feeding behaviors of nearby fauna.	Alternative 1	Operation	-1	3	4	4	3	4	-14	-1	3	4	3	2	3	-9	Medium	1	1	1.00	-9
Light Pollution: The facility's lighting can affect nocturnal animals, altering their natural behaviors and potentially displacing them from their habitats.	Alternative 1	Operation	-1	2	4	4	3	4	-13	-1	2	4	3	2	3	-8.25	Medium	1	1	1.00	-8.25
Collision Risks: Birds and bats may collide with power station structures, particularly during migration periods or in poor weather conditions.	Alternative 1	Operation	-1	2	4	3	3	4	-12	-1	1	3	2	2	3	-6	Medium	1	1	1.00	-6
Air Emissions: Emissions from the gas turbines, including nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter, can settle on nearby vegetation, affecting plant health and growth. Over time, this can lead to reduced photosynthesis and plant vigor.	Alternative 1	Operation	-1	3	4	3	3	4	-13	-1	3	4	2	3	3	-9	Medium	2	1	1.13	-10.125
Altered Hydrology: The operation of the power station might alter local hydrology, especially if water is used for cooling processes. This can impact the availability of water for local plant communities, leading to stress or changes in species composition.	Alternative 1	Operation	-1	3	4	3	4	3	-10.5	-1	2	4	2	3	2	-5.5	Medium	2	1	1.13	-6.1875
Concerns about safety of the CCGT Plant	Alternative 1	Planning	-1	3	2	3	2	5	-12.5	-1	3	2	2	2	3	-6.75	High	1	1	1.00	-6.75
Concerns about crime	Alternative 1	Construction	-1	3	2	4	2	5	-13.75	-1	3	2	3	2	4	-10	High	2	1	1.13	-11.25
Environmental nuisance	Alternative 1	Construction	-1	3	2	2	2	5	-11.25	-1	3	2	2	2	4	-9	High	2	2	1.25	-11.25
Traffic related impacts	Alternative 1	Construction	-1	3	2	3	2	5	-12.5	-1	3	2	2	2	4	-9	High	2	1	1.13	-10.125
Jobs and economic benefits	Alternative 1	Construction	1	3	2	3	2	4	10	1	3	2	4	2	5	13.75	High	2	1	1.13	15.46875
Jobs and economic benefits	Alternative 1	Operation	1	3	4	3	2	4	12	1	3	4	4	2	5	16.25	High	2	1	1.13	18.28125
Cleaner energy generation	Alternative 1	Operation	1	4	4	3	3	4	14	1	4	4	4	3	5	18.75	High	2	1	1.13	21.09375
Impacts on existing infrastructure and services	Alternative 1	Planning	-1	2	3	3	3	3	-8.25	-1	2	3	3	3	1	-2.75	Medium	1	2	1.13	-3.09375
Impacts on soil and agriculture	Alternative 1	Construction	-1	2	4	2	3	2	-5.5	-1	2	2	1	2	2	-3.5	Medium	1	1	1.00	-3.5
Impact on Air Quality	Alternative 1	Construction	-1	3	2	2	2	3	-6.75	-1	3	2	2	2	2	-4.5	Medium	1	1	1.00	-4.5
Impact on Air Quality	Alternative 1	Operation	-1	3	4	2	2	3	-8.25	-1	3	4	2	2	3	-8.25	Medium	1	1	1.00	-8.25
Impact on Air Quality	Alternative 1	Decommissioning	-1	3	2	3	2	3	-7.5	-1	3	2	3	2	2	-5	Medium	1	1	1.00	-5
Increase in noise levels	Alternative 1	Construction	-1	3	2	3	2	3	-7.5	-1	3	2	2	2	3	-6.75	Medium	1	1	1.00	-6.75
Increase in noise levels	Alternative 1	Operation	-1	3	4	4	3	4	-14	-1	3	4	2	3	3	-9	Medium	1	1	1.00	-9
Increase in noise levels	Alternative 1	Decommissioning	-1	3	2	3	2	3	-7.5	-1	3	2	2	2	3	-6.75	Medium	1	1	1.00	-6.75
Job losses	Alternative 1	Decommissioning	-1	4	4	4	2	4	-14	-1	4	4	2	2	4	-12	Medium	1	1	1.00	-12
Climate Change Impacts	Alternative 1	Operation	-1	5	4	5	4	4	-18	-1	5	4	5	4	4	-18	Medium	2	2	1.25	-22.5
Climate Change Impacts	Alternative 1	Construction	-1	4	3	3	2	3	-9	-1	4	3	2	2	3	-8.25	Medium	1	1	1.00	-8.25
Waste Management Impacts	Alternative 1	Operation	-1	2	4	3	3	3	-9	-1	2	4	2	3	3	-8.25	Medium	1	1	1.00	-8.25
Waste Management Impacts	Alternative 1	Decommissioning	-1	2	2	3	3	3	-7.5	-1	2	2	2	3	3	-6.75	Medium	2	2	1.25	-8.4375
Heritage Impacts (Incl Fossils)	Alternative 1	Construction	-1	2	5	2	2	1	-2.75	-1	2	5	1	2	1	-2.5	Medium	1	2	1.13	-2.8125
Visual Impacts	Alternative 1	Operation	-1	3	4	1	3	4	-11	-1	3	4	1	3	3	-8.25	Medium	3	1	1.25	-10.3125
Impacts due to communication inefficiency	Alternative 1	Planning	-1	3	4	4	3	3	-10.5	-1	3	2	2	2	2	-4.5	Medium	2	1	1.13	-5.0625
Natural gas pipeline installation	Alternative 1	Operation	-1	2	5	5	5	1	-4.25	-1	1	4	5	5	1	-3.75	Medium	1	3	1.25	-4.6875
Hydrogen Installation	Alternative 1	Operation	-1	2	5	4	5	1	-4	-1	1	5	4	5	1	-3.75	Medium	1	3	1.25	-4.6875
Ammonia Storage	Alternative 1	Operation	-1	2	5	5	5	1	-4.25	-1	1	5	4	5	1	-3.75	Medium	1	3	1.25	-4.6875
Cumulative Risk Impact of Project	Alternative 1	Operation	-1	2	5	5	5	1	-4.25	-1	5	4	5	5	1	-4.75	High	1	3	1.25	-5.9375

11 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets in a region. The sensitivity mapping technique integrates numerous datasets (base maps and shapefiles) into a single consolidated layer making use of Geographic Information System (GIS) software and analysis tools. Environmental sensitivity mapping is a rapid and objective method applied to identify areas which may be particularly sensitive to development based on environmental, cultural and social sensitivity weightings – which is determined by specialists' input within each respective field based on aerial or ground-surveys. Therefore, the sensitivity mapping exercise assists in the identification of sensitive areas within and surrounding the proposed CCGT power plant area.

This sensitivity mapping approach allows for the proposed activities to be undertaken whilst protecting identified sensitive environmental areas/ features through more rigorous mitigation (where possible). Areas identified as no-go would be fully excluded from any project related development regardless of the level of mitigation put forward. Furthermore, environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes.

The compilation of this map has taken into consideration the individual raking of sensitivity by the following respective specialist disciplines:

- Air Quality and Health Risk;
- Noise;
- Social;
- Soils and Agriculture; and
- Terrestrial Biodiversity (Plant, Animal and Ecology)

It is however noteworthy that some sensitivities identified by the EAP and the specialist team such as waste generation, communication inefficiencies, etc. were excluded from the sensitivity map as their effects cannot be directly or accurately measured to ascertain spatial sensitivity. Furthermore, from the Soils and Agriculture specialist and the Terrestrial biodiversity specialist did not identify sensitive features on site and rated the site's sensitivity as 'very low', whilst suggesting suitable mitigations to limit cumulative impacts emanating from the proposed area. Noise simulations and were also conducted for the construction and operational phases, discussed in Section 10.2, above.

It is clear from the figure below that there are limited biophysical sensitivities in the project area. The key sensitivities will be the potentially sensitive air quality and noise receptors nearby the project area which include residential areas within 5km of the project stie, i.e. Esther Park, Edleen, Cresslawn, Kelvin Estate, Croydon, Eden Glen and Illiondale as well as residential areas within 10 km from the project site which include Edenvale, Kempton Park, and Lethabong as well as OR Tambo International Airport. Refer to Figure 60 for the final sensitivity map for the propped Kelvin CCGT power plant development.

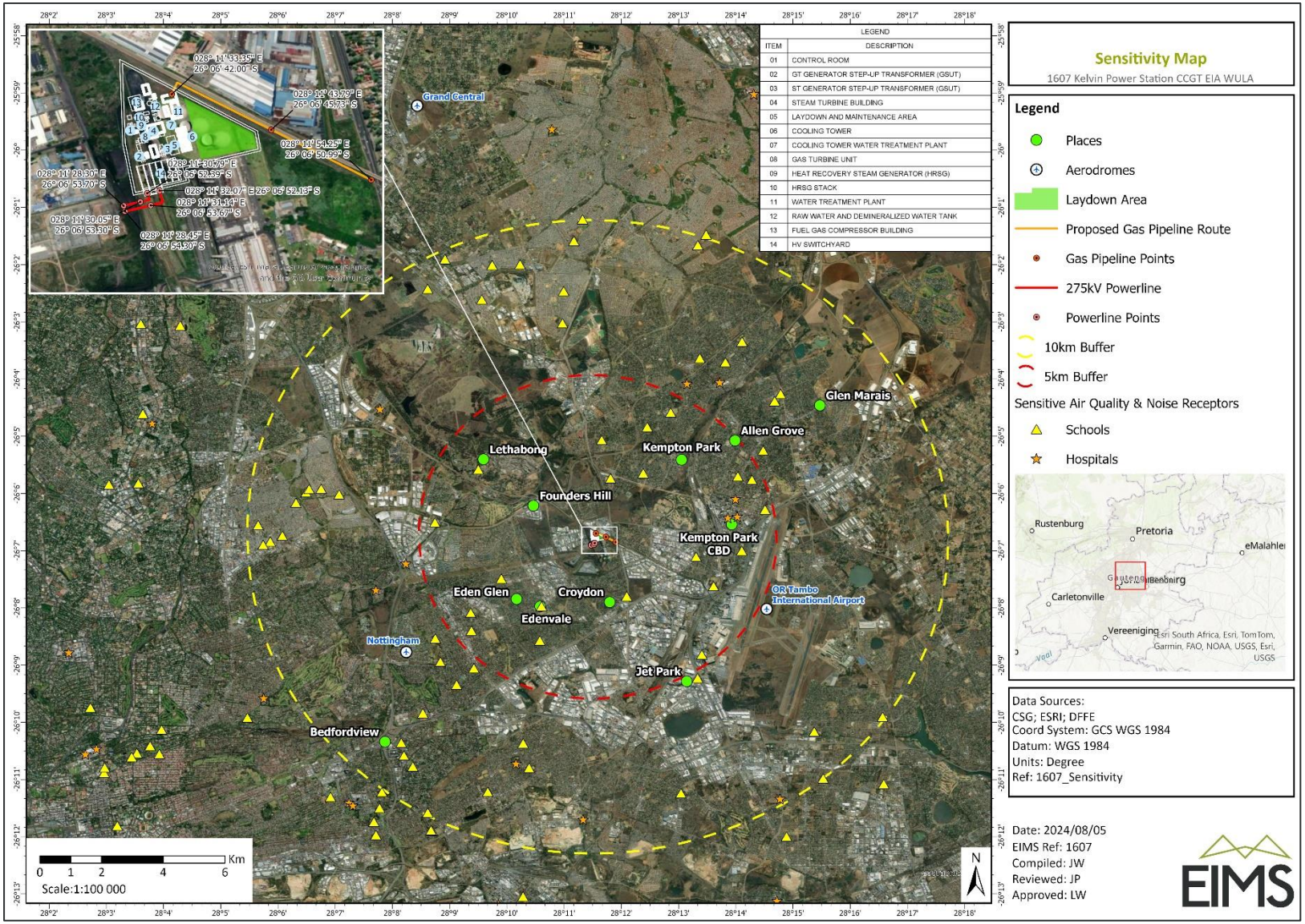

Figure 60: Final Sensitivity Map

12 CONCLUSIONS AND RECOMMENDATIONS

The Scoping Phase of the EIA process pre-identified potential issues and impacts associated with the proposed project and following the scoping consultation process, valuable comments were received from various I&APs which the EAP and specialist team considered carefully in the drafting of this EIA phase reports. The EIA Phase addressed those identified potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with applicable phases of the project and recommendations made of appropriate mitigation measures for potentially significant environmental impacts. The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised through the EIA process had been captured and adequately considered.

The EIA Phase aimed to achieve the following:

- Provide an overall assessment of the social, economic and biophysical environments affected by the proposed project.
- Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed project.
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
- Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

12.1 CONCLUSIONS FROM SPECIALIST STUDIES

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive, and every effort has been made to include representatives of all stakeholders in the study area. The main conclusions from each of the specialist studies are presented below.

12.1.1 AIR QUALITY STUDY CONCLUSIONS

The baseline air quality assessment found the following:

- The flow field is dominated by winds from the northwestern sector with calm conditions of 2%.
- Potential sensitive receptors within 5 km from the project include residential areas, i.e. Esther Park, Edleen, Cresslawn, Kelvin Estate, Croydon, Eden Glen and Illiondale. Residential areas within 10 km from the site include Edenvale, Kempton Park, and Lethabong.
- AQMS within the study area include Buccleugh AQMS (~11.5 km northwest of the project) and Alexandra AQMS (~7.8 km west of the project) owned by the City of Johannesburg; and Bedfordview AQMS (~8.8 km southwest of the project) owned by the Ekurhuleni Metropolitan.
- Non-compliance of the daily and annual NAAQS for PM10 and PM2.5 were recorded for the period 2023 at the Alexandra AQMS.

The findings from the air quality impact assessment due to project operations are as follows:

- The project was assessed for the operational phase:
    - Scenario 1: Normal operations assuming MES where exhaust gas goes through the main stacks.
    - Scenario 2: Normal operations assuming US EPA emission factors for SO_2. This scenario was included to understand the range in SO_2 ground level concentrations based on emission factors designed for gas turbines and sulfur content of the natural gas being used.

- Scenario 3: Normal operations assuming MES where off-gas goes through the main stacks and gas generators running for 1 hour per month assuming MES where off-gas goes through the main stack (when normal operations are not taking place). Only short-term impacts were assessed, i.e. highest hourly and highest daily (99th percentile).
- Scenario 4: Normal operations assuming US EPA emission factors for SO_2 and gas generators running for 1 hour per month assuming MES. Only short-term impacts were assessed for SO_2, i.e. highest hourly and highest daily (99th percentile).

- Simulated SO_2 concentrations for the project operations complied with NAAQS across the modelling domain for all scenarios.
- Simulated NO_2 concentrations for the project operations complied with NAAQS across the modelling domain for all scenarios.
- Simulated PM concentrations for the project operations complied with PM10 and PM2.5 NAAQS across the modelling domain for all scenarios.
- Annual SO_2 and NO2 concentrations due to project operations were below critical levels for vegetation throughout the domain for all scenarios.
- Simulated dust fallout due to project operations was well within the NDCR over the modelling domain.

The impact significance rating for the construction, operation and closure phases for the project was "**low**".

The Air Quality specialist thus concluded that the proposed CCGT Power Plant has lower air quality impacts that the existing coal fired power station (Station B) and will provide an improvement on air quality in the area. From an air quality perspective, it is recommended that the project go ahead on condition that:

- Emissions due to construction activities be mitigated using good practise guidelines.
- The emissions from the project comply with MES.

12.1.2 CLIMATE CHANGE STUDY CONCLUSIONS

The calculated CO2e emissions from the project (Scope 1), estimates 5 853 t for the project construction (3 774 tpa) and 19 210 749 t for the project operations (960 537 tpa). The project Scope 1 emissions due to the project would contribute approximately 0.001% (construction) and 0.33% (operation) of the remaining carbon budget per year and represent a contribution of 0.001% (construction) and 0.26% (operation) to the 2022 National GHG inventory total.

Local reporting requirements have yet to be developed to describe and assess environmental impacts for GHGs. Guidance is thus taken from international guidelines such as that developed for the Sacramento Metropolitan Air Quality Management District (SMAQMD, 2014). As part of the process to determine if a full GHG analysis and mitigate programme is required, an Initial Study is implemented to determine if a project may have a significant effect on the environment. As such a threshold of 1.1 Gg CO2e (project construction phase) and 10 Gg CO2e (operational phase) for stationary source projects per year is applied to new projects (SMAQMD, 2014). These thresholds were based on capturing 90% of the development projects across the state, ensuring that small projects, which generally have low emission levels, and would generally not be considered significant. As an alternative method of measure, a GHG threshold may be based on the classification of projects by the European Bank for Reconstruction and Development (EBRD), in which projects contributing more than 25 Gg CO2e per year to have significant GHG emissions (EBRD 2019). This is in line with the International Finance Corporation (IFC 2012). Section 8 of the IFC Performance Standards on Environmental and Social Sustainability: "For projects that are expected to or currently produce more than 25 000 Gg CO2e annually the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary, as well as indirect emissions associated with the off-site production of energy used by the project.

Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognised methodologies and good practice". In terms of the Equator Principles, a developer that is seeking funding from a financial institution that subscribes to the Equator Principles is required to publicly report on its combined Scope 1 and Scope 2 GHG emissions if it exceeds 100 Gg CO2e annually, for the operational phase of the project, during the life of the loan (Equator Principles, 2013). The Equator Principles also encourage clients to report publicly on projects emitting over 25 Gg CO2e, in line with the IFC Performance Standards (Equator Principles, 2013). As a further example, the South African Declaration of Greenhouse Gases as Priority Pollutants (Government Gazette 40966 of 21 July 2017) define production processes in Annexure A of the Declaration with the requirement to submit a Pollution Prevention Plan (PPP) to the Minister for approval with GHG in excess of 100 Gg CO2e.

When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects could replace existing development or baseline activity that has a higher GHG profile. Therefore, the significance of a project's emissions should be based on its net impact over its lifetime, which may be positive, negative or negligible. To meet the South African (SA) NDC targets and interim budgets, action is required to reduce GHG emissions from all sectors, including projects in the built and natural environment. The proposed project must therefore consider whether and how the project will contribute to or jeopardise the achievement of these targets. Such an assessment would however require a much broader evaluation of the project against all current energy mix and their resources practiced in South Africa. In the absence of such a comprehensive assessment, the current assessment will rely on using thresholds to define the significance of the GHG impact.

The proposed intensity rating for annual emissions is as follows:

25 Gg CO2e	:	Very Low (i.e., threshold used by EBRD, IFC and Equator Principals)
25 – 100 Gg CO2e	:	Low (i.e., DFFE PPP requirement threshold is 100 Gg CO2e)
100 – 500 Gg CO2e	:	Medium (i.e., DFFE PPP to 0.1% of the total gross SA GHG emissions)
500 – 5 000 Gg CO2e	**:**	**High (i.e., 0.1% to 1.0% of the total gross SA GHG emissions)**
>5 000 Gg CO2e	:	Very High (i.e., more than 1.0% of the total gross SA GHG emissions)

Project specific information together with local and internationally published emission factors were used to calculate Scope 1 (direct), Scope 2 (indirect) and Scope 3 (indirect) GHG emissions for the proposed project. Locally published literature was referred to, to understand the projected changes to climate for the area. Based on information provided, the project is likely to result in an estimated total of 5 853 t CO_2e direct emissions and 7 355 t CO_2e indirect emissions due to construction activities. For project operations, the estimated total GHG emissions is 19 210 749 t CO_2e (direct) and 3 872 961 t CO_2e (indirect). This was calculated to represent 0.001% (construction) and 0.33% (operation) of the remaining South African annual GHG budget. The impact of the project on climate change was assessed to have a **high** negative risk rating. As such, the project will be required to report carbon dioxide equivalent (CO_2e) emissions annually via the NAEIS.

The Climate Change Specialist stated that although South Africa is on a drive to eliminate fossil fuel driven energy, this needs to be done with a Just Energy Transition. This includes the gradual movement towards lower carbon technologies, while not negatively impacting society, jobs and livelihoods. The Just Energy Transition is important to the country and to our future growth and sustainability as an organisation. From a GHG emissions perspective reference is made to the United Stated Environmental Protection Agency's (US EPA's) Emissions and Generation Resource Integrated Database (eGRID), released in 2018 with 2016 data, which shows that at the national level, natural gas units have an average emission rate of 898 pounds CO_2 per megawatt-hour (MWh), while coal units have an emissions rate of 2,180 pounds CO_2 per MWh . Natural gas units, therefore, on average, release ~58% less CO2 per MWh compared to coal units.

From the perspective of climate change and given that GHG emissions are lower than coal burning electricity generation, it is the opinion of the specialist that the project be authorised, on condition that GHG emissions are reported annually according to legal requirements.

12.1.3 TERRESTRIAL BIODIVERSITY CONCLUSIONS

The study area includes all areas that maintain little to no native vegetation and/or where anthropogenic activity has substantially modified an area's primary ecological functions and species composition. Within the study area, these areas are comprised of the entrance area consisting of a gate and guard house, roads, parking lots – together with coal power station infrastructure such as cooling towers and various operational buildings. These areas include very few, if any, indigenous species and are associated with alien and invasive plant species.

The Terrestrial biodiversity study thus disputed the screening tools Animal Theme, Plant theme and Terrestrial theme sensitivity rating of High, Medium and Very High to Low, Very Low and Very Low, respectively.

The Terrestrial Biodiversity study concluded that the project area exists in a predominantly modified and degraded state, having been subjected to various anthropogenic impacts such as human ingress, brush cutting and vegetation clearing, dumping of rubble, high numbers of alien and invasive plants, overall transformation, coal storage areas, operating of a coal-fired power station and other related disturbances. This habitat is unlikely to recover without human intervention and will continue to degrade further without active rehabilitation.

Completion of the terrestrial biodiversity assessment led to the dispute of the 'Very High' classification for the terrestrial biodiversity theme sensitivity as allocated by the National Environmental Screening Tool. The project area is instead assigned an overall terrestrial sensitivity of 'Very Low'.

It is the opinion of the Terrestrial Ecology specialist that the proposed development is favourable only if all mitigation measures provided the Terrestrial Report and other specialist reports are implemented.

12.1.4 SOILS AND LAND CAPABILITY (AGRICULTURE) CONCLUSIONS

The three representative soil forms that were identified within the 50 m buffer area include the Nkonkoni, Glenrosa and Witbank soil forms. The proposed project area is dominated by the Witbank and Glenrosa soil forms and with Nkonkoni soil form being the least dominant soil form within the 50 m buffer area. The study area falls predominately on shallow red apedal soil which are mostly covered by transported anthropogenic materials.

The most sensitive soil form identified within the proposed project area, with a moderate suitability for crop production is the Nkonkoni soil form. The Nkonkoni soil form consists of an orthic topsoil horizon on top of a red apedal horizon underlain with a lithic horizon below. The soil is characterised with a moderate suitability for crop production due to its good drainage, aeration and inherent fertility. However, the presence of a shallow lithic horizon may impede root development and decrease the total soil water storage capacity which is critical for crop production under rainfed conditions.

Other less sensitive soil forms identified within the project area include Glenrosa and Witbank soil forms. The Glenrosa soil form consists with an orthic topsoil horizon on top of a lithic horizon below. The Witbank soil form consists of transported technosols mainly anthropogenic material covering natural soil. These soils are considered to have a lower suitability for crop production due to their restrictive limitations which include impermeable subsoil horizon of a fractured rock and occurrence of various elements at high concentrations that can be toxic for majority of important agronomic crops, which are found within the transported anthropogenic materials.

The most sensitive land capability of the above-mentioned soils has been determined to be class "IV", and the other less sensitive soils were determined to be of class "VI" and "VIII." The land capability class "IV" is characterised with severe limitations with a low arable potential and is mostly suitable for long term leys. The land capability class "VI" is characterised by limitations that preclude cultivation, and is mostly suitable for veld, pasture, and afforestation. Lastly, the land capability class "VIII" is characterised with extremely severe limitations, non-arable and is mostly suitable for wildlife. A climate capability of level 8 has been assigned to the proposed project area given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. By using the determined land capability for the most sensitive soils and the determined climate capability, a land potential of "L6" was calculated for the most sensitive land capability class. The land potential level for the less sensitive soil forms was calculated to be "L7" and "L8". The areas associated with the "L6", "L7" and "L8" land potential are considered to be non-arable.

Considering the soil properties, agricultural potential as well as the current land use of the proposed development area, the soil specialist concluded that the site has a “Low” agricultural sensitivity. Based on the confirmed sensitivities, the overall sensitivity of the proposed project area is also categorized as “Low”.

It is the specialist’s opinion that the proposed development will have an overall low residual impact on the agricultural production ability of the land. The approval of the project is subject to implementation of the proposed mitigation measures. Therefore, the proposed Kelvin Power Station can be considered for authorities by the Competent Authority

12.1.5 NOISE STUDY CONCLUSIONS

Survey sites were selected after careful consideration of future activities, accessibility, potential noise sensitive receptors, and safety restrictions. A total of 5 survey sites was selected for the survey conducted in February 2024. The survey sites were located within areas identified as sensitive receptors in the vicinity of the proposed development area included residential areas, namely, Esther Park, Edleen, Cresslawn, Croydon, Illiondale, and Edenvale.

Noise impacts anticipated during the construction phase of the project are anticipated from heavy vehicles, machinery and equipment. A noise simulation was conducted, with the assumption that construction activities would only occur in the daytime periods. It was predicted that the results due to project construction activities would be within the Gauteng Noise Control Regulations of 60 dBA and the proposed Environmental Noise Standards at all residential NSRs within the study area. For a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level is not detectable. According to SANS 10103 (2008); the predicted increase in noise levels from the current baseline due to proposed project construction activities only is expected to result in “no” reaction. As such the impact had a low negative final significance rating.

Daytime impacts of noise were assessed for the operational phase of the project as it was noted that the project is required for Eskom’s daily peaks, where the morning peaks occur between 6am and 9am, and evening peaks between 5pm and 7pm. The plant is designed for hot starts and black starts. Hot starts and black starts may be required under emergency conditions and do not form part of normal operations for the project. The plant is, however, required to run the diesel generators once a month for an hour for testing. Two scenarios were therefore assessed:

- Scenario 1: Normal operating conditions; and,
- Scenario 2: Normal operating conditions as well as the diesel generators running for an hour.

The 1992 Noise Control Regulations defines a “disturbing noise” as a noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more. The increase in noise levels from baseline due to project operations does not exceed 7 dBA at any NSR surrounding the project. The noise impact significance pre- and post mitigation is thus medium negative.

The below listed measures are typically applicable to industrial sites and are considered good practice by the IFC (2007) and British Standard BSI (2014). The specialist has thus recommended that should the need arise, the following mitigation measures are to be implemented:

- Controlling noise at source:
    - Unless it is an emergency situation, non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.
    - Complaints register, including the procedure which governs how complaints are received, managed and responses given, must be implemented, and maintained.
- Specification and Equipment Design:
    - Equipment to be employed should be reviewed to ensure the quietest available technology is used. Equipment with lower sound power levels must be selected in such instances and

vendors/contractors should be required to guarantee optimised equipment design noise levels.

- Enclosures/Noise Attenuation:
    - As far as is practically possible, sources of significant noise should be enclosed. The extent of enclosure will depend on the nature of the machine and their ventilation requirements. Generators, pumps and blowers are examples of such equipment.
    - It should be noted that the effectiveness of partial enclosures and screens can be reduced if used incorrectly, e.g. noise should be directed into a partial enclosure and not out of it, there should not be any reflecting surfaces such as parked vehicles opposite the open end of a noise enclosure.
    - The enclosures should provide noise attenuation to ensure that the noise levels are 85 dBA at a distance of 1 m from the equipment.
- Use and Siting of Equipment and Noise Sources:
    - Machines and mobile equipment used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily. This will reduce noise and conserve energy.
    - Acoustic covers of engines should be kept closed when in use or idling.
    - Doors to generators should be kept closed when in use.
- Maintenance:
    - Regular and effective maintenance of equipment are essential to noise control. Increases in equipment noise are often indicative of eminent mechanical failure. Also, sound reducing equipment/materials can lose effectiveness before failure and can be identified by visual inspection.
- Monitoring:
    - In the event that noise related complaints are received short term ambient noise measurements, at the complainant, should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions. The investigation of complaints should include an investigation into equipment or machinery that likely result or resulted in noise levels annoying to the community. This could be achieved with source noise measurements.

The following procedure should be adopted for all noise surveys (for complaints):

- Any surveys should be designed and conducted by a trained specialist.
- Sampling should be carried out using a Type 1 SLM that meets all appropriate IEC standards and is subject to annual calibration by an accredited laboratory.
- The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session.
- Samples sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples, representative of the day- and night-time acoustic environment should be taken.
- The following acoustic indices should be recoded and reported: LAeq (T), statistical noise level LA90, LAFmin and LAFmax, octave band or 3rd octave band frequency spectra.
- The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface.

- Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet.
- A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic environment of each site.

The Noise Impact Assessment report concluded that the noise impacts due to the project operations are within the Environmental Noise Standards at the closest NSRs if the plant operates with the sound pressure of 85 dBA at a distance of 1 m from all equipment. This may be achieved by including noise attenuators or enclosures where feasible. As such, the findings of the assessment and provided attenuation measures are in place, it is the specialist opinion that the project may be authorised.

12.1.6 SOCIO-ECONOMIC STUDY

The proposed CCGT will be situated between a residential and a light industrial area. The communities are already exposed to a number of social and environmental impacts from different sources. Given its location, it is not expected that the project will cause a significant influx of people into the area, as there are already people with some skills in the area that the power station could employ.

From an SIA perspective, the construction of the CCGT plant will not create significant social impacts, because it is on an industrial site in an industrial area. The project will create significant employment opportunities, which is a positive impact.

The following recommendations are made:

- Kelvin must develop a stakeholder engagement strategy specific to the CCGT plant;
- Kelvin must implement a community-friendly external grievance mechanism in conjunction with farmers and communities;
- Kelvin should put measures in place to ensure the most effective local employment strategy, in conjunction with local leadership;
- Kelvin must ensure that social requirements as specified in the mitigation measures are included in their contracts with sub-contractors.

The list of recommendations should be included in the environmental authorisation. From a social perspective, there are no fatal flaws. Therefore, the recommendation is that the construction of the CCGT plant should be approved on the condition that Kelvin puts certain social processes such as a grievance mechanism and community engagement strategy in place.

12.1.7 MAJOR HARZADOUS INSTALLATION - QUANTITATIVE RISK ASSESSMENT CONCLUSIONS

The Quantitative Risk Assessment stated that risk calculations are not precise. Accuracy of predictions is determined by the quality of base data and expert judgements. The risk assessment included the consequences of fires and explosions at the proposed CCGT facility in Kempton Park. A number of well-known sources of incident data were consulted and applied to determine the likelihood of an incident to occur.

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

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

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

12.1.7.1 NOTIFIABLE SUBSTANCES

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

The notifiable threshold for ammonia is listed as 20 tonne in a single vessel. As the proposed installation should not exceed the threshold limit, ammonia will not be classified as a notifiable substance.

12.1.7.2 POWER PLANT AND ASSCOCIATED EQUIPMENT

Hazardous substances associated with this facility would include; ammonia; hydrogen, diesel and natural gas. Of the listed substances, only ammonia and natural gas could result in offsite fatalities. The risk of 1x10-6 fatalities per person per year isopleth found to be immediately beyond but primarily within the site boundary.

12.1.7.3 IMPACTS ONTO NEIGHBOURING PROPERTIES, RESIDENTIAL AREAS AND MHIS

A large release of ammonia could extend a considerable downward distance impacting the commercial and residential areas of Kempton Park, Edenvale and Lethabong. However, fatalities will be limited to the industrial area and will not impact residential areas.

No residential area or vulnerable institutions would be seriously impacted with the construction and operation of the proposed CCGT.

12.1.7.4 MAJOR HAZARD INSTALLATIONS

This investigation concluded that under the current design conditions, the proposed CCGT facility in Kempton Park **would be considered as a Major Hazard Installation** and would require notification in accordance with the MHI regulations.

According to chapter 3 the “Classification of pipelines as major hazard establishment” of Major Hazard Installation Regulations, 2022:

A pipeline is considered an establishment if it contains a fluid which is or is to be conveyed in a pipeline as a gas which is flammable in air (is applicable to flammable gases conveyed as a gas. In such cases the additional duties only apply when the flammable gas is conveyed at a pressure in excess of 8 bars absolute. This covers such fluids as methane, butane and propane).

It should be noted that this study is not intended to replace the Major Hazard Installation risk assessment, which should be completed prior to construction of the terminal once final designs are available.

12.1.7.5 RECOMMENDATIONS

As a result of the risk assessment study conducted for the proposed CCGT facility in Kempton Park, a number of events were found to have risks beyond the site boundary. These risks could be mitigated to acceptable levels, as shown in the report.

RISCOM did not find any fatal flaws that would prevent the project proceeding to the detailed engineering phase of the project, and would support the project under the following conditions most of which will be detailed in the MHI study:

Compliance with all statutory requirements, i.e., pressure vessel designs;

- Compliance with applicable SANS codes, i.e., SANS 10087, SANS 10089, SANS 10108, etc. ;
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs;
- Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place;
- Full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm:
    - Including demonstration from the designer that sufficient and reliable instrumentation would be specified and installed at the facility;
- Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment: Including compliance to statutory laws, applicable codes and standards and world's best practice;
    - Including compliance to statutory laws, applicable codes and standards and world's best practice;
    - Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
    - Including the auditing of the built facility against the safety document;
    - Noting that codes such as IEC 61511 can be used to achieve these requirements;
- Demonstration by the CCGT owner or their contractor that the final designs would reduce the risks posed by the installation to the South African requirements as prescribed in SANS 1461 (2018);
- Signature of all terminal designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs;
- Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (with input from local authorities);
- Any increases to the product list or product inventories must be with the approval of the authorities under NEMA;
- Final acceptance of the facility risks with an MHI risk assessment that must be completed in accordance with the MHI regulations; Basing such a risk assessment on the final design and including engineering mitigation.

12.1.8 CIVIL AVIATION COMPLIANCE STATEMENT ATNS RECOMMENDATIONS

The proposed Kelvin Gas to Power project is in close proximity to OR Tambo International Airport (5km east of project site), Rand Airport (15km southwest of project site), and Grand Central airport (15km north of project site).

As agreed at the meeting with ATNS on 24 June 2024, this assessment would need to be completed prior to construction commencing, once all detailed designs are completed and once it is clear exactly where the infrastructure will be located. It is not possible to commence with the obstacle evaluation assessment until final locations for the project infrastructure are confirmed. Mitigation measures have been incorporated in the

project EMPr in this regard to ensure Kelvin Power complete the relevant obstacle assessment for the CCGT project prior to construction commencing.

Written comment was also requested from the SA Civil Aviation Authority for this application. The SACAA confirmed in line with the above, that an obstacle assessment would be required to be conducted through ATNS.

12.2 RECOMMENDATIONS FOR INCLUSION IN ENVIRONMENTAL AUTHORIZATION

The following key specialist recommendations are made for inclusion in the EA for the project:

- Kelvin shall appoint a suitably qualified and competent ECO who shall preferably be independent from the Applicant. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field. The ECO should have appropriate qualification and experience in the implementation of environmental management specifications. The ECO shall be tasked with auditing the environmental compliance on a regular basis (monthly). The Applicant shall provide the ECO with the necessary support to ensure that the environmental aspects relating to the development is adhered to.
- The EMPr must be made binding on all sub-contractors (if utilised) operating on behalf of Kelvin.
- Kelvin shall develop and implement an Emergency Preparedness and Response Plan which shall include and provide for the following as a minimum:
    - Risk assessment;
    - Response procedures;
    - Provision of equipment and resources;
    - Designation of responsibilities;
    - Communication and reporting (including that with potentially affected communities)
    - Periodic training to ensure effective response; and
    - Periodic review and revision, as necessary, to reflect changing conditions.
- Kelvin shall undertake safety audits to ensure compliance with the Occupational Health and Safety Act (Act No. 85 of 1993) and associated regulations
- Kelvin must complete a detailed in the MHI study once the detailed design of the plant has been finalized.
- An MHI risk assessment that must be completed in accordance with the MHI regulations basing such a risk assessment on the final design and including engineering mitigation.
- Kelvin should prepare and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment
- Complete a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.
- Kelvin should ensure full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm.

- An obstacle evaluation application must be undertaken prior to construction with Air Traffic Navigation services.
- Kelvin must develop a stakeholder engagement strategy specific to the CCGT plant. From a social perspective it is important to continue to communicate the mitigation, monitoring and management measures to the affected parties.
- Kelvin should ensure a fair number of secondary economic opportunities are given to local contractors. A percentage of goods as determined by Kelvin and the relevant stakeholders must also be procured locally. Services and goods must be procured locally as far as reasonably possible.
- Develop a pamphlet that describes the new technology, any safety issues and risks and how the risks are managed. Distribute to surrounding communities through existing channels such as WhatsApp groups and Home Owners Associations.
- A waste storage area must be established within the site camp/construction camp that provides for appropriate and adequate waste storage and waste separation for recycling. All waste must be adequately contained to prevent ground and/or water pollution. The total volume of general waste stored shall not exceed 100m3. In the case that a storage capacity exceeding this amount is required or planned for, the necessary waste permits must be obtained in accordance with the NEMWA beforehand.
- The site camp/construction camp shall have adequate provision for the storage of hazardous waste (e.g. old oil filters, soil from spills etc.) and the waste shall be contained within closed containers to prevent the possibility of spillages.
- All fuel storage areas shall be bunded to contain at least 110 % of the volume stored and will comply with the relevant safety regulations. Fuel storage areas may not be located within 100m of the watercourse and the total volume of fuel stored on site may not exceed applicable thresholds in the listing notices without the necessary authorisation in terms of the NEMA. Fuel storage areas must be provided with an impervious surface with the provision to contain any potential fuel spillages during refuelling (e.g. a bunded, sealed concrete slab which drains to a sump/oil separator). No person smoke or take part in any activity that may results in sparks near fuels and other flammable substances to prevent ignition.
- An Alien Invasive Plant Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition.
- A final site walkthrough must be conducted prior to the construction phase. The site walkthrough must be conducted during the summer season between October and March. Priority must be the identification of any listed flora species. Although not noted during the site visit conducted for the EIA, any observed TOPS (Threatened or Protected Species) of plants must be clearly demarcated prior to the commencement of site clearing. If construction activities are likely to affect any SCC or protected plants these individuals must be relocated as part of a plant rescue and protection plan, and a permit must be obtained before doing so.
- A stormwater management plan must be compiled and implemented.

13 ASSUMPTIONS AND LIMITATIONS

Certain assumptions, limitations, and uncertainties are associated with the EIA Phase. This report is based on information that is currently available and, as a result, the following limitations and assumptions are applicable:

13.1 GENERAL

- The EIA report is based on the technical information and process description provided by the client;
- It is worth noting that the supplier of gas has not been identified yet. The assumption is that the supply of gas will be stable and long term;
- The description of the baseline environment has been obtained from desktop analysis, previous specialist studies completed for the A-Station decommissioning project and specialist studies completed by the specialist team for the project.

13.2 AIR QUALITY

- The AIR is limited to the proposed facility during construction and normal operations only. The gas supply pipeline to the boundary fence; and the associated powerline development did not form part of the scope of this assessment as this project focuses only on the footprint activities inside the proposed project boundary fence.
- Emissions associated with the construction phase were based on the conservative US EPA emission factor.
    - The average monthly area in which construction would occur was calculated assuming the full facility extent (18 ha) and the planned number of months of construction.
    - It was assumed that construction would extend over a 36 to 42-month period based on 10 hours per day (7am to 5pm) and 5 days per week (Monday to Friday).
- Current Station B operations were quantified and simulated. This included stack emissions only and did not account for the coal transport and handling.
- Only normal project operations were assessed. The impacts due to emergency activities were not modelled.
- The project will operate at a 65% capacity. The general daily operations were provided as follows:
    - Morning peak between 6am and 9am;
    - Evening peak between 5pm and 7pm.
- The plant is designed for hot starts Natural Gas and black starts using diesel generators. Hot starts and black starts many be required under emergency conditions and do not form part of normal operations for the project. The plant is, however, required to run the diesel generator (10 MW) once a month for an hour for testing. Impacts due to the monthly testing was quantified and simulated. It was assumed that the generator would operate at MES and would emit off-gasses through the Bypass Stack 1.

13.3 CLIMATE CHANGE

- The following Scope 3 categories are excluded since these are not regarded applicable to the project:
    - Capital Goods .
    - Upstream Leased Assets.
    - Downstream Leased Assets.

- Franchises.
- Investments.

- Emissions from treated water as sufficient detailed information is not available at this stage of the project.
- Emissions which are likely to be negligible compared with other emissions from the project, including:
  - Emissions associated with combustion of fuels used in minor quantities such as welding gases, oils and greases.
  - Emissions due to clearing of vegetation as the construction is assumed to be on disturbed ground.

Input data assumptions used in estimating GHG emissions for the construction phases of the project are provided below:

- General:
  - The construction period was assumed to be 3.5 years (36-42 months).
- Scope 1:
  - The area to be cleared was assumed to be 0 ha as the area is already disturbed.
  - Assuming 3.5 years of construction. It is anticipated that up to four 250kW diesel powered generators (stationary) will be operated during the construction period, the average consumption for each generator per hour is approximate 55 l/h at full capacity, therefore the estimate is calculated on 8-hour day for 5 days a week resulting in 1 601 600 litres of diesel for the project duration.
  - Total diesel consumption estimated at 169 200 litres/year for mobile machinery/vehicles, assuming 3.5 years of construction.
- Scope 2:
  - No additional grid power will be used for construction.
- Scope 3:
  - It is estimated that there will be 50 construction material delivery trips per day, on average for 5 days a week, over an assumed 24-month peak construction period. The assumed distances travelled on average is 50km one-way. This equates to an estimated total distance of 1,300,000km. For long distance transport of abnormal loads from the Port of Durban to the site, it is estimated that there will be 30 trips in total, with a travel distance of 580km one-way. This equates to a total distance of 17,400km.
  - A total of 10 500m^3 of concrete will be required.
  - 400 tons of steel will be required.
  - 46 tons of Municipal waste is to be generated.
  - Distance to be travelled from site to landfill in a year is 177 km (assumed 25 km distance to landfill and transported in 13t trucks).
  - Distance to be travelled by commuters by car is 3 360 000 km. Estimates are based off an assumption that 20% of the workforce will use private vehicles. Approximately 120 car occupants will use 92 commuter cars (average occupancy of 1.3 passengers per car) to access the Site per day during construction activities. This estimation is based on a general calculation

of 40 km (round trip, i.e. 20 km in the morning and 20 km in the evening). This estimate is based on most of the workforce coming from Tembisa.

- Distance travelled by commuters by taxi is 931 840 It is estimated that approximately 80% of the workforce will commute by either minibus taxi or bus to the Site during construction activities. Due to the current servicing of public transport around the Site, it is anticipated that taxi transport will be prominent (80% minibus taxis, 20% buses).
- Distance travelled by commuters by bus is 77 653 km. Estimates are based off an assumption that 80% of the workforce will use minibus taxis or busses. Approximately 480 commuters will make use of public transport; of which approximately 384 commuters will use minibus taxis, and 96 commuters by bus. This equates to 26 taxi's (15 passenger capacity) and 3 buses (45 passenger capacity).

Input data assumptions used in estimating GHG emissions for the Operational phases of the project are provided below:

- General:
  - The facility is to be in operation for 20-years.
- Scope 1:
  - The amount of fuel to be consumed for the total capacity up to 600 MW, for the mid-merit operation, will be approximately 13 million GJ per annum. The estimated volume required, should the plant run 65% of the year, is 574 million m3 per annum.
  - Over the course of a year up to 5 complete black starts are expected. Each of these starts would require the 10MW diesel generators to run for up to 4 hours. It is estimated that 60,000 litres of diesel per year are required for this purpose.
  - The average for diesel consumption on site for the past eight years is approximately 170,000 litres/year. It is expected that this diesel consumption will be transferred from Station B (expected to be offline by 2029) to the Kelvin redevelopment plant. 182 039 litres per year are thus assumed.
- Scope 2:
  - A portion of the electricity generated will be used to operate the plant. The electricity consumed will be up to 15 MW, out of the up to 600 MW generated. No additional power will be taken from the grid.
- Scope 3:
  - The normal potable water for the plant is estimated at 10-12t/day is as 3650 – 4380 t/annum.
  - 70 tons/year of industrial waste are to be produced
  - 95 tons/year of municipal solid waste is to be produced
  - It is assumed that 635 km/year will be travelled from site to landfill in a year (Assumed 25 km distance to landfill and transported in 13t trucks)
  - Distance to be travelled by commuters by car is 673 846 km/year. It is anticipated that approximately 100 personnel will be required to operate the plant. Personnel will travel from surrounding areas per day. It is estimated than 60% of personnel will be skilled workers and will be travelling to Site by car. This equates to an estimated number of 60 commuters travelling to Site by car each day.

- Distance to be travelled by commuters by taxi is 62 293 km/year. It is estimated that approximately 40% of the workforce will commute by either minibus taxi or bus to the Site during the operational phase. Due to the current servicing of public transport around the Site, it is anticipated that taxi transport will be prominent (80% minibus taxis).
- 5 191 km/year to be travelled by bus. It is assumed that 32 people will travel by bus.

13.4 TERRESTRIAL BIODIVERSITY

- It is assumed that all information received from the client and landowner is accurate;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The assessment area (project area) was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- The area was surveyed during a single site visit, therefore, this assessment does not consider temporal trends (note that the data collected is considered sufficient to derive a meaningful baseline);
- The single site visit was conducted during the dry season, and this means that certain flora and fauna would not have been present or observable due to seasonal constraints. However, due to the modified condition of the project area and the limited indigenous biodiversity, the season would be unlikely to affect the outcome of this study;
- Whilst every effort was made to cover as much of the project area as possible, representative sampling was completed, and by its nature it is possible that some plant and animal species that are present within the project area were not recorded during the field investigations; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by up to 5 m.

13.5 SOILS AND LAND CAPABILITY (AGRICULTURE)

- Soil fertility analysis was not conducted on-site for this report;
- The GPS used for ground truthing is accurate to within five meters. Therefore, the wetland and the observation site's delineation plotted digitally may be offset by at up to five meters to either side; and
- No heavy metals have been assessed nor fertility been analysed for the relevant classified soils.

13.6 NOISE ASSESSMENT

- The quantification of sources of noise was limited to the construction and operational phase of the project. Closure and decommissioning phase activities are expected to be similar to construction phase and its impacts only assessed qualitatively. Noise impacts will cease post-closure.
- Although other existing sources of noise within the area were identified, such sources were not quantified but were taken into account during the survey.
- Construction activities for the project will be from 7am to 5pm, 5 days per week (Monday to Friday).
- The estimated construction will take approximately 36-42 months, with mobile equipment and activities generating the maximum noise only 50% of the time.
- Ony normal project operations were assessed. The impacts due to emergency activities were not modelled.

- It was provided that all equipment for operations will be selected to limit the sound pressure to below 85 dBA in any passage or work area. This will be achieved by ensuring that the noise of all equipment at 1 m will be less than 85 dBA. This may be achieved by including noise attenuators or enclosures where feasible. The attenuation modelling of the noise impacts under operating conditions takes this into account.
- The project will operate a 65% capacity (8760 hours per year). The general daily operations were provided as follows:
    - Morning peak between 6am to 9am;
    - Evening peak between 5pm and 7pm.
- Hot starts would be 30-40 minutes in duration.
- Black starts would be for 4 hours per occurrence and there would be up to 5 black starts per year (fewere as the Gauteng grid becomes more resilient).
- The environmental noise assessment focussed on the evaluation of impacts for humans. It is important to note that the applicability of environmental noise assessments to wildlife is limited as it is not possible simply to infer the impacts of anthropogenic noise on wildlife from the human literature. This is because the hearing ranges and sensitivities of non-human animals can be very different from those of humans. Noise studies on humans understandably use methodologies that tailors the quantification of anthropogenic noise to our hearing capabilities: for example, the use of microphones limited to the human hearing range (20 Hz – 20 kHz) and the implementation of frequency filters effectively mimicking human auditory sensitivity (A-weighting). As such, noise measurements may only cover part of the relevant acoustic range for other species. Moreover, species differences in behaviour, physiology, and ecology, in addition to hearing capabilities and perception, mean that extrapolations from human studies can provide only a limited understanding of the potential impact of anthropogenic noise on wildlife.

13.7 SOCIO-ECONOMIC

- Not every individual in the community could be interviewed therefore only key people in the community were approached for discussion. An online questionnaire has been distributed to everyone on the EIMS database. Additional information was obtained using existing data.
- The social environment constantly changes and adapts to change, and external factors outside the scope of the project can offset social changes, for example changes in local political leadership, droughts, or economic conditions. It is therefore difficult to predict all impacts to a high level of accuracy, although care has been taken to identify and address the most likely impacts in the most appropriate way for the current local context within the limitations. In addition, it is also important to manage social impacts for the life of the project, especially in the light of the changing social environment.
- Social impacts can be felt on an actual or perceptual level, and therefore it is not always straightforward to measure the impacts in a quantitative manner.
- Social impacts commence when the project enters the public domain. Some of these impacts will occur irrespective of whether the project continues or not, and other impacts have already started. These impacts are difficult to mitigate, and some would require immediate action to minimise the risk.
- There are different groups with different interests in the community, and what one group may experience as a positive social impact, another group may experience as a negative impact. This duality will be pointed out in the impact assessment section of the report.

- Social impacts are not site-specific but take place in the communities surrounding the proposed development.

13.8 MAJOR HARZADOUS INSTALLATION - QUANTITATIVE RISK ASSESSMENT

The risk assessment was based on the conceptual designs of the facility, excluding the details still to be determined from the detailed designs. Furthermore, EIAs are intended to suggest mitigation which may alter the design and layout of the project. It is thus understood that detailed designs would be required to complete the project for construction.

RISCOM used the information provided and made engineering assumptions as described in the document for the purposes of compiling this quantitative risk assessment. The accuracy of the document would be limited to the available documents presented for the completion of this report. However, the inventory of hazardous goods of the facility is not expected to increase from the amounts stated in this document and despite the potential of an improved site layout, we expect the maximum impacts to be representative.

With the detailed designs, we expect additional mitigation, which should reduce the risks as recommended.

The greatest impact on accuracy would be omissions from the design presented, changes to the process, substitution of hazards goods (typically), as required by the equipment supplier or the increase of hazardous goods inventory. These would be evaluated under the Major Hazardous Installation regulations, prior to construction.

The risk assessment excludes the following:

- Natural events, such as earthquakes and floods;
- Ecological risk assessment;
- The risk assessment of the underground pipeline leading up to the plant boundary;
- An emergency plan.

14 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I **John von Mayer** herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected Parties has been correctly recorded in the report.

Signature of the EAP

Date: 2024/08/14

15 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I **John von Mayer** herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with Interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

Signature of the EAP

Date: 2024/08/14

16 REFERENCES

Aivalioti, S. (2015). Electricity sector adaptation to heat waves. Sabin Center for Climate Change Law. Columbia Law School.

Alber, G. (2011). Cities and Climate Change. Thematic report prepared for Cities and Climate Change Global Report on Human Settlements 2011. Retrieved from http://www.unhabitat.org/grhs/2011

Amdur, M. (1978). Effects of Sulfur Oxides on Animals. In J. Nriagu, Sulphur in the Environment. Part II: Environmental Impacts (pp. 61 -74). Toronto: John Wiley and Sons.

Barnett, E. & Casper, M. 2001. Research: A definition of "social environment". American Journal of Public Health. 91(3): 465.

Beall, J. 2005. Exit, voice and tradition: loyalty to chieftainship and democracy in metropolitan Durban, South Africa. Crisis States Programme Working papers series no. 1. Development Studies Institute (DESTIN).

Bell, P.A., Fisher, J.D., Baum, A. & Greene, T.C. 1996. Environmental Psychology – Fourth Edition. Florida: Harcourt Brace College Publishers.

Booth, C., & Bennett, C. (2002). Gender Mainstreaming in the European Union: Towards a New Conception and Practice of Equal Opportunities? European Journal of Women's Studies, 9(4), 430-446.

CEPA/FPAC Working Group. (1999). National Ambient Air Quality Objectives for Particulate Matter. Part 1: Science Assessment Document. Gatineau, Quebec: Canadian Environmental Protection Agency (CEPA) Federal-Provincial Advisory Committee (FPAC) on Air Quality Objectives and Guidelines.

CI]. (2004). ADMS Urban Training. Version 2. Unit A.

Colin, M., Palhol, F., & Leuxe, A. (2016). Adaptation of transport infrastructures and networks to climate change. 6th Transport Research Arena, Transportation Research Procedia, 14, 86-95.

Constitution of the Republic of South Africa, 1996

Coppock, R., & Nostrum, M. (1997). Toxicology of oilfiend pollutants in cattle and other species. Vegreville, Alberta: Alberta Research Council, ARCV97-R2,.

Corn, M., Kotsko, N., Stanton, D., Bell, W., & Thomas, A. (1972). Response of Cats to Inhaled Mixtures of SO2 and SO2-NaCl Aerosol in Air. Archives of Environmental Health, 24, 248-256. doi:https://doi.org/10.1080/00039896.1972.10666079

Costa, D., & Amdur, M. (1996). Air Pollution. In C. Klaasen, M. Amdur, & D. J, Casarett and Doull's Toxicology: The Basic Science of Poisons (pp. 857-882). New York: McGraw-Hill.

Cox, B., Gasparrini, A., Catry, B., Fierens, F., Vangronsveld, J., & Nawrot, T. (2016). Ambient Air Pollution-Related Mortality in Dairy Cattle: Does It Corroborate Human Findings? Epidemiology, 27(6), 779-786. doi:10.1097/EDE.0000000000000545

CSIR. (2019). Retrieved from Green Book: Adapting South African settlements to climate change.: www.greenbook.co.za

CSIR. (2019). Retrieved from Green Book: Adapting South African settlements to climate change.: www.greenbook.co.za

Dankelman, I. (2002). Climate change: Learning from gender analysis and women's experiences of organising for sustainable development. Gender & Development.

Davis, C. E. (2014). The International Traveler's Guide to Avoiding Infections. Myers, J., Young, T., Galloway, M., Manyike, P. and Tucker, T. 2011 'References esponding to climate change in southern Africa – the role of research',.

DBSA. (2012). State of South Africa's Economic Infrastructure: Opportunities and challenges. Development Bank of South Africa.

Denton, F. (2002). mate change vulnerability, impacts and adaptation: Why does gender matter? Gender and Development, 10(2), 10-20.

Department of Arts and Culture. (2016). Revised White Paper on Arts, Culture and Heritage, Second Draft. Pretoria: Department of Arts and Culture.

Department of Water Affairs. (2013). Second National Water Resources Strategy. Pretoria: Department of Water and Sanitation.

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

DFFE. (2012, June 29). National Ambient Air Quality Standard for Particulate Matter with Aerodynamic Diameter less than 2.5 micron metres (PM2.5). Department of Environmental Affairs, Government Gazette No. 35463, 29 June 2012.

DFFE. (2013). National Environmental Management: Air Quality Act, 2004 - National Dust Control Regulations. Pretoria, SA: Department of Environmental Affairs.

DFFE. (2013). Regulations Prescribing Format of Atmospheric Impact Report. Department of Forestry, Fisheries and the Environment, Government Gazette No. 36904, 11 October 2013.

DFFE. (2013, March 31). List of activities and associated minimum emission standards. Department of Environmental Affairs, Government Gazette No. 37054, 22 November 2013.

DFFE. (2014). Regulations regarding Air Dispersion Modelling. Department of Environmental Affairs, Government Gazette No. 37804, 11 July 2014.

DFFE. (2017). Amendment of the Environmental Impact Assessment Regulations (Listing Notice 1 of 2014). Department of Forestry, Fisheries and the Environment, Government Gazette No. 40772 (No. 327), 7 April 2017.

DFFE. (2017). Amendment of the Environmental Impact Assessment Regulations (Listing Notice 1 of 2014). Department of Forestry, Fisheries and the Environment, Government Gazette No. 40772 (No. 327), 7 April 2017.

DFFE. (2017). Amendment of the Environmental Impact Assessment Regulations (Listing Notice 2 of 2014). Department of Forestry, Fisheries and the Environment, Government Gazette No. 40772 (No. 325), 7 April 2017.

DFFE. (2017). Amendment of the Environmental Impact Assessment Regulations (Listing Notice 3 of 2014). Department of Forestry, Fisheries and the Environment, Government Gazette No. 40772 (No. 324), 7 April 2017.

DFFE. (2017). Amendment of the Environmental Impact Assessment Regulations, 2014. Department of Forestry, Fisheries and the Environment, Government Gazette No. 40772 (No. 326), 7 April 2017.

DFFE. (2021). Draft South Africa's 4th Biennial Update Report to the United Nations Framework Convention On Climate Change. Pretoria, South Africa: Department of Forestry, Fisheries and Environment.

DFFE. (2022a). GHG Inventory Report for South Africa 2000 -2020. DFFE. Retrieved 09 14, 2022, from https://www.dffe.gov.za/sites/default/files/gazetted_notices/8thnational-greenhouse-gasinventory-reportg47133gon2321.pdf

DFFE. (2022b). Methodological Guidelines for Quantification of Greenhouse Gas Emissions: A companion to the South African National GHG Emission Reporting Regulations. Version No: MG-2022.1. Pretoria: Government Gazette, 7 October 2022, No. 47257(2598), Department of Forestry, Fisheries and Environment.

Du Preez, M. & Perold, J. 2005. Scoping/feasibility study for the development of a new landfill site for the Northern Areas of the Metropolitan Municipality of Johannesburg. Socio-Economic Assessment. Mawatsan.

Duncker, L. (2018). Green Book – The impact of climate changeon sanitation services provision within settlements. Pretoria: CSIR.

Dunker, L., & Van Wyk, L. (2018). Green Book – The impact of climate change on stormwater management within settlements. CSIR.

Economic Commission for Africa. November 2007. Harnessing traditional governance in Southern Africa. Economic Commission for Africa. Southern Africa office.

EIPCCB. (2009). *Reference Document on Best Available Techniques for Energy Efficiency.* Sevilla: European Commision.

Engelbrecht, F. (2019). Technical Report: Green Book – Detailed Projections of Future. Report reference number: CSIR/BE/SPS/ER/2019/0005/C. Pretoria: CSIR (Council for Scientific and Industrial Research).

EPA. (2016). Climate Adaptation and Stormwater Runoff. Retrieved from https://www.epa.gov/arcx/climate-adaptation-and-stormwater-runoff

Esteves, A.M., Franks, D. & Vanclay, F. 2012. Social impact assessment: The state of the art, Impact Assessment & Project Appraisal 30(1): 35-44

Garland, R. (2018). Green Book – The impact of climate changeon human health in settlements. Pretoria: CSIR.

Garnaut Climate Change Review. (2008). Impact of Climate Change on Australia's Telecommunications Infrastructure.

Gellings, C., & Yeager, K. (2004). Transforming the electric infrastructure. Physics Today, 57, 45-51.

Geneletti, D., & Zardo, L. (2016). Ecosystem-based adaptation in cities: An analysis of European urban climate adaptation plans. Land use policy, 50, 38-47.

Global Reporting Initiative. [Sa] Focal Point South Africa. Available: https://www.globalreporting.org/network/regional-networks/gri-focal-points/fp-southafrica/Pages/default.aspx

Goldreich, Y., & Tyson, P. (1988). Diurnal and Inter-Diurnal Variations in Large-Scale Atmospheric Turbulence over Southern Africa. South African Geographical Journal, 48-56.

Hofste, R., Kuzma, S., Walker, S., Sutanudjaja, E., Bierkens, M., Kuijper, M., . . . Reig, P. (2019). Aqueduct 3.0: Updated Decision- Relevant Global Water Risk Indicators: Technical Note. Washington, DC: World Resources Institute. Retrieved from Available online at: https://www.wri.org/publication/aqueduct-30

http://www.bksv.com

https://www.municipalities.co.za (accessed 29/02/2024)

IFC. (2007). Environmental, Health, and Safety Guidelines for Noise Management. International Finance Corporation. World Bank Group.

IFC. Stakeholder Engagement: A Good Practice Handbook for companies doing business in Emerging Markets. Washington.

International Association for Impact Assessment. 2003. Social Impact Assessment: International Principles. Special Publication Series no.2. IAIA; Fargo.

International Finance Corporation, 2012. Performance Standards on environmental and social sustainability. Washington, DC: International Finance Corporation.

International Organisation for Standardisation, 2010. ISO 26000 Guidance on Social Responsibility. Geneva: International Organization for Standardization.

Interorganizational Committee on Principles and Guidelines for Social Impact Assessment. US Principles and Guidelines – Principals and guidelines for social impact assessment in the USA. Impact Assessment and Project Appraisal, 21(3):231-250.

IPCC. (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Retrieved from Intergovernmental Panel on Climate Change: http://www.ipcc-nggip.iges.or.jp/public/2006gl/

IPCC. (2007). Intergovernmental Panel on Climate Change 4th Assessment Report. Retrieved from Intergovernmental Panel on Climate Change: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_appendix.pdf

IPCC. (2013). Intergovernmental Panel on Climate Change 5th Assessment Report. Retrieved from Intergovernmental Panel on Climate Change: https://www.ipcc.ch/report/ar5/

IPPC. (2022). IPCC WGI Interactive Atlas: Regional information (Advanced). Retrieved January 6, 2023, from https://interactive-atlas.ipcc.ch

Koop, S., & van Leeuwen, C. (2017). The challenge of water, waste and climate change in cities. Environ. Dev. Sustain, 19, 385-418.

Kratzer, S., & le Masson, V. (2016). Things to know: Gender equality and achieving climate goals. Climate and Development Knowledge Network.

Kusangaya, S., Shekede, M., & Mbengo, I. (2017). Chapter 8: Water Resources. In C. Davis-Reddy, & K. Vincent, Climate Risk and Vulnerability: A Handbook for Southern Africa (2nd Ed) (pp. 82-90). Pretoria: CSIR.

Le Roux, A., van Niekerk, W., Arnold, K., Pieterse, A., Ludick, C., Forsyth, G., . . . Mans, G. (2019). Green Book Risk Profile Tool. (CSIR, Pretoria) Retrieved 09 30, 2022, from riskprofiles.greenbook.co.za

Mainlay, J., & Tan, S. (2012). Mainstreaming gender and climate change in Nepal. . London: IIED Climate Change Working Paper (2).

Matta, R., Mercer, G., & R.S., T. (n.d.). *Power Systems for the 21st Century - "H" Gas Turbine Combined Cycles.* New York: GE Power Systems.

Menzel, D. (1994). The toxicity of air pollution in experimental animals and humans: the role of oxidative stress. Toxicology Letters, 72(1-3), 269-277.

meteoblue AG. (2024, 02 28). Climate Change Posmasburg. Retrieved from meteoblue - weather close to you: https://www.meteoblue.com/en/climate-change/-25.969N28.181E1585_Africa%2FJohannesburg

meteoblue AG. (2024, 02 28). *Climate Change Posmasburg*. Retrieved from meteoblue - weather close to you: https://www.meteoblue.com/en/climate-change/-25.969N28.181E1585_Africa%2FJohannesburg

MFE. (2004). Health effects of CO, NO2, SO2, ozone, benzene and benzo(a)pyrene in New Zealand, Air Qualit Technical Report No. 43. Wellington, New Zealand: New Zealand Ministry for the Environment. Retrieved from https://www.mfe.govt.nz/sites/default/files/air-quality-tech-report-43.pdf

Mineral and Petroleum Resource Development Act 28 of 2002. Mineral and Petroleum Resource Development Act 28 of 2002

Mokonyama, M., & Van Wyk, L. (2018). Green Book - Transport and mobility: the impact of climate change on transport and mobility within settlements. CSIR.

Mølhave, L. (1990). Volatile Organic Compounds, Indoor Air Quality and Health. Indoor Air '90 in Toronto, 5, pp. 15-33.

Mondol, J. D., & Carr, C. (2017). Techno-economic assessments of advanced Combined Cycle Gas Turbine(CCGT) technology for the new electricity market in the United Arab Emirates. *Sustainable Energy Technologies and Assessments*.

Myers, J., Young, T., Galloway, M., Manyike, P., & Tucker, T. (2011). Responding to climate change in southern Africa – the role of research.

Naidoo, S. (2018). Green Book – The impact of climate change on ICT services provision within settlements. . Pretoria: CSIR.

National Environmental Management Act no 107 of 1998 (NEMA). Mineral and Petroleum Resource Development Act 28 of 2002

National Heritage Resources Act 25 of 1999. Republic of South Africa.

National Planning Commission. 2012. National Development Plan 2030: Our future–make it work. Pretoria: National Planning Commission.

National Water Act 36 of 1998. Republic of South Africa.

Newman, J. (1979). Effects of industrial air pollution on wildlife. Biological Conservation, 15(3), 181-190. doi:https://doi.org/10.1016/0006-3207(79)90039-9

NOAA. (2021, September). Earth System Research Laboratory Global Monitoring Division. Retrieved from National Oceanic and Atmospheric Administration: https://gml.noaa.gov/ccgg/trends/global.html

Nortje, K. (2018). Green Book – the impact of climate change on gender and inclusivity in settlements. Pretoria: CSIR.

Nyukuri, E. (2016). Gender approaches in climate compatible development: Lessons fromKenya. Funded by the Climate and Development Knowledge Network. Retrieved from cdkn.org/project/gender-equality-climate-compatible-development

Oelofse, S. (2018). The impact of climate change on solid waste management within settlements. CSIR.

Patel, S. (2023) *A brief history of GE Gas Turbines*, *POWER Magazine*. Available at: https://www.powermag.com/a-brief-history-of-ge-gas-turbines-2/ (Accessed: 04 March 2024).

Pelling, M. (2003). The Vulnerability of Cities: Natural Disasters and Social Resilience. Earthscan.

Pieterse, A., & Crankshaw, B. (2018). Green Book –The impact of climate change on ecosystem services in settlements. Pretoria: CSIR.

Practical Action Consulting. (2015). Why gender approaches matter to Climate Compatible development". Emerging findings from the Drivers and Challenges of Gender Equality and Climate Compatibility in Urban Locations research project. Funded by the Climate and Development Knowledge Network. Retrieved from cdkn.org/project/genderequality-climate-compatible-development.

Promotion of Administrative Justice Act 3 of 2000. Republic of South Africa

Rattanachot, W., Wang, Y., & Chong, D. (2015). Adaptation strategies of transport infrastructures to global climate change. Transport Policy, 41, 159-166.

SANS 10103. (2008). The measurement and rating of environmental noise with respect to annoyance and to speech communication. Pretoria: Standards South Africa.

SAWS. (2017). A Climate Change Reference Atlas 2017 - based on CMIP5 – CORDEX downscaling. Pretoria, South Africa: South African Weather Service and the Water Research Commission. Retrieved from https://www.weathersa.co.za/home/climatechangeatlas

Scott, C. (2014). Gender inequality and urban informality. London: Climate Development Knowledge Network. Retrieved from cdkn.org/2014/06/opinion-gender-inequality-and-urban-informality-what-it-means-for-climate-compatible-development/?loclang=en_gb/

Sellers, S. (2016). Gender and Climate Change: A Closer look at existing evidence. Global Gender and Climate Alliance.

South African National Biodiversity Institute. (2021, 07 15). 2012 Vegetation Map App [Vector] 2012. Pretoria. Retrieved from Available from the Biodiversity GIS website: http://bgis.sanbi.org/SpatialDataset/Detail/595

Statistics South Africa. 2014. The South African MPI: Creating a multidimensional poverty index using census data.

Statistics South Africa. 2015. Methodological report on rebasing of national poverty lines and development on pilot provincial poverty lines – Technical Report. Pretoria: Statistics South Africa.

Statistics South Africa. 2016. Community Survey 2016 Provinces at glance. Pretoria: Statistics South Africa. Pretoria: Statistics South Africa.

Statistics South Africa. Census 2011.

Statistics South Africa. Census 2022.

StatsSA. (2015). General household survey, 2015.

Thambiran, T., & van Wyk, L. (2018). Green Book – The impact of climate change on energy services provision within settlements. Pretoria: CSIR.

Thom, B., Cane, J., Cox, R., Farrell, C., Hayes, P., Kay, R., Smith, T. (2010). National Climate Change Adaptation Research Plan for Settlements and Infrastructure. National Climate Change Adaptation Research Facility, .

Tiwary, A., & Colls, J. (2010). Air pollution: Measurement modelling and mitigation. 3rd edition. London and New York: Routledge.

UNDP. (2013). Overview of linkages between gender and Climate Change. Gender and Climate Change: Asia and the Pacific. Policy Brief 1. United Nations Development Programme. Retrieved from www.undp.org/gender

UNEP, 2002. EIA Training Resource Manual. 2nd Ed. UNEP.

UNEP. (2010). Waste and Climate Change: Global Trends and Strategy Framework. Retrieved from http://www.unep.or.jp/ietc/Publications/spc/Waste&ClimateChange/Waste&ClimateChange.pdf.

UNFCCC. (2017). United Nations Framework Convention on Climate Change e-Handbook . Retrieved from United Nations Framework Convention on Climate Change: http://bigpicture.unfccc.int/

United Nations. 2013a. Overview of the UN Global Compact. Available: https://www.unglobalcompact.org/AboutTheGC/index.html

Van den Hoven, R. (2011). Air Pollution and Domestic Animals. In A. (. Moldovean, Air Pollution New Developments (pp. 179-202). Rijeka: Intech.

van Wyk, L. (2018). Green Book – The impact of climate change on culture and heritage in settlements. Pretoria: CSIR.

Vanclay, F. 2003. Conceptual and methodological advances in Social Impact Assessment. In Vanclay, F. & Becker, H.A. 2003. The International Handbook for Social Impact Assessment. Cheltenham: Edward Elgar Publishing Limited.

Vanclay, F., Esteves, A.M., Aucamp, I. & Franks, D. 2015. Social Impact Assessment: Guidance for assessing and managing the social impacts of projects. Fargo ND: International Association for Impact Assessment.

Wamsler, C., Brink, E., & Rivera, C. (2013). Planning for climate change in urban areas: from theory to practice. Journal of Cleaner Production, 50, 68-81.

WHO. (1999). Guidelines to Community Noise. (B. Berglund, T. Lindvall, & D. Schwela, Eds.) Geneva: WHO.

WHO. (2016). Global report on urban health: equitable, healthier cities for sustainable development. Geneva. Retrieved from http://www.who.int.

Winkler, H. (2007). Energy policies for sustainable development in South Africa. Energy for Sustainable Development, 11, 26-34.

WSP (2023). Pre-Feasibility Study to Develop a 450-600mw Gas Fired Power Plant at Kelvin Power Pre-Feasibility Study Report.

Zimmerman, R., & Faris, C. (2010). Infrastructure Impacts and Adaptation Challenges In: New York City Panel on Climate Change 2010. Report. Annals of the New York Academy of Sciences, 1196, 63-86.

www.ge.com

WRI & WBCSD. (2004). *The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard.* Washington & Switzerland: WRI & WBCSD

Appendix A: EAP CV

Appendix B: Maps

Appendix C: Public Participation Information

Appendix D: Copy of EA application form

Appendix E: DFFE Screening Tool and Site Screening Verification Report

Appendix F: Specialist Studies

Appendix G1: Environmental Management Programme (EMPr)

Appendix G2: Environmental Management Programme (EMPr) – generic powerline EMPr

Appendix G3: Environmental Management Programme (EMPr) – generic gas pipeline EMPr