



**GLENCORE OPERATIONS SOUTH AFRICA (PTY) LTD - LION
SMELTER, A GLENCORE MERAPE VENTURE**

BASIC ASSESSMENT REPORT

IN RELATION TO THE ENVIRONMENTAL AUTHORISATION APPLICATION
BY MEANS OF A
BASIC ASSESSMENT (BA) PROCESS AND INTENTION TO AMEND THE
EXISTING AIR EMISSIONS LICENCE (AEL)

GLENCORE

APRIL 2022

REFERENCE NUMBER: 12/1/9/1-GS243


NEAS REFERENCE NUMBER: LIM/EIA/0001522/2022

GLENCORE-MERAPE JV – LION SMELTER: ECF BASIC ASSESSMENT REPORT (BAR)

Glencore Operations South Africa (Pty) Ltd. – Lion Smelter

PO Box 218,
Steelpoort,
1133
Limpopo

DOCUMENT CONTROL:

DOCUMENT ISSUE	Draft rev 01 (for public review)			
LEDET REF.	12/1/9/1-GS243			
NAES REF.	LIM/EIA/0001522/2022			
DOCUMENT NO.	GCL/21/04.03			
PROJECT NO	GCL/21/04			
TITLE	Energy Conversion Facility (ECF) – Basic Assessment Report			
	NAME	SIGNATURE	DATE	QUALIFICATIONS AND REGISTRATIONS
EAP	Anandi Alers		25 April 2022	MSc Geography and Environmental Management Natural Scientist (400016/17) and registered EAP (2019/1514)
REVIEWER	Marius Alers		25 April 2022	Hon.BSc. Environmental Sciences Natural Scientist (400386/14)

DISTRIBUTION:

TO	DESCRIPTION	DATE	COMMENTS/CHANGES
Kennedy Owuor	Draft report rev 00	5 April 2022	Correct statement on index I; correct word “emit” on page 13; conclude statement on page 97; and update PP information on page 188.
Frans Engelbrecht			
Hendrik Strumpfer	Draft report rev 01	25 April 2022	

Legal notice

The findings, results, observations, conclusions, and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. Netzero (Pty) Ltd, hereinafter referred to as Netzero, reserve the right to modify aspects of the report including the recommendations if new information may become available from on-going research, monitoring, further work in this field pertaining to the investigation.

This report must not be altered or added to without the prior written consent of the author. Netzero reserves the copy right of this document. The format and content of this report may not be copied, reproduced, or used in any other projects than those related to the Glencore ECF project. Where information from this document is used in other reports, presentations or discussions, full reference and acknowledgement must be given to Netzero. These conditions also refer to electronic copies of this report, which may be supplied for the purposes of record keeping or inclusion as part of other reports.

EXECUTIVE SUMMARY

The Lion Smelter, a Glencore Merafe Venture Operation, appointed Netzero (Pty) Ltd as an independent Environmental Assessment Practitioner (EAP) in terms of Regulation 12 of the EIA regulations (GNR 982 GG 38282 of 4 December 2014, as amended), to complete the necessary environmental applications associated to the proposed development.

Glencore Operations South Africa (Pty) Ltd has entered into an energy conversion service agreement with Swedish Stirling, which involves the proposed construction and commissioning of a standalone energy conversion facility located on the Lion Smelter complex premises. The proposed facility (hereafter referred to as Lion ECF or the proposed development), will convert the thermal energy from the excess furnace gas produced by Lion Smelter Complex into electrical energy in the Swedish Stirling's proprietary power generation technology (PWR BLOK 400-F units). The electric energy will then be fed back into the electrical supply of the Lion Smelter. In addition, Swedish Stirling intends to develop a carbon credit programme of activities, titled the 'Flare Gas Energy Programme' (FGEP). The programme will provide a framework under which project component activities (CPAs) can be included, of which the proposed development will be the first CPA registered.

LEGISLATIVE CONTEXT

The following listed activities, as define in Listing Notice (LN) 1 and 3 (GNR 983 & 5 GG 38282 dated 4 December 2014, as amended), are relevant to this application:

- **LN 1, Activity 2** - The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where— (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare.
- **LN 1, Activity 34** - The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is 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; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.
- **LN 3, Activity 12** - The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. e. Limpopo i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.

In addition to the activities as listed in the listing notices in terms of the EIA regulations, the proposed development will also require that the Air Emissions Licence (AEL), associated with the existing Lion Smelter, be amended to include Sub-category 1.5: Reciprocating engines as per GN 893 GG 37054 dated 22 November 2013, as amended.

Based on the defined listed activities, the EAP has determined that a Basic Assessment (BA) process is applicable to the required application for Environmental Authorisation (EA). Therefore, this Basic Assessment Report (BAR) and developed Environmental Management Programme (EMPr), in the opinion of the EAP, would sufficiently provide the competent authority, in this instance Limpopo's Department of Economic Development, Environment and Tourism (LEDET), with the required information to issue the EA.

SITE SENSITIVITY VERIFICATION AS PER THE SCREENING REPORT

In addition the required BAR and EMPr, a Site Sensitivity Verification Report (SSVR) served to confirm or dispute the land use and environmental sensitivities as provided in the Screening Report (Appendix A – Screening Report), identified by the national web-based environmental screening tool (hereafter referred to as the screening tool), in terms of Regulation 16 (1) (v) of the Environmental Impact Assessment (EIA) Regulations (GNR 982 GG 38282 of 4 December 2014, as amended).

Various specialist assessments were identified by the screening tool. The following table summarises the verification outcome following the required desktop analysis and on-site inspection:

SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/PLAN OF STUDY	RELEVANT APPENDIX OF REQUIRED ASSESSMENT
AGRICULTURAL IMPACT ASSESSMENT			
High	Low	Compliance Statement	Appendix F
LANDSCAPE AND VISUAL IMPACT ASSESSMENT			
ND	Low – Potentially Moderate - visual impact at a local and/or regional scale	Visual Impact Assessment (VIA)	Appendix G
ARCHAEOLOGICAL AND PALAEOONTOLOGY IMPACT ASSESSMENT			
Low	Low	Phase 1 Heritage Impact Assessment (HIA)	Appendix H
TERRESTRIAL BIODIVERSITY, PLANT AND ANIMAL SPECIES IMPACT ASSESSMENT			
Low - terrestrial biodiversity	Low - terrestrial biodiversity	Compliance Statement	Appendix I
Medium - plant species	Low - plant species		
High - animal species	Low - animal species		
AQUATIC BIODIVERSITY IMPACT ASSESSMENT			
Low	Low	Compliance Statement	Appendix J
HYDROLOGICAL AND GEOHYDROLOGICAL ASSESSMENT			
ND	Low	Conceptual Storm Water Management Plan (CSWMP)	Appendix K
NOISE IMPACT ASSESSMENT			
ND	Low	Compliance Statement	Appendix L
TRAFFIC IMPACT ASSESSMENT			
ND	Low	Traffic Impact Assessment	Appendix M
HEALTH IMPACT ASSESSMENT			
ND	TBA	Health Risk Assessment	Appendix N

SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/PLAN OF STUDY	RELEVANT APPENDIX OF REQUIRED ASSESSMENT
SOCIO-ECONOMIC IMPACT ASSESSMENT			
ND	Low	Social Compliance Statement	Appendix O
AIR QUALITY IMPACT ASSESSMENT			
ND	TBA	Level 2 Air Quality Impact Assessment	Appendix P

* ND – Not Defined; TBA – to be assessed during the BA process

NEED AND DESIRABILITY

The need and desirability of the proposed development was assessed by answering the questions listed the Guideline on Need and Desirability (DEA, 2017). The proposed development is situated within an area where the socio-economic need for education and distribution of equitable wealth is of highest importance. The development priority of the local municipality as stated in the IDP and SDF is to actively protect, manage and enhance the natural environment while promoting economic development sustainably in mainly the mining, farming and tourism sector. Once authorised, it is the intention of registering the ECF project as one of the first projects as part of Swedish Stirling's (solely reliant on the service agreement with Glencore) carbon credit programme, subsequently playing a part in addressing climate change. Overall, the proposed development will contribute positively toward sustainable development, whereby the overall anticipated low impact on the natural environment can be managed to an acceptable level by implementing the developed EMPr throughout the entire life-cycle.

ASSESSMENT OF ALTERNATIVES

A total of 4 (four) alternative locations were considered as part of this application. From the onset, all alternative locations considered was predetermined to have experienced some form of disturbance to the natural environment. The preferred alternative (Alternative 3) was selected based on the potential environmental, social and heritage impacts as well as operational considerations (see section 5).

IMPACT STATEMENT

The overall impact associated with the proposed development can be considered **low** on condition that the management measures defined in the developed EMPr, are implemented.

The following table provides the summary of the outcome of the required specialist assessments in line with the relevant protocols (GN 320 GG 43110 dated 20 March 2020 and GN 1150 GG 43855 dated 30 October 2020):

IMPACT STATEMENT	REFERENCE IN TERMS OF ADDRESSING RECOMMENDATIONS	OPINION FOR ISSUING OF EA
AGRICULTURAL COMPLIANCE STATEMENT		
The site consists of land which is subject to severe permanent limitations including the pedocutanic horizon as well as hard rock. It is therefore only suitable for occasional row cropping in long ley rotations, or for use under grazing. As such the site is classified as having a low agricultural potential.	Recommendations and mitigation measures identified by the Agricultural Compliance Statement (Appendix F), have been incorporated into the EMPr (see Tables 8 & 12).	As a result of the classification of the site to a low sensitivity for agricultural production it is the author's opinion that the project should go ahead.
LANDSCAPE AND VISUAL IMPACT ASSESSMENT		

Overall, the post mitigation significance of the visual impacts is expected to be low . Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed ECF.	Recommendations and mitigation measures identified by the Landscape and Visual Impact Assessment (Appendix G), have been incorporated into the EMPr (see Tables 8 & 14).	Considering all factors, it is recommended that the development of the facility as proposed be supported subject to the implementation of the recommended mitigation measures and management programme.
ARCHAEOLOGICAL AND PALAEOLOGY IMPACT ASSESSMENT		
No heritage sites of significance are located within the impact area and therefore no adverse impact to heritage resources is expected. Impacts of the project on heritage resources is expected to be low during all phases of the development.	Recommendations and mitigation measures identified by the Archaeological and Palaeontological Impact Assessment (Appendix H), have been incorporated into the EMPr (see Tables 8 & 16).	The project can commence provided that the recommendations in Appendix H are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval.
TERRESTRIAL BIODIVERSITY, PLANT AND ANIMAL SPECIES COMPLIANCE STATEMENT		
The “ medium to low sensitivity” for the plant species, “ medium-low sensitivity” animal species, and “ low sensitivity” terrestrial biodiversity sensitivity is confirmed. The vegetation structure and species composition of the two habitats have been completely altered as such, has a very low conservation value and ecological sensitivity from both a faunal and floral perspective.	Recommendations and mitigation measures identified by the Compliance Statement (Appendix I), have been incorporated into the EMPr (see Tables 8 & 10).	No fatal flaws are evident for the proposed project. It is the opinion of the specialists that the project, may be favourably considered for authorisation.
AQUATIC BIODIVERSITY COMPLIANCE STATEMENT		
Due to the unlikelihood of the presence of the identified endangered species within the site boundary of the proposed development, the outcome of the site verification concurred with the “ low sensitivity” as identified by the screening tool.	Recommendations and mitigation measures identified by the Compliance Statement (Appendix J), have been incorporated into the EMPr (see Tables 8 & 11).	Provided proposed recommendations are implemented, it is the opinion of the specialist that there are no fatal flaws for the proposed activities.
HYDROLOGICAL ASSESSMENT		
The risk assessment for both construction and post-construction phases of the project is considered low , with mostly reversible and manageable impacts.	Recommendations and mitigation measures identified by the Hydrological Assessment and Conceptual Storm Water Plan (Appendix K), have been incorporated into the EMPr (see Tables 8 & 13).	This hydrological assessment cannot find any grounds or identify high hydrological risks to not proceed with the development. This is grounded on the assumption that the proposed mitigation measures, CSWMP, EMPr and EIA recommendations are implemented during the construction and operational phase of the development.
NOISE IMPACT COMPLIANCE STATEMENT		

The potential noise impact from the proposed ECP Project will be low with all the mitigatory measures in place.	Recommendations and mitigation measures identified by the Compliance Statement (Appendix L), have been incorporated into the EMPr (see Tables 8 & 15).	Authorisation for the ECP Project may be granted from an environmental noise point of view.
TRAFFIC IMPACT ASSESSMENT		
The potential traffic impact from the proposed ECP Project will be low with all the mitigatory measures in place.	Recommendations and mitigation measures identified by the Traffic Assessment (Appendix M), have been incorporated into the EMPr (see Tables 8 & 19).	Authorisation for the ECP Project may be granted from a traffic point of view.
HEALTH IMPACT ASSESSMENT		
The respiratory and cardiovascular related health affects associated with the determined pollutants associated with the proposed development has been determined to be low .	Recommendations and mitigation measures identified by the Health Risk Assessment (Appendix N) and Air Quality Impact Assessment (Appendix P), have been incorporated into the EMPr (see Tables 8 & 17).	From a community health risk perspective, the proposed activity is acceptable, therefore the proposed activity should be authorised.
SOCIO-ECONOMIC IMPACT ASSESSMENT		
A low site sensitivity from a socio-economic perspective with the anticipated negative impacts mitigated and positive impacts enhanced.	Recommendations and mitigation measures identified by the Social Assessment (Appendix O), have been incorporated into the EMPr (see Tables 8 & 18).	It is recommended that the environmental authorisation of the project be allowed.
AIR QUALITY IMPACT ASSESSMENT		
Based on the modelled outcome, the contribution of the proposed development to exceeding the legislative air quality standards, is overall considered to be low .	Recommendations and mitigation measures identified by the Air Quality Impact Assessment (Appendix P), have been incorporated into the EMPr (see Tables 8 & 9).	It is recommended that the environmental authorisation of the project be allowed on the condition that mitigation measures be implemented and the facility operates in line with the emission standards as per the amended AEL..

REASONED OPINION FOR AUTHORISATION

Nettzero (Pty) Ltd as the appointed EAP recommends that on the conditions that all the requirements, conditions, and measures listed in the developed EMPr and specialist assessments be adhered to, that there is no reason why this activity should not be authorised. Section 9.3 provides several conditions recommended by the EAP to be included in the required EA. These conditions relate to the following:

- General conditions, including the requirement to appoint an Environmental Control Officer (ECO);
- Air quality management measures, including the requirement to amend the existing AEL;
- Terrestrial biodiversity protection measures;
- Aquatic and surface water protection measures, including the 32-meter development exclusion zone;
- Noise specific measures;
- Heritage protection measures;
- Socio-economic impact management measures;
- Traffic impact management measures;
- Waste management measures;

- Auditing and reporting requirements; and
- Closure requirements, including the requirement to apply for a EA at least a year prior to planned closure.

PERIOD FOR WHICH EA IS REQUIRED

The EA is required for at least **45 years**.

PUBLIC PARTICIPATION

This document is considered to be the draft BAR, providing the registered Interested and Affected Parties (I&AP) an opportunity to comment as per the required commenting period of at least 30 days.

It is therefore requested that all comments on the BAR, as well as the EMPr and associated appendices be submitted in form of a formal correspondence (email, sms, fax, and/or during arranged public meeting) using the following contact information:

Company: Netzero (Pty) Ltd

Contact Person: Mrs. Anandi Alers (EAP)

Fax: +27 86 673 0945

Tel: +27 13 007 1145

Email: publicparticipation@nettzero.co.za

Email reference: ECP BAR & EMPr comments

TABLE OF CONTENTS

EXECUTIVE SUMMARY	II
TABLES.....	XI
FIGURES	XIII
ACRONYMS AND ABBREVIATIONS.....	XV
1 INTRODUCTION.....	1
2 PROJECT BACKGROUND INFORMATION.....	3
2.1 SCOPE OF THE PROPOSED ACTIVITY	3
2.2 PROJECT LOCATION	6
2.3 DIRECTLY AFFECTED PROPERTIES	6
2.4 CURRENT LAND USE	8
2.5 OUTCOME OF NATIONAL WEBBASED SCREENING REPORT.....	10
2.5.1 ENVIRONMENTAL MANAGEMENT FRAMEWORK	10
2.5.2 RELEVANT DEVELOPMENT INCENTIVES, RESTRICTIONS, EXCLUSIONS OR PROHIBITIONS.....	14
2.5.3 SITE SENSITIVITY VERIFICATION OUTCOME	14
2.6 LISTED ACTIVITIES.....	15
2.7 NEED AND DESIRABILITY.....	17
2.7.1 THE PROPOSED DEVELOPMENT AND CLIMATE CHANGE	17
2.7.2 MUNICIPAL INTEGRATED DEVELOPMENT PLANS AND SPATIAL DEVELOPMENT FRAMEWORKS	19
2.7.3 ENVIRONMENTAL MANAGEMENT FRAMEWORK	20
2.7.4 NEED AND DESIRABILITY ASSESSMENT	22
3 POLICY AND LEGISLATIVE CONTEXT	35
4 EAP DETAILS AND EXPERIENCE SUMMARY.....	43
4.1 SUMMARY OF EAP QUALIFICATION	43
4.2 SUMMARY OF EAP'S PAST EXPERIENCE.....	43
4.3 APPOINTED SPECIALISTS.....	43
5 ASSESSMENT OF ALTERNATIVES	45
5.1 METHOD OF ASSESSING ALTERNATIVES	46
5.2 ALTERNATIVES CONSIDERED.....	48
5.2.1 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH ALTERNATIVES	48
5.2.2 IMPACTS AND RISKS IDENTIFIED FOR EACH ALTERNATIVE.....	50
5.2.3 MOTIVATION FOR PREFERRED ALTERNATIVE	51
6 SPECIALIST ASSESSMENT OUTCOME	51
6.1 OVERVIEW OF SITE ENVIRONMENT.....	51
6.1.1 CLIMATE	51

6.1.2	TOPOGRAPHY	55
6.1.3	LAND TYPE	55
6.1.4	GEOLOGY.....	55
6.2	AGRICULTURAL AND SOIL	56
6.2.1	SOIL CHARACTERISTICS.....	56
6.2.2	COMPLIANCE STATEMENT.....	58
6.2.3	OPINION FOR ISSUING EA	58
6.3	LANDSCAPE AND VISUAL	58
6.3.1	OUTCOME OF ANALYSIS.....	59
6.3.2	CONCLUDING SUMMARY OF VISUAL IMPACT	63
6.3.3	IMPACT STATEMENT	67
6.3.4	OPINION FOR ISSUING EA	67
6.4	ARCHAEOLOGICAL AND PALAEOLOGY	68
6.4.1	OUTCOME OF SURVEY.....	68
6.4.2	IMPACT STATEMENT	73
6.4.3	OPINION FOR ISSUING AN EA	74
6.5	TERRESTRIAL BIODIVERSITY	74
6.5.1	DESKTOP ASSESSMENT OUTCOME	74
6.5.2	FIELD ASSESSMENT	77
6.5.3	IMPACT STATEMENT	82
6.5.4	OPINION IF ISSUING EA	84
6.6	AQUATIC BIODIVERSITY	84
6.6.1	DESKTOP ASSESSMENT OUTCOME	84
6.6.2	FIELD ASSESSMENT	89
6.6.3	COMPLIANCE STATEMENT.....	93
6.6.4	OPINION FOR ISSUING EA	93
6.7	HYDROLOGICAL.....	93
6.7.1	SUB-CATCHMENTS / HYDROLOGICAL RESPONSE UNITS (HRUs)	94
6.7.2	HYDROGEOLOGY	96
6.7.3	FLOODLINES	101
6.7.4	DEPTH TO GROUNDWATER.....	101
6.7.5	SURFACE WATER USERS WITHIN THE SUB-CATCHMENT ASSOCIATED WITH THE SITE	101
6.7.6	SURFACE WATER QUALITY	101
6.7.7	SURFACE WATER QUALITY OBJECTIVES.....	103
6.7.8	CONCEPTUAL STORM WATER MANAGEMENT PLAN	104
6.7.9	IMPACT STATEMENT	106
6.7.10	OPINION FOR AN EA.....	106

6.8	NOISE.....	107
6.8.1	OUTCOME OF ASSESSMENT	107
6.8.2	IMPACT STATEMENT	112
6.8.3	OPINION TO ISSUE EA	112
6.9	TRAFFIC IMPACT.....	112
6.9.1	OUTCOME OF DATA COLLECTION AND INVESTIGATION	115
6.9.2	DETERMINATION OF THE LEVELS OF SERVICE AT THE RELEVANT INTERSECTIONS	127
6.9.3	IMPACT STATEMENT	131
6.9.4	OPINION TO ISSUE EA	132
6.10	HEALTH ASSESSMENT	133
6.10.1	ASSESSMENT OUTCOME SUMMARY	133
6.10.2	IMPACT STATEMENT	142
6.10.3	OPINION TO ISSUE AN EA	142
6.11	SOCIO-ECONOMIC	142
6.11.1	GENERAL DESCRIPTION OF STUDY AREA FROM A SOCIAL PERSPECTIVE	142
6.11.2	SOCIAL PROFILE	146
6.11.3	BASIC SERVICE DELIVERY	149
6.11.4	LOCAL ECONOMIC PROFILE	150
6.11.5	ANTICIPATED SOCIO-ECONOMIC IMPACTS	151
6.11.6	COMPLIANCE STATEMENT.....	155
6.11.7	OPINION FOR ISSUING AN EA.....	156
6.12	AIR QUALITY	157
6.12.1	DISPERSION MODELLING CONSIDERATIONS	157
6.12.2	IMPACT STATEMENT	159
6.12.3	OPINION FOR ISSUING AN EA	161
6.13	SUMMARY OF SPECIALIST FINDINGS	162
7	IMPACT AND RISK ASSESSMENT	164
7.1	IMPACT AND RISK ASSESSMENT METHODOLOGY	164
7.2	ASSESSMENT OF IDENTIFIED POTENTIAL IMPACTS AND RISKS	165
7.2.1	PLANNING PHASE	165
7.2.2	CONSTRUCTION PHASE.....	170
7.2.3	OPERATIONAL PHASE.....	181
7.2.4	CLOSURE/DECOMMISSIONING PHASE.....	188
8	DETAILS ON THE PUBLIC PARTICIPATION PROCESS	197
8.1	SUMMARY OF PROCESS FOLLOWED.....	197
8.1.1	LISTING THE I&AP.....	197
8.1.2	PRE-APPLICATION MEETINGS WITH CA'S.....	198

8.1.3	NOTIFICATIONS.....	198
8.1.4	INFORMATION PROVIDED TO THE I&AP	199
8.1.5	CONSULTATIONS	200
8.2	SUMMARY OF ISSUES RAISED BY I&AP	202
9	ENVIRONMENTAL IMPACT STATEMENT	208
9.1	SUMMARY OF IMPACT ASSESSMENT KEY FINDINGS & RECOMMENDATIONS	208
9.2	FINAL SITE LAYOUT.....	215
9.3	REASONED OPINION FOR AUTHORISATION.....	215
9.4	PERIOD FOR WHICH EA IS REQUIRED.....	217
9.5	FINANCIAL PROVISIONING FOR REHABILITATION, CLOSURE AND POST DECOMMISSIONING ...	217
9.6	INFORMATION REQUIRED BY THE COMPETENT AUTHORITY	219
9.7	OTHER MATTERS REQUIRED IN TERMS OF SECTION 24 (4) (A) AND (B) OF NEMA	219
10	ASSUMPTIONS, UNCERTAINTIES, AND GAPS IN KNOWLEDGE	220
11	UNDERTAKING BY EAP	222
	APPENDIX A – SCREENING REPORT	224
	APPENDIX B – LOCALITY MAP AND SITE LAYOUT.....	226
	APPENDIX C – SITE SENSITIVITY VERIFICATION REPORT.....	227
	APPENDIX D – EAP DECLARATION AND CV	228
	APPENDIX E – PUBLIC PARTICIPATION PROCESS REPORT	229
	APPENDIX F – AGRICULTURAL COMPLIANCE STATEMENT	230
	APPENDIX G – LANDSCAPE AND VISUAL IMPACT ASSESSMENT	231
	APPENDIX H – ARCHAEOLOGICAL AND PALAEOLOGICAL IMPACT ASSESSMENT	232
	APPENDIX I – TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT	233
	APPENDIX J – AQUATIC BIODIVERSITY COMPLIANCE STATEMENT	234
	APPENDIX K – HYDROLOGICAL AND GEOHYDROLOGICAL ASSESSMENT.....	235
	APPENDIX L – NOISE COMPLIANCE STATEMENT.....	236
	APPENDIX M – SITE TRAFFIC IMPACT ASSESSMENT.....	237
	APPENDIX N – HEALTH RISK ASSESSMENT	238
	APPENDIX O – SOCIO-ECONOMIC COMPLIANCE STATEMENT	239
	APPENDIX P – AIR QUALITY IMPACT ASSESSMENT	240

TABLES

TABLE 1: BASIC ASSESSMENT REPORT (BAR) CONTENT CHECKLIST AS PER APPENDIX 1 OF THE EIA REGULATIONS.....	2
TABLE 2: DIRECTLY AFFECTED PROPERTIES	6

TABLE 3: SUMMARY OF THE DESIRED STATE IDENTIFIED IN THE PUBLISHED OLIFANTS ENVIRONMENTAL FRAMEWORK (OEMF)	11
TABLE 4: LISTED ACTIVITIES ASSOCIATED WITH THE PROPOSED ECF PROJECT	15
TABLE 5: SUMMARY OF HOW THE PROPOSED DEVELOPMENT MAY AFFECT THE DESIRED STATE AS DEFINED IN THE OEMF	20
TABLE 6: QUESTIONS INDICATING HOW THE DEVELOPMENT CONSIDERED ECOLOGICAL SUSTAINABILITY AND THE USE OF NATURAL RESOURCES	22
TABLE 7: QUESTIONS INDICATED HOW THE PROPOSED DEVELOPMENT JUSTIFIED ECONOMIC AND SOCIAL DEVELOPMENT	26
TABLE 8: A DESCRIPTION OF THE POLICY AND LEGISLATIVE CONTEXT WITHIN WHICH THE DEVELOPMENT IS PROPOSED	35
TABLE 9: DETAILS OF THE APPOINTED EAP	43
TABLE 10: LIST OF APPOINTED INDEPENDENT SPECIALIST	43
TABLE 11: ALTERNATIVE'S ASSESSMENT RATING MATRIX	47
TABLE 12: OUTCOME OF EAP'S ALTERNATIVE ASSESSMENT AS PER TABLE 11 FOR THE CONSIDERED ALTERNATIVES	50
TABLE 13: OPERATIONAL QUALITATIVE ANALYSIS OF ALTERNATIVES	50
TABLE 14: SOIL DATA COLLECTED AT THE SITE	56
TABLE 15: RECORDED HERITAGE OBSERVATIONS DURING SITE INSPECTION	68
TABLE 16: SENSITIVITY COLOUR INDICATION ASSOCIATED WITH FIGURE 30	73
TABLE 17: SUMMARY OF RELEVANCE OF THE PROPOSED PROJECT TO ECOLOGICALLY IMPORTANT LANDSCAPE FEATURES	74
TABLE 18: THREATENED FLORA SPECIES THAT MAY OCCUR WITHIN THE ASSESSMENT AREA ASSOCIATED WITH THE PROPOSED PROJECT AREA. EN=ENDANGERED	77
TABLE 19: TREES, SHRUB, GRAMINOID AND HERBACEOUS PLANT SPECIES RECORDED IN THE SITE BOUNDARY OF THE PROPOSED DEVELOPMENT	78
TABLE 20: AVIFAUNAL SPECIES RECORDED IN THE PROJECT AREA	81
TABLE 21: SUMMARY OF HABITAT TYPES DELINEATED WITHIN THE SITE BOUNDARY OF THE PROPOSED DEVELOPMENT	82
TABLE 22: DESKTOP DATA PERTAINING TO THE ECOLOGICAL CONDITION OF THE SQR ASSESSED (DWS, 2018)	88
TABLE 23: RESULTS FOR THE HABITAT ASSESSMENT IN THE STEELPOORT TRIBUTARY	90
TABLE 24: SUMMARY OF MONITORING POINTS (JMA, 2021)	101
TABLE 25: SUMMARY OF HYDROCHEMISTRY RESULTS FOR MARCH 2021 (JMA, 2019)	102
TABLE 26: SUMMARY OF HYDROCHEMISTRY RESULTS FOR AUGUST 2021 (JMA, 2019)	103
TABLE 27: WATER QUALITY LIMITS FOR THE CATCHMENT DOWNSTREAM OF DE HOOP DAM CATCHMENTS OF THE STEELPOORT SUB-CATCHMENT	103
TABLE 28: LOCATION OF NOISE RECEPTORS	107
TABLE 29: NOISE INTRUSION LEVEL CRITERIA	108
TABLE 30: NOISE INTRUSION LEVELS (IN DBA) DURING CONSTRUCTION PHASE	108
TABLE 31: CUMULATIVE NOISE LEVELS (DBA) DURING THE OPERATIONAL PHASE	109
TABLE 32: SUMMARY OF THE EXTEND OF THE PROPOSED PROJECT FOR THE RESPECTIVE PHASES	114
TABLE 33: SUMMARY OF INTERSECTION CONTROL AT EXISTING INTERSECTIONS UNDER INVESTIGATION	117
TABLE 34: SUMMARY OF ROAD CHARACTERISTICS	117
TABLE 35: URBAN FUNCTIONAL ROAD CLASSIFICATION (COTO TRH26 – SOUTH AFRICAN ROAD CLASSIFICATION AND ACCESS MANAGEMENT MANUAL VERSION 1.0 AUGUST 2012)	118
TABLE 36: URBAN ACCESS MANAGEMENT REQUIREMENTS AND FEATURES (COTO TRH26 - SOUTH AFRICAN ROAD CLASSIFICATION AND ACCESS MANAGEMENT MANUAL VERSION 1.0 AUGUST 2012)	120
TABLE 37: PEAK HOUR PERIODS AT THE RELEVANT INTERSECTIONS	123
TABLE 38: TRIP GENERATION RATES AND EXPECTED NUMBER OF VEHICLES TRIPS TO BE GENERATED DUE TO THE PROPOSED PROJECT AND THE DISTRIBUTION OF VEHICLE TRIPS (CONSTRUCTION PHASE)	125
TABLE 39: TRIP GENERATION RATES AND EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED DUE TO THE PROPOSED PROJECT DISTRIBUTION OF VEHICLE TRIPS (OPERATIONAL PHASE)	125

TABLE 40: AVAILABLE INTERSECTION STOPPING AND DECISION SIGHT DISTANCE AT THE EXISTING INTERSECTION OF ROAD R555 AND SMELTER ACCESS ROAD (POINT A)	127
TABLE 41: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTION WITHOUT THE PROPOSED PROJECT	128
TABLE 42: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS	129
TABLE 43: CRITERIA POLLUTANT CONCENTRATIONS	134
TABLE 44: CR (VI) ANNUAL AVERAGE AIR CONCENTRATION	136
TABLE 45: AF'S OF MORTALITY AND HOSPITAL ADMISSIONS ASSOCIATED WITH SHORT-TERM EXPOSURE TO PM _{2.5}	137
TABLE 46: AF'S OF MORTALITY AND HOSPITAL ADMISSIONS ASSOCIATED WITH LONG-TERM EXPOSURE TO PM _{2.5}	138
TABLE 47: AF'S OF ASTHMA EXACERBATION ASSOCIATED WITH SHORT-TERM EXPOSURE TO SO ₂	138
TABLE 48: AF'S OF ASTHMA-RELATED EMERGENCY VISITS AND HOSPITALISATION ASSOCIATED WITH SHORT-TERM EXPOSURE TO NO ₂	139
TABLE 49: AF'S OF MYOCARDIAL INFARCTION HOSPITALISATION ASSOCIATED WITH SHORT-TERM EXPOSURE TO CO	139
TABLE 50: TIER 1 ASSESSMENT OF MODELLED ANNUAL AVERAGE AIR CONCENTRATIONS OF CR (VI)	140
TABLE 51: TIER-2 CR (VI) INHALATION CANCER-RISK ASSESSMENT	141
TABLE 52: LOCAL SETTLEMENTS WITHIN THE STUDY AREA	144
TABLE 53: POPULATION FIGURES	146
TABLE 54: POPULATION STABILITY	146
TABLE 55: EDUCATION LEVELS	147
TABLE 56: EMPLOYMENT PROFILE	147
TABLE 57: HOUSEHOLDS AND HOUSING INFRASTRUCTURE	149
TABLE 58: ANTICIPATED SOCIO-ECONOMIC IMPACTS AND RISKS ASSOCIATED WITH THE PROPOSED ECF	151
TABLE 59: OVERARCHING RISKS AND MITIGATION/ENHANCEMENT TARGETS	155
TABLE 60: PRIMARY POLLUTANTS IDENTIFIED THAT WILL BE APPLICABLE TO THE PROPOSED DEVELOPMENT	158
TABLE 61: SUMMARY OF SPECIALIST FINDINGS	162
TABLE 62: RANKING SCALE OF THE FOUR FACTORS CONSIDERED TO DETERMINE SIGNIFICANCE RATING	164
TABLE 63: POTENTIAL IMPACTS AND RISKS IDENTIFIED DURING THE PLANNING PHASE OF THE PROPOSED DEVELOPMENT	165
TABLE 64: POTENTIAL IMPACTS AND RISKS IDENTIFIED DURING THE CONSTRUCTION PHASE OF THE PROJECT	170
TABLE 65: POTENTIAL IMPACTS AND RISK IDENTIFIED DURING THE OPERATIONAL PHASE OF THE PROPOSED DEVELOPMENT	181
TABLE 66: POTENTIAL IMPACTS AND RISKS IDENTIFIED DURING THE CLOSURE/DECOMMISSIONING PHASE OF THE PROPOSED DEVELOPMENT	188
TABLE 7: PHOTOGRAPHIC RECORD OF MEETING THAT TOOK PLACE ON 21 APRIL 2022	201
TABLE 67: SUMMARY OF COMMENTS AND RESPONSE	203
TABLE 68: SUMMARY OF IMPACT ASSESSMENT OUTCOME AND RECOMMENDATIONS	208
TABLE 69: OBJECTIVES OF THE CLOSURE PLAN	218
TABLE 70: CHECKLIST INDICATING COMPLIANCE WITH SECTION 24 (A) AND (B) OF NEMA	219
TABLE 71: SUMMARY OF ASSUMPTIONS, UNCERTAINTIES, AND GAPS IN KNOWLEDGE FOR VARIOUS ASPECTS CONSIDERED DURING THE ASSESSMENT PROCESS	220

FIGURES

FIGURE 1: IMAGE OF THE PBU (SOURCE: HTTPS://SWEDISHSTIRLING.COM)	4
FIGURE 2: EXAMPLE OF SIMILAR PROJECT (SOURCE: HTTPS://SWEDISHSTIRLING.COM)	4
FIGURE 3: PROCESS FLOW DIAGRAM	5
FIGURE 4: LOCALITY MAP OF THE PROPOSED DEVELOPMENT	6
FIGURE 5: MAP OF THE LOCATION OF THE PROPOSED DEVELOPMENT IN RELATION TO THE PROPERTIES AS CONSOLIDATED	7
FIGURE 6: MAP OF THE LOCATION OF THE PROPOSED DEVELOPMENT IN RELATION TO THE PROPERTIES AS KNOWN PRIOR TO CONSOLIDATION	8

FIGURE 7: PROPOSED TUBATSE SEZ (WWW.GLOBALAFRICANETWORK.COM)	9
FIGURE 8: LOCATION OF ALTERNATIVES CONSIDERED	48
FIGURE 9: TERRESTRIAL BIODIVERSITY, AQUATIC BIODIVERSITY, ANIMAL, AND PLANT SPECIES THEME AS DETERMINED BY THE SCREENING TOOL.....	49
FIGURE 10: ARCHAEOLOGICAL, PALAEOLOGICAL, AND AGRICULTURAL THEME AS DETERMINED BY THE SCREENING TOOL..	49
FIGURE 11: AVERAGE YEARLY TEMPERATURES (METEOBLUE, 2021)	52
FIGURE 12: WIND ROSE FOR THE PROPOSED SITE AS CENTRE POINT (METEOBLUE, 2021).....	53
FIGURE 13: RAINFALL DISTRIBUTION (STATION O593014) (WRC, 2015).....	54
FIGURE 14: SIMULATED RUNOFF FOR CATCHMENT B41J (WRC, 2015)	55
FIGURE 15: SOIL FORMS IDENTIFIED WITHIN THE PROJECT SITE.....	57
FIGURE 16: OBSERVED DIRT ROAD WITHIN THE SITE BOUNDARY OF THE PROPOSED DEVELOPMENT WHICH HAVE BEEN CLASSIFIED AS DISTURBED ANTHROSOL, GRABOUW SOILS.	58
FIGURE 17: MAP INDICATING THE POTENTIAL (PRELIMINARY) VISUAL EXPOSURE OF THE PROPOSED LION ECF DEVELOPMENT.	61
FIGURE 18: VEGETATION COVER ADJACENT TO THE R555 PROVIDES HIGH VAC.....	62
FIGURE 19: LOW VAC AT THE SENAKANGWEDI SUBSTATION.....	63
FIGURE 20: PROXIMITY ANALYSIS AND POTENTIAL SENSITIVE VISUAL RECEPTORS.....	65
FIGURE 21: VISUAL IMPACT INDEX AND POTENTIALLY AFFECTED SENSITIVE VISUAL RECEPTORS	66
FIGURE 22: SPATIAL LOCATION OF RECORDED ARTEFACTS IN THE STUDY AREA.	69
FIGURE 23: ISOLATED CERAMICS RECORDED NEXT TO A GRAVEL ROAD.....	70
FIGURE 24: GENERAL SITE CONDITIONS WHERE CERAMIC SCATTERS WERE NOTED.	70
FIGURE 25: IRON AGE CERAMIC SHERD.....	70
FIGURE 26: DECORATED AND UNDECORATED CERAMICS.....	70
FIGURE 27: 1976 TOPOGRAPHICAL MAP OF THE STUDY AREA INDICATING THE AREA AS CULTIVATED WITH A POWERLINE THAT TRAVERSES THE STUDY AREA.....	71
FIGURE 28: 1977 TOPOGRAPHIC MAP OF THE STUDY AREA INDICATING MINING ACTIVITIES IN THE SURROUNDING AREA.	71
FIGURE 29: 2002 TOPOGRAPHIC MAP OF THE STUDY AREA INDICATING SEVERAL MINING DEVELOPMENTS IN THE SURROUNDING AREA.	72
FIGURE 30: PALEONTOLOGICAL SENSITIVITY OF THE APPROXIMATE STUDY AREA AS INDICATED ON THE SAHRA PALAEOLOGICAL SENSITIVITY MAP.	73
FIGURE 31: MAP ILLUSTRATING THE VEGETATION TYPE ASSOCIATED WITH THE PROJECT AREA.....	76
FIGURE 32: MAP SHOWING THE GRID DRAWN TO COMPILE AN EXPECTED SPECIES LIST (BODATASA-POSA, 2016).....	77
FIGURE 33: PHOTOGRAPHS ILLUSTRATING SOME OF THE FLORA RECORDED WITHIN THE ASSESSMENT AREA. A) DICHROSTACHYS CINEREA SUBSP. AFRICANA, B) VACHELLIA TORTILIS., C) EUPHORBIA INGENS., D) ALOE GLOBULIGEMMA., AND E) SOLANUM LICHTENSTEINII WILLD.....	79
FIGURE 34: THE HABITAT UNITS IDENTIFIED IN THE SITE BOUNDARY OF THE PROPOSED DEVELOPMENT	83
FIGURE 35: THE CONFIRMED SENSITIVITY OF THE SITE AREA OF THE PROPOSED DEVELOPMENT.....	84
FIGURE 36: THE PROJECT AREA SUPERIMPOSED ON THE LIMPOPO BIODIVERSITY CONSERVATION PLANS (LCP, 2013).....	85
FIGURE 37: THE MAP HIGHLIGHTING THE PROTECTION STATUS OF AQUATIC ECOSYSTEMS WITHIN THE PROPOSED PROJECT AREA (NBA, 2018).....	86
FIGURE 38: THE MAP HIGHLIGHTING THE THREAT STATUS OF AQUATIC ECOSYSTEMS WITHIN THE PROPOSED PROJECT AREA (NBA, 2018).....	86
FIGURE 39: ILLUSTRATION OF NFEPAS ASSOCIATED WITH THE PROJECT AREA (INDICATED IN YELLOW SQUARE)	89
FIGURE 40: CHANNEL MODIFICATION WITHIN THE TRIBUTARY (GOOGLE EARTH IMAGERY, 2021)	91
FIGURE 41: ILLUSTRATION OF CONCRETE WITHIN THE BED OF THE TRIBUTARY.....	91
FIGURE 42: ILLUSTRATION OF TYRES USED FOR EROSION CONTROL	92
FIGURE 43: ILLUSTRATION OF THE RIPARIAN ZONE AND APPLIED 32 M BUFFER	93
FIGURE 44: SITE LOCALITY AND DRAINAGE.....	95

FIGURE 45: REGIONAL GEOLOGY	99
FIGURE 46: REGIONAL GEOHYDROLOGY	100
FIGURE 47: 1:100 YEAR FLOOD LINE FOR THE STEELPOORT RIVER (EXTRACTED FROM KNIGHT PIÉSOLO CONSULTING, 2019)	101
FIGURE 48: DIRTY AND CLEAN WATER AREAS	104
FIGURE 49: CONCEPTUAL STORMWATER MANAGEMENT SYSTEM	106
FIGURE 50: NOISE RECEPTORS IN THE VICINITY OF THE PROPOSED ECF PROJECT FOOTPRINT	108
FIGURE 51: NOISE CONTOURS DURING THE OPERATIONAL PHASE	111
FIGURE 52: LOCALITY OF THE PROPOSED DEVELOPMENT AND RELEVANT INTERSECTION UNDER INVESTIGATION	113
FIGURE 53: EXISTING ROAD NETWORK LAYOUT	116
FIGURE 54: HOURLY TRAFFIC PATTERN PER 15 – MINUTE INTERVAL FOR ALL MODES OF VEHICLES (06:00 TO 18:00) AT THE RELEVANT INTERSECTIONS	124
FIGURE 55: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING EXISTING SENSITIVE AREAS AND INTERSECTIONS WITHOUT THE PROPOSED PROJECT.	131
FIGURE 56: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING PREDICTED SENSITIVE AREAS AND INTERSECTIONS, WITH THE PROPOSED PROJECT, WITHOUT MITIGATION MEASURES	132
FIGURE 57: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING PREDICTED SENSITIVE AREAS AND INTERSECTIONS, WITH THE PROPOSED DEVELOPMENT, WITH MITIGATION MEASURES.....	132
FIGURE 58: SETTLEMENTS WITHIN THE STUDY AREA.....	145
FIGURE 59: NETZERO PRESENTING THE FINDINGS OF THE BA PROCESS	201
FIGURE 60: COPIES OF THE PRESENTATION HANDED OUT TO ATTENDEES	201
FIGURE 61: ATTENDANCE REGISTERS BEING SIGNED	201
FIGURE 62: ATTENDANCE AT EASTERN LIMB TRAINING FACILITY	201

ACRONYMS AND ABBREVIATIONS

AEL	Air Emissions Licence
AQMP	Air Quality Management Plan
BA	Basic Assessment
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
COTO	Committee of Transport Officials
DARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
DFFE	Department of Forestry, Fisheries, and the Environment
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECF	Energy Conversion Facility
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
FEPA	Freshwater Ecological Priority Area
FGTM	Fetakgomo Greater Tubatse Local Municipality
GIS	Geographic Information System
HIA	Heritage Impact Assessment

I&AP	Interested and Affected Parties
LDEDET	Limpopo Department of Economic Development, Environment and Tourism
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MW	Mega Watt
NEMA	National Environmental Management Act, Act no. 107 of 1998
NEMAQA	National Environmental Management Air Quality Act, Act no. 39 of 2004
NEMBA	National Environmental Management: Biodiversity Act, Act no. 10 of 2004
NEMPA	National Environmental Management: Protected Areas Act, Act no. 57 of 2003
NHRA	National Heritage Resources Act, Act no. 25 of 1999
OEMF	Olifants Environmental Management Framework
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SCE	Sekhukhuneland Centre of Endemism
SEZ	Special Economic Zone
SSVR	Site Sensitivity Verification Report
STA	Site Traffic Impact Assessment
TIA	Traffic Impact Assessment
VIA	Visual Impact Assessment
WMA	Water Management Agency

1 INTRODUCTION

The Lion Smelter, a Glencore Merafe Venture Operation, appointed Netzero (Pty) Ltd as an independent Environmental Assessment Practitioner (EAP) in terms of Regulation 12 of the EIA regulations, to complete the required Basic Assessment (BA) Process in order obtain the required Environmental Authorisation (EA) associated with the proposed development.

This report has been developed in line with Appendix 1 of the 2014 EIA regulations (GNR 982 GG 38282 of 4 December 2014, as amended). The objective of the basic assessment process is to, through a consultative process:

- a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- b) identify the alternatives considered, including the activity, location, and technology alternatives;
- c) describe the need and desirability of the proposed alternatives;
- d) through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
 - (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
 - (ii) 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; and
- e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to:
 - (i) identify and motivate a preferred site, activity and technology alternative;
 - (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and
 - (iii) identify residual risks that need to be managed and monitored.

Table 1 provides the Basic Assessment Report (BAR) content checklist indicating where in this report each requirement as per Appendix 1 of the EIA regulations has been addressed.

Table 1: Basic Assessment Report (BAR) content checklist as per Appendix 1 of the EIA regulations

NO.	REQUIREMENT	REPORT PAGE REFERENCE
3 (1)	A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include— (a) details of— (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Section 4, page 21 - 24
	(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;	Section 2.2, page 6
	(c) a plan which locates the proposed activity or activities applied for as well as 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; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Appendix B
	(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 activities to be undertaken including associated structures and infrastructure	Section 2.6, page 7 – 9 Section 2.1, page 4 - 5
	(e) a description of the policy and legislative context within which the development is proposed including— (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments	Section 3, page 10 - 21
	(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 2.7, page 10
	(g) a motivation for the preferred site, activity and technology alternative;	Section 5.2.3
	(h) a full description of the process followed to reach the proposed preferred alternative within the site, including— (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, 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 associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	Section 5.1 Section 5.2 Section 8
	(i) a full description of the process undertaken to identify, assess and rank the impacts the activity 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 7, Table 43 to 46
	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; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	Section 7, Table 43 to 46
	(k) where applicable, a summary of the findings and impact management measures identified in 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 report;	Section 6, page 26 to 133 Section 6.13
	(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	Section 9.1, Table 48

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;	
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Section 9.1, Table 48
(n) 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;	Section 9.1
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 10
(p) 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;	Section 9.3
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	Section 9.7
(r) 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 and affected parties; and	Section 11 Appendix D
(s) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Section 9.8
(t) any specific information that may be required by the competent authority;	Section 9.9
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	Section 9.10

2 PROJECT BACKGROUND INFORMATION

2.1 SCOPE OF THE PROPOSED ACTIVITY

Glencore Operations South Africa (Pty) Ltd has entered into an energy conversion service agreement with Swedish Stirling, which involves the proposed construction and commissioning of a standalone energy conversion facility located on the Lion Smelter complex premises. The proposed facility (hereafter referred to as Lion ECF), will convert the thermal energy from the excess furnace gas produced by Lion Smelter Complex into electrical energy in the Swedish Stirling's proprietary power generation technology (PWR BLOK 400-F units). The electric energy will then be fed back into the electrical supply of the Lion Smelter.

The following associated structures and infrastructures will form part of the proposed facility:

- 26 Containerised power generating module (referred to as a PWR BLOK Unit or PBU) with 14 engines and all necessary ancillaries;
- Containerised Gas Conditioner (CGC), which conditions the incoming gas prior to being fed to the PWR BLOK;
- A cooling plant interconnected with the PWR BLOK module providing the necessary cooling for the 14 PCU's;
- A main substation;
- A backup generator (10 kW);
- N₂ bulk storage facility;
- Offices, ablution facilities, and kitchen;
- Hazardous chemical storage area;
- Waste storage area;
- Covered parking; and

- Storm water management infrastructures.

Figure 3 illustrates the process flow of the proposed facility.



Figure 1: Image of the PBU (source: <https://swedishstirling.com>)



Figure 2: Example of similar project (source: <https://swedishstirling.com>)

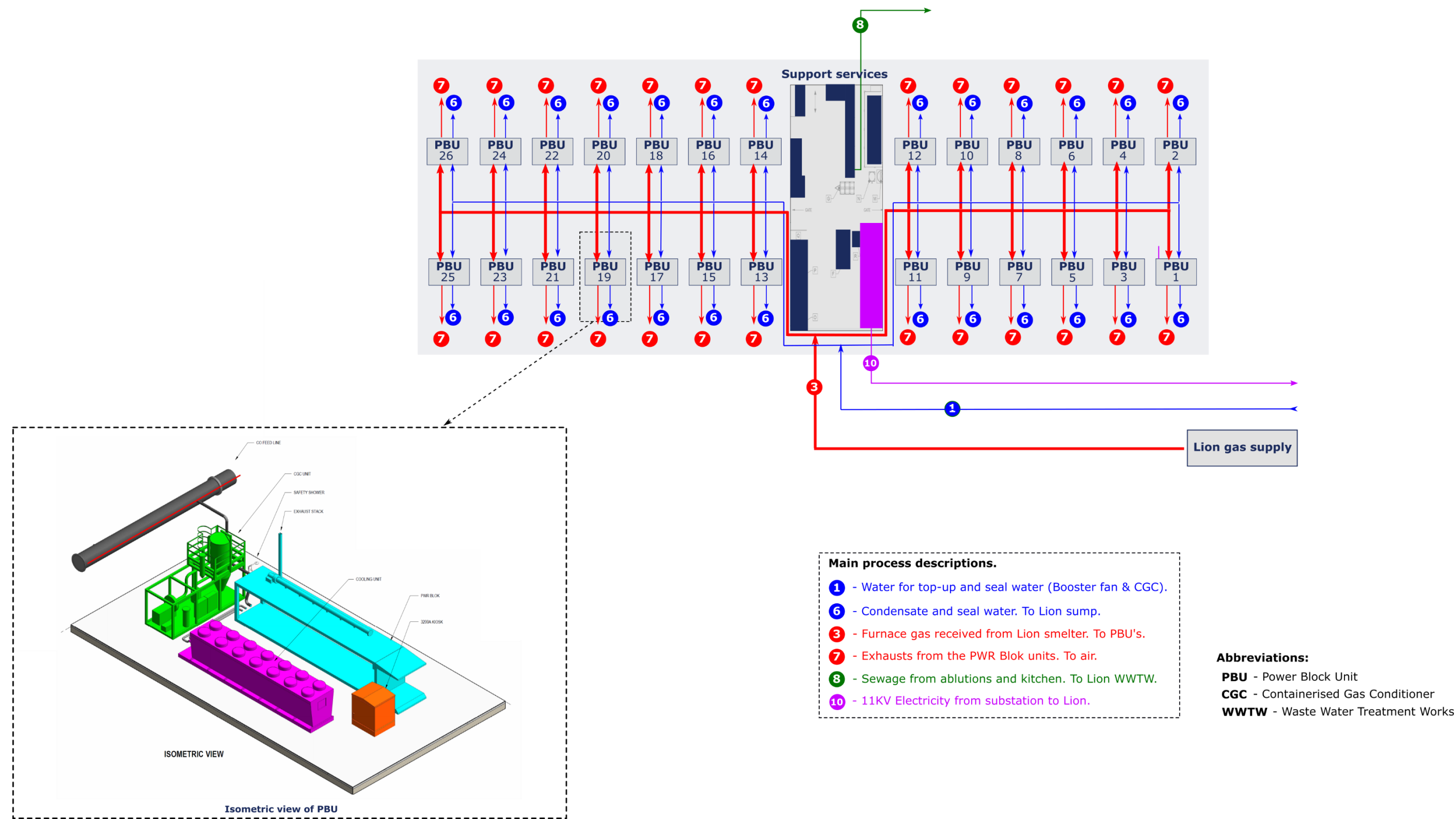


Figure 3: Process flow diagram

2.2 PROJECT LOCATION

The Lion Smelter site falls within the Fetakgomo – Greater Tubatse Local Municipality (FGTM) which is located within the Greater Sekhukhune District Municipality of the Limpopo Province of the Republic of South Africa. The Lion ECF will be located within the Lion Smelter premises, farm Xtrata 630 KT, with the following central coordinates: 24°49'15.69"S, 30° 6'35.76"E (WGS84).

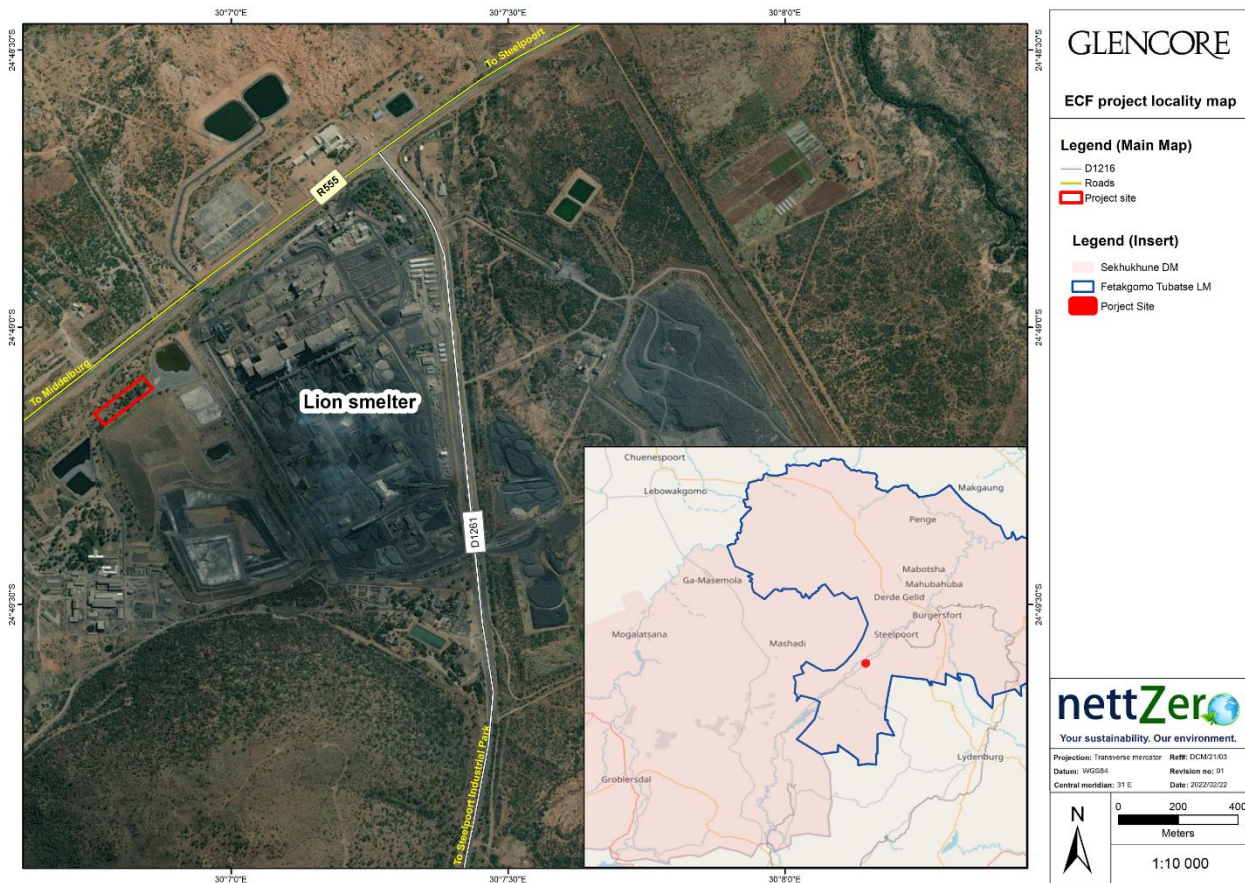


Figure 4: Locality map of the proposed development

See Appendix B the detailed Site Layout Plan and Locality Map.

2.3 DIRECTLY AFFECTED PROPERTIES

Table 2 provides information related to the direct affected properties.

Table 2: Directly Affected Properties

FARM/AREA	PORTIONS/HOLDINGS	ERF.	PROPERTY DESCRIPTION	PROPERTY SIZE (HA)	DEED OF TRANSFER	OWNER DETAILS
Farm Xtrata	630 KT	1220	1220, Steelpoort Extension 11 Township, Registration Division KT	172.3772	T46395/2012, Pretoria	Glencore Operations South Africa (Pty) Ltd 1997/017998/07 P.O. Box 218, Steelpoort, 1133. 013 230 5000
21 DIGIT SURVEYOR GENERAL CODE:				TOKT00100000122000000		

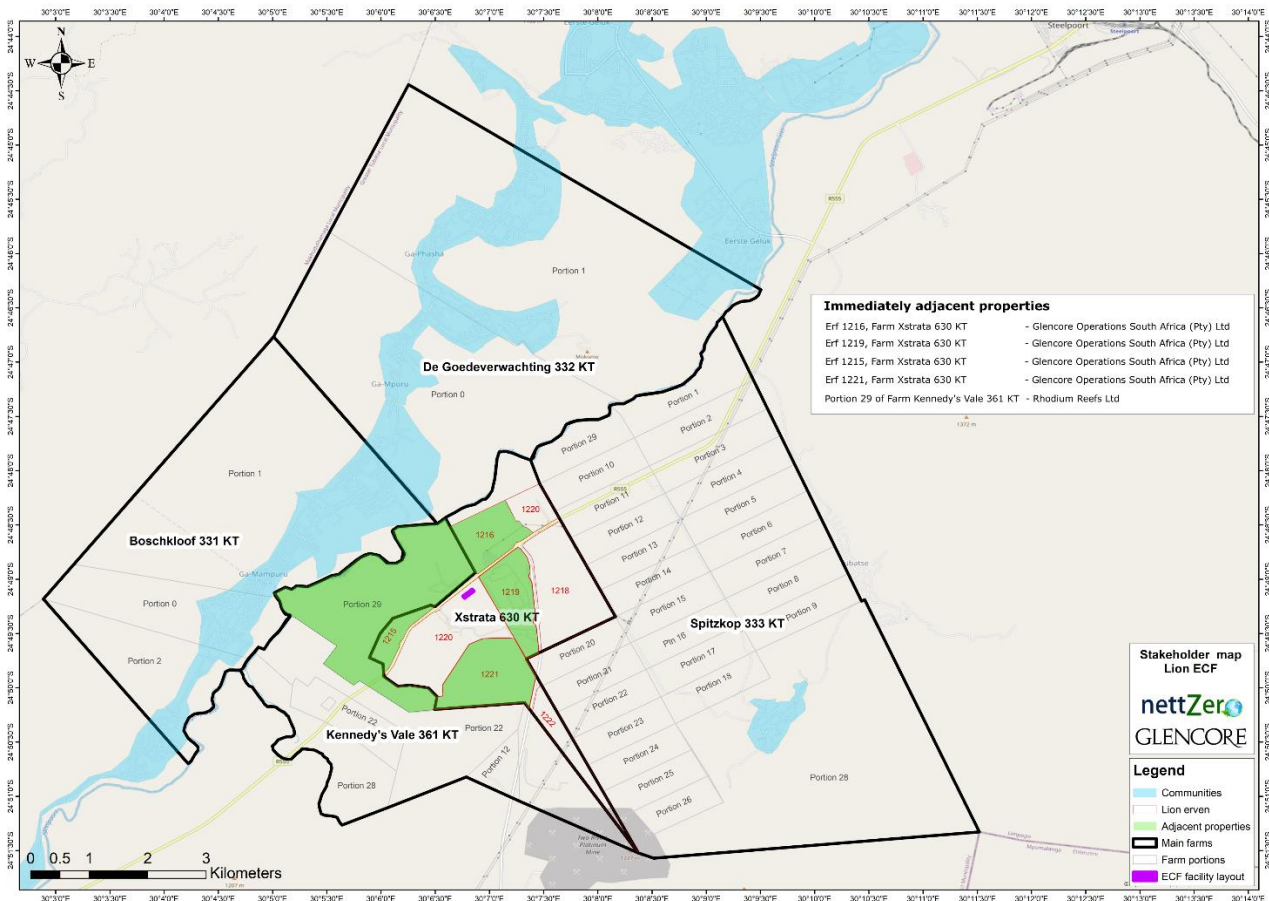


Figure 5: Map of the location of the proposed development in relation to the properties as consolidated

As per Figure 5 and Figure 6, the proposed development is situated erf 1220 of Farm Xstrata 630 KT, prior to the consolidation known as Ptn. 8 and 27 of Farm Kennedy's Vale 361 KT.

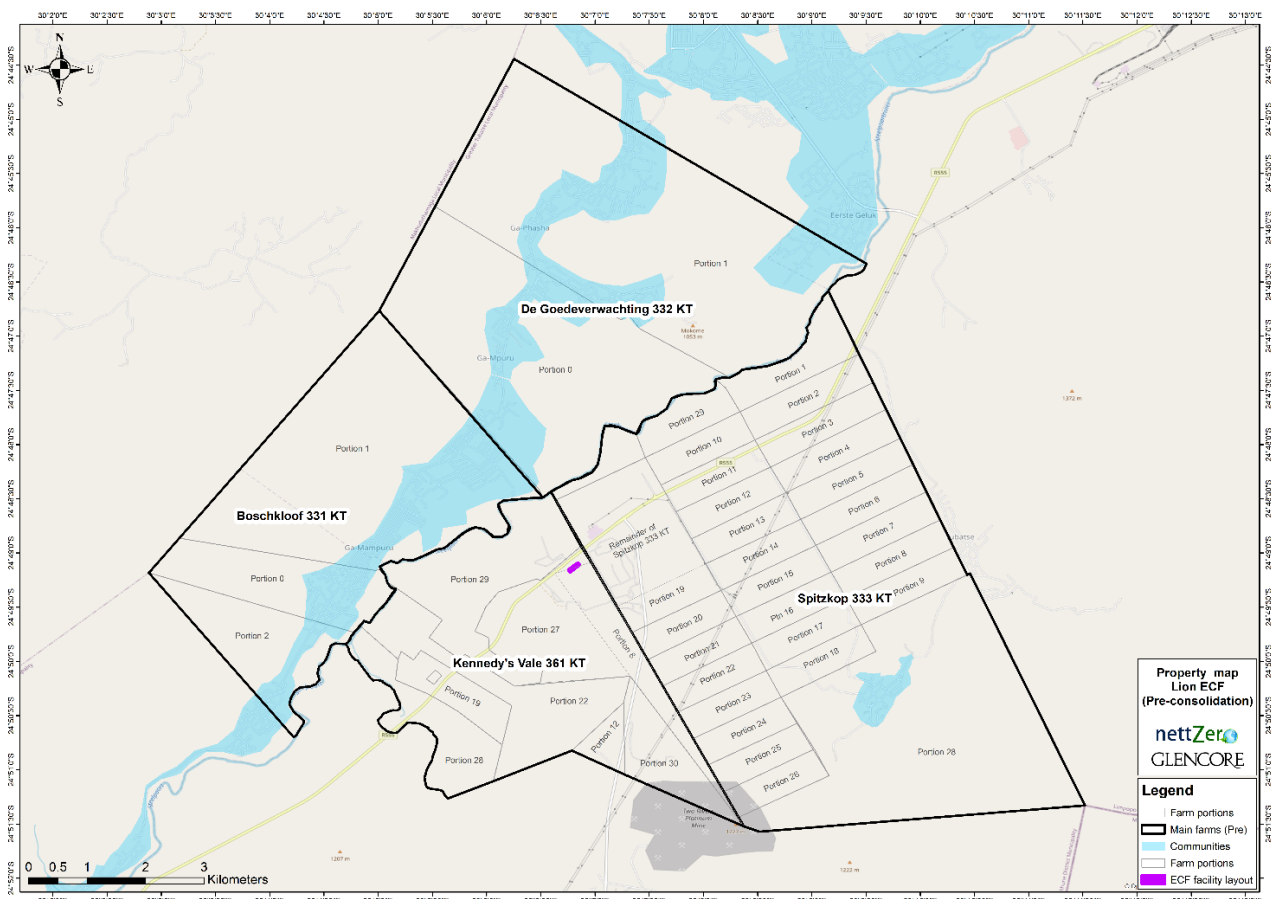


Figure 6: Map of the location of the proposed development in relation to the properties as known prior to consolidation

2.4 CURRENT LAND USE

Large portions of land within the Sekhukhune District and the FTLM are subject to land claims which influences the land-uses. These land parcels usually fall under traditional authorities and sometimes competing claims have been lodged. Most of these claims are not likely to be easily resolved and need tenure reform rather than restitution. The nature of land claims in the district hampers development and result in shortages of land but can also cause instability amongst communities.

Although the study area does not fall under the jurisdiction of a tribal authority, land claims have been lodged for the farms Kennedy's Vale 361 KT (Bakgatla Ba Mosehla Community) and Spitzkop 333 KT. These farms have been consolidated into the farm Xstrata 630 KT. The status of the land claims is under review, but the claims have not been settled (Government Gazette Vol 663 no 41473 dated 2 March 2018).

The land-use in the study area is characterised by various mining related activities. Some land parcels in the study area are zoned as Industrial 2. A Special Economic Zone (SEZ) is further proposed on the farm Spitzkop 333 KT to the northeast of the proposed site along the R555.

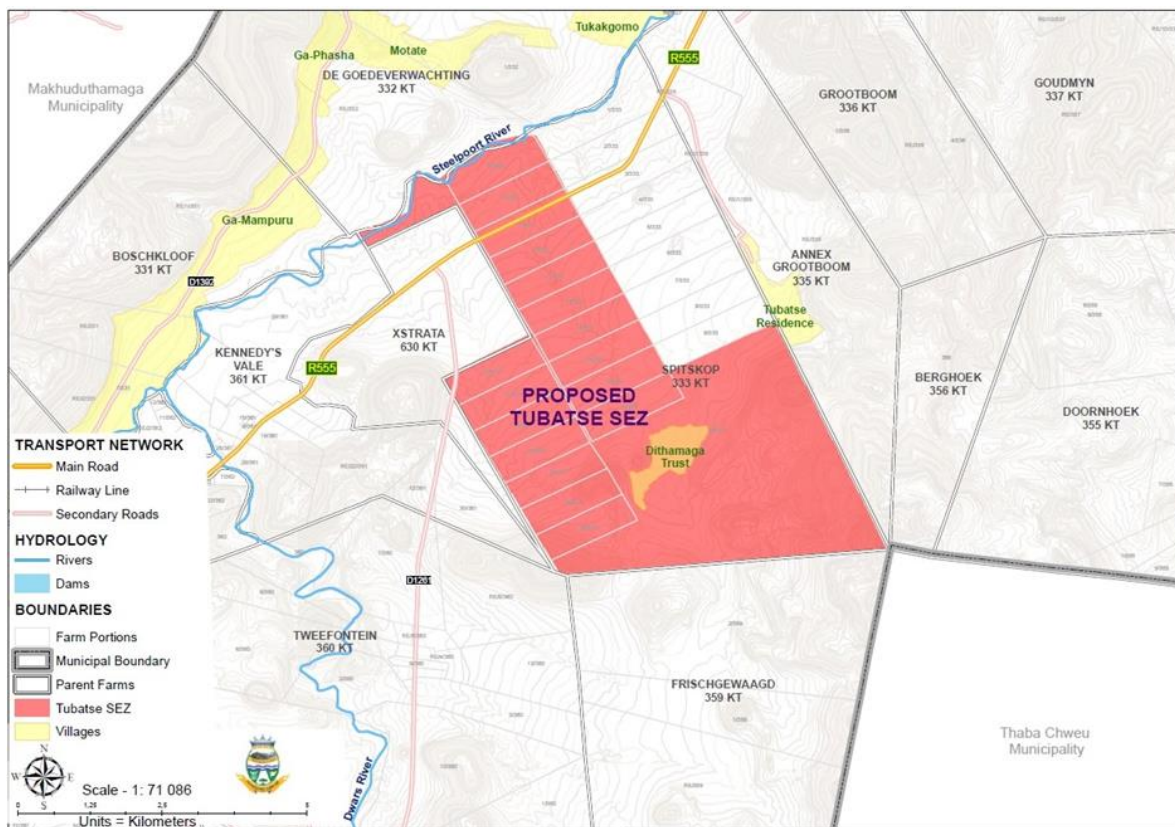


Figure 7: Proposed Tubatse SEZ (www.globalafricanetwork.com)

Steelpoort town is characterised by mixed used developments that include heavy engineering enterprises; suppliers to the mines; transport facilities; building material suppliers; distributors/ wholesale, medium density housing and a small retail component.

Various mines are found within the larger study area, and include the following mines to the northeast towards Burgersfort:

- Tubatse Ferrochrome;
- Winterveld Chrome Mine; and
- Modikwa Platinum Mine.

Mines to the south include:

- Tweefontein Mine;
- Dwarsrivier Chrome Mine;
- Two Rivers Platinum Mine;
- Thorncliffe Chrome Mine;
- Der Brochen Mine;
- Helena Mine; and
- Magareng Mine.

The land-uses in the larger area impact on the visual character which ranges from natural rural areas, and rural settlements to mining related activities and infrastructure. The proposed site for the ECF is thus surrounded by areas of mining activity as well as natural veld with some hills to the south and larger mountains further to the north.

2.5 OUTCOME OF NATIONAL WEBBASED SCREENING REPORT

A Screening Report, using the national web-based screening tool, was generated on 2 February 2022 by Netzero (Pty) Ltd in the following application category: “Activity requiring permit or licence in terms of National or Provincial legislation governing the release or generation of emissions”.

The generated Screening Report is attached as Appendix A – Screening Report.

2.5.1 ENVIRONMENTAL MANAGEMENT FRAMEWORK

The proposed development falls within the Olifants Environmental Management Framework (OEMF), Zone B (Highveld to Bushveld transition area).

2.5.1.1 Constraints, opportunities, and potential conflicts within the OEMF

As per the EMF, several constraints have been identified for this zone, including the following:

- Over-allocation of water resources;
- Drought has been identified as a possible risk;
- A high possibility of containing critically endangered and endangered vegetation, which currently does not fall within a statutory or private protected area;
- Risk of losing vegetation from encroaching developments;
- Excessive medicinal plant harvesting;
- Pollution of water resources from human activities; and
- Poorly functioning municipal sewage treatment plants.

The following opportunities have been identified by the published EMF:

- Rich in mining resources (chrome, platinum and vanadium) and potential for future mining operation exists;
- Part of the Sekhukhuneland Centre of Endemism (SCE) and has a relatively unspoilt natural environment where large areas has been identified as possible conservation areas by the National Protected Areas Expansion Strategy (containing endangered vegetation);
- Good opportunity for conservation, recreation and tourism;
- Development of cultural activities also has some potential; and
- Some areas classified as highly arable land and irrigated agriculture also takes place in this zone.

There are, however, potential conflicts between the opportunities identified above, as in most instances the mining resources overlaps with the SCE, implying that an opportunity cost analysis will be required to determining how the course of action of one opportunity, will affect the viability of the other. In this zone the main conflict anticipated is tourism and conservation verses mining activities.

2.5.1.2 Desired state of the OEMF

Table 3 summarises the desired state of management Zone B and identified management guidelines:

Table 3: Summary of the desired state identified in the published Olifants Environmental Framework (OEMF)

TOPIC	REQUIRED STATE	GUIDELINES	RESPONSIBILITY
Water utilisation	<ul style="list-style-type: none"> Due to the over-allocation of water resources within this zone, the ecological reserve requirements must always be met ensuring the health of the river ecosystem. Due to current activities within this zone causing significant pollution, the strictest possible water quality release standards must be applied. Releases must be monitored effectively, and transgressors should be dealt with in terms of the applicable legislation. Introduction of a polluter pays charge system should be considered that allocates clean-up cost as well as the opportunity cost of the pollution to the polluter. 	<p><u>Water allocation:</u></p> <ul style="list-style-type: none"> No further negative impact on the ecological reserve of any part of the river system. Water allocation to meet the needs of municipalities to take prevalence over the allocation to other users. Water allocations for the agricultural, mining and industrial sectors must come from savings from existing allocations that are relocated. Illegal use of water must be investigated, followed up and perpetrators should be prosecuted. <p><u>Water quality:</u></p> <ul style="list-style-type: none"> Water released back into the system must comply with the relevant quality standards. Water release quality standards must be applied strictly, and transgressors should be prosecuted. Municipalities should be capacitated to upgrade and manage sewage works to acceptable standards. Municipalities that fail, should be prosecuted. 	Department of Water and Sanitation (DWS) and water users
Conservation	<ul style="list-style-type: none"> Due to the high conservation potential and several existing conservation areas, conservation should be the dominant and key land use in the area. Establishment of conservation zones should be actively encouraged. All other activities that are allowed in the area should be done in such a way that it does not diminish the conservation potential. 	<ul style="list-style-type: none"> All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009. Conservation and associated tourism are the preferred land-use in the area and any other land-use that is 	<ul style="list-style-type: none"> Land owners and users DEA, Department of Mineral Resources and Energy (DMRE),

TOPIC	REQUIRED STATE	GUIDELINES	RESPONSIBILITY
	<ul style="list-style-type: none"> Ecology of river systems should be rehabilitated to a natural state. Exotic fish species and other organisms in the zone should be eradicated to allow for the reestablishment of indigenous species in the rivers and streams. 	allowed should not have significant detrimental long term impact on the conservation land-use focus.	LDEDET and MDEDET
Tourism	<ul style="list-style-type: none"> Due to the high potential for natural tourism, the active promotion of tourism in this zone should become a planning priority at national, provincial, and local levels of government. Private investment in tourism with an emphasis on quality tourism products that match the tourism potential of the area should be encouraged. 		
Mining	<ul style="list-style-type: none"> Before any further mining is allowed in this zone, a Strategic Mining Plan (SMP) should be developed between the relevant government departments to ensure mining occurs in a manner that is appropriate to the overall nature of the zone. Meets the requirements to ensure that the conservation and tourism potential of the area is not diminished. Mining to be limited to an agreed maximum surface area and that further mining should be dependant on the successful completion and rehabilitation of mining activities as stipulated in the SMP. 	<ul style="list-style-type: none"> A strategic mining plan should be developed for this zone that limits the unrehabilitated surface area of mines to the minimum possible. 	<ul style="list-style-type: none"> DMRE
Industry	<ul style="list-style-type: none"> Due to the conservation and tourism potential within this zone, heavy industry should not be allowed in this zone. Metallurgical industries associated with mines in the zone should be located on derelict land outside the zone. 	<ul style="list-style-type: none"> The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government. 	<ul style="list-style-type: none"> All government institutions
Agriculture	<ul style="list-style-type: none"> Agriculture is not regarded as growth activity in Zone B due to limited suitable land. Cattle grazing as a land use on natural vegetation should continue where conservation is not established in a manner that does not lead to overgrazing. 		

TOPIC	REQUIRED STATE	GUIDELINES	RESPONSIBILITY
	<ul style="list-style-type: none"> The same applies to game farms. 		
Transportation	<ul style="list-style-type: none"> The current status of major roads within this area are exceptionally poor, and the repair and maintenance of these roads should therefore be a high priority. 		
Business, service and government	<ul style="list-style-type: none"> The zone is rural in nature and business activities are limited to small rural towns and local service centres. Legislation is ahead of the ability of government to implement it, prevails in this zone. 	<p><u>Cooperative government:</u></p> <ul style="list-style-type: none"> Government instructions at all levels should coordinate their activities in such a way that authorisations, licences and permits issued does not conflict with one another. Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement. <p><u>Air Quality:</u></p> <ul style="list-style-type: none"> The Air Quality Management Plan (AQMP) (currently being compiled) that will apply to the zone should be implemented. The implementation of the AQMP should be monitored and where it fails corrective action must be taken. 	<ul style="list-style-type: none"> All government institutions

2.5.2 RELEVANT DEVELOPMENT INCENTIVES, RESTRICTIONS, EXCLUSIONS OR PROHIBITIONS

The proposed development falls within the Strategic Transmission Corridor (International Corridor). Transmission development within the location of the site will be confirmed during the Basic Assessment process.

2.5.3 SITE SENSITIVITY VERIFICATION OUTCOME

A Site Sensitivity Verification Report (SSVR) (see Appendix C) was completed in order to confirm or dispute the land use and environmental sensitivities as provided in the Screening Report (Appendix A – Screening Report), identified by the national web-based environmental screening tool (hereafter referred to as the screening tool), in terms of Regulation 16 (1) (v) of the Environmental Impact Assessment (EIA) Regulations (GNR 982 GG 38282 of 4 December 2014, as amended).

Various specialist assessments were identified by the screening tool. The following table summarises the verification outcome following the required desktop analysis and on-site inspection:

SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/PLAN OF STUDY	MOTIVATION PROVIDED IN SECTION REFERENCE
AGRICULTURAL IMPACT ASSESSMENT			
High	Low	Compliance Statement	6.2
LANDSCAPE AND VISUAL IMPACT ASSESSMENT			
ND	Moderate - visual impact at a local and/or regional scale	Visual Impact Assessment (VIA)	6.3
ARCHAEOLOGICAL AND PALAEOLOGY IMPACT ASSESSMENT			
Low	Low	Phase 1 Heritage Impact Assessment (HIA)	6.4
TERRESTRIAL BIODIVERSITY, PLANT AND ANIMAL SPECIES IMPACT ASSESSMENT			
Low - terrestrial biodiversity	Low - terrestrial biodiversity	Compliance Statement	6.5
Medium - plant species	Low - plant species		
High - animal species	Low - animal species		
AQUATIC BIODIVERSITY IMPACT ASSESSMENT			
Low	Low	Compliance Statement	6.6
HYDROLOGICAL AND GEOHYDROLOGICAL ASSESSMENT			
ND	Low	Conceptual Storm Water Management Plan (CSWMP)	6.7
NOISE IMPACT ASSESSMENT			
ND	Low	Compliance Statement	6.8
TRAFFIC IMPACT ASSESSMENT			
ND	Low	Site Traffic Impact Assessment	6.9
HEALTH IMPACT ASSESSMENT			
ND	TBA	Health Risk Assessment	6.10
SOCIO-ECONOMIC IMPACT ASSESSMENT			
ND	Low	Social Compliance Statement	6.11
AIR QUALITY IMPACT ASSESSMENT			
ND	TBA	Level 2 Air Quality Impact Assessment	6.12

* ND – Not Defined; TBA – to be assessed during the BA process

2.6 LISTED ACTIVITIES

Table 4 provides the confirmed listed activities as part of the Basic Assessment Process (BA) and Air Emissions Licence (AEL) application.

Table 4: Listed activities associated with the proposed ECF project

ACTIVITY DESCRIPTION	RELEVANT LEGISLATION	LISTED ACTIVITIES	KEY PROCESS COMPONENTS
Construction, and operation, and¹Closure of the Energy Conversion Facility (PWR BLOK 400-F Units)	GNR 983 GG 38282 dated 4 December 2014 (as amended by GN 327 GG 4077 dated 7 April 2017, GN 706 GG 41766 dated 13 July 2018, and GN 517 GG 44701 dated 11 June 2021) – Environmental Impact Assessment Regulations, Listing Notice 1	Activity 2 - The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where— (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare.	<ul style="list-style-type: none"> • Environmental Authorisation (EA) application in terms of NEMA; • Site Sensitivity Verification Report; • Basic Assessment Report (BAR), Environmental Management Programme (EMPr), and Closure Plan; • Specialist Reporting as required by the Screening Report generated by the National Web-based screening tool; • Amendment of the existing Air Emissions Licence (AEL); and • Engagement with the registered I&AP.
		Activity 34 - The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is 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; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.	
	GNR 985 GG 38282 dated 4 December 2014 (as amended by GN 324 GG 4077 dated 7 April 2017, GN 706 GG 41766 dated 13 July 2018, and GN 517 GG	Activity 12 - The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. e. Limpopo i.	

¹ As per section 9.4, the period for which the EA is required has been specified as 45 years. Therefore, activity 31 of Listing Notice 1 (GNR 983 GG 38282 dated 4 December 2014, as amended) is excluded as part of this application.

ACTIVITY DESCRIPTION	RELEVANT LEGISLATION	LISTED ACTIVITIES	KEY PROCESS COMPONENTS
	44701 dated 11 June 2021) – Environmental Impact Assessment Regulations, Listing Notice 3	Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.	
Operation of the Energy Conversion Facility (PWR BLOK 400-F Units)	GN 893 GG 37054 dated 22 November 2013 (as amended by GN 551 GG 38863 dated 12 June 2015, GN 1207 GG 42013 dated 31 October 2018, GN 687 GG 42427 dated 22 May 2019, and GN 421 GG 43174 dated 27 March 2020) – List of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage	Sub-category 1.5: Reciprocating Engines – Liquid and gas fuel stationary engines used for electricity generation. (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)	

2.7 NEED AND DESIRABILITY

Several factors are considered in the determination of needs and desirability associated with any development. For the proposed development the following was considered by the proponent:

- How will the proposed development contribute and/or reduce the effect it has on climate change?
- How will the proposed development contribute to the sustainable development goals?
- Is the proposed development in line with the Fetagoma Tubatse Local Municipality (FTLM)'s Integrated Development Plans ("IDPs") and Spatial Development Frameworks ("SDFs")?
- How will the proposed development mitigate or manage both its positive and/or negative contribution to the present state of the environment as defined in the OEMF?

The following sections will describe all considerations in detail.

2.7.1 THE PROPOSED DEVELOPMENT AND CLIMATE CHANGE

The energy conversion service agreement with Swedish Stirling South Africa, will allow the reuse of the Lion Smelter's excess gas to be converted into thermal energy using their proprietary technology. It is the intention of Swedish Stirling to register the proposed development under the Clean Development Mechanism (CDM) with the United Nations Framework Convention on Climate Change (UNFCCC).

The Clean Development Mechanism (CDM), defined in Article 12 of the ²Kyoto Protocol, has the ability to assist developing countries (³not included in Annex I) in achieving sustainable development (SD) by meeting their emission-reduction or emission-limitation commitment under the Protocol

When registering a specific project as a CDM allows such projects to earn saleable certified emissions reduction (CER) credits, each equivalent to one tonne of CO₂, which will then count towards obtaining credits in meeting the committed targets of the specific country where the project will be located. Benefits of registering CDM projects include investment in climate change mitigation projects in developing countries, as well as improvement in the livelihood of communities through the creation of employment or increased economic activity.

To register a CDM project, the participants require a written approval of the voluntary participation from the designated national authority (DNA) of each party involved, including confirmation by the host party that the project activity assists in achieving sustainable development. Host country project approval is one of the prerequisites of registration of a potential CDM project with the UNFCCC. Therefore, the Department of Mineral Resources and Energy (DMRE), as the DNA, has set out a procedure to evaluate a proposed CDM projects based on sustainable development criteria.

Swedish Stirling intends to develop a carbon credit programme of activities, titled the 'Flare Gas Energy Programme' (FGEP).

² The Kyoto Protocol is an agreement signed on the 11 December 1997 among industrial leaders to reduce greenhouse gas emissions (GHG). The Kyoto Protocol operationalises the United Nations Framework Convention on Climate Change (UNFCCC) by committing industrialised countries and economies transition to limit and reduce GHG emissions. The signees or participants of the agreement or UNFCCC programs commits to reduce carbon dioxide and GHGs within a specific country.

³ Non-Annex I – parties listed in this annex are mostly developing countries. Certain countries listed in this annex are recognised as being especially vulnerable to the adverse impacts of climate change or that are more vulnerable to the potential economic impacts of climate change response measures.

The goal of the programme is to generate energy from industrial waste heat sources in South Africa. Swedish Stirling intends to submit the carbon credit programme for approval and registration under the CDM. The approval process will entail a validation audit by an independent auditor.

The programme will provide a framework under which project component activities (CPAs) can be included. All CPAs will comprise Swedish Stirling's PWR BLOK systems, which include Stirling engines, for the purpose of extracting energy from residual and flare gases in industrial facilities. The waste heat from the flaring is recovered and converted to electricity. The electricity is sold directly to third parties. The application of PWR BLOK systems therefore enables significant energy savings, which reduce global carbon dioxide (CO₂) emissions.

The first CPA under the programme is the proposed ECF project.

The framework for the programme implementation will be managed by the Coordinating and Managing Entity (CME), Swedish Stirling South Africa (Pty) Ltd. Swedish Stirling is responsible for developing all necessary CDM documentation, conducting procedures for the approval of the programme and included CPAs, monitoring of CPAs and selling of accruing certified credits.

The first CPA, the Lion Energy Conversion Facility, is expected to generate approximately 58 138 tCO₂e/year of emission reductions in the first crediting period, which runs for the first five years. The programme is a voluntary action by the CME, Swedish Stirling.

The programme will contribute to sustainable development in the Republic of South Africa in accordance with the national sustainable development criteria⁴ through:

2.7.1.1 Economic Development:

The programme will contribute to economic development through the provision of renewable energy to South Africa's industrial companies. The national economy is heavily dependent on these industrial companies, which are also heavily dependent on energy. The national utility is unable to cater for the current and growing demand making it vital that clean, renewable energy sources are developed to support sustainable development and growth in the country. The electricity generated under the PoA will increase the security of electricity supply for major industrial facilities, which will increase the ability to continue operations with minimal interruptions as a result of the frequent disruptions to national electricity supplies.

Generating power from waste industrial gases is considered to be green, as it does not rely on natural resources. The generated power potentially reduces the required amounts of coal used for electricity generation and other fossil fuel use associated with the industrial companies. In addition, the project can contribute to national and local economic development by bringing foreign exchange into the country through the sale of carbon credits. Contributions to economic development will be achieved through the creation of employment opportunities during the implementation of each CPA. The skills transfer and capacity building associated with the project are also considered as benefits to economic development.

⁴ Sustainable development criteria for approval of clean development mechanism projects by the Designated National Authority of the CDM (source: Department of Minerals and Energy; 14 October 2004)

2.7.1.2 Social Development:

The construction, installation and implementation phase of each CPA will require human and other resources, which will result in increased local employment opportunities and the procurement of goods and services from the local economy.

2.7.1.3 Environmental:

The electricity generated through the project activities, recovery of the waste heat from flaring, will reduce electricity generated from the South African electricity grid. The South African electricity grid is predominantly coal-fired and therefore emissions intensive. The reduction in electricity consumed from the grid will result in a reduction in greenhouse gas emissions, atmospheric emissions, water consumption for cooling purposes in coal fired power stations as well as the other negative impacts associated with coal mining.

The technology in this programme is environmentally safe and sound and has been in use since the 19th century⁵.

2.7.2 MUNICIPAL INTEGRATED DEVELOPMENT PLANS AND SPATIAL DEVELOPMENT FRAMEWORKS

As stated earlier, the proposed development is situated in the Fetagoma Tubatse Local Municipality (FTLM). The published Integrated Development Plans (“IDPs”) and Spatial Development Frameworks (“SDFs”) clearly characterises the municipality with a weak economic base, inadequate infrastructure, major service backlogs, dispersed human settlements and high poverty levels. As per the “State of Local Government in South Africa: Overview Report” (CoG, 2009) FTLM is classified as a B4 municipality that is mainly rural, located in economically depressed areas, consequently having difficulty in attracting and retaining skilled managers/professionals and are struggling from a revenue generation perspective.

The main economic sectors within FTLM include agriculture, mining and quarrying, trade, tourism, manufacturing, general government, community, social and personal services, catering and accommodation (FTLM: IDP: 2021).

Situated northeast of the proposed development is the proposed Tubatse Special Economic Zone (SEZ). The establishment of the SEZ is driven by the projected mining and beneficiation forecasts of the Platinum Group of Metals (PGM). According to the Limpopo Economic Development Agency (LEDA), the Tubatse Special Economic Zone will impact positively on more than a million people in the province due to improved economic activities within the Dilokong Spatial Economic Initiative as well as improving economic progress within other districts and municipalities (FTLM: IDP: 2021).

The agriculture sector in the FTLM is still emerging and heavily under-invested. Lack of mechanisation makes smallholder farming one of the smallest contributors to the municipality’s economic growth.

The manufacturing sector covers the manufacturing of goods, products and beverages. It also comprises the production, processing and preservation of meat, fish, fruit, vegetables, oils and dairy products; grain mill, starches and tobacco products; textile products; spinning, weaving; and petroleum products and nuclear fuel. This sector has a vast potential as job creator but is still in its infancy.

With regards to the tourism sector, it was noted that the unique selling benefits of local heritage sites and other tourism facilities in the municipality are not effectively profiled and marketed. The tourism sector is

⁵ Reference: <https://swedishstirling.com/en/technology/stirlingteknologi/>

further being overshadowed by mining to the extent that more strategic focus is unevenly invested in the latter at its expense.

To summarise, investment opportunities in the FTLM include:

- mining investment;
- land availability;
- tourism;
- funding source from private sector; and
- job creation from infrastructure investment.

The following planning and development priorities has been identified in FTLM's SDF:

- To actively protect, manage and enhance the natural environment in order to reduce conflicts between the mining, agriculture and tourism sector in the area.
- Promote mining activities in the area to ensure job creation and development of the Dilokong Corridor.
- To promote farming, industry and food production (agri-processing), with the help of the proposed De Hoop Dam.
- Concentrate on promoting tourism of natural beauty and historic culture.
- Assist in speeding development by focusing on education and skills development.

Therefore, any development within the FTLM that feeds into the above would prove economically advantageous.

2.7.3 ENVIRONMENTAL MANAGEMENT FRAMEWORK

As mentioned in section 2.5.1, the proposed development falls within the Olifants Environmental Management Framework (OEMF), Zone B (Highveld to Bushveld transition area).

With reference to Table 3, the proposed development may affect the desired state in the following ways:

Table 5: Summary of how the proposed development may affect the desired state as defined in the OEMF

TOPIC	IMPROVEMENT OPPORTUNITIES	POTENTIAL DEGRADING EFFECT
Water utilisation	<ul style="list-style-type: none"> • By implementing the conditions of the EA and EMPr associated with the proposed development, will further enhance the monitoring of the current state of environment and ensure adherence with the strictest environmental management principles. 	<ul style="list-style-type: none"> • Due to the low-risk classification on impacting on nearby wetlands or natural drainage lines (see section 7), potential impacts can effectively be managed to prevent any further alteration of the surrounding surface water quality.
Conservation	<ul style="list-style-type: none"> • Due to the fact the area selected as the preferred site location has been previously disturbed, upon closure of the facility, the required rehabilitation measures (as specified in the EMPr), may potentially improve the ecological status. 	<ul style="list-style-type: none"> • The proposed development is situated within an ecosystem classified as endangered.
Industry	<ul style="list-style-type: none"> • The proposed development will be located on a property that is zoned as Industrial 2. Therefore, positive, or negative effects that may be as a result of the proposed development will be managed in line with the strategic land use define by the zoning certificate. 	

TOPIC	IMPROVEMENT OPPORTUNITIES	POTENTIAL DEGRADING EFFECT
Agriculture	<ul style="list-style-type: none"> The preferred location of the proposed development revealed a very low agricultural potential (see section 6.2). In addition, strategically the property is zoned as Industrial 2. Therefore, positive, or negative effects on the potential agricultural economy is negligible. 	
Transportation	<ul style="list-style-type: none"> Implementation of recommendations as per the Traffic Impact Assessment (see Appendix M) and management measures of the EMPr, may potentially improve the state of the R555 within immediate vicinity of the proposed development. 	<ul style="list-style-type: none"> An increase in heavy vehicles during the construction of the proposed development is expected and may pose a risk to further strain of the current status of the R555.
Business, service and government	<ul style="list-style-type: none"> As the proposed development is situated in a zone that is rural in nature, business activities are limited to small rural towns and local service centres. Therefore, job opportunities as a result of the construction and operational phase, may promote skills and small business development opportunities. 	

2.7.4 NEED AND DESIRABILITY ASSESSMENT

The need and desirability of the proposed development was further assessed by answering the questions listed the Guideline on Need and Desirability (DEA, 2017).

2.7.4.1 Securing ecological sustainable development and use of natural resources

Table 6: Questions indicating how the development considered ecological sustainability and the use of natural resources

QUESTION		ANSWER	CROSS-REFERENCE
1	How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?	<p>An independent Terrestrial and Aquatic Biodiversity specialist was appointed to conduct an assessment identifying the potential impacts associated with the proposed development on the ecological integrity of the area. The proposed development is situated within an ecosystem classified as endangered. However, following the site assessment it has been recorded that the preferred location has been previously disturbed. The recommendations and mitigation measures has been incorporated into the EMPr and will be required to be implemented during the entire life cycle of the proposed development.</p> <p>In addition, the property selected is zoned as Industrial 2 and the proposed development will be in line with the specified activities associated with the zoning.</p>	<p>See section 6.5 & 6.6 (Appendix I & J).</p> <p>See Table 10 & 11 of the EMPr.</p>
1.1	How were the following ecological integrity considerations taken into account?:		
1.1.1	Threatened Ecosystems,		
1.1.2	Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure		
1.1.3	Critical Biodiversity Areas (“CBAs”) and Ecological Support Areas (“ESAs”),		
1.1.4	Conservation targets,		
1.1.5	Ecological drivers of the ecosystem,		
1.1.6	Environmental Management Framework,		
1.1.7	Spatial Development Framework, and		
1.1.8	Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).		
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including		

	offsetting) the impacts? What measures were explored to enhance positive impacts?		
1.3	How will this development pollute and/or degrade the biophysical environment? 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 (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The main potential polluting risk associated with the proposed development is considered to be atmospheric emissions associated with the operational phase of the proposed development. The existing Air Emissions Licence (AEL) allows the Lion Smelter operation to omit emissions as per the minimum emissions standards. As the proposed development will convert energy from the excess furnace gas from the smelting operations, the emissions associated with the proposed development will not be consider as increasing the total volume of contributing emissions to the atmosphere.	See section 6.12 (Appendix P). See Table 9 of the EMPr.
1.4	What waste will be generated by this development? What measures were explored to firstly 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?	<p>The following waste streams has been identified throughout the entire life cycle of the proposed development:</p> <ul style="list-style-type: none"> • Construction waste (including some hazardous waste as a result of maintenance of construction vehicles or contaminant in the event of the accidental release of hazardous chemicals used during the construction of the operation); • Power Blok Unit (PBU) and Containerised Gas Conditioner (CGC) condensate during the operational phase; • General waste throughout the entire life cycle (office paper, food waste, plastics ect.); • Sewage effluent from the ablution facilities; • Emissions from the PBU exhaust and emergency vents; and • Demolition waste (including building rubble potentially contaminated with hazardous substances) <p>The waste management hierarchy has been considered in the development of the EMPr.</p>	See Table 20 of the EMPr.
1.5	How will this development 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	Independent specialists, assessing the potential impacts the development poses on the landscape (visual impacts) and the nation's cultural heritage, was appointed.	See section 6.3 & 6.4 (Appendix G & H).

	<p>minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</p>	<p>No heritage sites of significance are located within the impact area and therefore no adverse impact to heritage resources is expected.</p> <p>All potential impacts/risks will be managed by implementing the mitigation measures identified in the EMPr.</p>	<p>See Table 14 & 16 of the EMPr.</p>
1.6	<p>How will this development 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 to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</p>	<p>As discussed in section 2.7.1, the ECF project will be one of the first projects registered as part of Swedish Stirling's carbon credit programmes. The facilities function is to generate thermal energy from excess furnace gas, reducing its energy consumption from the Eskom's power grid.</p>	<p>See section 2.7.1</p>
1.7	<p>How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact 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?</p>		
1.7.1	<p>Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)</p>		
1.7.2	<p>Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and</p>		

	intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)		
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?		
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts?	<p>During the impact/risk assessment process (see section 7), direct, indirect, and cumulative impacts (both positive and negative) were considered.</p> <p>The various appointed independent specialist considered a risk-adverse and cautious approach in their recommendations.</p> <p>All identified potential impact/risk can be effectively managed through the implementation of the EMPr throughout the entire life cycle of the proposed development.</p>	<p>See section 7 (Appendix Q).</p> <p>See section 6 (Appendices F – P).</p> <p>See Table 8 - 20 of the EMPr.</p>
1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?		
1.8.2	What is the level of risk associated with the limits of current knowledge?		
1.8.2	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?		
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?		
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?		
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.)?	<p>As highlighted throughout this document, the preferred site is located within the property of the existing Lion Smelter (zoned and Industrial 2). The various independent specialist appointed recorded that the proposed development will be in an area previously disturbed.</p> <p>The socio-economic effect the proposed development would have on the current state of dependencies between human wellbeing, livelihoods, and ecosystem services, is low.</p>	See section 6.11 (Appendix O).

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?	<p>Section 2.7.3 (Table 5) explained how the proposed development will potentially affect the current state of the environment as described in the OEMF.</p> <p>Based on the outcome of the assessment (section 7), overall, the significance of the impacts/risks associated with the ECF project, is considered to be low.</p> <p>In implementing the monitoring and rehabilitation requirements specified in the EMPr throughout the life cycle of the ECF project, potential impacts/risks that would have been considered as negative could be enhanced and managed as a positive impact.</p>	<p>See section 2.7.3 (Table 5).</p> <p>See section 7 (Appendix Q).</p> <p>See Table 8 - 20 of the EMPr.</p>
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?	Section 5 describes in detail how all alternatives was assessed.	See section 5.
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?	See section 7 for the impact assessment considering direct, indirect, and cumulative impacts associated with the EDF project.	See section 7 (Appendix Q).

2.7.4.2 Promoting justifiable economic and social development

Table 7: Questions indicated how the proposed development justified economic and social development

QUESTION		ANSWER	CROSS-REFERENCE
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?:	The socio-economic context is described in detail in section 6.11 and Appendix O.	See section 2.7.2.

2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,		See section 6.11 (Appendix O).
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?	<p>The FTLM's SDF prioritises the following:</p> <ul style="list-style-type: none"> To actively protect, manage and enhance the natural environment in order to reduce conflicts between the mining, agriculture and tourism sector in the area. Promote mining activities in the area to ensure job creation and development of the Dilokong Corridor. To promote farming, industry and food production (agri-processing), with the help of the proposed De Hoop Dam. Concentrate on promoting tourism of natural beauty and historic culture. Assist in speeding development by focusing on education and skills development. <p>Therefore, any development within the FTLM that feeds into the above would prove economically advantageous.</p> <p>The socio-economic assessment conducted (Appendix O) indicated that the potential impacts/risks is anticipated to be low. The recommendations and management measures identified (and included in the EMPr) will limit the negative impacts and enhance the positive impacts.</p>	<p>See section 6.11 (Appendix O).</p> <p>See Table 8 - 20 of the EMPr.</p>
2.2.1	Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	Yes, by implementing the recommended skills development policy throughout the entire life cycle of the proposed development.	

2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	<p>The status of education and employment within the FTLM is concerning.</p> <p>Although overall skills levels have increased over the years, a lack of relevant skills among locals can result in employers still recruiting outside the local municipal areas. This hampers the municipality's job creation efforts. Skills shortages are thus a challenge that needs to be overcome (FTLM: IDP: 2021).</p> <p>The number of households without any form of income or very low levels of income remain of concern. The poverty levels within the province, municipal areas and study area therefore remain a significant socio-economic challenge.</p> <p>Unemployment is a further source of concern, especially if the categories of "discouraged work-seekers" and "other non-economically active" are considered. Those falling within the "other" category can include individuals that are being supported by breadwinners working elsewhere or some relying on social grants, or some could be subsistence farmers or include women running the households and looking after dependants. These sectors of the population will still rely on the employed sections of the population.</p> <p>The negative impact of Covid-19 on poorer households must also be considered. In addition, the state of the economy in South Africa could have contributed to an increase in the unemployment figures provided and could have significantly increased the poverty profile within the study area since the statistical surveys were conducted.</p> <p>Therefore, local recruitment and skills development throughout the entire life cycle of the ECF project, is expected to be welcomed.</p>	See Appendix O.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will	During the construction phase a total of 50 job opportunities (23 skilled and 27 unskilled) is estimated.	

	the impact be socially and economically sustainable in the short- and long-term?	During the operational phase a total of 10 permanent job opportunities will be generated (long-term).	
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,		
2.5.2	reduce the need for transport of people and goods,	The proposed development will not affect 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 public transport),	The proposed development has a low impact on the public transport infrastructure.	See section 6.9. See Table 19 of the EMPr.
2.5.4	compliment other uses in the area,	The ECF project will provide thermal energy generated from the excess furnace gas from the existing Lion Smelter back into the operation.	
2.5.5	be in line with the planning for the area,	The ECF project is located on a property zoned as Industrial 2.	
2.5.6	for urban related development, make use of underutilised land available with the urban edge,	Not applicable.	
2.5.7	optimise the use of existing resources and infrastructure,	The ECF project will provide thermal energy generated from the excess furnace gas from the existing Lion Smelter back into the operation, therefore reducing the electricity usage of the Eskom grid.	
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),	Not relevant.	
2.5.9	discourage "urban sprawl" and contribute to compaction/densification,	The ECF project is not within the urban edge.	
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,	The ECF project is located within a traditional rural area.	
2.5.11	encourage environmentally sustainable land development practices and processes,	Enhances resource efficiency (reduction in electricity usage from the Eskom grid).	

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.),	The FTLM's SDP identifies mining and industry associated with mining as the highest economical potential.	
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),	The proposed development will rely on the continuous operation of the existing Lion Smelter, which is located within a strategical distance to the required raw materials.	
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	The ECF project is located within an area previously disturbed and zoned as Industrial 2. The impact/risk is limited due to the existing land-use in the area, and subsequent impact on the sense of place.	See Appendix O.
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?	The existing Lion Smelter is considered to be a core activity in a local hub of mining activities.	
2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	The risk/impact assessment was conducted and assessed based on current knowledge of the socio-economic situation. There is no way of predicting future socio-economic conditions in terms of the political climate and the effects thereof on the surrounding communities. The high levels of inequality in the local economy, high levels of poverty and unemployment pose a risk in terms of the surrounding community's acceptance of the proposed development.	See Appendix O. See Table 8 - 20 of the EMPr.
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?		
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?		
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?		
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	During the impact/risk assessment process (see section 7), direct, indirect, and cumulative impacts (both positive and negative) were considered.	See section 7 (Appendix Q).
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 various appointed independent specialist considered a risk-adverse and cautious approach in their recommendations.	See section 6 (Appendices F – P). See Table 8 - 20 of the EMPr.
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	All identified potential impact/risk can be effectively managed through the implementation of the EMPr throughout the entire life cycle of the proposed development.	

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 development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	<p>Section 2.7.3 (Table 5) explained how the proposed development will potentially affect the current state of the environment as described in the OEMF.</p> <p>Based on the outcome of the assessment (section 7), overall, the significance of the impacts/risks associated with the ECF project, is considered to be low.</p> <p>In implementing the monitoring and rehabilitation requirements specified in the EMPr throughout the life cycle of the ECF project, potential impacts/risks that would have been considered as negative could be enhanced and managed as a positive impact.</p>	<p>See section 2.7.3 (Table 5).</p> <p>See section 7 (Appendix Q).</p> <p>See Table 8 - 20 of the EMPr.</p>
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Section 5 describes in detail how all alternatives was assessed.	See section 5.
2.10	<p>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)?</p> <p>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?</p>		
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 management measures forming part of the developed EMPr focusses on employing local unskilled labour and enhancing skills development of employed labour.	See Table 18 of the EMPr.
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?	The development of a health and safety management plan is a requirement of the EMPr developed.	See Table 17 of the EMPr.
2.13	What measures were taken to:	A comprehensive public participation programme is implemented by the existing Lion Smelter operations.	See section 8 (Appendix E).
2.13.1	ensure the participation of all interested and affected parties,		

2.13.2	provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	As part of this application section 8 describes the measures taken associated with the PPP.	
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 were 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)?	<p>During the construction phase a total of 50 job opportunities (23 skilled and 27 unskilled) is estimated.</p> <p>During the operational phase a total of 10 permanent job opportunities will be generated (long-term).</p>	
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 work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	The development of a health and safety management plan is a requirement of the EMPr developed.	See Table 17 of the EMPr.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects:	During the construction phase a total of 50 job opportunities (23 skilled and 27 unskilled) is estimated.	
2.16.1	the number of temporary versus permanent jobs that will be created,		

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),	During the operational phase a total of 10 permanent job opportunities will be generated (long-term). Procurement of employees will be focussed locally and in line with current agreements and negotiations.	
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 (i.e. equitable distribution of costs and benefits), and		
2.16.5	the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).		
2.17	What measures were taken to ensure:	A comprehensive public participation programme is implemented by the existing Lion Smelter operations. As part of this application section 8 describes the measures taken associated with the PPP.	See section 8 (Appendix E).
2.17.1	that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and		
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?	During the impact/risk assessment process (see section 7), direct, indirect, and cumulative impacts (both positive and negative) were considered. The various appointed independent specialist considered a risk-adverse and cautious approach in their recommendations. All identified potential impact/risk can be effectively managed through the implementation of the EMPr throughout the entire life cycle of the proposed development.	See section 7 (Appendix Q). See section 6 (Appendices F – P). See Table 8 - 20 of the EMPr.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The measures described in the developed EMPr is considered to be realistic and implementable over the entire life cycle of the proposed development. As part of the EIA regulations, a holder of an EA must ensure that an independent audit assessing the compliance with conditions specified in the EMPr is conducted as specified by the relevant authority or if not specified every 5 years. In addition, this audit must determine if the EMPr sufficiently addressed all risks associated with the development. This required process will ensure that the EMPr is kept up to date and relevant.	

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?	The issuance of the EA will provide the relevant authorities with the legally available means to enforce the effective management of pollution, environmental damage and adverse health effects by the applicant.	
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?	Section 5 describes in detail how all alternatives was assessed.	See section 5.
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?	See section 7 for the impact assessment considering direct, indirect, and cumulative impacts associated with the EDF project.	See section 7 (Appendix Q).

2.7.4.3 Need and desirability statement

Overall, it is clear that the proposed development is situated within an area where the socio-economic need for education and distribution of equitable wealth is of highest importance. The development priority of the local municipality as stated in the IDP and SDF is to actively protect, manage and enhance the natural environment while promoting economic development sustainably in mainly the mining, farming and tourism sector.

Once authorised, it is the intention of registering the ECF project as one of the first projects as part of Swedish Stirling's (solely reliant on the service agreement with Glencore) carbon credit programme, subsequently playing a part in addressing climate change.

As discussed in detail in previous sections and answering the questions as listed in the Guideline on Need and Desirability (DEA, 2017), it is clear that the proposed development will contribute positively toward sustainable development, whereby the overall anticipated low impact on the natural environment can be managed to an acceptable level by implementing the developed EMPr throughout the entire life-cycle.

3 POLICY AND LEGISLATIVE CONTEXT

All relevant acts, regulations, formal departmental guidelines, and templates, as well as formal provincial and municipal regulatory frameworks were considered throughout the entire BA process.

Table 8 summarises the policy and legislative considerations.

Table 8: A description of the policy and legislative context within which the development is proposed

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	DESCRIPTION
NATIONAL LEGISLATION AND REGULATIONS		
Section 24 of the Constitution of South Africa Act no. 108 of 1996	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Adherence with all legislation and regulations that prevents pollution and ecological degradation, promotes conservation, and secures an ecological sustainable development and use of natural resources while promoting justifiable economy and social development.
National Environmental Management Act 107 of 1998 (NEMA)	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	<ul style="list-style-type: none"> • Development of an EMPr for the proposed activities. • Application for authorisation resulting in the submission of this document. • Including emergency response procedures within the submitted EMPr. • Ensuring compliance with a monitoring and audit schedule and plan.
The following regulations in terms of NEMA are applicable:		
GN R. 982(GG 38282 dated 4 December 2014, as amended): National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014 (2014 EIA regulations)	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Independent EAP appointed to ensure adherence with the EIA procedure.

GN R. 983 – 985 (GG 38282 dated 4 December 2014, as amended): Listing notices 1 to 3	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Application for authorisation of listed activities submitted followed by the submission of the EIR, and EMPr.
GN. 320 (GG 43110 dated 20 March 2020): Procedure for the assessment and minimum criteria for reporting on identified environmental themes in terms of section 24(5)(a) and (h) and 44 of NEMA when applying for environmental authorisation. GN. 1150 (GG 43855 dated 30 October 2020): Procedure for the assessment and minimum criteria for reporting on identified environmental themes in terms of section 24(5)(a) and (h) and 44 of NEMA when applying for environmental authorisation. (Terrestrial animal and plant specie themes)	A Site Sensitivity Verification Report (Appendix C) completed by the EAP. Appendices F – P.	All specialist assessments were conducted in line with the prescribed protocols.
National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA)	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	<ul style="list-style-type: none"> Requirements as stipulated in the Act are incorporated with the EMPr submitted for approval. Recommendations made by the specialist report (Appendix P) incorporated into this report as well as the EMPr. The existing Air Emissions Licence (AEL) to be amended to include the additional activity in terms of GN 893 GG 37054 dated 22 November 2013 (as amended) associated with the proposed development: Sub-category 1.5 Reciprocating Engines.
The following regulations in terms of NEMAQA are applicable:		
GN 893 (GG 37054 dated 22 November 2013, as amended): List of activities which result in atmospheric emissions	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr. Application process followed via the online SAAILIP system.	The existing Air Emissions Licence (AEL) to be amended to include the additional activity in terms of GN 893 GG 37054 dated 22 November 2013 (as amended) associated with the proposed development: Sub-category 1.5 Reciprocating Engines.

GN R. 827 (GG 36974 dated 1 November 2013): National dust control regulations	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Requirements incorporated in the EMPr.
GN R. 283 (GG 38633 dated 2 April 2015): National atmospheric emissions reporting regulations	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Requirements incorporated in the EMPr.
GN R. 1210 (GG 32816 dated 24 December 2009): National ambient air quality standards	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Requirements incorporated in the EMPr.
GN. 747 (GG 36904 dated 11 October 2013, as amended): Regulations prescribing the format of the atmospheric impact report	Appendix P.	The Air Quality Impact assessment (Appendix P) was conducted as prescribed.
National Environmental Management: Waste Act 59 of 208 (NEMWA)	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	All waste management activities associated to the proposed mining operation must comply with the requirements set out by the Act. These requirements have been incorporated into the EMPr.
The following regulations in terms of NEMWA are applicable:		
GN R. 634 (GG 36784 dated 23 August 2013): Waste classification and management regulations	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Waste classification requirements to be considered during the classification of all waste streams associated with the proposed development.
GN R. 921 (GG 37083 dated 29 November 2013, as amended): Activities listed requiring a waste management licence (WML)	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	No listed activities are foreseen to be associated with the proposed development.
GN R. 625 (GG 35583 dated 13 August 2012): National waste information regulations	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	All waste generated as part of the proposed development will be reported as part of a waste stream associated with the existing Lion Smelter.

GN R. 635 (GG 36784 dated 23 August 2013): National Norms and Standards for the assessment of waste for landfill disposal	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	This regulation stipulates the requirements to assess generated waste for disposal to specific designed landfills. As a result, the requirements stipulated in these regulations have been considered in the EMPr.
GN R. 636 (GG 36784 dated 23 August 2013): National norms and standards for disposal of waste to landfill	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	This regulation stipulates the general principles associated to the disposal of waste to landfill. As a result, the requirements stipulated in these regulations have been considered in the EMPr.
GN R. 926 (GG 37088 dated 29 November 2013): National norms and standards for storage of waste	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	This regulation describes the general requirements for the management and storage of waste. As a result, the requirements stipulated in these regulations have been considered in the EMPr.
Environmental Conservation Act of 1989 (ECA) GN R. 425 (GG 31901 dated 13 February 2009): Waste tyre regulations GN R. 154 (GG 13717 dated 10 January 1992): Noise control regulations in terms of section 25 of ECA	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Requirements incorporated in the EMPr.
National Water Act 36 of 1998 (NWA)	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	No additional water uses are associated with the proposed development.
Hazardous Substances Act 15 of 1973	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	<ul style="list-style-type: none"> Requirements incorporated into the EMPr. Requirements to be incorporated into ECF project's Health and Safety management plan.
Petroleum Products Act of 1977 GN R. 627 (GG 44363 dated 30 March 2021): Regulations regarding petroleum products specification and standards	BAR: EIA process followed as specified by the NEMA regulations. EMPr: Requirements included in the EMPr.	Throughout the construction, operation, and decommissioning phase of the proposed mining activities petroleum products will be used. These requirements have been included in the EMPr.

<p>Occupational Health and Safety Act of 1993</p> <p>GN R. 647 (GG 37942 dated 29 August 2014): Construction regulations, 2014.</p>	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>The requirements set out by the listed regulations must be incorporated into the ECF project's Health and Safety Management plan. Some of the requirements associated to the environmental health have been incorporated into the EMPr. The following specific sections are applicable in this report and the EMPr:</p> <ul style="list-style-type: none"> • Storage of hazardous substances; • Acquisition of hazardous chemicals; and • Air conditioning and refrigerant equipment.
<p>National Road traffic Act of 1996</p> <p>GN R. 225 (as amended by GN. 485 GG 35413 dated 8 June 2012): National Road traffic regulations</p>	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>The requirements set in these regulations have been incorporated into the EMPr. However this should also form part of the ECF project's Health and Safety Management plan and Traffic management plan. The section specifically considered in the EIR and EMPr are as follows:</p> <ul style="list-style-type: none"> • Transport of hazardous waste. • Loading and offloading of dangerous goods.
<p>Human Tissue Act 65 of 1983</p> <p>National Health Act, 2003 – Regulations regarding the general control of human bodies, tissue, blood, blood products and gametes</p> <p>Medicines and related substances control Act 101 of 1965 & regulations</p>	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<ul style="list-style-type: none"> • Requirements incorporated into the EMPr. • Requirements to be incorporated into the ECF project's Health and Safety management plan. • Requirements to be incorporated in the onsite clinic management plan.
<p>Fertilizers, farm feeds, agricultural remedies and stock remedies Act 36 of 1947</p>	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>The requirements specifically related to the use of herbicides and pesticides have been incorporated into the EMPr.</p>
<p>Conservation of Agricultural Resources Act 43 of 1983 (CARA)</p> <p>GN R. 1048 (GG 9238 dated 25 May 1984, as amended): Declared Weeds and Invader plants</p>	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>The requirements have been incorporated into the EMPr and final site layout plan.</p> <p>This act also deals with permitting of land zoned as Agriculture.</p>

National Environmental Management: Biodiversity Act, 2002 (NEMBA)	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>Requirements incorporated into the EMPr. However, before the commencement of site clearance an application must be lodged for the removal of protected species as identified in the Terrestrial Ecological Assessment (Appendix I).</p>
National Veldt and Forest Fire Act 101 of 1998	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>Measures to prevent the spreading of fires are incorporated into the EMPr.</p>
National Forest Act 84 of 1998	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>Requirements incorporated into the EMPr. However, before the commencement of site clearance an application must be lodged for the removal of protected species as identified in the Terrestrial ecological assessment (Appendix I).</p>
National Heritage Resources Act 25 of 2000	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>The BAR & EMPr document complies with section 38(8) of the NHRA that stipulates that a Heritage Resources Management (HRM) process must be implemented if an evaluation of the impact of a development on heritage resources is required in terms of the NEMA, the integrated environmental management guidelines issued by the Department of Environment Affairs (DEA), or any other legislation. The consenting authority (in this instance the LEDET) must ensure that the evaluation fulfils the requirements of the South African Heritage Resources Agency (SAHRA) and / or the Provincial Heritage Resources Authority in terms of section 38(3) of the NHRA. The HIA reports completed for the project complies with the section. Any comments and recommendations of SAHRA and / or the provincial authority must be taken into account prior to the granting of the consent.</p>
Carbon Tax Act 15 of 2019	<p>Process initiated by Swedish Stirling to apply for carbon credits under their 'Flare Gas Energy Programme'.</p>	<p>Swedish Stirling intends to develop a carbon credit programme of activities, titled the 'Flare Gas Energy Programme' (FGEP). The goal of the programme is to generate energy from industrial waste heat sources in South Africa. Swedish Stirling intends to submit the carbon credit programme for approval and registration under the CDM. The approval process will entail a validation audit by an independent auditor.</p>

		<p>The programme will provide a framework under which project component activities (CPAs) can be included. All CPAs will comprise Swedish Stirling's PWR BLOK systems, which include Stirling engines, for the purpose of extracting energy from residual and flare gases in industrial facilities. The waste heat from the flaring is recovered and converted to electricity. The electricity is sold directly to third parties. The application of PWR BLOK systems therefore enables significant energy savings, which reduce global carbon dioxide (CO₂) emissions.</p> <p>The first CPA under the programme is the proposed ECF project. The framework for the programme implementation will be managed by the Coordinating and Managing Entity (CME), Swedish Stirling South Africa (Pty) Ltd. Swedish Stirling is responsible for developing all necessary CDM documentation, conducting procedures for the approval of the programme and included CPAs, monitoring of CPAs and selling of accruing certified credits.</p> <p>The first CPA, the Lion Energy Conversion Facility, is expected to generate approximately 58 138 tCO₂e/year of emission reductions in the first crediting period, which runs for the first five years. The programme is a voluntary action by the CME, Swedish Stirling.</p>
GOVERNMENT POLICIES		
Waste Management policies	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>In terms of waste management in South Africa, there are two main policies that have been considered in the development of the EMPr. The two main policies considered were regarding the management and disposal of fluorescent tube disposal and the management of sewage sludge. Best practice principles were incorporated into the EMPr.</p>
National Environmental Health Policy	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>This policy document is intended as a 'broad guideline for the effective implementation and rendering of Environmental Health Services in South Africa'. It incorporates the philosophy of Environmental Health includes principles such as primary prevention, transparency, polluter pays, precautionary principle and cradle to grave.</p>

SANS STANDARDS		
Hazardous substances management	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>The following two SANS standards were incorporated into the EMPr:</p> <ul style="list-style-type: none"> • SANS 10089-1:2008 - Specifications for above-ground storage facilities for petroleum products • SANS 310: 2011 - Storage tank facilities for hazardous chemicals: Above-ground storage tank facilities for flammable, combustible and non-flammable chemicals.
PROVINCIAL LEGISLATION		
Limpopo Environmental Management Act (Act of 2003)	<p>BAR: EIA process followed as specified by the NEMA regulations.</p> <p>EMPr: Requirements included in the EMPr.</p>	<p>Requirements incorporated into the EMPr.</p> <p>Protected species identified in the Terrestrial Biodiversity Assessment (Appendix I).</p>

4 EAP DETAILS AND EXPERIENCE SUMMARY

Nettzero (Pty) Ltd, designated Mrs. Anandi Alers (EAP registration no. 2019/1514) as the lead EAP to manage the application process on behalf of the Lion Smelter.

Table 9: Details of the appointed EAP

EAP:	Anandi Alers
EAP REGISTRATION:	2019/1514
CONSULTING COMPANY:	Nettzero (Pty) Ltd
CONTACT NUMBER:	+27 72 604 0455
FAX NUMBER:	+27 86 673 0945
EMAIL:	Anandi.alers@nettzero.co.za

4.1 SUMMARY OF EAP QUALIFICATION

Mrs. Anandi Alers completed a Master of Science degree in Environmental Management and Geography in 2015 at the North West University (Potchefstroom) under the guidance of Prof. Luke Sandham.

She holds a Bachelors of Science Honours degree in environmental sciences, specialising in Environmental Management and Geography, and a Bachelors of Science degree in Tourism, Zoology, and Geography.

4.2 SUMMARY OF EAP'S PAST EXPERIENCE

Mrs Anandi Alers has extensive knowledge of the South African EIA process and holds a Master of Science degree in Environmental Management on the subject of EIA follow-up. Her practical experience includes, but is not limited to the following:

- Environmental Management of a number of construction, mining, and industry related projects;
- Environmental auditing of a number of projects against the approved EMPr's and EA (Environmental Authorisations);
- The development and management of an ISO 14001 EMS (Environmental Management Systems) on a number of construction, mining and industry related projects;
- Development and implementation of policies and procedures managing environmental impacts; and
- Managing applications for a number of permits and licences (EA's, WML's, and WUL's).

4.3 APPOINTED SPECIALISTS

Nettzero has appointed the following independent specialist on behalf of the Lion Smelter, to conduct the required assessments as part of the BA process (Table 10):

Table 10: List of appointed independent specialist

NAME	DESIGNATION	PROF. REG. /ACCREDITATION	YEARS EXPERIENCE	QUALIFICATIONS
AGRICULTURAL IMPACT ASSESSMENT – LAND MATTERS ENVIRONMENTAL CONSULTING (PTY) LTD				
Rowena Harrison	Soil Scientist	SACNASP Reg. No. 400715/15	> 12 years	PhD Candidate - Soil Science (University of Free State and the

				University of Burgundy, France)
LANDSCAPE/VISUAL IMPACT ASSESSMENT - LOGIS				
Lourens du Plessis	Visual Impact Assessment Specialist	GISc Practitioner registered with the South African Geomatics Council (SAGC). Membership no. PGP0147	> 29 years	BA (Geography)
ARCHAEOLOGICAL, CULTURAL HERITAGE AND PALAEOLOGY IMPACT ASSESSMENT – BEYOND HERITAGE				
Jaco van der Walt	Air quality specialist	Accredited CRM Archaeologist with SAHRA Accredited CRM Archaeologist with AMAFA	> 20 years	Phd (Archaeology)(in progress) MA (Archaeology) BA. Hon. (Archaeology) BA (Archaeology)
TERRESTRIAL BIODIVERSITY, PLANT AND ANIMAL SPECIES IMPACT ASSESSMENT – THE BIODIVERSITY COMPANY				
Andrew Husted	Ecologist and Aquatic Scientist	SACNASP Reg. No. 400213/11	> 12 years	M.Sc in Aquatic Health
Lusanda Matee	Ecologist	SACNASP Reg. No. 11927/2018	> 4 years	B.Sc Honours, and MSc in Biological Sciences from the University of KwaZulu-Natal.
AQUATIC BIODIVERSITY IMPACT ASSESSMENT – THE BIODIVERSITY COMPANY				
Christian Fry	Aquatic Scientist	SACNASP Reg. No. 119082	> 8 years	M.Sc in Aquatic Health
Dale Kindler	Aquatic Scientist	SACNASP Reg. No. 114743	> 9 years	M.Sc in Aquatic Health
HYDROLOGY - GCS				
Hendrik Botha	Geohydrologist	SACNASP Reg. No. 400139/17	> 8 years	B.Sc. Chemistry and Geology B.Sc. Hon. Hydrology M.Sc. Geohydrology and Hydrology
NOISE IMPACT ASSESSMENT - DBACOUSTICS				
Barend van der Merwe	Environmental Noise Specialist	Member of the South African Acoustics Institute (SAAI)	> 20 years	M.Sc
TRAFFIC IMPACT ASSESSMENT - SIYAZI				
Paul van der Westhuizen	Road Engineer			
HEALTH IMPACT ASSESSMENT – INFOTOX (PTY) LTD				
Dr. Willie van Niekerk	Health Scientist	QEP (Qualified Environmental	> 20 years	

		Professional), IPEP, USA, 1996. SACNASP Reg. No. 400284/04		BSc (Chemistry), Potchefstroom, 1965. Hons BSc (Chemistry), Potchefstroom, 1966. MSc (Chemistry), Potchefstroom, 1967. PhD (Chemistry), UNISA, 1973.
SOCIO-ECONOMIC ASSESSMENT – BATHO EARTH				
Ingrid Snyman	Social Scientist		> 20 years	B A (Political Science) University of Pretoria B A (Hons) Anthropology University of Pretoria
AIR QUALITY – ENVIRONGAKA (PTY) LTD				
Jan Potgieter	Chemical Engineer	ECSA Reg. No. 20040140	> 15 years	Degree in Chemical Engineering

5 ASSESSMENT OF ALTERNATIVES

Alternatives in terms of the site layout was determined, as guided by the DEAT (2004) Criteria for determining Alternatives in EIA, Integrated Environmental Management, Information Series 11.

A comprehensive comparison of all potential impacts, both direct, indirect, and cumulative have been considered during the BA assessment process. Reasonable and feasible alternatives have been considered during the pre-application phase to determine the most suitable alternatives. The alternatives described in the sections to follow, included the assessment of the following:

- Location alternatives; and
- Site layout alternatives.

No alternatives in terms of scheduling, routing and design are applicable to the proposed development.

The consideration of alternatives considered significant constraints such as social, financial, and environmental issues during the evaluation process. The preferred option is highlighted in **section 5.2.3** and was presented to the stakeholders ensuring that their views were taken into account during the Public Participation Process. All the alternatives have been identified, and the best option is presented. The elimination process is well documented and substantiated, with an explanation of why certain alternatives are not being considered in detail. A detailed analysis of potential environmental impacts, as well as a consideration of technical and financial aspects, are provided for each of the remaining preferred alternatives.

5.1 METHOD OF ASSESSING ALTERNATIVES

An alternative assessment matrix was developed by the appointed EAP, taking the following into consideration:

- Environmental context – potential impacts related to aquatic and terrestrial biodiversity, soil, and water resources.
- Social context – potential impacts related to the social context of the community (including traffic related issues), visual and noise impact in relation to the sensitive receptors.
- Heritage and sites with cultural importance – potential impacts on sites of historical importance and graves.

Table 11 provides the developed alternative assessment matrix.

Prior to the appointment of the EAP, the proponent conducted a qualitative analysis of the potential sites. Several criteria were considered by the developer and a weighted score provided for each to determine the overall best sites in terms of the operation. The following criteria was taken into consideration and assigned a weighting percentage to indicate its priority from an operational perspective:

- Size (15%) – The total available footprint to take into considerations the potential of expanding the facility.
- Gradient (5%) – Slope of land, water runoff management, and any other risks associated with the gradient of the site options.
- Geotechnical (5%) – Is there information available, what type of conditions that would affect the construction cost.
- Site accessibility (5%) - Ease of access to public roads; direct or indirect access: for construction and operations.
- Existing infrastructure (5%) – Removal or use of existing buildings, slabs, roads, infrastructure, fencing and gates.
- Furnace gas supply (5%) - Routing for Furnace Gas supply i.e. distance and interference with existing operations.
- Electricity export to smelter (5%) – Routing for electrical evacuation to the existing operation.
- Servitudes (10%) – Existing servitudes to and from site and within, capacity within servitudes for project use.
- Neighbour and security risk (15%) - Prevailing winds and types of contamination; Security issues during construction & operations.
- Utilities (5%) - Existing or accessibility to services and ease of routing services.
- Environmental permits (10%) - Existing permits, any area specific thresholds or Critical Biodiversity Areas.
- Impact on existing operation (15%) - How will project construction and operations on proposed site impact existing (or future) operations?

Both of the above assessment outcomes were considered in the final selection of the preferred alternative.

Table 11: Alternative’s assessment rating matrix

Alternative assessment rating matrix									
					Likelihood				
				Environmental	Almost certain to have irreversible consequence to the environment (fatally flawed significance)	Likely to have irreversible consequence to environment (very high significance)	Possible to have a irreversible consequence to the environment (high significance with implementation of mitigation measures)	Unlikely to have a irreversible consequence to the environment (medium significance with implementation of mitigation measures)	Rare to have a irreversible consequence to the environment (low significance with the implementation of mitigation measures)
				Heritage	Almost certain to have irreversible loss of sites of high historical importance or destruction of graves (fatally flawed significance - sites cannot be relocated)	Likely to have irreversible loss of sites of high historical importance or destruction of graves (very high significance - sites cannot be relocated/in-situ conservation)	Possible to have irreversible loss of sites of medium historical importance or destruction of graves (high significance - possibility of relocation/in-situ conservation)	Unlikely to have irreversible loss of sites of medium/low historical importance or destruction of graves (medium significance - possibility of relocation/moving heritage artifacts or sites)	Rare to have irreversible loss of sites of medium/low historical importance or destruction of graves (low significance - not compromising any sites or graves)
				Social	Almost certain to have irreversible consequence to the social context (fatally flawed significance). Unavoidable visual and vibrational impact.	Likely to have irreversible consequence to the social context (very high significance - relocation of communities will be required, high possibility of community unrest). Unavoidable visual and vibrational impact.	Possible to have a irreversible consequence to the social context (high significance with implementation of mitigation measures - relocation of communities, compensation to communities). Visual and vibrational impacts could possibly be managed. Noise generation high possibility of affecting the surrounding community.	Unlikely to have a irreversible consequence to the social context (medium significance with implementation of mitigation measures - no relocation required, agreement with communities). Visual and vibrational impacts could be managed. Noise generation medium possibility of affecting the surrounding community.	Rare to have a irreversible consequence to the social context (low significance with the implementation of mitigation measures - safe distance from communities, communities support operation). No visual and vibrational impacts. Noise generation low possibility of affecting the surrounding community.
	Environment	Heritage	Social		Almost Certain	Likely	Possible	Unlikely	Rare
Consequence	Development has an insignificant impact or consequence on the environment.	No sites (high importance) will be impacted by the development footprint.	Development footprint has an insignificant impact to the social context. No visual and vibrational impacts. Noise generation low possibility of affecting the surrounding community.	Insignificant	6	5	4	3	2
	Development has a negligible impact or consequence on the environment.	Sites (high importance) located within close proximity to the development footprint.	Development footprint has a negligible impact to the social context. Manageable visual and vibrational impacts. Noise generation low to medium possibility of affecting the surrounding community.	Negligible	7	6	5	4	3
	Development has a moderate impact or consequence on the environment. Reversible consequences with the implementation of mitigation measures and rehabilitation. Offsetting possible.	Sites (high importance) located within close proximity to the development footprint. In-situ conservation prevents impact on identified sites.	Development footprint has a moderate impact to the social context. Manageable visual and vibrational impacts. Noise generation medium to high possibility of affecting the surrounding community.	Moderate	8	7	6	5	4
	Development has an extensive impact or consequence on the environment. Irreversible consequences even with implementation of mitigation measures or rehabilitation. Offsetting possible.	Sites (high importance) located within the development footprint. In-situ conservation not possible. Relocation required.	Development footprint has an extensive impact to the social context. Manageable visual and vibrational impacts. Noise generation high possibility of affecting the surrounding community.	Extensive	9	8	7	6	5
	Development has significant impact or consequence to the environment (fatally flawed). No offsetting possible.	Sites (high importance) located within the development footprint. In-situ conservation not possible. Relocation not possible.	Development footprint has a significant impact to the social context. Irreversible visual and vibrational impacts. Noise generation high possibility of affecting the surrounding community.	Significant	10	9	8	7	6
*	Environmental	Includes impacts related to the aquatic, terrestrial, soil, surface, and groundwater environment.							
*	Social	Includes impacts related to the social context of the community and visual and noise impacts in relation to the localised community.							
*	Heritage	Includes impacts on sites of historical importance and graves							

5.2 ALTERNATIVES CONSIDERED

A total of 4 (four) alternative locations were considered as part of this application. From the onset, all alternative locations considered was predetermined to have experienced some form of disturbance to the natural environment.

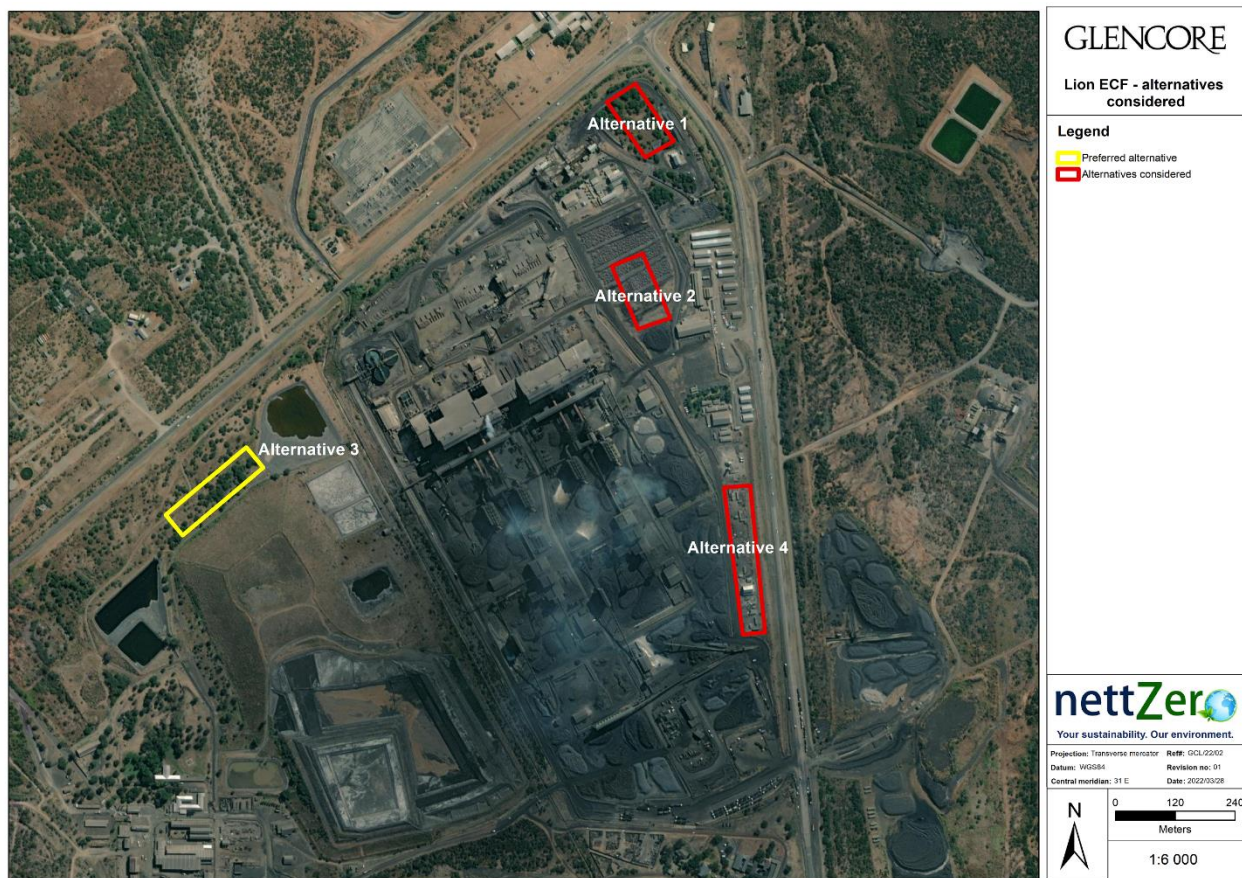


Figure 8: Location of alternatives considered

5.2.1 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH ALTERNATIVES

The national web-based screening tool was used to determine the potential sensitivities of the alternatives considered.

From Figure 9 all sites were of a “medium” sensitivity when considering the animal species theme and alternative 1 was situated within a “high” sensitivity when considering the terrestrial biodiversity theme. All alternatives considered was situated in a “low” sensitivity when considering the aquatic biodiversity theme.

From Figure 10 alternative 1, 3 and 4 appeared to be situated in a “high” agricultural theme. All alternatives are located within a “medium” sensitivity in terms of the paleontological theme and within a “low” sensitivity in terms of the archaeological theme.



Figure 9: Terrestrial biodiversity, aquatic biodiversity, animal, and plant species theme as determined by the screening tool

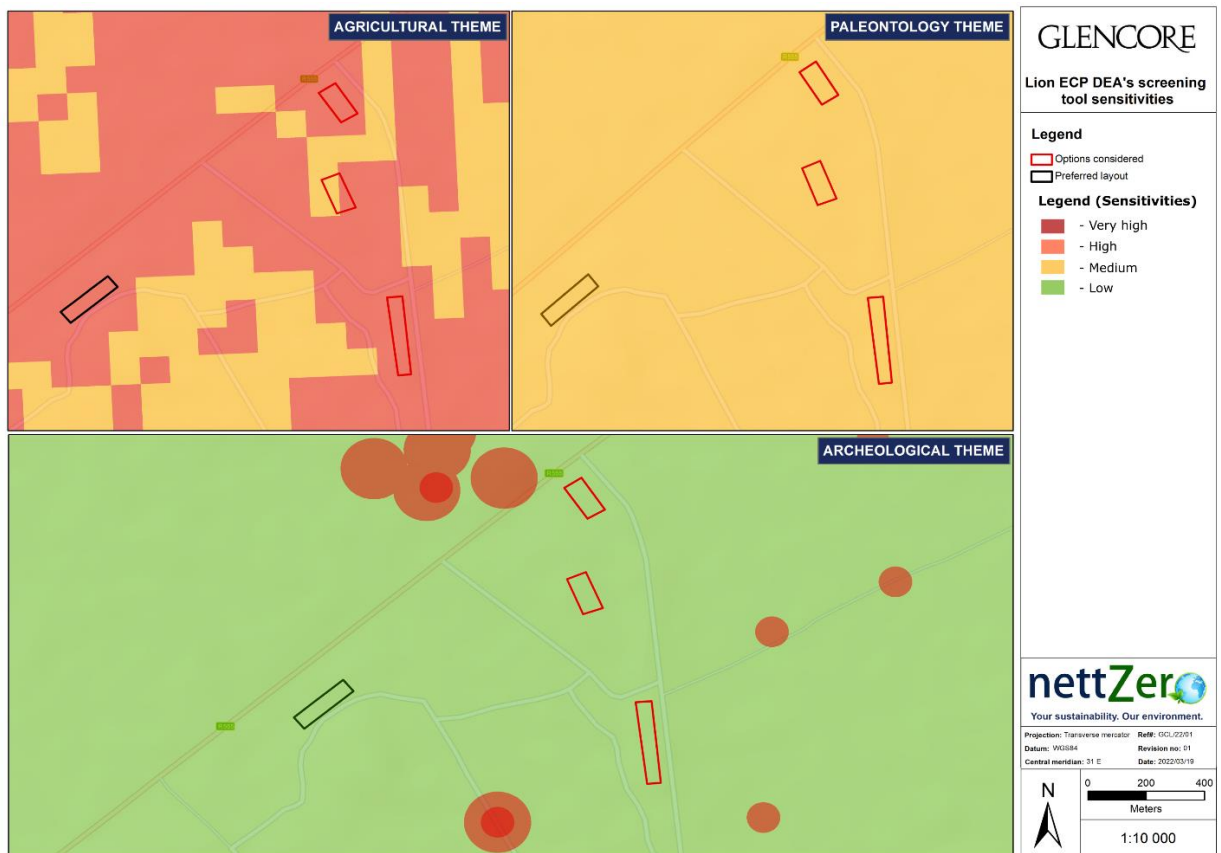


Figure 10: Archaeological, palaeontological, and agricultural theme as determined by the screening tool

5.2.2 IMPACTS AND RISKS IDENTIFIED FOR EACH ALTERNATIVE

Table 12 summarises the EAP's assessment as per the matrix presented in Table 11.

Table 12: Outcome of EAP's alternative assessment as per Table 11 for the considered alternatives

ASPECT CONSIDERED	ALTERNATIVE RISK ASSESSMENT RATING AS PER TABLE 11							
	ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 4	
ENVIRONMENT	6	Medium to low risk	4	Low to insignificant risk	6	Medium to low risk	4	Low to insignificant risk
SOCIAL	6	Medium to low risk	2	Low to insignificant risk	5	Low to medium risk	2	Low to insignificant risk
HERITAGE	3	Low to insignificant risk	3	Low to insignificant risk	3	Low to insignificant risk	3	Low to insignificant risk
OVERALL RANKING	3		1		2		1	
RANKING FOLLOWING VERIFICATION	3		1		1		1	
RANKING LEGEND	1= Low to insignificant impact; 5= High to very high impact							

From Table 12, no high risks associated to any of the alternatives were identified. From the environmental, social and heritage risk perspective alternatives 2 and 4 would appear to be the preferred options.

Error! Not a valid bookmark self-reference. summarises the outcomes of the alternative assessments using the methods as described in section 5.1.

Table 13: Operational qualitative analysis of alternatives

ASPECT CONSIDERED	WEIGHT	ALTERNATIVE RISK ASSESSMENT RATING AS PER TABLE 11							
		ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 4	
SIZE	15%	3	Limited laydown and no expansion.	3	Limited laydown and no expansion.	5	Space for laydown and Expansion.	2	Narrowness of site impacts preferred plant layout, limited laydown and expansion.
GRADIENT	5%	5	Flat	5	Flat	5	Flat	5	Flat
GEOTECHNICAL	5%	4	Site conditions inferred Ground condition. favourable for normal pad type foundations.	4	Site conditions inferred. Ground conditions favourable for normal pad type foundations.	5	Actual site was tested. Ground conditions favourable for normal pad type foundations.	4	Site conditions inferred. Ground conditions favourable for normal pad type foundations.
SITE ACCESSIBILITY	5%	4	Public road on boundary. Construction traffic management issues.	2	Through existing smelter.	5	Public road on boundary and existing roads within property provide access to site.	4	Public road on boundary. Construction traffic management issues.
EXISTING INFRASTRUCTURE	5%	5	Greenfields	2	Used as raw materials handling & storage area.	5	Greenfields.	3	Existing buildings would need to be removed.
FURNACE GAS SUPPLY	5%	3	Est 0,55 km. The rest of the sites have more site interferences and works.	5	Est 0,25 km. The rest of the sites have more site interferences and works.	3	Est 0,7 km. No Plant interferences.	4	Est 0,475 km. The rest of the sites have more site interferences and works.
ELECTRICITY EXPORT TO SMELTER	5%	3	Est 0,6 km.	5	Est 0,3 km.	2	Est 0,8 km.	3	Est 0,575 km. Routing will interfere with existing operations.
SERVITUDES	10%	1	Eskom 132 kV servitude traverses the site.	5	None.	5	None.	5	None

NEIGHBOUR AND SECURITY RISKS	15%	3	Low amounts of dust present. Close to fence and public road.	2	High dust loads. Far from public roads.	5	Very low amounts of dust. Plant can be located away from boundary fence.	3	Low amounts of dust present. Close to fence and public road.
UTILITIES	5%	2	TBC	4	TBC	1	Further away from existing services.	3	TBC
ENVIRONMENTAL PERMITS	10%	2	Critical Biodiversity Area 2.	4	Ecological Support Area 2.	1	Critical Biodiversity Area 2 and Ecological Support Area 1.	2	Ecological Support Areas 1 and 2.
IMPACT ON EXISTING OPERATIONS	15%	4	Separate site - Construction dust and noise would have low impact.	1	Major impact on raw materials handling and storage processes.	6	Not within normal operational area	3	Near to LION boundary, construction dust and noise impact. Disruption to current operation.
TOTAL SCORE	100%	3.1		3.2		4.2		3.2	
RANKING		75%		76%		100%		77%	
SCORING LEGEND		1= poor; 5= excellent							

From Table 13, alternative 3 from an operational perspective is the preferred alternative.

5.2.3 MOTIVATION FOR PREFERRED ALTERNATIVE

Although Table 12 indicated that alternative 3 is not the best option from an environmental, social and heritage risk perspective, from Table 13 it is clear that it is the best alternative from an operational perspective.

Following the site sensitivity verification (section 2.5), the sensitivities that was defined as “high” and “medium” sensitivity according to the national screening tool (see Figure 9 and Figure 10) was verified as “low” sensitivity. Therefore, taking the verification into consideration, the overall ranking for alternative 3 could also be considered as best option, as it aligns with the operational requirements.

6 SPECIALIST ASSESSMENT OUTCOME

This section will summarise the findings following the desktop analysis and the onsite inspection, with the focus verifying the land use and site sensitivities as identified in by the screening tool.

6.1 OVERVIEW OF SITE ENVIRONMENT

As mentioned in previous sections, the proposed development falls within the Olifants Environmental Management Framework (OEMF), Zone B (Highveld to Bushveld transition area).

Information presented in this section was obtained from the OEMF, as well as been confirmed by the appointed specialists.

6.1.1 CLIMATE

The proposed development falls within the Highveld to Bushveld transition area with high maximum temperatures and cool winter nights without severe frost occurring.

In addition, it falls within the summer rainfall region with varying mean annual precipitation.

6.1.1.1 Temperature

The average yearly temperature (refer to Figure 11) for the project area ranges from 23 to 37 °C (high) and 3 to 8 °C (Low). The study area is situated in a warm temperate, winter dry, hot summer climate (Cwa), as per the Köppen Climate Classification (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006). Hence, the area received summer rainfall.

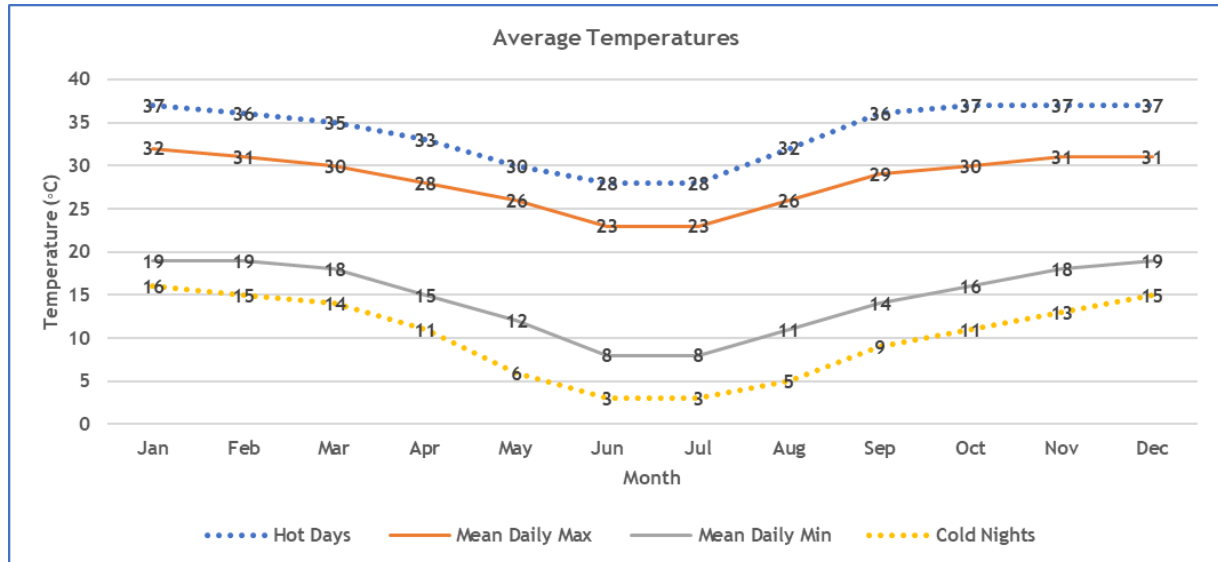


Figure 11: Average yearly temperatures (Meteoblue, 2021)

6.1.1.2 Wind speed and direction

Figure 12 shows the wind rose for the project area (the site used as a reference site) and presents the number of hours per year the wind blows from the indicated direction. Wind generally blows from North East, North-North East, at velocities from <5 to >28 km/h. Precipitation intensity during wind will likely cause intensity changes on slopes perpendicular to the wind direction, throughout the year.

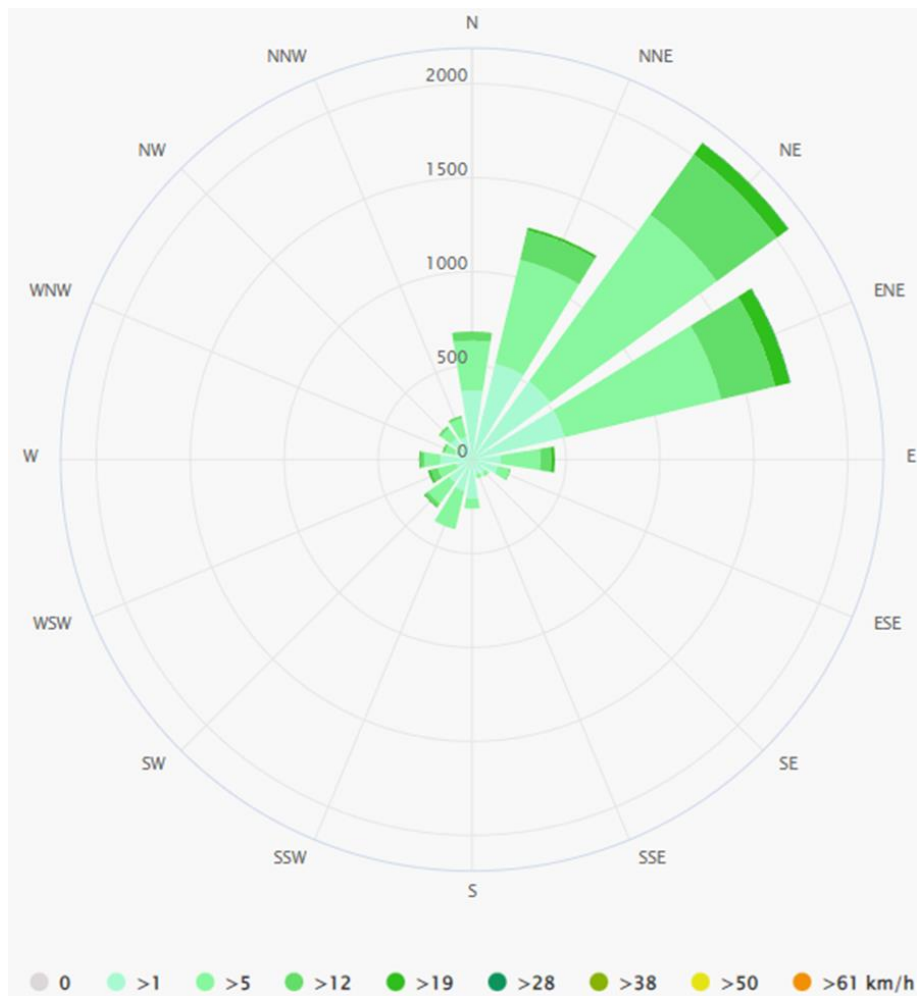


Figure 12: Wind rose for the proposed site as centre point (Meteoblue, 2021)

6.1.1.3 Rainfall and evaporation

The project area is situated in rainfall zone B4D. The rainfall data used to calculate Mean Annual Precipitation (MAP) was obtained from rainfall station 0593015 (station Sekhukhuneland situated 12km NW of the site). Available rainfall data suggest a MAP ranging from 319 (30th percentile) to 1050 (90th percentile) mm/yr, based on a historical record of 76 years (i.e., 1907 to 1983). The average rainfall is in the order of 554 mm/yr. Design rainfall data (Station: Sekhukhuneland) suggest a MAP in the order of 552 mm/yr – hence the data is in the same order of magnitude. Monthly rainfall for the site is likely to be distributed as shown in Figure 13, below.

The site falls within evaporation zone 4A, of which Mean Annual Evaporation (MAE) ranges from 1 300 to 1 500 mm/yr. The MAE far exceeds the MAP for the site, which implies greater evaporative losses when compared to incident rainfall. Monthly evapotranspiration for the site is likely to be distributed as shown in Figure 13, below.

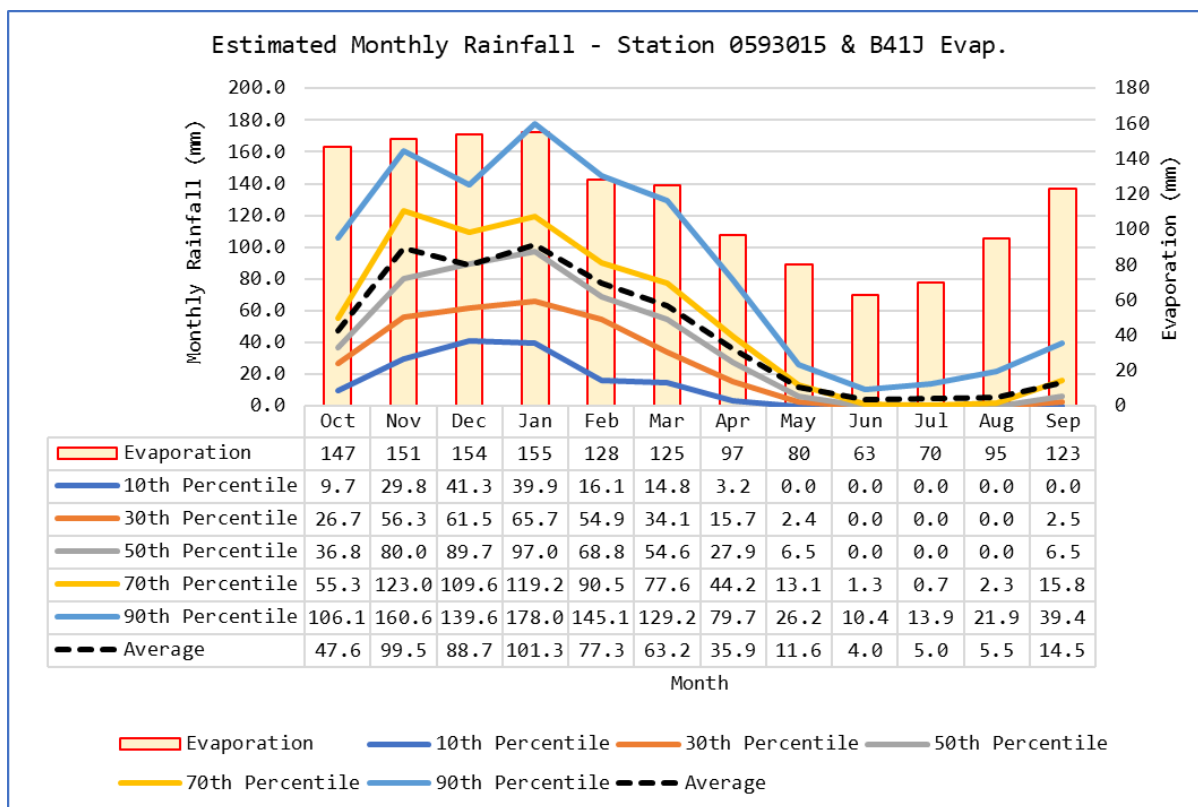


Figure 13: Rainfall distribution (station 0593014) (WRC, 2015)

6.1.1.4 Runoff

Runoff from natural (unmodified) catchments in Catchment B41J is simulated in WR2012 as being equivalent to 19 mm/yr over the surface area (WRC, 2015). This is equal to approximately 3% of the MAP and amounts to approximately 13 Mm³/yr over the surface of the quaternary catchment. Monthly runoff is distributed as shown in Figure 14, below.

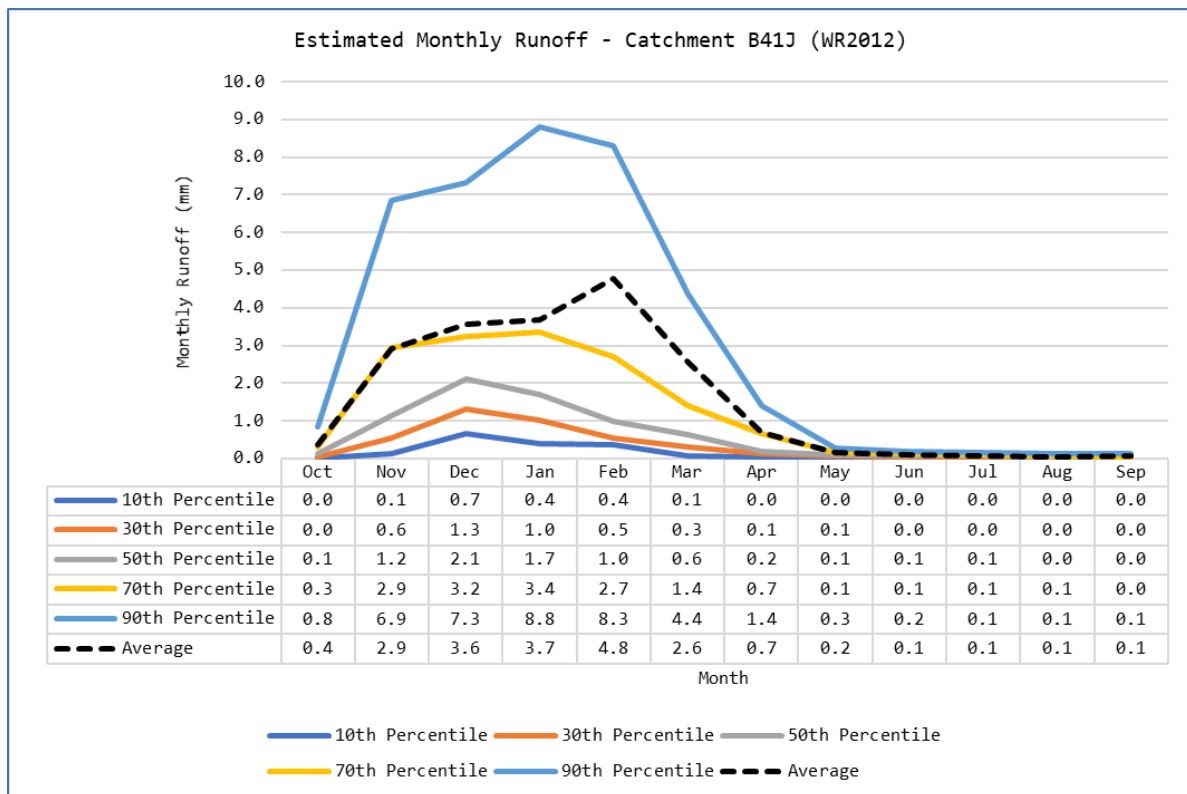


Figure 14: Simulated runoff for catchment B41J (WRC, 2015)

6.1.2 TOPOGRAPHY

The larger area in which the project is to be located is characterised by a landscape dominated by flat plains which are surrounded by hills of moderately steep topography. The project site is situated within an anthropogenically modified environment as a result of the existing Lion Smelter infrastructure. It has a north-westerly aspect with a gentle slope. Average slopes are 3-4%, with a maximum slope of 8.5%. The project site ranges in altitude from 812 m above sea level (absl) along the eastern boundary to 806m absl along the western boundary. Topography is therefore not a limitation to agricultural production.

6.1.3 LAND TYPE

Land type data for the site was obtained from the Agricultural Research Council (ARC). The land type data is presented at a scale of 1:250 000 and entails the division of land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units (in the cross section). The soil data is classified according to the Binomial System. The soil data was interpreted and re-classified according to the Taxonomic System (Land Type Survey Staff, 1972-2006).

The project site is situated within the Ae27 Land Type as defined in the relevant Land Type Map (2430 Pilgrims Rest). Ae indicates land with red and yellow soils with a high base status. Soil forms are therefore represented by either a red apedal (structureless), yellow-brown apedal or neocutanic horizons. These soils are classified as the Hutton, Clovelly, Griffin, and Oakleaf soil forms. They are regarded as mature soils and have a high infiltration rate. They generally have an increase in clay content with depth in the profile. The soils are however expected to be shallow in nature (>300mm deep). These soils therefore have limitations for crop cultivation.

6.1.4 GEOLOGY

6.2 AGRICULTURAL AND SOIL

Land Matters Environmental Consulting was appointed by Netzero (Pty) Ltd to conduct the required Agricultural Compliance Statement, in line with the Protocol for the Specialist Assessment and minimum Report content requirements for environmental impacts on agricultural resources (GN 320 GG 43110 dated 20 March 2020) for the proposed development.

In field data collection was taken on the 30th of November 2021. Soil sampling was conducted throughout the project area using a standard hand-held auger with a depth of 1200mm. At each sampling point the soil was described to form and family level according to “Soil Classification: A Natural and Anthropogenic System for South Africa” (Soil Classification Working Group, 2018).

The following properties were recorded:

- Soil diagnostic horizons;
- Depth of the profile;
- Soil colour – as per the Munsell System;
- Soil field texture;
- Permeability of the B horizon (wetness indicators);
- Effective rooting depth; and
- Observations at the sampling point including any surface crusting, vegetation cover and rockiness.

The following sections only summarises the outcomes of the Compliance Statement and the full report is attached as **Appendix F**.

6.2.1 SOIL CHARACTERISTICS

Table 14 gives information on the different soil characteristics identified within the project site.

Table 14: Soil data collected at the site

SOIL FORM	DIAGNOSTIC HORIZONS	SOIL FAMILY CODE	FIELD TEXTURE	EFFECTIVE ROOTING DEPTH (MM)	PERMEABILITY	SLOPE CLASS (%)
Palala	Orthic A	PI 2120	Sandy Clay	450	Restricted	0-2%
	Neocutanic B					
	Pedocutanic					
Palala	Orthic A	PI 2120	Sandy Clay	400	Restricted	0-2%
	Neocutanic B					
	Pedocutanic					
Hofmeyr	Orthic A	Hf 2122	Sandy Clay Loam	400	Restricted	6-8%
	Neocutanic B					
	Hard Rock					
Grabouw	Physically Disturbed Anthrosol	Gr 1000	Sandy Clay	100	Severely Restricted	3-5%

The desktop and field investigation identified the following important soil and landscape characteristics of the site:

- **Soil texture:** Analysis of the texture during the field investigation revealed that the soils within the site are a sandy clay loam to a sandy clay texture. These soils therefore have a clay percentage of 30-60%, with an increase in clay content with depth in the soil profile. The soils were found to be luvic in nature, meaning that there was an identifiable increase in clay content with depth in the profile. The presence of a pedocutanic layer in the Palala soils is a clear textural contrast between the overlying neocarbonate layer. A pedocutanic horizon has a strong structure and is seen as a limitation to plant growth as well as the infiltration of stormwater.
- **Soil depth:** Soil depth for crop growth is limited within the project site as a result of the presence of the pedocutanic horizon as well as the presence of hard rock. Profiles varied from 400mm to 450mm, limiting the type of crop that can be grown within the site. The area is therefore more suited to grazing activities.
- **Soil permeability:** The permeability of the soils associated with the site was found to be restricted as a result of the pedocutanic horizon, the presence of hard solid rock, as well as anthropogenic changes to the soil profiles through the construction of dirt roads. Soil permeability is identified as a limitation to agricultural productivity within the site.
- **Slope:** The site consisted of gentle terrain with the slope percentages recorded in the 0-8% category. Slope is therefore not a limitation to cultivation.
- **Rockiness:** Hard rock was identified within the subsurface horizons and is a limitation to the depth of soils. Surface rocks or surface calcrete was identified throughout the project site and is seen as a limitation to cultivation. The site is more suited to grazing activities.
- **Existing disturbances:** Portions of the proposed project site have existing disturbances as a result of dirt roads (Figure 16). Due to the existence of the roads, the soils within these areas are described as Physically Disturbed Anthrosols. This soil is further classified as the Grabouw soil form and is no longer suitable for agricultural production as the original soil profile has been mixed and is no longer identifiable. The Grabouw soils occupy 0.81ha (19.4%) of the site.

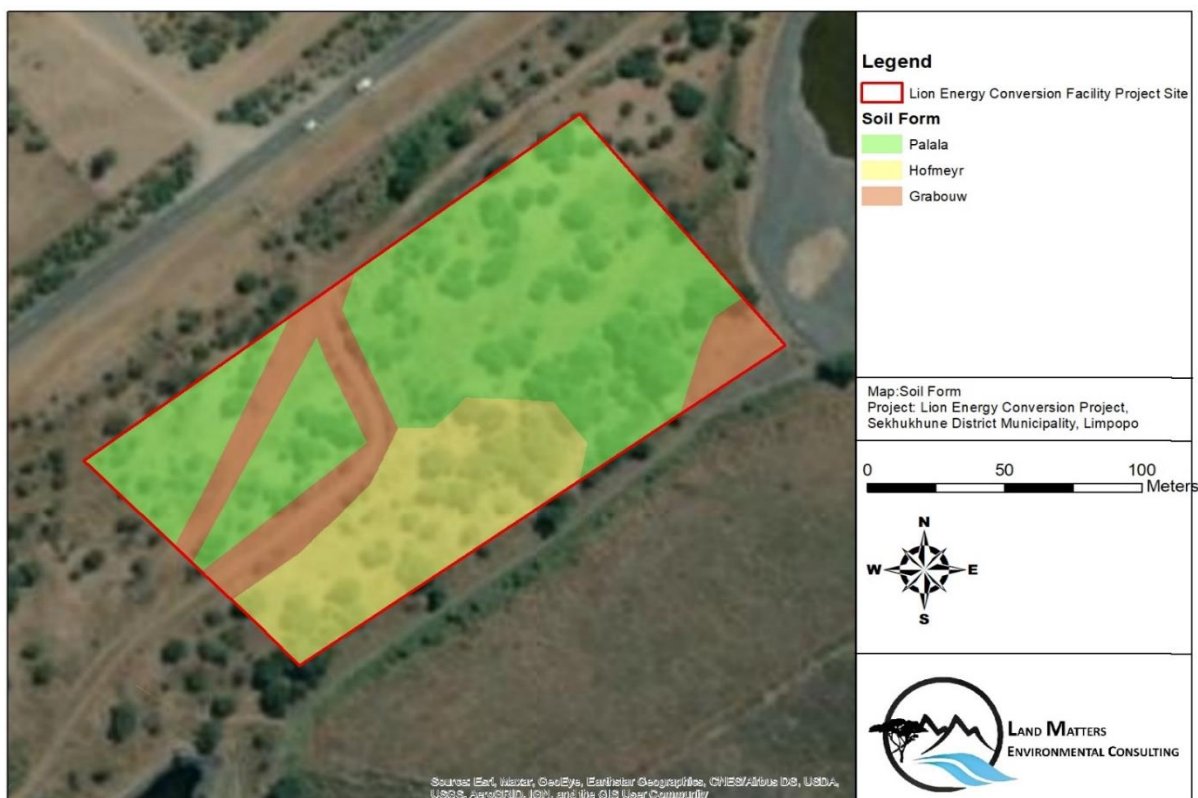


Figure 15: Soil forms identified within the project site



Figure

16: Observed dirt road within the site boundary of the proposed development which have been classified as disturbed Anthrosol, Grabouw soils.

6.2.2 COMPLIANCE STATEMENT

The site consists of land which is subject to severe permanent limitations including the pedocutanic horizon as well as hard rock. It is therefore only suitable for occasional row cropping in long ley rotations, or for use under grazing. As such the site is classified as having a **low** agricultural potential.

6.2.3 OPINION FOR ISSUING EA

As a result of the classification of the site to a low sensitivity for agricultural production it is the author's opinion that the project should go ahead. No impact on agricultural production will occur as a result of this project. The ECF site is situated within a small portion of the existing Lion Smelter site and will not have an impact on neighbouring properties or any agricultural activities within the area.

6.3 LANDSCAPE AND VISUAL

LOGIS was appointed by Netzero (Pty) Ltd to conduct the required Landscape and Visual assessment in line with the General Required Assessment Protocols (GN 320 GG 43110 dated 20 March 2020) and Appendix 6 of the EIA regulations for the proposed development.

The study was undertaken using Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility.

The viewshed analysis was undertaken from a representative number of vantage points within the development footprint at an offset of 5m above ground level (the maximum height of the ECF structures) and 10m for the emission stacks. This was done in order to determine the general visual exposure (visibility) of the area under investigation, simulating the maximum height of the proposed structures associated with the facility.

The methodology utilised to identify issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model of the potentially affected environment.
- The sourcing of relevant spatial data. This included cadastral features, vegetation types, land use activities, topographical features, site placement, etc.
- The identification of sensitive environments or receptors upon which the proposed facility could have a potential impact.
- The creation of viewshed analyses from the proposed project site in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures and activities.

The following sections only summarises the outcomes of the assessment and the full report is attached as **Appendix G**.

6.3.1 OUTCOME OF ANALYSIS

The result of the viewshed analysis for the proposed facility is shown on the map below (Figure 17).

It is clear that the relatively constrained dimensions of the ECF would amount to a fairly limited core area of potential visual exposure. The shorter distance visual exposure would largely be contained within a 1.5 km radius of the proposed development site, with the predominant long-distance exposure to the north-west, especially along the south-east facing slopes of the Sekhukhune Mountain.

The following is evident from the viewshed analyses:

6.3.1.1 0 – 0.5km

The Lion ECF may be highly visible within a 500m radius of the development. Most of this zone falls within the Lion Smelter Plant property or within the Kennedy's Vale Mine property. These properties are not expected to contain any sensitive visual receptors, due to their inherent mining or industrial characters, and due to their association with the Glencore Lion Smelter.

The R555 traverse this zone and observers travelling along this road are expected to have a clear view of the ECF infrastructure, if no mitigation is undertaken. It should however be noted that the viewing of the infrastructure will not be in isolation, but within the context of the existing visual disturbances (i.e. the smelter plant and mine dumps) at this location.

Sensitive visual receptors (and the highest level of viewer incidence) are expected to predominantly include observers (commuters or visitors to the region) travelling along the R555 main road in closer proximity to the facility. It is possible that observers may be negatively impacted upon by visual exposure to the ECF infrastructure.

6.3.1.2 0.5 – 1.5km

Visibility within this zone will still only encompass mining and industrial land and potentially sections of the R555 main road. The visual exposure is more scattered and interrupted due to the undulating nature of the topography.

6.3.1.3 1.5 – 3km

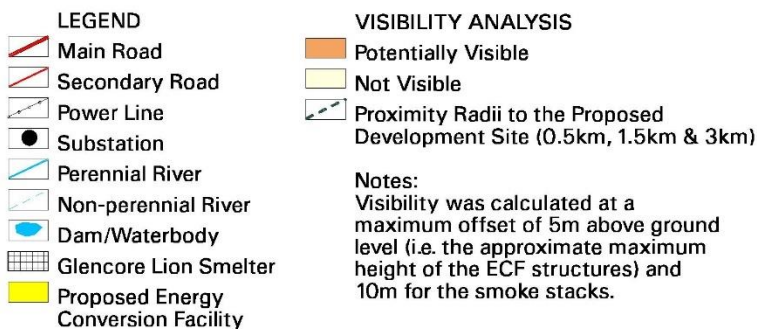
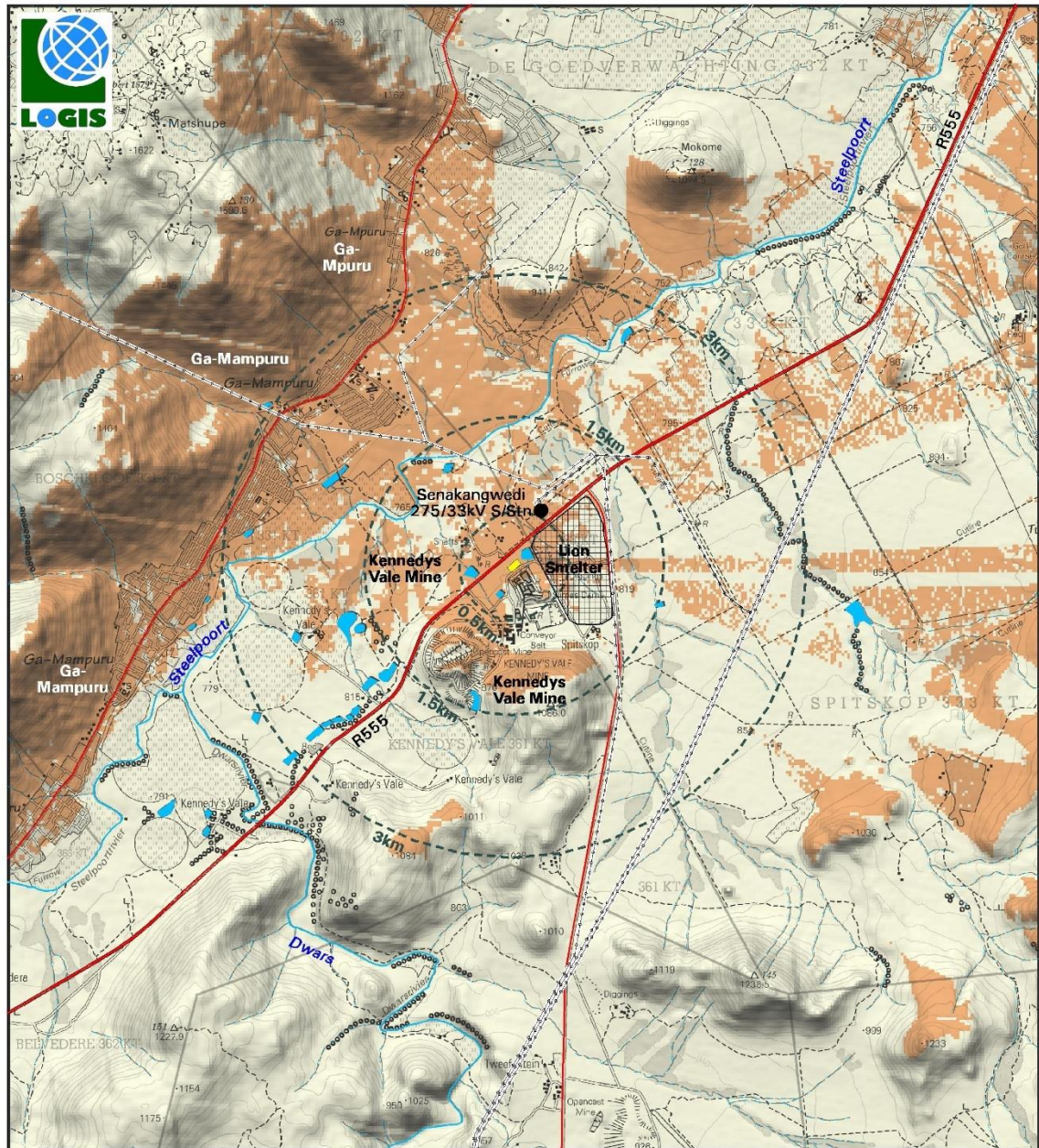
Within a 1.5 – 3km radius, the visual exposure is predominantly from the higher-lying terrain to the north of the Steelpoort River. This zone also contains parts of the Ga-Mampuru (north) and Ga-Mpuru settlements.

The proposed Lion ECF infrastructure would theoretically be visible from the south-eastern outlying parts of these settlements, although the exposure would once again not be in isolation, but within the context of the existing visual disturbances of industrial and mining structures and activities.

It is expected that the viewer's perception, unless the observer is associated with (or supportive of) the ECF project, would generally be negative. It should be noted though, that these settlements are located further away from the proposed ECF, and that visual exposure to the infrastructure will not be in isolation. Additionally, the built-up nature of the abovementioned settlements will mean that visual exposure will predominantly be along the perimeter of the built-up areas.

6.3.1.4 > 3km

At distances exceeding 3km the intensity of visual exposure is expected to be very low and highly unlikely due to the distance between the object (development) and the observer. This zone contains parts of the Ga-Mampuru (south) settlement and northern parts of the Ga-Mpuru settlement.



Lion Energy Conversion Facility



Figure 17: Map indicating the potential (preliminary) visual exposure of the proposed Lion ECF development.

6.3.1.5 Visual absorption capacity

The vegetation cover within the study area (woodland, thicket, bushland and bush clumps) has a high visual absorption capacity due to the height and density of these vegetation units. This is especially true for areas where the natural vegetation is still in a relatively natural and undisturbed state (e.g. within the R555 servitude and along the perimeter of the Lion Smelter property boundary). This high visual absorption capacity (VAC) will mitigate and even negate the visual impact of the ECF along some sections along this road. Construction activities of this project must be sensitive to this fact and ensure that minimum disturbance of natural vegetation take place surrounding the construction site.

The VAC will also be high within the Ga-Mampuru and Ga-Mpuru settlements, and within the industrial and mining areas due to the presence of built structures and mine dumps.



Figure 18: Vegetation cover adjacent to the R555 provides high VAC

Where the vegetation cover have been removed (e.g. as at the Senakangwedi Substation – see Figure 19) the substation is clearly visible with no vegetation concealment. The ECF would similarly be exposed should the vegetation cover in between the facility and the R555 be removed. This would deprive the project of the potential to mitigate the visual impact from this road through the utilisation of existing vegetation cover.



Figure 19: Low VAC at the Senakangwedi Substation

6.3.2 CONCLUDING SUMMARY OF VISUAL IMPACT

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed Lion ECF are displayed on Figure 21. Figure 20 provides a map indicating the identified sensitive receptors.

In summary the magnitude of the potential visual impact is as follows:

- **0-0.5 km:** The majority of the exposed areas in this zone fall within mining/industrial land, generally devoid of potential sensitive visual receptors. It is only the section of the R555 main road (identified as receptor site no. 1 on Figure 21), traversing near the proposed development site that may potentially experience visual impacts of very high magnitude.
- **0.5-1.5 km:** The majority of the exposed areas in this zone fall within mining/industrial land, generally devoid of observers or potential sensitive visual receptors. There are no residences within this zone and no visual impacts of high magnitude are expected.
- **1.5-3 km:** The eastern outlying part of the Ga-Mampuru settlement (identified as receptor site no. 2) is located just beyond 1.5km from the proposed ECF. It is expected that observers (residents) at this locality may experience visual impacts of moderate magnitude, at worst. This is due to the fact that the ECF would not likely be visible in isolation, but rather within the context of the much larger Lion Smelter complex.

The proposed Lion ECF is based on a relatively newly developed technology. To the author's knowledge there are no other ECFs in South Africa, and none within closer proximity to the Lion ECF study area. Therefore, in terms of this specific technology, no cumulative visual exposure is expected, and no potential cumulative visual impacts will ensue. In fact, the placement of the ECF within the Lion Smelter property, and in very close proximity to the smelter plant itself, is expected to consolidate the potential visual impact to a large degree.

This is due to the industrial nature of the site and the existing visual disturbances present at this locality i.e. the visual amenity of this site have already been compromised.

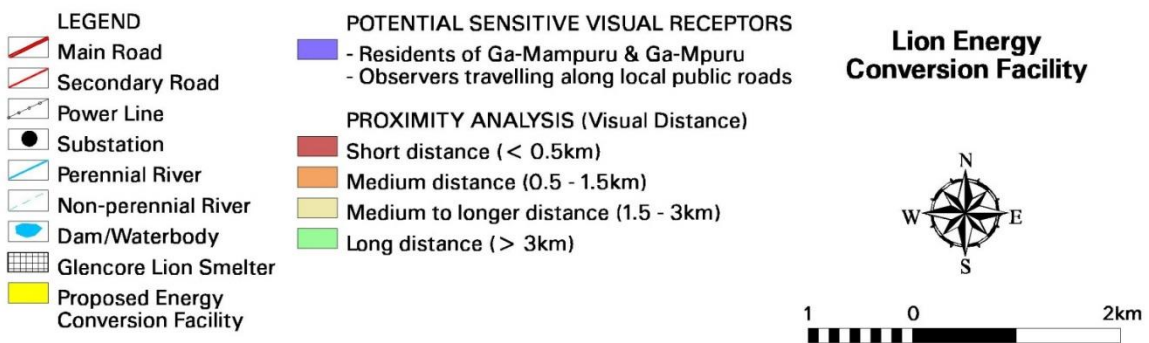
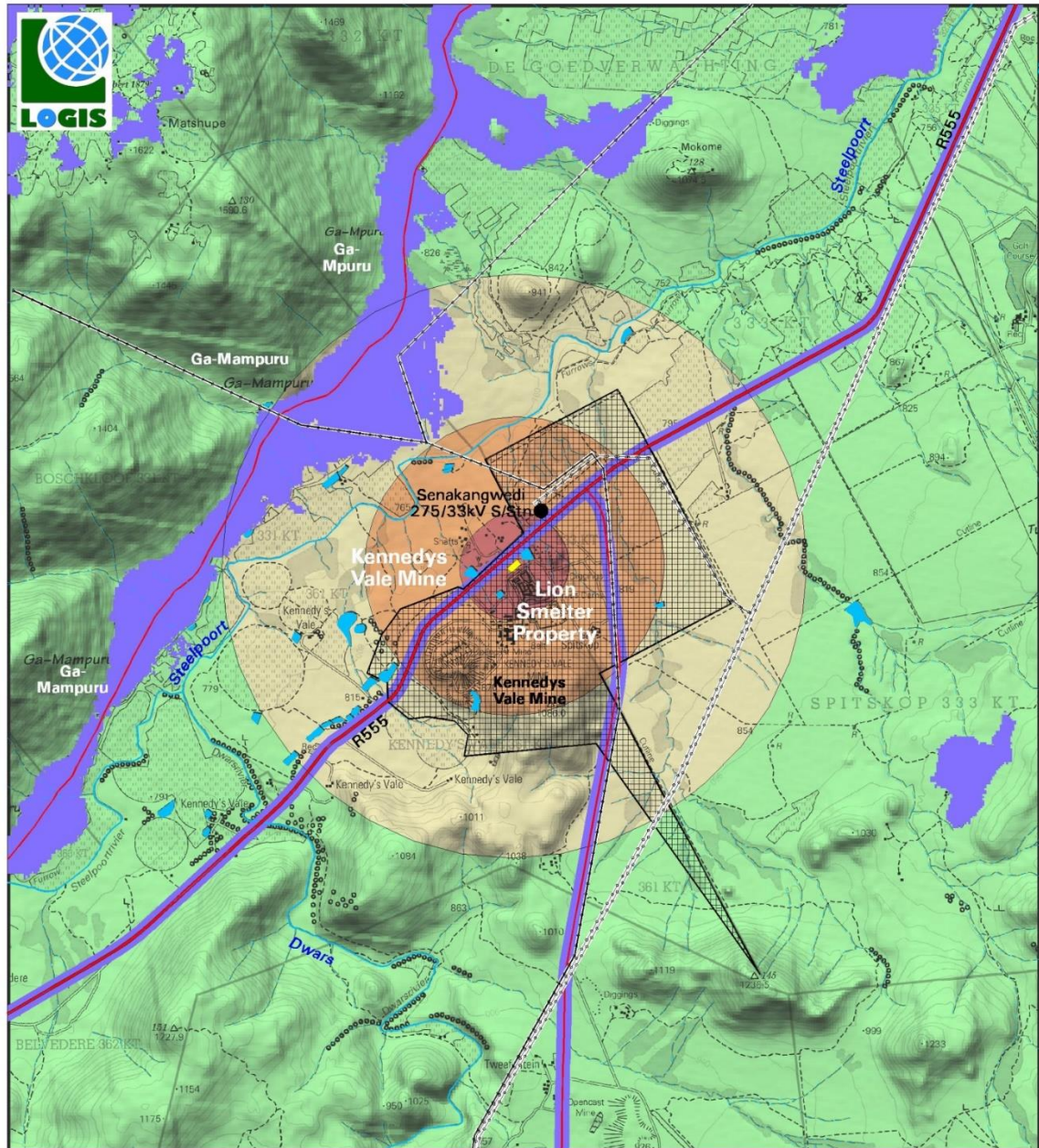


Figure 20: Proximity analysis and potential sensitive visual receptors

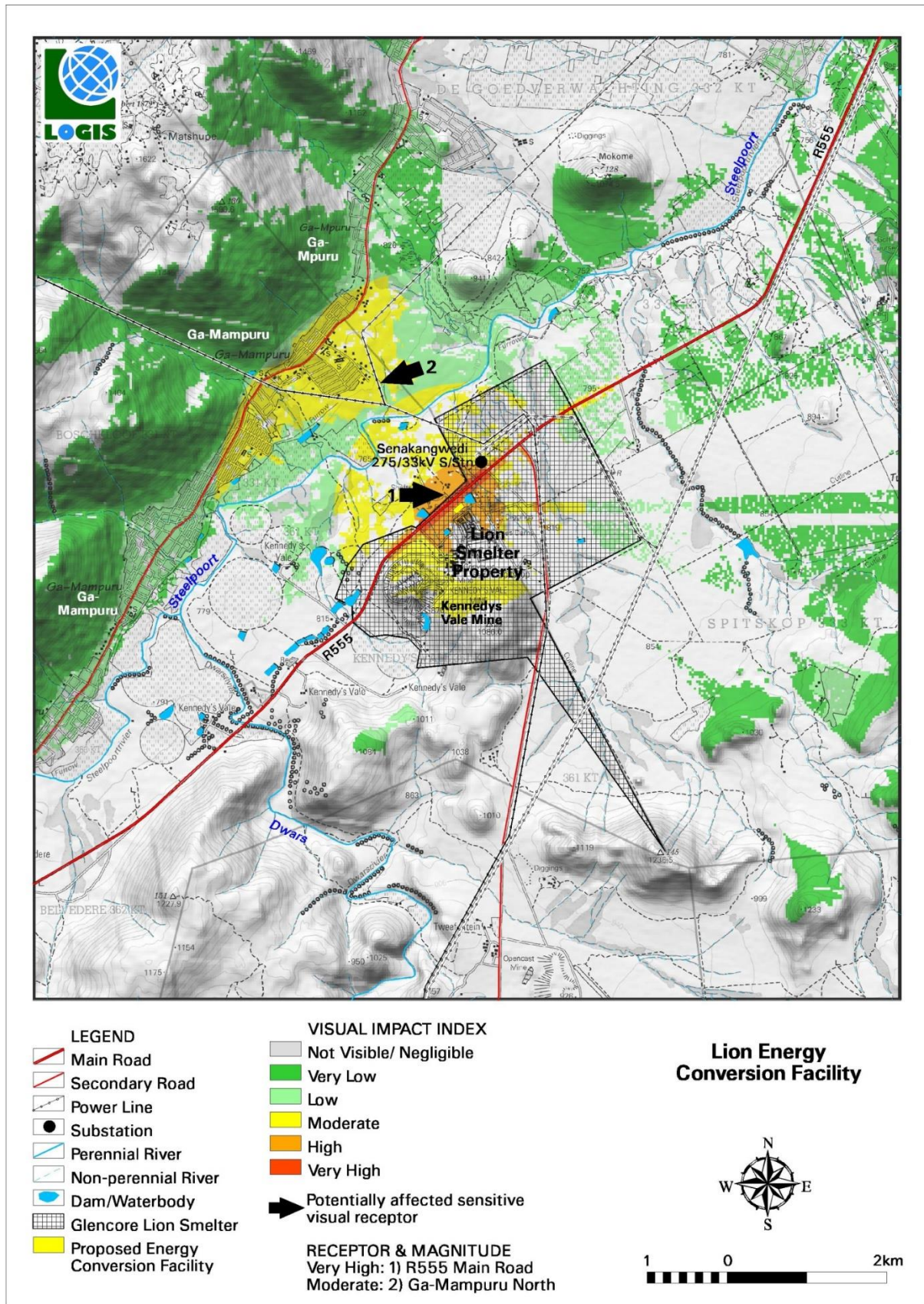


Figure 21: Visual impact index and potentially affected sensitive visual receptors

6.3.3 IMPACT STATEMENT

The findings of the Visual Impact Assessment undertaken for the proposed Lion ECF is that the visual environment surrounding the site, especially within a 0.5km radius the proposed facility, may be visually impacted during the anticipated operational lifespan of the facility (i.e. a minimum of 20 years), should no mitigation be undertaken.

This impact is primarily applicable to the individual ECF and no cumulative visual impacts are expected.

The following is a summary of impacts remaining, assuming mitigation as recommended, is exercised:

- During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate, temporary visual impact that may be mitigated to low.
- The ECF is expected to have a moderate visual impact on observers travelling along the R555 main road. This impact significance may be reduced to low with the implementation of mitigation measures. Mitigation measures include the preservation and maintenance of the natural vegetation cover located in between the ECF site and the R555 road.
- The operational ECF could have a low visual impact on observers within 0.5 – 1.5km radius of the structures, both before and after the implementation of mitigation measure. This is due to the fact that there are no residences within this zone.
- The operational ECF could have a low visual impact on observers at Ga-Mampuru located within 1.5 – 3km radius of the structures, both before and after the implementation of mitigation measure.
- The anticipated impact of lighting at the ECF is likely to be of moderate significance, and may be mitigated to low.
- The anticipated visual impact resulting from the construction of on-site ancillary infrastructure is likely to be of low significance both before and after mitigation.
- The anticipated visual impact of the proposed ECF on the regional visual quality (i.e. beyond 3km of the proposed infrastructure), and by implication, on the sense of place, is generally expected to be of low significance.
- The cumulative visual impact of the proposed ECF is expected to be of low significance due to the industrial nature of the site and the existing visual disturbances present at this locality i.e. the visual amenity of this site have already been compromised.

Overall, the post mitigation significance of the visual impacts is expected to be low. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed ECF.

6.3.4 OPINION FOR ISSUING EA

Considering all factors, it is recommended that the development of the facility as proposed be supported subject to the implementation of the recommended mitigation measures and management programme.

6.4 ARCHAEOLOGICAL AND PALAEOLOGY

Beyond Heritage was appointed by Netzero (Pty) Ltd to conduct the required Heritage Impact Assessment (HIA), in line with Appendix 6 of the EIA regulations, associated with the proposed development.

A site visit was conducted on 29 November 2022 by the appointed specialist to verify the desktop information available.

This section only provides the summary of the outcome of the HIA, and the report is attached as **Appendix H**.

6.4.1 OUTCOME OF SURVEY

6.4.1.1 Heritage Resources

Previous disturbances relating to clearing for roads as well as mining activities are evident in the larger area and heritage finds were limited to sparsely scattered Iron Age ceramics (findspots) recorded as observation points (Figure 22 and Table 15). The ceramics are weathered, probably from water displacement and found on vertic soils. Iron Age settlements were usually not located on vertic soils although these areas were used for cultivation. Few pieces with decoration were found, consisting of incised lines and stylistically date to the Early Iron Age. No surface features were noted, and the ceramics are likely out of context and are of low significance with a Field Rating of Generally Protected C. General site conditions are illustrated in Figure 23 – Figure 26. No other heritage resources such as buildings or burial sites were noted.

Table 15: Recorded heritage observations during site inspection

OBSERVATION POINT	DESCRIPTION	LONGITUDE	LATITUDE	ELEVATION
202	Small scatter of ceramic sherds	30° 06' 45.5940" E	24° 49' 07.4891" S	903,1923
203	Small scatter of ceramic sherds	30° 06' 44.8776" E	24° 49' 08.2631" S	905,2637
204	Small scatter of ceramic sherds	30° 06' 45.2195" E	24° 49' 07.3307" S	904,4333
205	Small scatter of ceramic sherds	30° 06' 46.3103" E	24° 49' 09.7679" S	909,4252

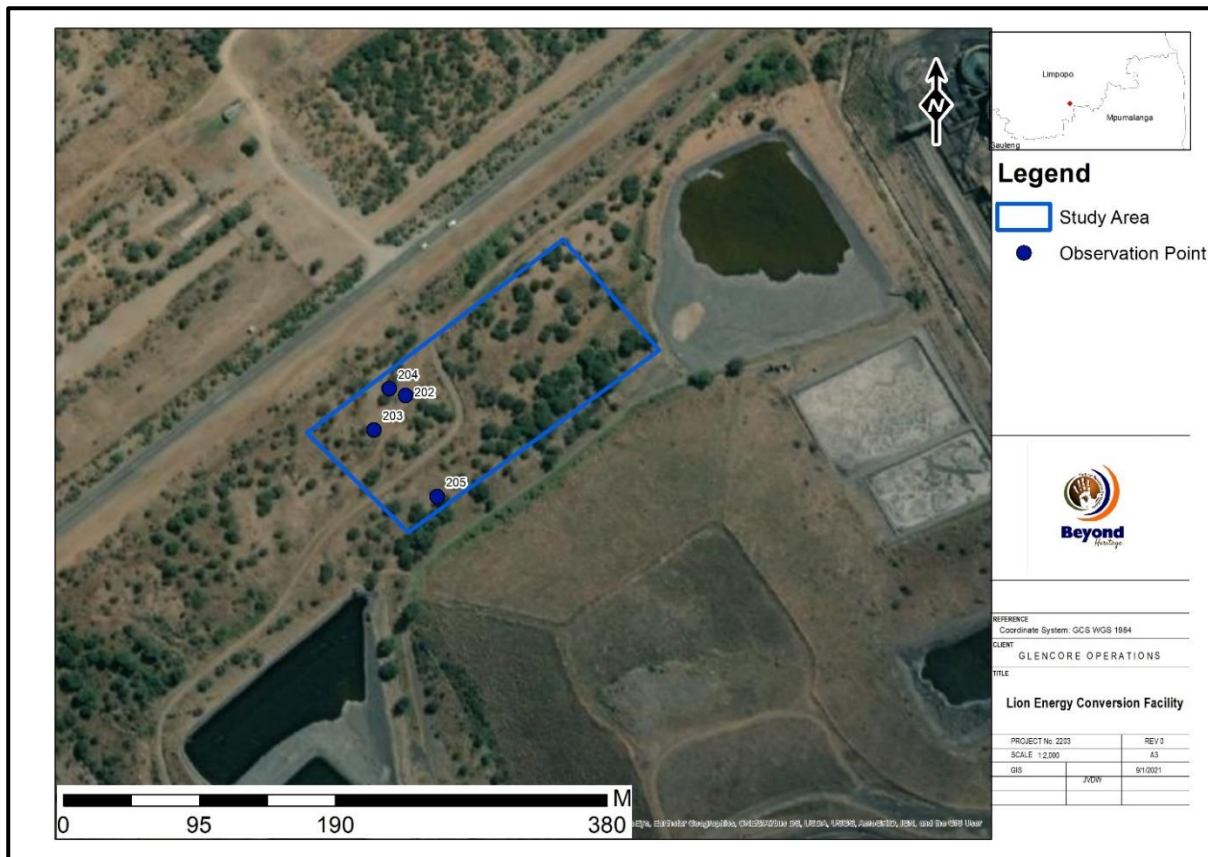


Figure 22: Spatial location of recorded artefacts in the study area.



Figure 23: Isolated ceramics recorded next to a gravel road.



Figure 24: General site conditions where ceramic scatters were noted.



Figure 25: Iron Age ceramic sherd.



Figure 26: Decorated and undecorated ceramics.

6.4.1.2 Cultural Landscape

The cultural landscape of the region is characterised by a rural area that is extensively disturbed by mining activities and in the past by agricultural activities. From the archaeological database of the general area archaeological settlements show different land use patterns. Many agriculturally orientated societies dating to the Early and Middle Iron Age built their villages in the valleys near cultivatable alluvium. Others (probably Ndebele) built terraced settlements on basal slopes of the valley edge, while farm labourers usually lived in the valleys as well. Historical maps indicate the impact area as being cultivated from before the 1970's (Figure 27 & Figure 28) with extensive mining activities in the surrounding areas (Figure 29) that would have impacted on any heritage features if any ever occurred in the study area.

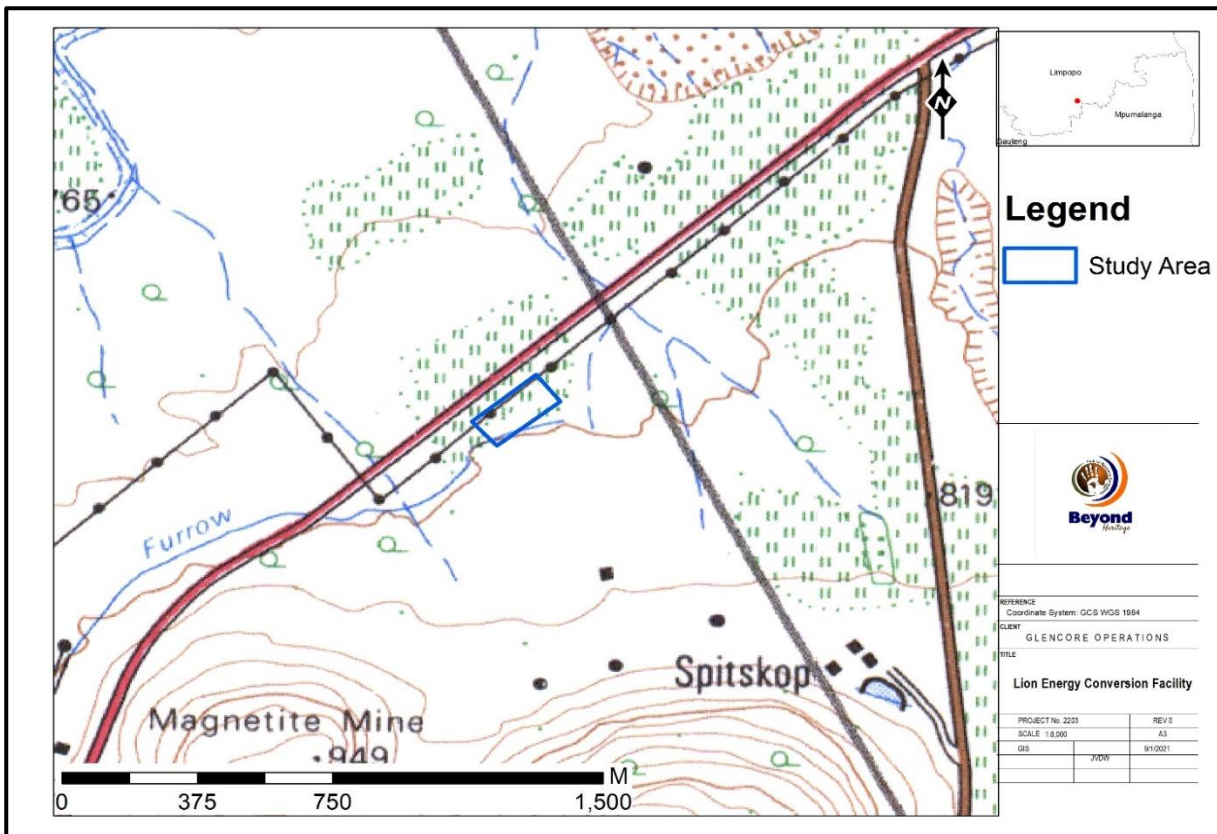


Figure 27: 1976 Topographical map of the study area indicating the area as cultivated with a powerline that traverses the study area.

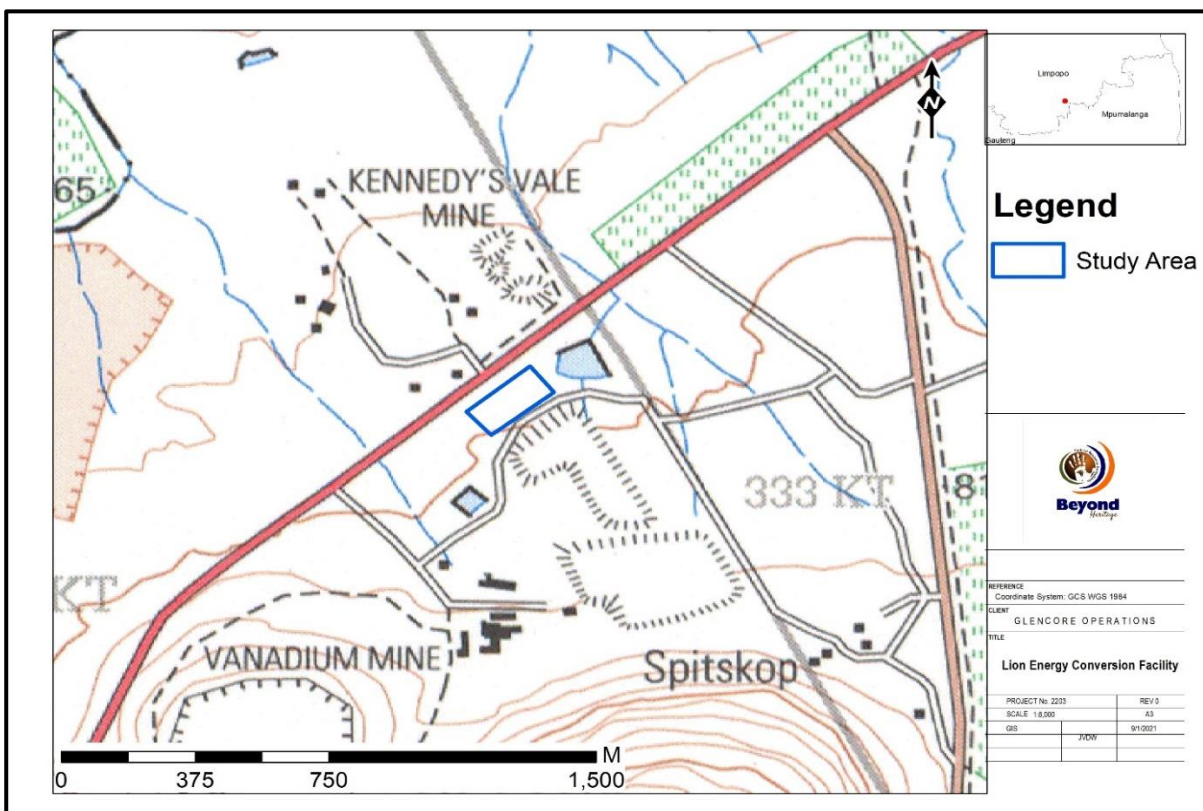


Figure 28: 1977 Topographic map of the study area indicating mining activities in the surrounding area.

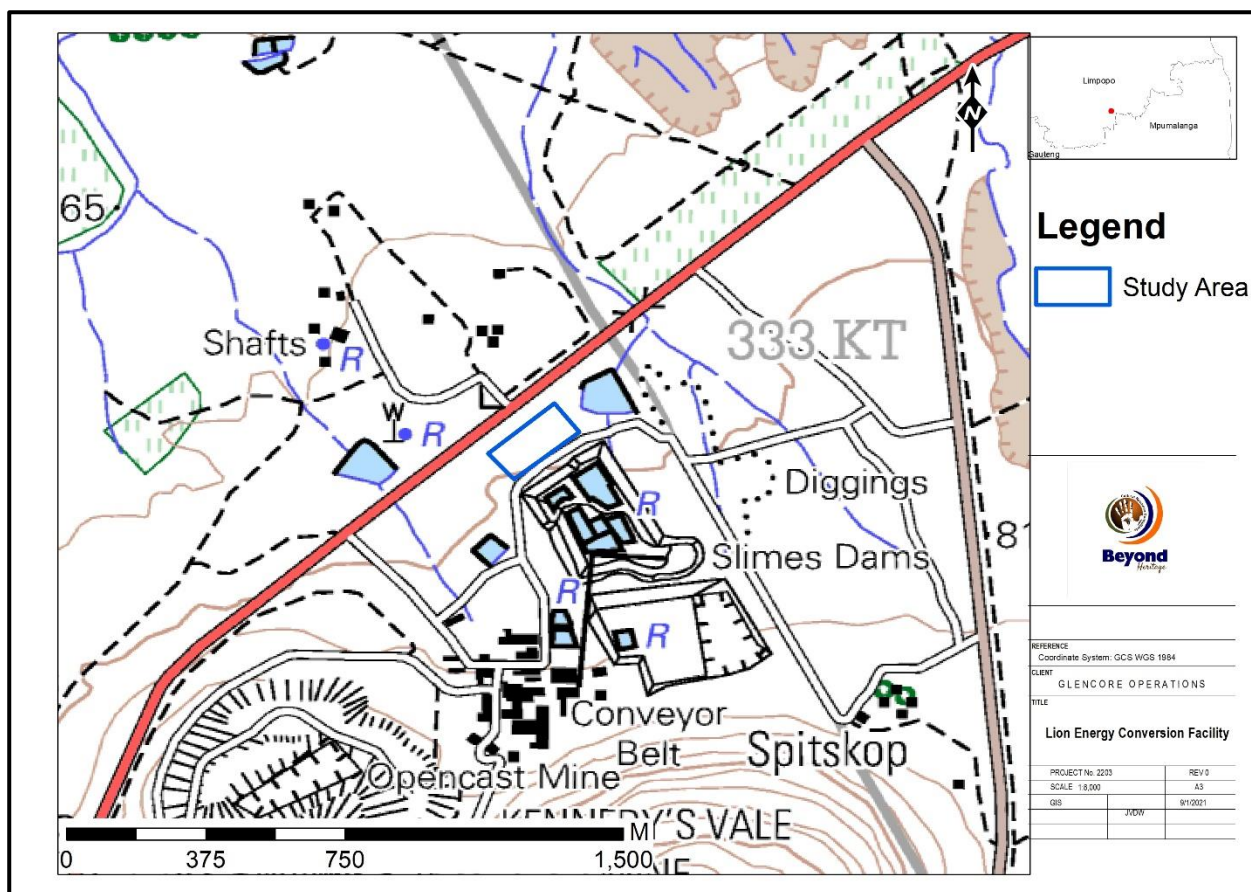


Figure 29.: 2002 Topographic map of the study area indicating several mining developments in the surrounding area.

6.4.1.3 Paleontological Heritage

Based on the SAHRA Paleontological map the study area is of low sensitivity and no further studies are required in this regard (Figure 30).



Figure 30: Paleontological sensitivity of the approximate study area as indicated on the SAHRA Palaeontological sensitivity map.

Table 16: Sensitivity colour indication associated with Figure 30

COLOUR	SENSITIVITY	REQUIRED ACTION
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map

6.4.2 IMPACT STATEMENT

The study area has been subjected to cultivation from the 1970's and impacted on by road developments as well as mining activities. These developments would have impacted on heritage resources if any were present in the area.

No heritage sites of significance are located within the impact area and therefore no adverse impact to heritage resources is expected.

Impacts of the project on heritage resources is expected to be **low** during all phases of the development.

6.4.3 OPINION FOR ISSUING AN EA

The impact to heritage resources is low and the project can commence provided that the recommendations in **Appendix H** are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval.

6.5 TERRESTRIAL BIODIVERSITY

The Biodiversity Company was appointed by Netzero (Pty) Ltd to conduct the required Terrestrial Compliance Statement, in line with the Protocol for Specialist Assessment and minimum Report requirements for environmental impacts on Terrestrial Biodiversity, Plant and Animal Species (GN 320 GG 43110 dated 20 March 2020 and GN 1150 GG 43855 dated 30 October 2020).

For the purpose of this section, it provides with the summary of findings and the detailed report is attached as **Appendix I**.

6.5.1 DESKTOP ASSESSMENT OUTCOME

6.5.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed development to ecologically important landscape features are summarised in Table 17.

Table 17: Summary of relevance of the proposed project to ecologically important landscape features

DESKTOP INFORMATION CONSIDERED	RELEVANT/IRRELEVANT
Ecosystem Threat Status	Relevant – Overlaps with an EN ecosystem.
Ecosystem Protection Level	Relevant – Overlaps mainly with a Poorly Protected Ecosystem.
Protected Areas	Irrelevant – The proposed development does not occur within any protected area and there is no protected area in close proximity to the project area. The De Hoop Private Nature Reserve is more than 20 km away from the project area.
Limpopo Conservation Plan	Relevant –The project area traverses areas that are classified as NNR areas
National Threatened Ecosystems (2011)	Irrelevant - The project area does not fall within any National Threatened Ecosystems (2011).
Important Bird and Biodiversity Areas	Irrelevant – More than 10 from the closest IBAs

6.5.1.2 Flora Assessment

This section is divided into a description of the vegetation type expected under natural conditions and the expected flora species.

6.5.1.2.1 Regional Vegetation

The project area is located within the vast Savanna biome, which covers large parts of southern Africa. At a more intricate spatial scale, it is located within the Sekhukhune Plains Bushveld unit (SVcb 27) (Mucina & Rutherford 2006; SANBI, 2018) previously referred to as the Mixed Bushveld (Acocks, 1953; Low and Rebelo, 1996). It is distributed in the Limpopo and Mpumalanga Provinces and occurs on the low lying areas where the altitude ranges between 700 and 1 100 m. The vegetation unit is described as semiarid plains and open valleys, surrounded by low hills and mountains associated with the escarpment (Mucina and Rutherford, 2006). The vegetation is further described as open to closed Thornveld with Aloe species and succulents with

large areas degraded and over exploited. This resulted in encroachment by indigenous and alien species (Mucina and Rutherford, 2006)

6.5.1.2.2 Sekhukhune Plains Bushveld (SVcb 27)

The Sekhukhune Plains Bushveld occurs in the Limpopo and Mpumalanga Provinces, mainly in semi-arid plains and open valleys in between small mountains. The vegetation consists predominantly of open to close thornveld with large numbers of Aloe species.

Important Taxa

Tall Trees: *Vachellia erioloba*, *Philenoptera violacea*.

Small Trees: *Senegalia mellifera* subsp. *detinens*, *Vachellia nilotica*, *V. tortilis* subsp. *heteracantha*, *Boscia foetida* subsp. *rehmanniana*, *Acacia grandicornuta*, *Albizia anthelmintica*, *Balanites maughamii*, *Combretum imberbe*, *Commiphora glandulosa*, *Maerua angolensis*, *Markhamia zanzibarica*, *Mystroxydon aethiopicum* subsp. *schlechteri*, *Ptaeroxylon obliquum*, *Schotia brachypetala*, *Ziziphus mucronata*.

Succulent Tree: *Euphorbia tirucalli*.

Tall Shrubs: *Searsia engleri*, *Cadaba termitaria*, *Dichrostachys cinerea*, *Ehretia rigida* subsp. *rigida*, *Grewia bicolor*, *Karomia speciosa*, *Maerua decumbens*, *Rhigozum brevispinosum*, *R. obovatum*, *Tinnea rhodesiana*, *Triaspis glaucophylla*.

Low Shrubs: *Felicia clavipilosa* subsp. *transvaalensis*, *Seddera suffruticosa*, *Gnidia polycephala*, *Gossypium herbaceum* subsp. *africanum*, *Jamesbrittenia atropurpurea*, *Jatropha latifolia* var. *latifolia*, *Lantana rugosa*, *Melhania rehmannii*, *Monechma divaricatum*, *Myrothamnus flabellifolius*, *Pechuel-Loeschea leubnitziae*, *Plinthus rehmannii*.

Succulent Shrubs: *Aloe cryptopoda*, *Euphorbia enormis*, *Kleinia longiflora*, *Aloe castanea*, *A. globuligemma*.

Woody Succulent Climber: *Sarcostemma viminalis*.

Herbaceous Climbers: *Coccinia rehmannii*, *Decorsea schlechteri*.

Graminoids: *Cenchrus ciliaris*, *Enneapogon cenchroides*, *Panicum maximum*, *Urochloa mosambicensis*, *Aristida adscensionis*, *A. congesta*, *Eragrostis barbinodis*, *Paspalum distichum*, *Schmidtia pappophoroides*, *Stipagrostis hirtigluma* subsp. *patula*, *Tragus berteronianus*.

Herbs: *Becium filamentosum*, *Phyllanthus maderaspatensis*, *Blepharis integrifolia*, *Corchorus asplenifolius*, *Hibiscus praeteritus*, *Ipomoea magnusiana*.

Geophytic Herbs: *Drimys altissima*, *Sansevieria pearsonii*.

Biogeographically Important Taxa

Small Tree: *Lydenburgia cassinoides*.

Tall Shrub: *Nuxia gracilis*

Low Shrubs: *Amphiglossa triflora*, *Asparagus furei*, *Hibiscus barnardii*, *Orthosiphon fruticosus*, *Petalidium oblongifolium*, *Searsia batophylla*.

Woody Climber: *Asparagus sekukuniensis*.

Herb: *Aneilema longirrhizum*.

Geophytic Herb: *Chlorophytum cyperaceum*.

Succulent Herb: *Piarranthus atosanguineus*.

Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006), this vegetation type is classified as VU. The national target for conservation protection for this vegetation type is 19%, with approximately 2% statutorily conserved in Potlake, Bewaarkloof and Wolkberg Caves Nature Reserves. Approximately 25% of this area has been transformed and is mainly under dry-land subsistence cultivation.

6.5.1.2.3 Sekhukhuneland Centre of Plant Endemism

The project area is situated within the Sekhukhuneland Centre of Plant Endemism (SCPE). SCPE has an extraordinary level of endemism, with 2 000 indigenous species within 4 000 km². This number or rather figure is extraordinary if compared with islands in the world, namely New Zealand has 2 000 species on 268 000 km² and Hawaii which has 2000 indigenous species on 16600 km². SCPE comprises a mountainous region with flat to undulating valleys. Sekhukhune land is known for its parallel belts or rocky ridges and mountains, including the Leolo and Dwars River ranges. The core of the Centre is formed by the surface outcrops of the Rustenburg Layered Suite of the eastern Bushveld Complex.

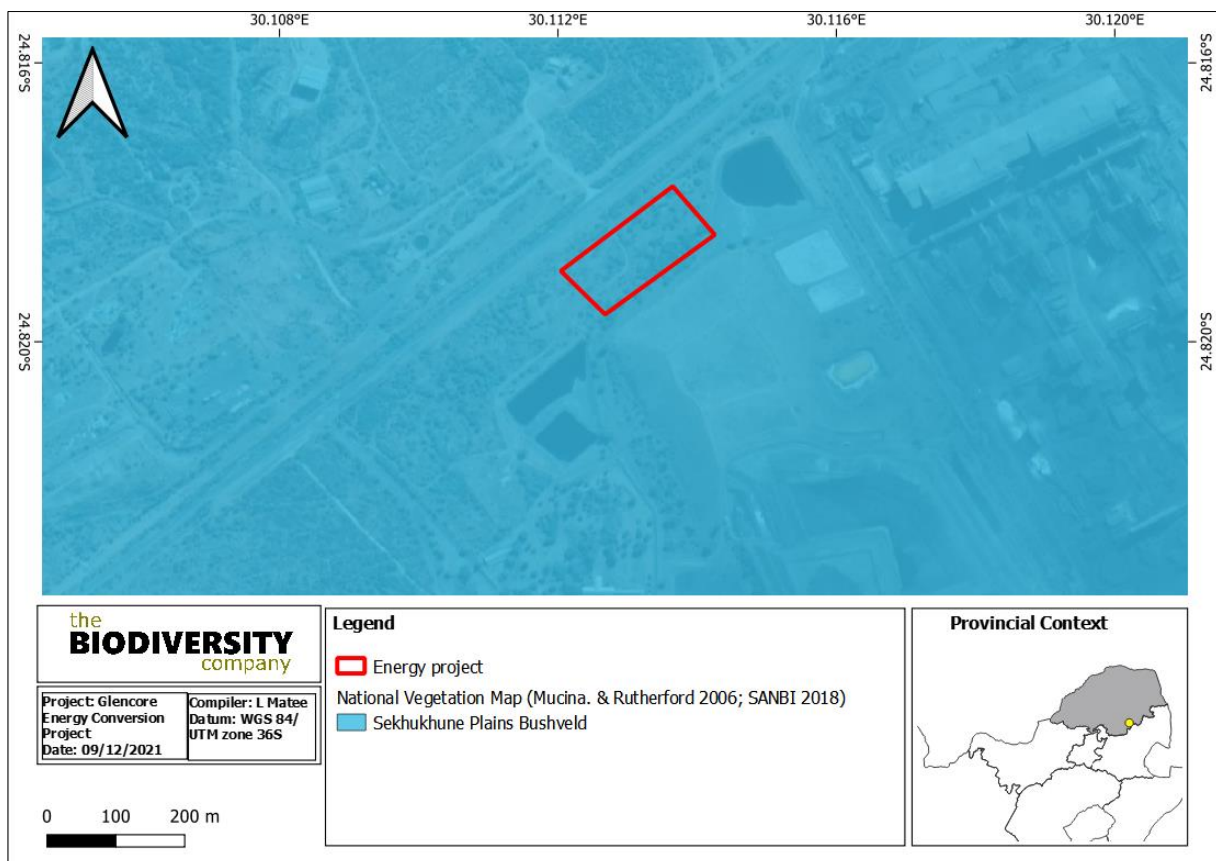


Figure 31: Map illustrating the vegetation type associated with the project area

6.5.1.2.4 Expected Flora Species

According to the new Plants of Southern Africa (POSA) database underpinned by the Botanical Database of Southern Africa (BODATSA), a total of 485 species of indigenous plants are expected to occur within the assessment area and immediate landscape. A total of 8 Red List/ SCC according to the IUCN Red List status could be expected to occur within the assessment area and are provided in Table 18 below (according to the relevant POSA Grid Squares represented on Figure 32).

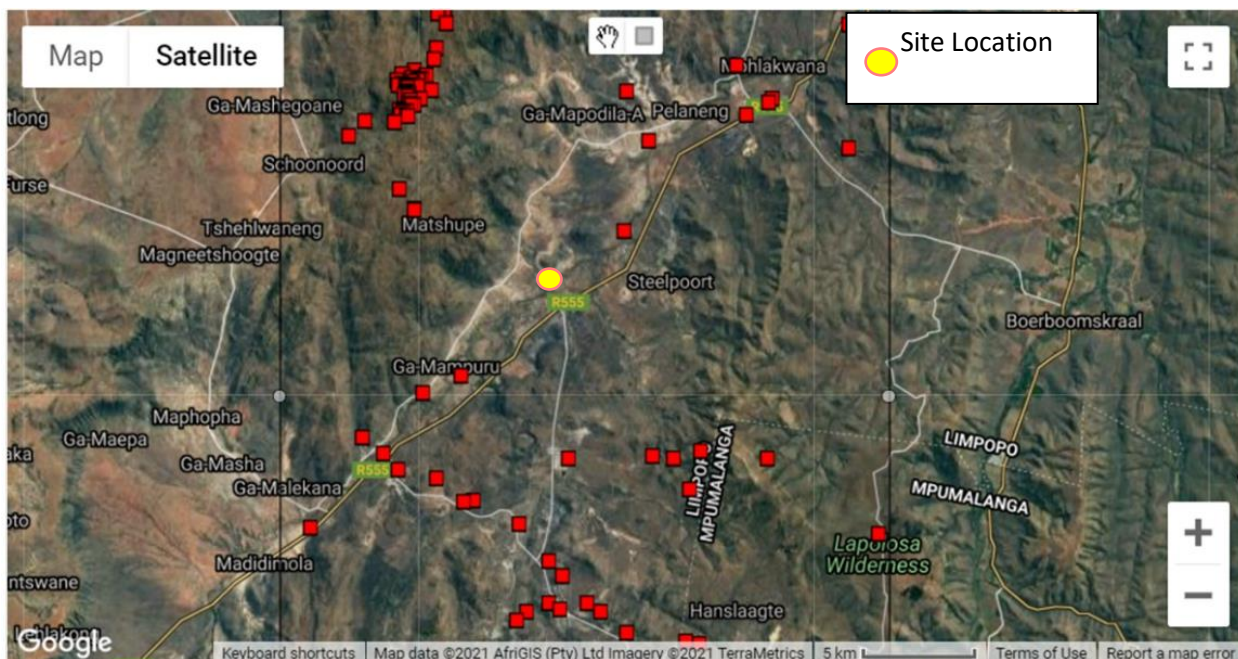


Figure 32: Map showing the grid drawn to compile an expected species list (BODATASA-POSA, 2016)

Table 18: Threatened flora species that may occur within the assessment area associated with the proposed project area.

EN=Endangered

FAMILY	SPECIES	IUCN	DIAGNOSTIC	ECOLOGY
Acanthaceae	<i>Dicliptera fruticosa</i>	NT	herb;	Indigenous; Endemic
Iridaceae	<i>Gladiolus reginae</i>	CR	geophyte;	Indigenous; Endemic
Anacardiaceae	<i>Searsia batophylla</i>	VU	shrub;	Indigenous; Endemic
Hyacinthaceae	<i>Ledebouria dolomiticola</i>	VU	geophyte;	Indigenous; Endemic
Passifloraceae	<i>Adenia fruticosa</i>	NT	tree; succulent; climber; shrub;	Indigenous; Endemic
Scrophulariaceae	<i>Nemesia zimbabwensis</i>	EN		Indigenous
Polygalaceae	<i>Polygala sekhukhuniensis</i>	VU		Indigenous
Scrophulariaceae	<i>Jamesbrittenia macrantha</i>	NT	shrub; dwarf shrub;	Indigenous; Endemic

6.5.2 FIELD ASSESSMENT

The following sections provide the results from the field survey for the proposed development that was undertaken on 14 of December 2021.

6.5.2.1 Flora Assessment

A total of 28 woody, graminoid, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 19). This includes two species that have been assigned alien invader plant categories under the National Environmental Management: Biodiversity Act (NEMBA). Plants listed in Category 1b appear in green. Some of the plant species recorded can be seen in Table 19.

Table 19: Trees, shrub, graminoid and herbaceous plant species recorded in the site boundary of the proposed development

SCIENTIFIC NAME	COMMON NAME	THREAT STATUS (SANBI, 2017)	SA ENDEMIC	ALIEN CATEGORY
<i>Aloe globuligemma</i>	Knoppiesaalwyn	LC	Not Endemic	
<i>Argemone ochroleuca</i>	Mexican Poppy		Not Indigenous; Naturalised; Invasive	NEMBA Category 1b.
<i>Asparagus laricinus</i>	Wild asparagus	LC	Indigenous, Not Endemic	
<i>Dichrostachys cinerea subsp. africana</i>	Small-leaved Sickie Bush	LC	Not Endemic	
<i>Digitaria eriantha</i>	Woolly Finger Grass	LC	Not Endemic	
<i>Elephantorrhiza elephantina</i>	Elephant's root	LC	Indigenous, Not Endemic	
<i>Eragrostis chloromelas</i>	Blue Love Grass	LC	Not Endemic	
<i>Eragrostis curvula</i>	Weeping Love Grass	LC	Not Endemic	
<i>Eragrostis gummiflua</i> Nees	Gum Grass	LC	Not Endemic	
<i>Eragrostis superba</i> Peyr.	Heart-seed Grass	LC	Not Endemic	
<i>Euphorbia ingens</i>	Cactus Euphorbia	LC	Indigenous, Not Endemic	
<i>Gomphocarpus tomentosus</i>	Woolly Milkweed	LC	Not Endemic	
<i>Gymnosporia senegalensis</i>	Red Spike-thorn	LC	Indigenous, Not Endemic	
<i>Hibiscus engleri</i>	Wild Hibiscus	LC	Indigenous, Not Endemic	
<i>Jatropha gossypifolia</i>	Bellyache Bush		Not Indigenous; Naturalised; Invasive	
<i>Leonotis nepetifolia</i>	Lion's Ear	LC	Not Endemic	
<i>Opuntia stricta</i>	Shell Mound Pricklypear		Not Indigenous; Naturalised; Invasive	NEMBA Category 1b.
<i>Panicum maximum</i>	Guinea Grass	LC	Indigenous, Not Endemic	
<i>Sansevieria hyacinthoides</i>	Mother-in-law's-tongue	LC	Indigenous, Not Endemic	
<i>Solanum lichtensteinii</i> Willd.	Large Yellow Bitter Apple	LC	Not Endemic	
<i>Tricholaena monachne</i>	Blousaadgras	LC	Not Endemic	
<i>Urochloa mosambicensis</i>	Herringbone Grass	LC	Indigenous, Not Endemic	
<i>Vachellia karroo</i>	Sweet Thorn, Cape Gum	LC	Indigenous, Not Endemic	
<i>Vachellia tortilis</i>	Umbrella Thorn	LC	Not Endemic	
<i>Viscum combreticola</i> Engl.	Bushwillow Mistletoe	LC	Not Endemic	
<i>Xanthium spinosum</i>	Spiny cocklebur		Not Indigenous; Naturalised; Invasive	
<i>Xanthium strumarium</i>	Large Cocklebur		Not Indigenous; Naturalised; Invasive	
<i>Ziziphus mucronata</i>	Buffalo thorn	LC	Not Endemic	



Figure 33: Photographs illustrating some of the flora recorded within the assessment area. A) *Dichrostachys cinerea subsp. africana*, B) *Vachellia tortilis*, C) *Euphorbia ingens*, D) *Aloe globuligemma*, and E) *Solanum lichtensteinii* Willd

6.5.2.1.1 Invasive Alien Plants

The National Invasive Species Council (Invasive Species Advisory Committee, 2006) defines alien invasive species that are non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, these plants must be controlled using an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species. Although bush encroachment and invasion are sometimes used loosely and commonly interchangeably it is crucial to recognise that these are different processes. Bush encroachment refers to the spread of plant species into an area where previously it did not occur, thus, bush encroachment could occur even with indigenous species, and it is more defined by plant density than species themselves.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal

and/or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued;
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government-sponsored invasive species management programme. No permits will be issued;
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones; and
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing; and
- Take steps to manage the listed invasive species in compliance with:
 - Section 75 of the Act;
 - The relevant invasive species management programme developed in terms of regulation 4; and
 - Any directive issued in terms of section 73(3) of the Act.

Two IAP species listed under the Alien and Invasive Species List 2016, Government Gazette No. 40166 as Category 1b were recorded for the area. These IAP species must be controlled by implementing an Invasive Alien Plant Management Programme in compliance of section 75 of the Act as stated above. Plants listed as Category 1 alien or invasive species under the National Environmental Management: Biodiversity Act (NEMBA) appear in the green text (Table 19).

6.5.2.2 Faunal Assessment

6.5.2.2.1 Avifauna

A total of twenty-five (25) bird species were recorded in the project area during the survey based on either direct observation or the presence of visual tracks & signs. Avian diversity within this habitat was relatively poor due to the project area's surrounding land-use. In addition to this, the avian diversity recorded was not considered unique and is typical of what occurs across large areas of the Savannah Biome, which therefore suggests that the sensitivity of the site, from an avian perspective, will not be of any great significance.

Table 20: Avifaunal species recorded in the project area

SPECIES	COMMON NAME	CONSERVATION STATUS	
		REGIONAL (SANBI, 2016)	IUCN (2017)
<i>Acridotheres tristis</i>	Myna, Common	Unlisted	LC
<i>Apus affinis</i>	Swift, Little	Unlisted	LC
<i>Cercotrichas leucophrys</i>	Scrub-robin, White-browed	Unlisted	LC
<i>Columba guinea</i>	Pigeon, Speckled	Unlisted	LC
<i>Corvinella melanoleuca</i>	Shrike, Magpie	Unlisted	LC
<i>Corvus albus</i>	Crow, Pied	Unlisted	LC
<i>Cossypha humeralis</i>	Robin-chat, White-throated	Unlisted	LC
<i>Dendroperdix sephaena</i>	Francolin, Crested	Unlisted	LC
<i>Dicrurus adsimilis</i>	Drongo, Fork-tailed	Unlisted	LC
<i>Hirundo dimidiata</i>	Swallow, Pearl-breasted	Unlisted	LC
<i>Lamprotornis nitens</i>	Starling, Cape Glossy	Unlisted	LC
<i>Laniarius atrococcineus</i>	Shrike, Crimson-breasted	Unlisted	LC
<i>Mirafra africana</i>	Lark, Rufous-naped	Unlisted	LC
<i>Numida meleagris</i>	Guineafowl, Helmeted	Unlisted	LC
<i>Onychognathus morio</i>	Starling, Red-winged	Unlisted	LC
<i>Passer diffusus</i>	Sparrow, Southern Grey-headed	Unlisted	LC
<i>Ploceus velatus</i>	Masked-weaver, Southern	Unlisted	LC
<i>Pycnonotus tricolor</i>	Bulbul, Dark-capped	Unlisted	Unlisted
<i>Streptopelia capicola</i>	Turtle-dove, Cape	Unlisted	LC
<i>Streptopelia senegalensis</i>	Dove, Laughing	Unlisted	LC
<i>Trachyphonus vaillantii</i>	Barbet, Crested	Unlisted	LC
<i>Turdoides bicolor</i>	Babbler, Southern Pied	Unlisted	LC
<i>Turdoides jardineii</i>	Babbler, Arrow-marked	Unlisted	LC
<i>Turdus libonyana</i>	Thrush, Kurrichane	Unlisted	Unlisted
<i>Vanellus coronatus</i>	Lapwing, Crowned	Unlisted	LC

6.5.2.2.2 Amphibians and Reptiles

No reptile or amphibian species were recorded in the project area during the survey, this can be attributed to the lack of suitable habitat and a river system that is also ephemeral and the lack of water (albeit standing or flowing) and the past human settlements and mining areas.

6.5.2.2.3 Mammals

No mammal species were recorded in the project area due to lack of suitable habitat as well as ecological risk from past or current smelter-related emissions as well as edge effects from smelter related activities resulting in the project area being in a degraded state.

6.5.3 IMPACT STATEMENT

As per section 2.5.3, the screening tool identified the proposed development to fall within an area with a “low sensitivity” in terms of the terrestrial biodiversity theme and “medium sensitivity” in terms of the plant and animal theme.

The “medium to low sensitivity” for the plant species theme is confirmed, as presented in the sensitivity map (Figure 34) confirming the sensitivity observed on site.

The “medium-high sensitivity” animal species theme is disputed as no faunal species or signs of any were recorded in the project area, with the exception of avifaunal species.

The “low sensitivity” terrestrial biodiversity sensitivity is confirmed. As stated above the vegetation structure and species composition of the two habitats have been completely altered as such, has a very low conservation value and ecological sensitivity from both a faunal and floral perspective.

Table 21: Summary of habitat types delineated within the site boundary of the proposed development

HABITAT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Degraded Bushveld	Low	Low	Low	Medium	Low
Riparian zone	Low	Low	Low	Medium	Low

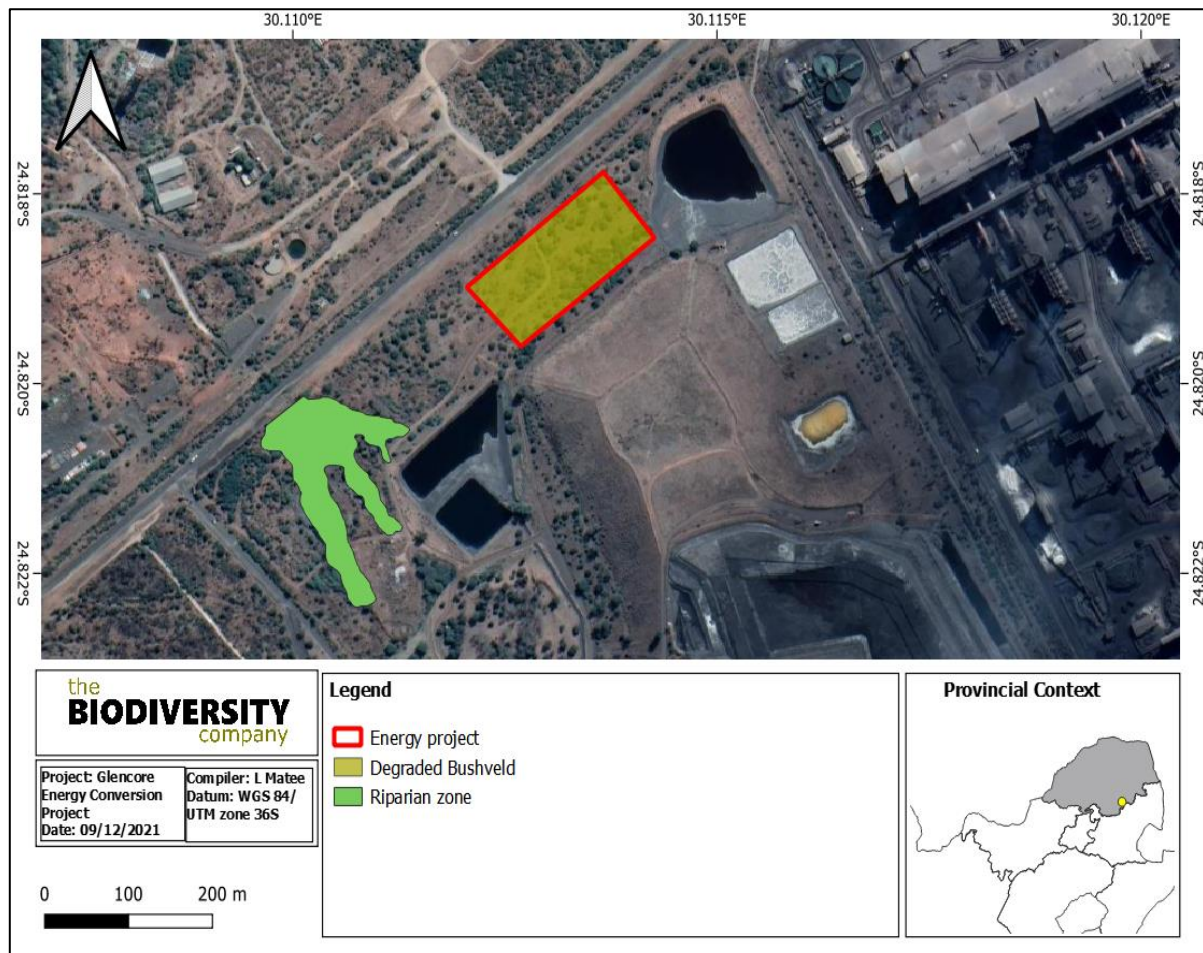


Figure 34: The habitat units identified in the site boundary of the proposed development

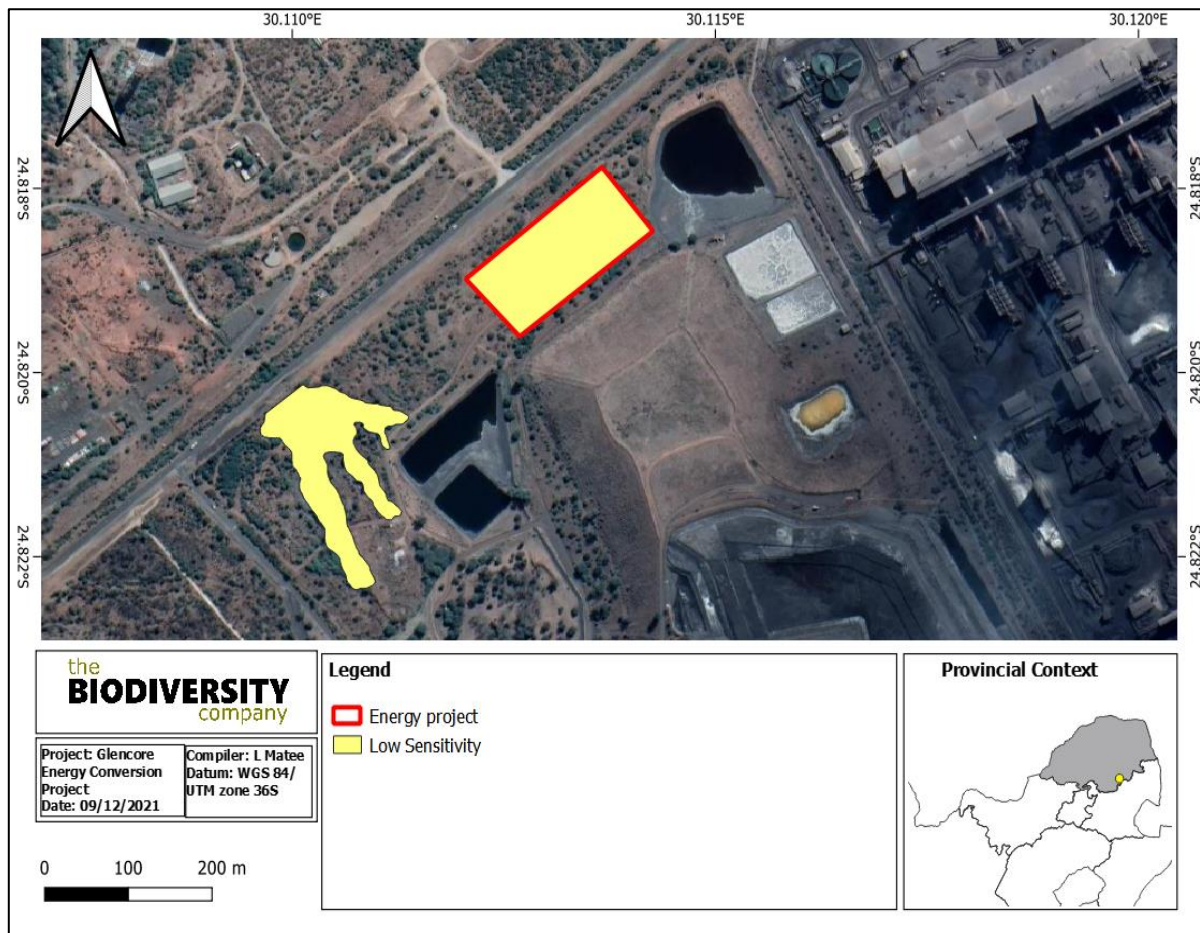


Figure 35: The confirmed sensitivity of the site area of the proposed development

6.5.4 OPINION IF ISSUING EA

No fatal flaws are evident for the proposed project. It is the opinion of the specialists that the project, may be favourably considered for authorisation.

6.6 AQUATIC BIODIVERSITY

Nettzero (Pty) Ltd appointed The Biodiversity Company to conduct the required Aquatic Biodiversity Compliance statement in line with the Protocol for the Specialist Assessment and minimum Report requirements for environmental impacts on Aquatic Biodiversity (GN 320 GG 43110, dated 20 March 2020).

The following section summarises the outcomes of the compliance statement and the detailed report is attached as **Appendix J**.

6.6.1 DESKTOP ASSESSMENT OUTCOME

The following features describes the general area and habitat, this assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and SANBI.

6.6.1.1 Limpopo Conservation Plan

Figure 36 illustrates the project area overlaps with areas designated as Critical Biodiversity Area (CBA) 2, Ecological Support Area (ESA) 1 and ESA2 which align with the terrestrial conservations plans. No aquatic features fall within the project area, however, a drainage lines falls within 300 m south west of the proposed activities. The drainage line east of the project area no longer exists due to the construction of the smelter and associated infrastructure.

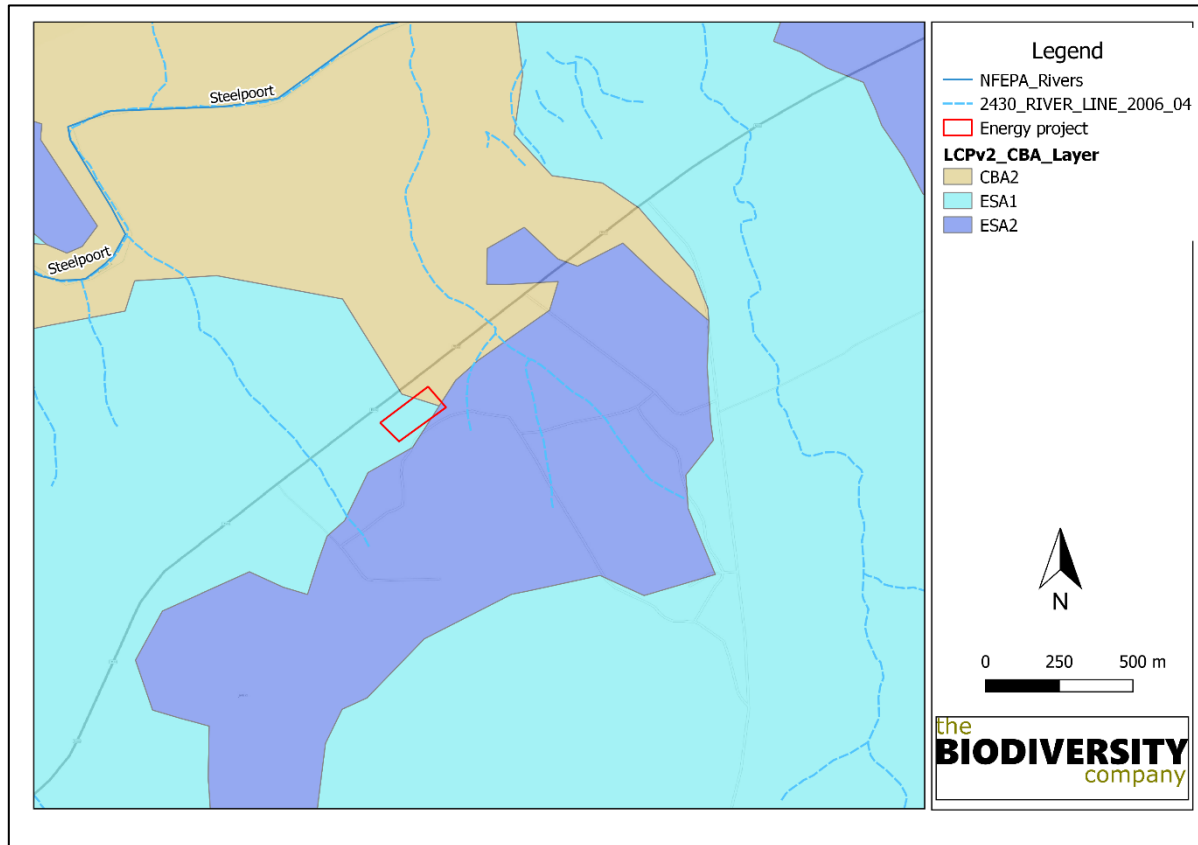


Figure 36: The project area superimposed on the Limpopo Biodiversity Conservation Plans (LCP, 2013)

6.6.1.2 Ecosystem Protection Level and Treat status

Based on Figure 37 and Figure 38 the aquatic ecosystems associated with the development are rated as Poorly Protected. The Threat status of the rivers associated with the proposed project is rated as Endangered (EN).

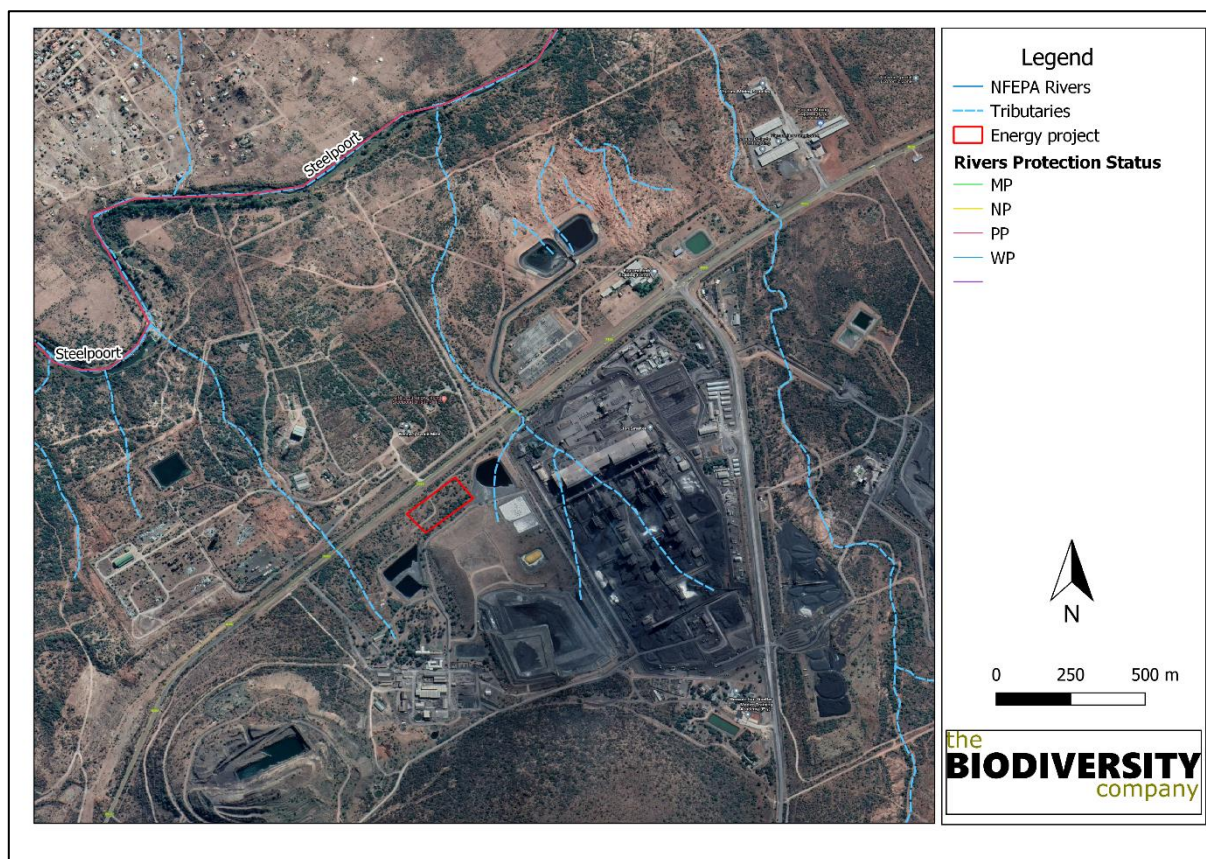


Figure 37: The map highlighting the protection status of aquatic ecosystems within the proposed project area (NBA, 2018)

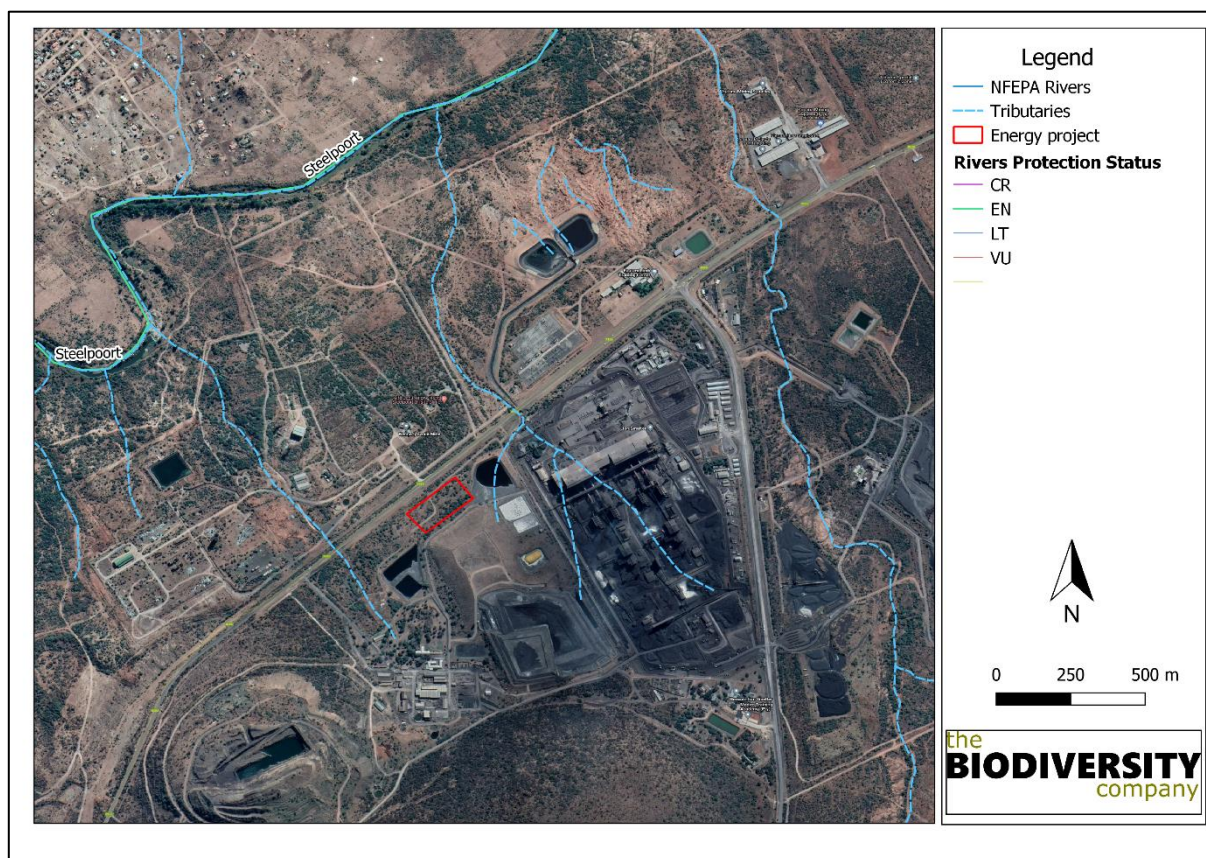


Figure 38: The map highlighting the threat status of aquatic ecosystems within the proposed project area (NBA, 2018)

6.6.1.3 Ecological condition of the Sub - quaternary Catchment (CQR)

The project area is located in the Olifants Water Management Area (WMA2) (NWA, 2016), and the Eastern Bankenveld ecoregion. The project area is located within the quaternary catchments, B41J which drains north into the Steelpoort River (Figure 38). The proposed activities addressed in the study fall adjacent to a tributary off the Steelpoort River. The watercourse associated with the project area is characterised as ephemeral drainage line.

The Steelpoort River reach which is the downstream receiving environment is represented by the B41J-576 Sub-quaternary catchment (SQR). The ecological status and composition of the classified SQR is shown in Table 22, whilst the ecological status of the unclassified drainage line is unknown. The B41J-576 SQR was classified as class D or largely modified ecological classification. Factors contributing to the modified nature of the watercourse includes largely modified instream habitat continuity, moderate flow modifications, and impacts to water quality. The ecological importance and sensitivity of the SQR was found to be high.

Table 22: Desktop data pertaining to the ecological condition of the SQR assessed (DWS, 2018)

B41J-576	PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE		ECOLOGICAL SENSITIVITY	
	D (largely Modified)		High		High	
	VARIABLE	STATUS	VARIABLE	STATUS	VARIABLE	STATUS
	Modifications to Instream Habitat Continuity	Small	Fish species per sub quaternary catchment	17	Fish Physico-Chemical sensitivity description	Very high
	Modifications to Riparian/ Wetland Zone Continuity	Moderate	Invertebrate taxa per sub quaternary catchment	47	Fish No-flow sensitivity description	Very high
	Potential Instream Habitat Modifications	Large	Habitat Diversity Class	Very Low	Invertebrate Physico-Chemical sensitivity	Very high
	Modifications to Riparian/ Wetland Zones	Large	Instream Migration Link Class	Very High	Invertebrate velocity sensitivity	Very high
	Potential Flow Modifications	Moderate	Riparian-Wetland Zone Migration Link	High	Stream size sensitivity to modified flow/water level changes description	Low
	Potential Physico-Chemical Modifications	Large	Instream Habitat Integrity Class	Moderate	Riparian-Wetland Vegetation intolerance to water level changes description	Low
	ANTHROPOGENIC IMPACTS					
The following impacts/activities were identified: SMALL: Abstraction (run-of river)/increased flows, Irrigation, Runoff/effluent: Irrigation, MODERATE: Exotic vegetation, Roads, Runoff/effluent: Urban areas, LARGE: Agricultural lands, Erosion, Mining, Runoff/effluent: Mining, Sedimentation, Grazing / trampling, Urbanization, Vegetation removal, SERIOUS: Algal growth,						

6.6.1.4 National Fresh Water Protection Areas

The watercourses considered in this assessment fall within a single river Freshwater Ecosystem Priority Areas (FEPA), including a Fish Support Area and fish sanctuary in the B41J-576 SQR. The watercourses therefore need to be managed in a manner that enables the systems to remain in a good condition to contribute to national biodiversity goals and support sustainable use of water resources.

The B41J-576 SQR is labelled as a fish support area for the fish species *Opsaridium peringueyi* (Southern barred minnow). According to the IUCN, the species is listed as Least Concern (LC) due to its large distribution range across Southern Africa, however population reductions are associated with habitat loss (IUCN, 2021).

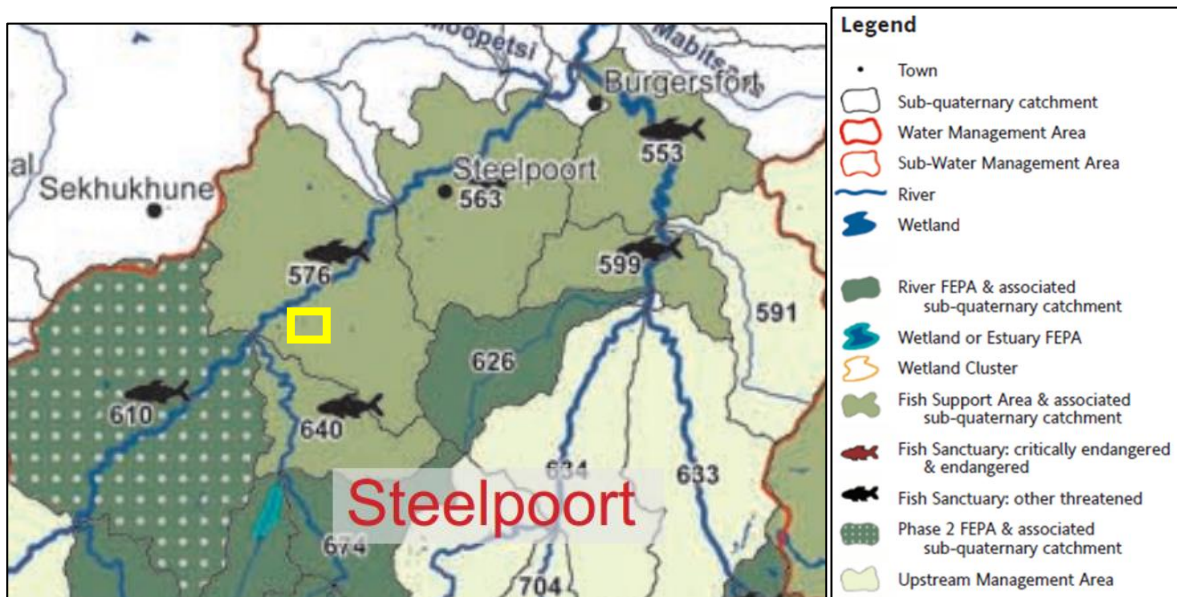


Figure 39: Illustration of NFEPA associated with the project area (indicated in yellow square)

6.6.1.5 Fish community assessment

Due to the absence of a watercourse within the project area, no fish are expected. However it is stressed that land use activities within the catchment, such as the those associated with the Glencore project, do pose risk to water quality and fish populations within the downslope receiving watercourses (Steelpoort River NFEPA).

6.6.2 FIELD ASSESSMENT

A single high flow survey was conducted on the 14th of December 2021. As the site was dry during the survey, a focus on habitat of the site and reached based assessments were conducted.

The results of the Intermediate Habitat Integrity Assessment (IHIA) for the Steelpoort tributary are provided in Table 23.

The results of the IHIA for the tributary indicated largely modified instream conditions. Instream modifications were largely attributed to channel modification with the construction of a channel below the R555 (Figure 40). Additionally, extensive bed modification occurred within the upper reaches of the tributary, with concrete slabbing observed throughout the upper reaches (Figure 41), and the use of rubber tyres for erosion control, which have been burnt during veld fires resulting in solid waste within the tributary (Figure 42). The riparian zone has been moderately modified from reference conditions (unmodified watercourse), with channel and bed modification and indigenous vegetation removal contributing to the loss of habitat integrity.

Table 23: Results for the habitat assessment in the Steelpoort tributary

INSTREAM	STEELPOORT TRIBUTARY	
	IMPACT SCORE	WEIGHTED SCORE
Water abstraction	7	3,92
Flow modification	10	5,2
Bed modification	20	10,4
Channel modification	25	13
Water quality	8	4,48
Inundation	5	2
Exotic macrophytes	0	0
Exotic fauna	5	1,6
Solid waste disposal	5	1,2
TOTAL INSTREAM		58.2
CATEGORY		D
RIPARIAN	STEELPOORT TRIBUTARY	
	IMPACT SCORE	WEIGHTED SCORE
Indigenous vegetation removal	15	7,8
Exotic vegetation encroachment	12	5,76
Bank erosion	17	9,52
Channel modification	20	9,6
Water abstraction	2	1,04
Inundation	0	0
Flow modification	5	2,4
Water quality	0	0
TOTAL RIPARIAN		64
CATEGORY		C



Figure 40: Channel modification within the tributary (Google Earth imagery, 2021)



Figure 41: Illustration of concrete within the bed of the tributary



Figure 42: Illustration of tyres used for erosion control

A riparian delineation was conducted using vegetation features along the visible drainage lines observed onsite with results presented in Figure 43. Despite the low sensitivity of the drainage lines, it is recommended that a 32 m buffer be applied to the riparian zone, and that any construction activities or stockpiling occur outside of the applied buffer to limit habitat and water quality impacts within this system and the downstream Steelpoort River NFEPA.

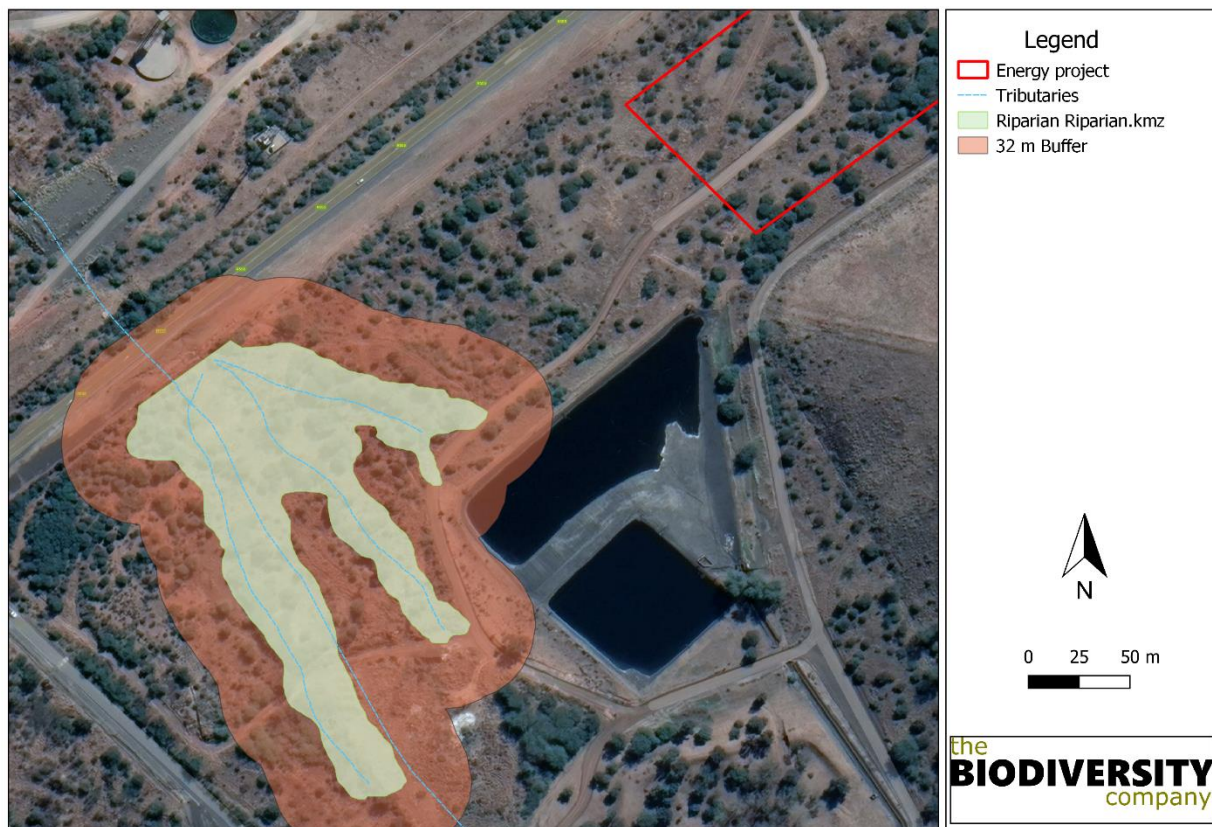


Figure 43: Illustration of the riparian zone and applied 32 m buffer

6.6.3 COMPLIANCE STATEMENT

According to NBA (2018) the “threat status” of the rivers associated with the proposed project are rated as endangered (EN). The ecological sensitivity and importance is rated “high” with fish and invertebrates sensitivity to changes in physico-chemical properties and velocity are rated as “very high”. A single fish species, *Oreochromis mossambicus*, expected within the greater project area is listed as Near Threatened. The species is threatened due to hybridisation with *Oreochromis niloticus*, and therefore the proposed activities do not pose a threat to the species. It is highly unlikely that any of the species occurs directly within the project area. The tributary observed during the site visit was found to be dry during the survey. However, the species are expected to occur within the downstream reaches (approximately 1 km downstream).

Due to the unlikelihood of the presence of the identified endangered species within the site boundary of the proposed development, the outcome of the site verification concurred with the “**low** sensitivity” as identified by the screening tool.

6.6.4 OPINION FOR ISSUING EA

Provided proposed recommendations are implemented, it is the opinion of the specialist that there are no fatal flaws for the proposed activities.

6.7 HYDROLOGICAL

GCS Water and Environmental Consultants was appointed by Netzero (Pty) Ltd to conduct the required Hydrological Assessment and to develop a conceptual storm water management plan in line with the General Required Assessment Protocols (GN 320 GG 43110 dated 20 March 2020) and Appendix 6 of the EIA regulations for the proposed development.

GCS undertook a pre-screening of the site, in terms of hydrology (GCS, 2022), and as part of the findings, it was determined that a CSWMP is required in a dedicated hydrology assessment report to describe stormwater management and drainage for the site. As mentioned previously, the project falls within the lower reaches of quaternary catchment B41J of the Olifants Water Management Area (WMA) (DWS, 2016). Elevations on the site typically range from 770 to 840 metres above mean sea level (mamsl).

The following sections only summarises the outcomes of the assessment and the full report is attached as **Appendix K**.

6.7.1 SUB-CATCHMENTS / HYDROLOGICAL RESPONSE UNITS (HRUs)

Two (2) hydrological response units (HRUs) describe the natural drainage for the study area (using a 1:200 stream count and 15m DTM fill) – refer to Figure 44. The HRUs delineated correspond well to known non-perennial drainage lines associated with the site.

The origin of the non-perennial stream appears to be near the existing tailings facility (TSF) towards the southwest, and the pollution control dam (PCD) towards the northeast from the position of the proposed site. Hence, and based on available elevation data, the area zoned for the proposed ECF (Energy Conversion Facility) Plant is situated on a sub-catchment water divide. Approximately 90% of the proposed layout falls within HRU1, and 10% in HRU2. Hence, drainage from the position of the proposed EFC Plant will primarily be towards the northeast, with some minor runoff towards the northwest.

Drainage from the Lion Smelter site is towards the north-west, via two (2) non-perennial streams (as identified with HRU1 and HRU2) and flow is towards the Steelpoort River, situated approximately 1.14 km northwest of the site. Distance from the site to the nearest drainage lines is recorded as approx. 160 and 272 m.

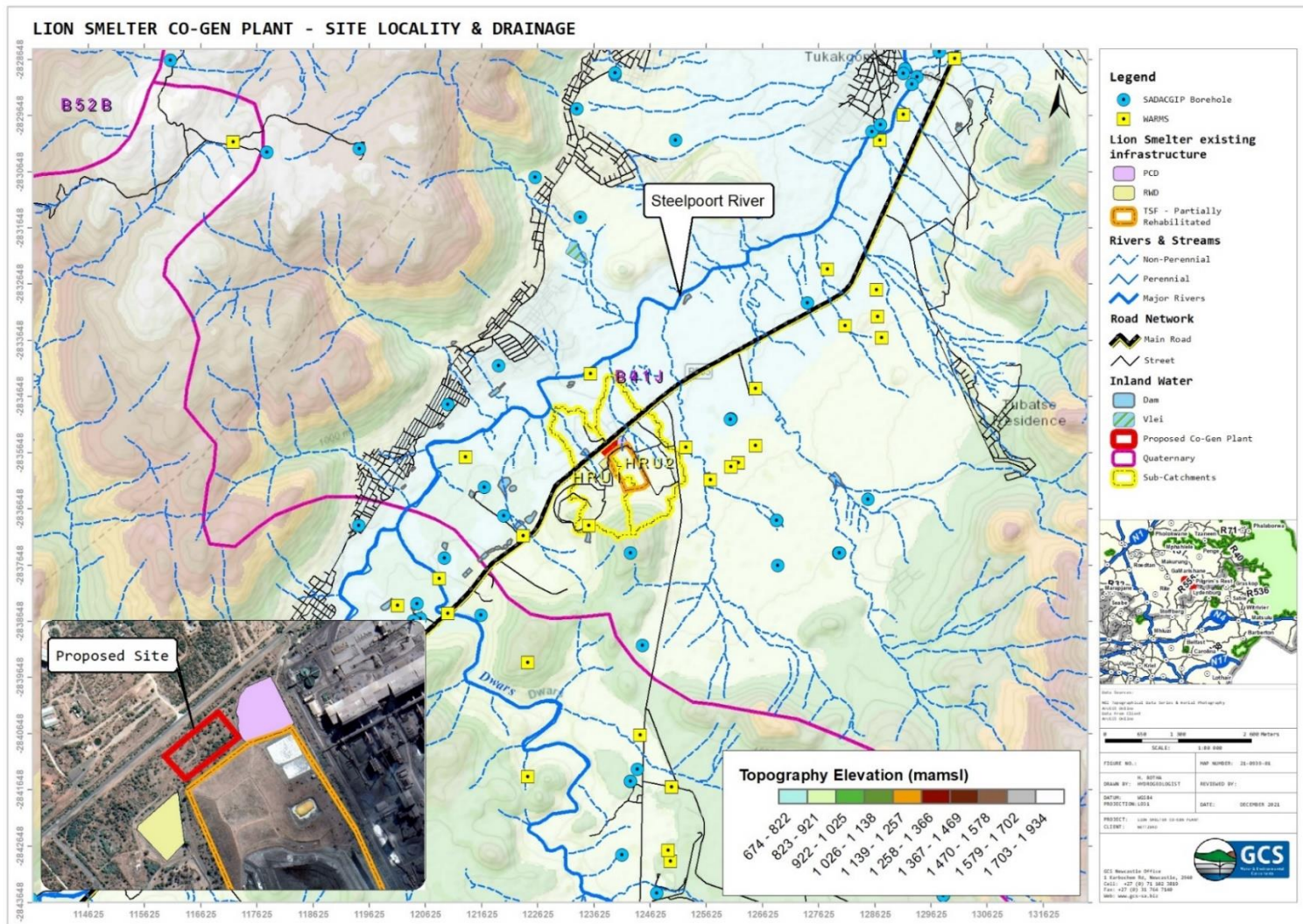


Figure 44: Site locality and drainage

6.7.2 HYDROGEOLOGY

The regional hydrogeological conditions are naturally influenced by the associated geological formations and properties thereof. The hydrogeology data in this section were extracted from JMA (2019) and further supplemented by literature data.

The regional geohydrology at Lion is discussed concerning the available information relevant to the clipped regions of the published 1:500 000 Hydrogeological Map Series of the Republic of South Africa, specifically:

- Sheet 2326 Polokwane, 2003.
- Sheet 2330 Phalaborwa, 1998.
- Sheet 2526 Johannesburg, 1999.
- Sheet 2530 Nelspruit, 1999.

There are two distinctly separate stratigraphic sequences within the larger study area, each with its geohydrological manifestations, summaries of which are given below.

6.7.2.1 Geohydrological Zone 1: Pretoria Group Meta-Sediments

The area to the east of Lion is underlain by predominantly meta-argillaceous and meta-arenaceous rocks of the Pretoria Group - denoted by Vp in Figure 45. Within this zone the groundwater primarily occurs within the joints and fractures of the competent argillaceous (mudstones, siltstones, shales) and arenaceous rocks (sandstones and quartzite), related to tensional or compressional stresses and offloading.

The borehole yielding potential within this geohydrological zone is classified as D3, which implies a median yield that varies between 0.5 l/s to 2.0 l/s and d4, which implies a median yield that varies between 2.0 l/s to 5.0 l/s.

No large scale groundwater abstraction is indicated to occur from these fractured aquifers within the bounds of the study area. The groundwater potential for this area is given as >60%, which indicates the probability of drilling a successful borehole (yield > 0.1 l/s) whilst the probability of obtaining a yield above 2 l/s is given as between 40% and 50% - refer to Figure 46.

The mean annual recharge (MAR) to the groundwater system in the eastern parts of the study area is estimated to be between 25 mm and 37 mm per annum, which relates to between 4% and 6% of the MAP. The groundwater contribution to surface stream base flow is relatively low, indicated at less than 10 mm/annum (DWAF, 2006).

The depths to groundwater levels are estimated to range between 10 m and 20 m below the surface. The aquifer storativity (S) for the fractured aquifers in this part of the study area is indicated to be less than 0.001. The saturated interstice types (storage medium) are fractures that are restricted principally to the zone directly below the groundwater level. The pristine groundwater quality is good with an expected TDS range of between 300 mg/l to 500 mg/l (JMA, 2019).

6.7.2.2 Geohydrological Zone 2: Rustenburg Layered Suite

The groundwater study area at Lion is underlain by ultramafic/mafic intrusive rocks of the Rustenburg Layered Suite - denoted by Vr on Figure 45. The geohydrological properties of this zone are therefore of utmost importance and will be addressed in detail in the sections that follow.

The primary groundwater occurrences within this zone are in the joints and fractures occurring within the contact zones related to the heating and cooling of the country rocks as well as in fractures in the transitional zones between the weathered and un-weathered rocks. Numerous faults are recorded within the Rustenburg Layered Suite within the study area and potentially act as additional preferential groundwater flow zones.

The borehole yielding potential within this geohydrological zone is classified as D3, which implies a median yield that varies between 0.5 l/s to 2.0 l/s and d4, which implies a median yield that varies between 2.0 l/s to 5.0 l/s. The groundwater potential for these aquifers area is given as > 60%, which indicates the probability of drilling a successful borehole (yield > 0.1 l/s) whilst the probability of obtaining a yield over 2 l/s is given as between 20 and 30% - refer to Figure 45.

The MAR to the groundwater system in the central and northern parts of the study area is estimated to be between 15 mm and 25 mm per annum, which relates to between 3% and 5% of the MAP. The aquifer storativity (S) for the fractured aquifers in this part of the study area is indicated to be less than 0.001. The saturated interstice types (storage medium) are fractures that are restricted principally to the zone directly below the groundwater level.

The groundwater contribution to surface stream base flow is relatively low, indicated as negligible (DWAF, 2006).

6.7.2.3 *Aquifer Types (Primary, Weathered, Fractured, Karst)*

Concerning the local geology of the site, it is regarded that two major aquifer types occur within the study area, namely: 1) a laterally extensive shallow weathered zone aquifer system and 2) a more localized fractured aquifer system (JMA, 2019).

The predominant aquifer type present within the study area is a laterally extensive shallow weathered zone aquifer which occurs within the weathered and weathering related fractured zone, within the predominantly norite host rock matrix. This aquifer extends across the entire study area and has an average vertical thickness of 13.16 m.

This aquifer zone will store and transport the bulk of the groundwater in the study area and will display unconfined to semi-unconfined piezometric conditions. This shallow weathered zone aquifer will, therefore, as a result, be highly susceptible to surface-induced anthropogenic influences on site.

The localized fractured aquifers present within the study area are restricted to the contact zones between the intrusive dolerite dykes and the host rocks as well as along the major fault zones. Although these aquifers may potentially have high yields, high transmissivity values and represent preferential flow paths; they have a limited storage capacity as well as restricted recharge characteristics.

The bulk of the water supplied by the fractured aquifers will be drained laterally from storage within the shallow weathered zone aquifers neighbouring onto them. These aquifers can transmit surface-induced contaminants over great distances, and as such have been identified as potential fatal flaws if their lateral continuation extends beyond the delineated lateral aquifer boundaries.

With regards to the two aquifer types present within the study area and subject to the site-specific host matrix physical properties, it is assumed that the bulk of the groundwater zone within the study area will display porous groundwater flow conditions. The “fractured conditions” encountered along with the linear geological features, may, due to their scale and interconnectivity, also be regarded as porous groundwater flow zones within the delineated lateral aquifer boundaries.

6.7.2.4 Aquifer zones

Available hydrogeological investigations information indicate that there are no extensive perched aquifer systems within the study area (JMA, 2019). There are 2 distinct aquifer zones in the study area.

6.7.2.4.1 Unsaturated Zone:

Due to the nature of the shallow weathered zone aquifers at Lion, the top of the unsaturated zone is defined by the land surface, whilst the bottom of the unsaturated zone is defined by the groundwater table/level. The thickness of the unsaturated zone is therefore determined according to the natural groundwater levels recorded. The average thickness of the unsaturated zone at Lion is recorded to range between 2.9 m and 36.2 m with an average thickness of 13.24 m.

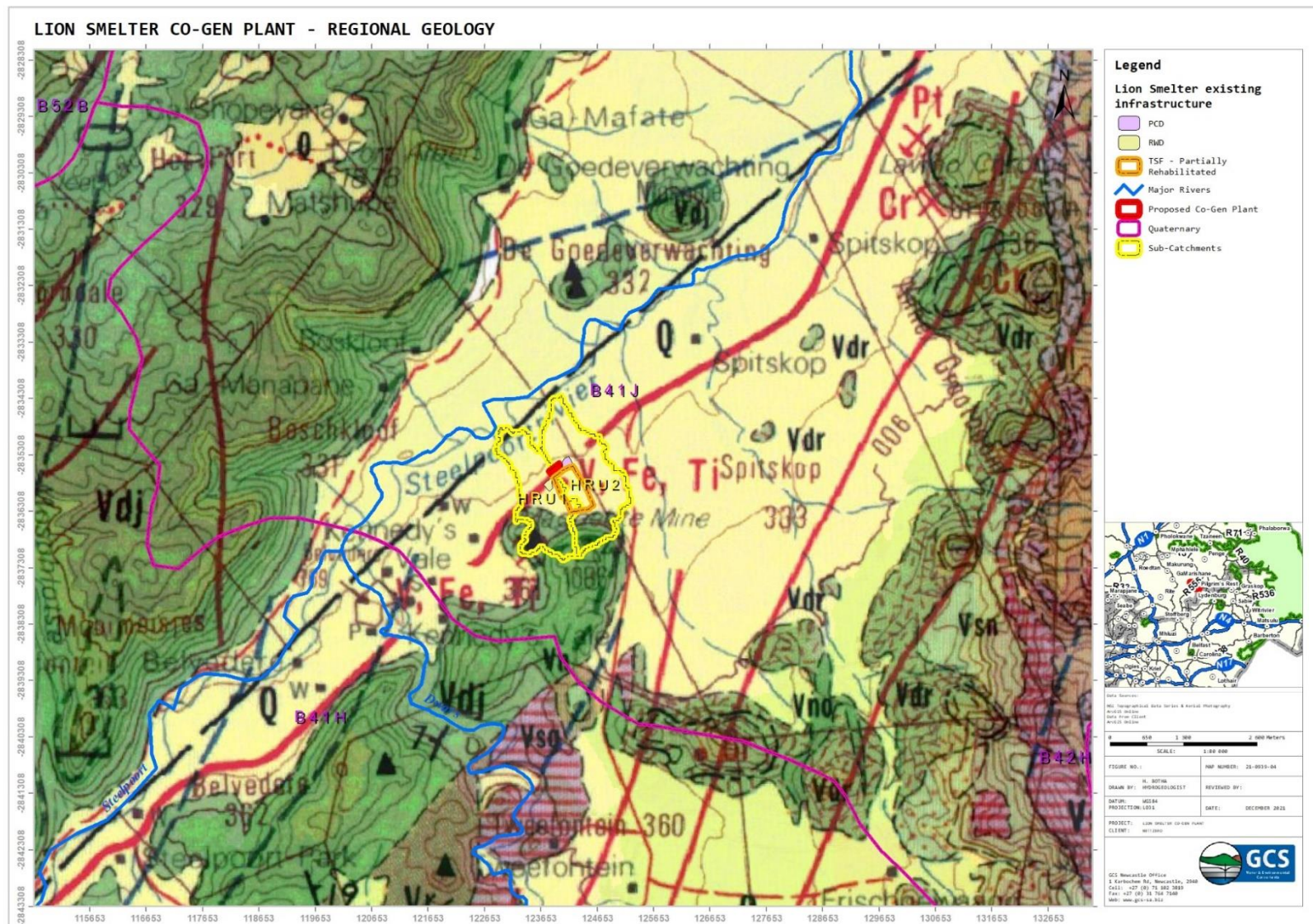
6.7.2.4.2 Saturated Zone:

The saturated zone of the shallow weathered zone aquifer at Lion is defined at the top by the groundwater table/level and the bottom by the weathered/fractured and fresh bedrock interface. The saturated aquifer thickness of the shallow weathered zone aquifer at Lion is calculated by subtracting the measured natural groundwater level depth from the weathered or weathering related fractured depth as recorded at the groundwater monitoring boreholes.

The average thickness of the natural saturated zone at Lion varies between 0.11 m and 60.23 m with an average thickness of 13.16 m.

6.7.2.5 Blow yields

Blow yields were obtained from 64 of the geological/geohydrological investigative boreholes during the drilling of the boreholes. The blow yields values range between 0.01 l/s and 7.00 l/s. A calculation of the arithmetic means yields a value of 1.31 l/s (JMA, 2019).



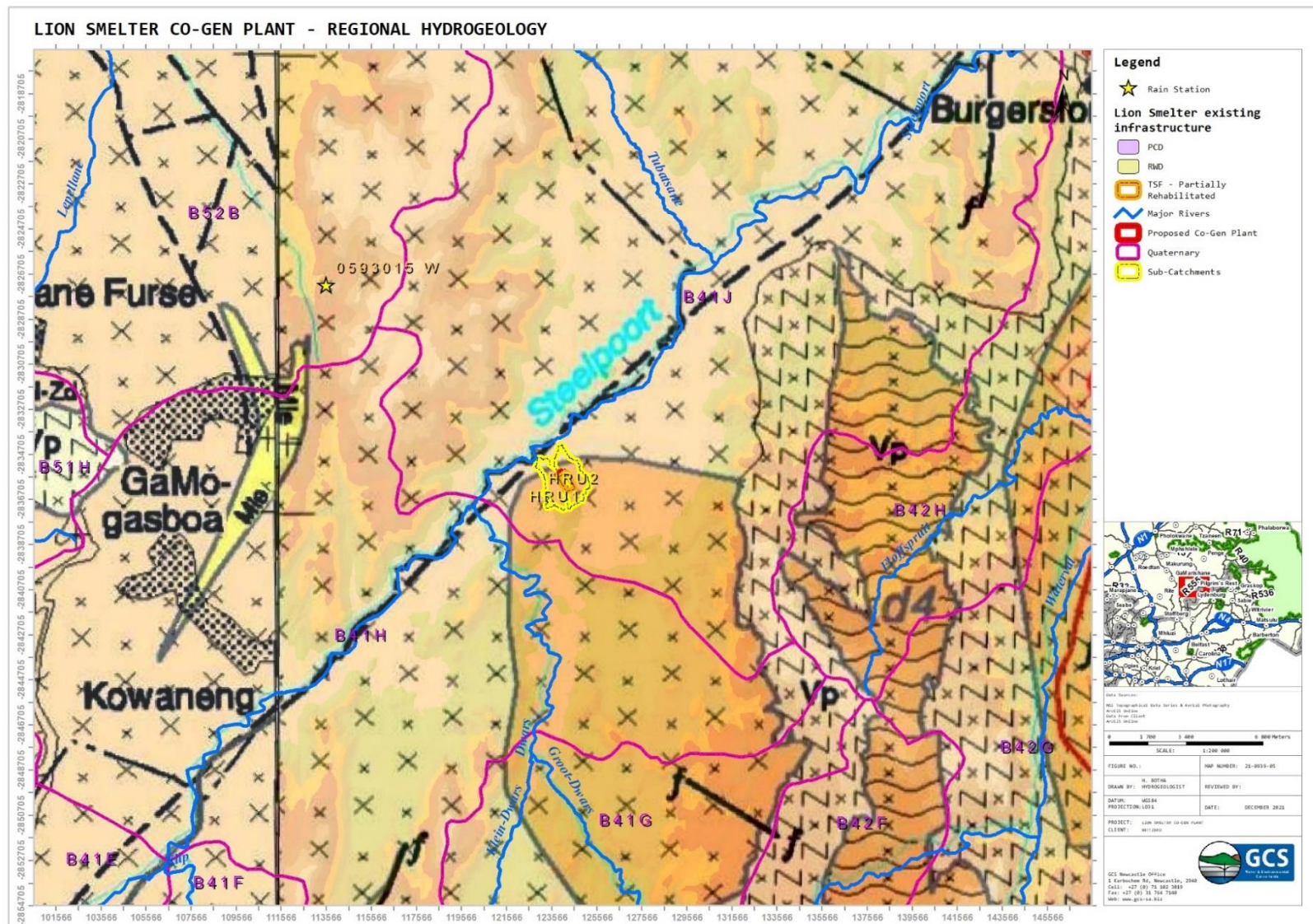


Figure 46: Regional geohydrology

6.7.3 FLOODLINES

A review of the hydrological assessment report compiled by Knight Piésold Consulting (2019) suggests that the site falls well outside the modelled 1:100 year flood lines of the Steelpoort River tributary (refer to Figure 47).

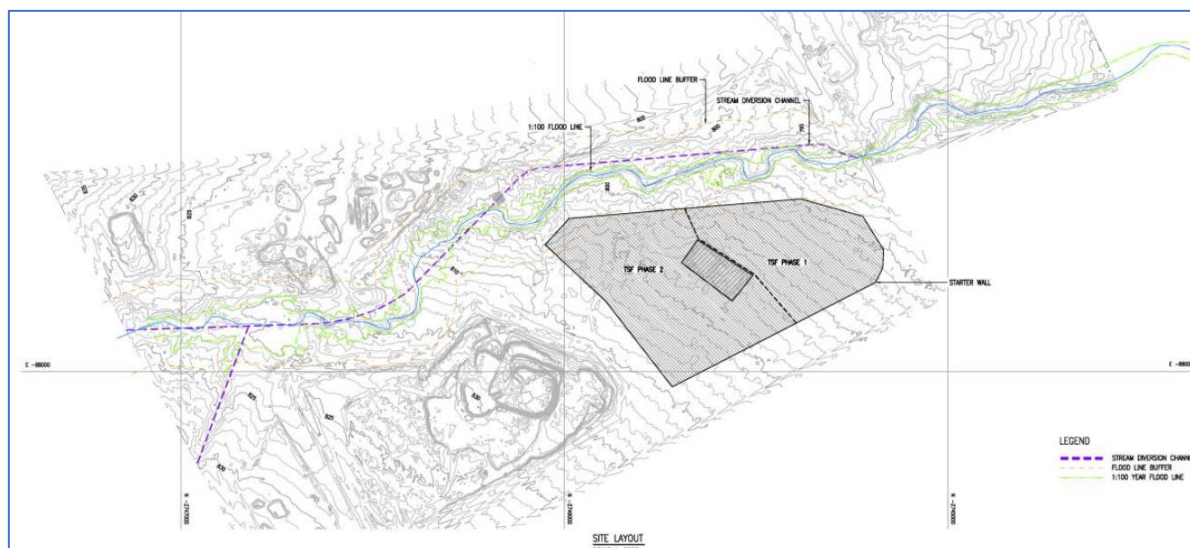


Figure 47: 1:100 year flood line for the Steelpoort River (extracted from Knight Piésold Consulting, 2019)

6.7.4 DEPTH TO GROUNDWATER

According to WR2012 (Bailey & Pitman, 2015) and DWAF GRAII (DWAF, 2006) data, the groundwater level in the study area on average is in the order of 18.8 mbgl (metre below ground level). According to the hydrogeology report compiled by JMA (JMA, 2021), the depths to groundwater levels are also estimated to range between 10 m and 20 m below the surface.

6.7.5 SURFACE WATER USERS WITHIN THE SUB-CATCHMENT ASSOCIATED WITH THE SITE

According to Water Allocation Registration Management System (WARMS) for Section 21(a) and Section 21 (b) water uses, there is one (1) registered water user within HRU1, and one (1) registered water user along the Steelpoort River (2 in total). Both water users are registered as Lion Smelter, one is an abstraction from a borehole along the Steelpoort River (ID: 24009350, 163520 m³/yr) and the other is for water storage in a dam (ID: 24084090, total storage = 677 929 m³/yr).

6.7.6 SURFACE WATER QUALITY

A review of the JMA (2021) monitoring reports (Jan 2021 to August 2021) suggest that there are 9 existing surface water monitoring points at Lion Smelter Operations (refer to Table 24).

Table 24: Summary of monitoring points (JMA, 2021)

ID	LATITUDE	LONGITUDE	POSITION
LSWM-S1	-24.79231	30.13089	Steelpoort River Downstream for Lion.
LSWM-S2	-24.80756	30.10963	Steelpoort River Opposite Lion.
LSWM-S3	-24.82850	30.08030	Steelpoort River Upstream from Lion.

LSWM-S4	-24.83303	30.07568	Steelpoort river upstream from Dwars River Confluence.
LSWM-D1	-24.83201	30.07980	Dwars River Upstream from Steelpoort River Confluence.
LSWM-D2	-24.85639	30.09959	Dwars River further Upstream at Irrigation Weir.
LSWM-D3	-24.92841	30.10860	Dwars River further Upstream at Big Bridge.
LSWM-D4	-24.99781	30.13400	Dwars River further Upstream at Small Bridge.
LSWM-D5	-25.04661	30.12080	Dwars River further Upstream at Upstream Weir.

A review of the hydrochemistry data for the sample points suggests that parameters measured (pH, TDS, Ca, Mg, Na, Cl, SO₄, NH₄, PO₄, F, Al, Mn, Cr⁶⁺ and Zn) generally fall well within regulatory limits, except for Al concentrations which have been observed to be high several times in from January to August 2021 – refer to Table 25 and Table 26 below for snapshots of typical water quality.

Table 25: Summary of hydrochemistry results for March 2021 (JMA, 2019)

	pH	TDS (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Cl (mg/l)	SO ₄ (mg/l)	NH ₄ (mg/l)	PO ₄ (mg/l)	F* (mg/l)	Al* (mg/l)	Mn* (mg/l)	Cr ⁶⁺ * (mg/l)	Zn* (mg/l)
RQO Olifants Catchment (Steelpoort River)									0.125	2	0.063	0.68	0.068	0.014
LSWM-S1	7.60	116	19.4	9.19	10.5	9.25	7.70	<0.45	<0.03	0.12	0.45	0.01	<0.02	<0.01
LSWM-S2	8.00	122	21.3	9.22	9.06	7.71	16.4	<0.45	<0.03	0.12	0.41	<0.01	<0.02	<0.01
LSWM-S3	7.95	121	19.8	10.6	9.29	8.61	8.30	<0.45	<0.03	0.10	0.51	<0.01	<0.02	<0.01
LSWM-S4	7.96	113	19.3	9.11	9.15	8.13	7.62	<0.45	<0.03	0.12	0.97	0.02	<0.02	<0.01
LSWM-D1	8.13	130	21.2	13.2	6.81	5.63	6.32	<0.45	<0.03	0.09	0.65	<0.01	<0.02	<0.01
LSWM-D2	8.01	141	21.0	12.9	7.21	7.58	18.5	<0.45	<0.03	0.10	0.88	0.01	<0.02	<0.01
LSWM-D3	7.94	108	16.4	11.3	5.04	3.62	6.91	<0.45	<0.03	0.10	1.18	<0.01	<0.02	<0.01
LSWM-D4	7.90	87.2	14.3	8.89	4.53	3.40	7.53	<0.45	<0.03	0.11	0.65	<0.01	<0.02	<0.01
LSWM-D5	7.62	72.1	14.4	6.48	3.84	2.28	5.06	<0.45	<0.03	0.10	0.67	<0.01	<0.02	<0.01

Table 26: Summary of hydrochemistry results for August 2021 (JMA, 2019)

	pH	TDS (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Cl (mg/l)	SO ₄ (mg/l)	NH ₄ (mg/l)	PO ₄ (mg/l)	F* (mg/l)	Al* (mg/l)	Mn* (mg/l)	Cr ⁶⁺ * (mg/l)	Zn* (mg/l)
RQO Olifants Catchment (Steelpoort River)									0.125	2	0.063	0.68	0.068	0.014
LSWM-S1	7.47	170	24.4	14.2	16.5	20.7	20.9	<0.45	<0.03	0.18	<0.01	<0.01	<0.02	<0.01
LSWM-S2	7.68	164	24.4	14.2	14.3	20.5	17.9	<0.45	<0.03	0.25	<0.01	<0.01	<0.02	<0.01
LSWM-S3	7.60	148	22.3	13.8	12.2	16.7	13.3	<0.45	<0.03	0.15	<0.01	<0.01	<0.02	<0.01
LSWM-S4	7.61	150	24.4	12.8	12.8	16.8	12.9	<0.45	<0.03	0.12	<0.01	<0.01	<0.02	<0.01
LSWM-D1	7.67	231	30.3	25.7	11.0	10.2	24.5	0.54	<0.03	<0.09	<0.01	<0.01	<0.02	<0.01
LSWM-D2	7.82	248	31.5	27.2	10.4	12.1	26.5	<0.45	<0.03	<0.09	<0.01	<0.01	<0.02	<0.01
LSWM-D3	7.78	213	27.7	23.0	7.41	7.70	21.1	<0.45	<0.03	<0.09	0.02	<0.01	<0.02	<0.01
LSWM-D4	7.69	124	20.1	12.9	5.20	5.12	17.9	<0.45	<0.03	<0.09	0.03	<0.01	<0.02	<0.01
LSWM-D5	7.57	82.8	14.9	8.82	3.42	2.63	5.89	<0.45	<0.03	0.12	0.26	<0.01	<0.02	<0.01

6.7.7 SURFACE WATER QUALITY OBJECTIVES

An integrated water quality management plan for the Olifants river system was conducted in August 2017 by the DWS. The study assessed the water quality downstream of the De Hoop Dam in the Steelpoort sub-catchment. Water Planning limits were then set for sub-catchment and are indicated in Table 27. Water Quality assessments for the Lion Smelter should be assessed to align with the Water quality limits set by the Department of Water and Sanitation for the Sub-Catchment, as well as the existing Water Use License (WUL) for the site.

Table 27: Water Quality limits for the catchment downstream of De Hoop Dam catchments of the Steelpoort Sub-Catchment

VARIABLE	UNITS	VALUE
Calcium	mg/L	15
Chloride	mg/L	25
Total Dissolved Solids	mg/L	260
Electrical Conductivity	µS/m	30
Fluoride	mg/L	0.7
Potassium	mg/L	10
Magnesium	mg/L	30
Sodium	mg/L	20
Ammonium	mg/L	0.05
Nitrate	mg/L	0.5
Total Phosphorus	mg/L	0.25
pH	ph Unit	6.5-8.4
Ortho-phosphate	mg/L	0.01
Sulphate	mg/L	20
Total Alkalinity	mg/L	120
Dissolved Organic Carbon	Carbon	5
Dissolved Oxygen	mg/L	9
SAR	Unitless Ratio	2
Suspended Solids	mg/L	25
Chlorophyll	µg/L	1
Escherichia coli	CFU/100mL	130
Faecal coliforms	CFU/100mL	130
Aluminium	mg/L	0.01
Boron	mg/L	0.5
Chromium (V)	µg/L	7
Iron	mg/L	0.1
Manganese	mg/L	0.2

6.7.8 CONCEPTUAL STORM WATER MANAGEMENT PLAN

Based on the ALOS DTM for the project area, two (2) stormwater sub-catchments were identified (namely SWHRU01 and SWHRU02) – refer to Figure 48. Based on the stormwater sub-catchment dimensions, it is observed that the upper portions of the catchments (i.e. associated with the TSF) will likely be dirty runoff generation areas. Moreover, the pavement / bunded area associated with the proposed development will become an isolated potentially dirty water area. Open areas falling outside of the plant and not associated with the TSF area will potentially be clean runoff areas. As such these areas need to be managed separately.

The aim is to control potentially dirty water that may be generated by the plant and water flowing towards the development (which may compromise the structural integrity of the developed area). The clean water captured in the servitudes will generally be free draining into the environment, with only dirty water from the TSF and the plant area to be captured/ released into suitable receiving environments. The CSWMP aims to mitigate the impacts of high flows that may lead to erosion, siltation, sedimentation and poor-quality overland runoff from the above-mentioned areas.

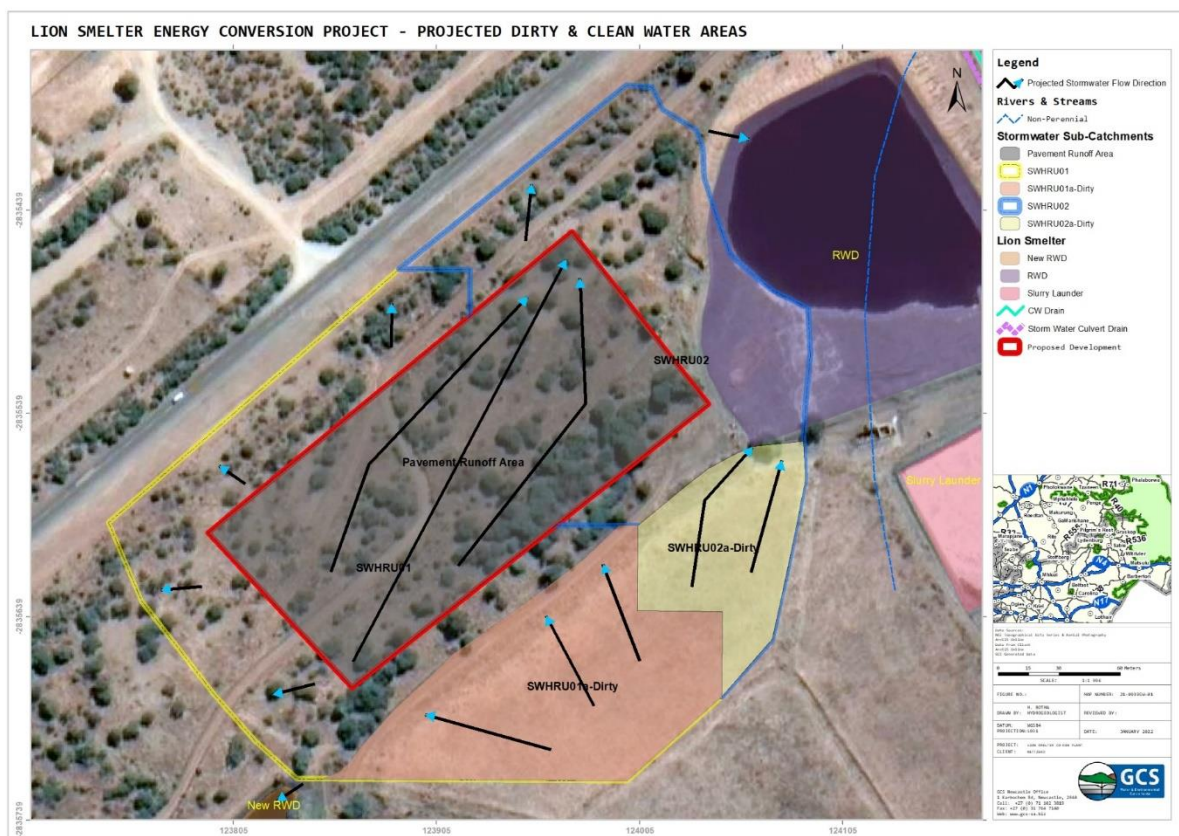


Figure 48: Dirty and clean water areas

Considering the proposed activities and likely stormwater peak flows determined by the Hydrological Assessment, the following stormwater systems are proposed (refer to Figure 49 and numbers assigned to the SW system):

1. It is proposed that a vegetated/grassed lined surface channel (or V-drain grassed equivalent) be installed along the existing access road, to capture any dirty water runoff from the TSFs that is not captured by the toe drains.

- a. It is proposed that any dirty water runoff captured in the vegetated/grassed lined surface channel be gravity fed to the two (2) existing return water dams/pollution control dams (RWDs/PCDs) downstream of the site (if possible – or whichever dam is suitable). Rock rip rap basin at the outfall from the channel, into the WRD, is sufficient to prevent erosion along the RWD/PCD banks.
2. No runoff from the development is anticipated from the site.
 - a. As per the engineering designs for the development, all dirty water shall be managed with a dedicated secondary catchment under the PBU's (modular trays above the surface are envisaged). As such, all water captured above the slab shall be considered to be clean water (Swedish Stirling, 2021).
3. Stormwater runoff not captured in modular trays (potentially contaminated) on the pavement premises will need to be conveyed to the lowest portion of the site, to prevent runoff into the environment (i.e. to ensure no runoff as per item 2 above). The lowest corner of the site, as per the ALOS DTM assessed, is the northern corner.
 - a. It is proposed that stormwater be conveyed to the lowest point of the property using several concrete drains with intake mesh (to be designed and sized by the civil designs engineer).
 - b. Water captured in the system would need to pass through a silt trap (or several traps) and an oil trap before discharge into the environment.
 - c. It is proposed that water from the development site be discharged to a vegetated/grassed lined surface channel (or V-drain grassed equivalent) and joint to the proposed system in Item 1 for discharge into the RWDs/PCDs.

As an alternative, to the above-mentioned system, all stormwater generated from the pavement area could be conveyed to the existing stormwater main (situated 2.30m east of the site). However, this would entail the installation of a dedicated stormwater pipe/culvert drain system to join the existing stormwater drain. The final designs for the development stormwater system will determine which option may be most viable (if at all required).

To circumvent potential erosion and sedimentation in open and unvegetated areas associated with the site native species of vegetation in the area can be re-planted in eroded areas. The expansive root systems of these plants provide support within the soil and prevent erosion due to rain runoff.

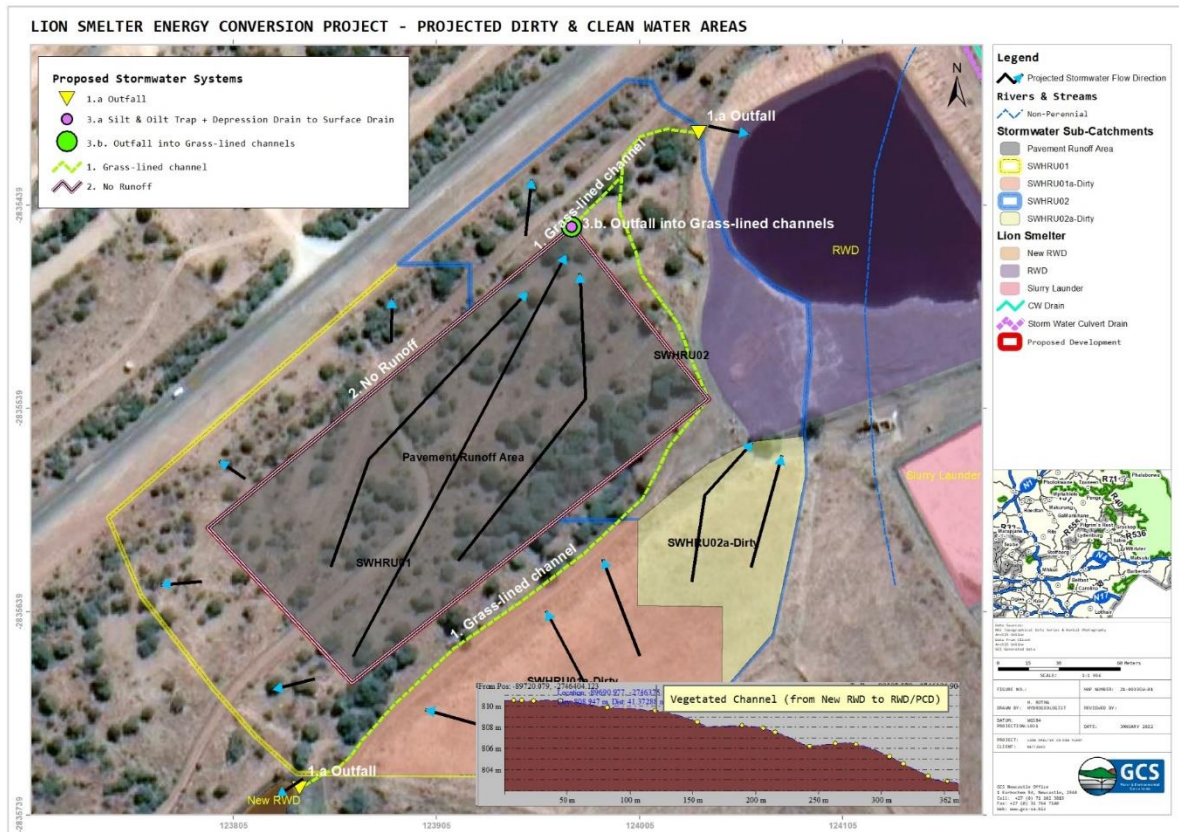


Figure 49: Conceptual stormwater management system

6.7.9 IMPACT STATEMENT

The risk assessment for both construction and post-construction phases of the project is considered marginal, with mostly reversible and manageable impacts. Mixing of dirty and clean water on the premises and potential overall runoff and stormwater discharge from the site into the surrounding environment (increased peak flows) may cause erosion of the soils surrounding the development and may impact land capability. This is the largest risk and should be managed with the on-site stormwater management plan (as per the developer designs) and the conceptual stormwater management plan as proposed in this document.

The risk of flooding, poor quality seepage via the vadose zone, and impacts on surface water quality is predicted to be zero during the construction and operational phase of the project. This is largely due to the proposed concrete barrier to be installed, the absence of any surface water streams, and the fact that the zoned area has already been modified as a result of the existing Lion Smelter activities.

6.7.10 OPINION FOR AN EA

This hydrological assessment cannot find any grounds or identify high hydrological risks to not proceed with the development. This is grounded on the assumption that the proposed mitigation measures, CSWMP, EMPr and EIA recommendations are implemented during the construction and operational phase of the development.

6.8 NOISE

dBAcoustics was appointed by Netzero (Pty) Ltd to conduct the required Noise Compliance Statement, in line with the Protocol for the Specialist Assessment and minimum Report content requirements for noise impacts (GN 320 GG 43110 dated 20 March 2020) for the proposed development.

A baseline measurement, inline with the relevant legislation and standards, was taken during the day and night of 1 December 2021.

The following sections only summarises the outcomes of the assessment and the full report is attached as **Appendix L**.

6.8.1 OUTCOME OF ASSESSMENT

During the assessment, a number of noise receptors associated with the proposed development was identified.

The communities to the north of the ECF and the distance between the ECF and the communities are presented in Table 28 and illustrated in Figure 50: Noise receptors in the vicinity of the proposed ECF project footprint.

Table 28: Location of noise receptors

RECEPTOR	DISTANCE FROM THE PROPOSED ECF FOOTPRINT IN METERS	LAND USE TYPE
A	1 509	Community – residential, main road and business.
B	2 348	Community – residential, main road and business.
C	3 200	Community – residential, main road and business.
D	5 016	Community – residential, main road and business.
Mediro training facility	1 166	Training facility.
Tshufi camp	3 172	Guest farm.
North-western boundary	70	North-western boundary onto the R555 feeder road.

The location of the noise receptors (A to D, Mediro training facility and Tshufi camp in the vicinity of the proposed ECF footprint is illustrated in Figure 50.

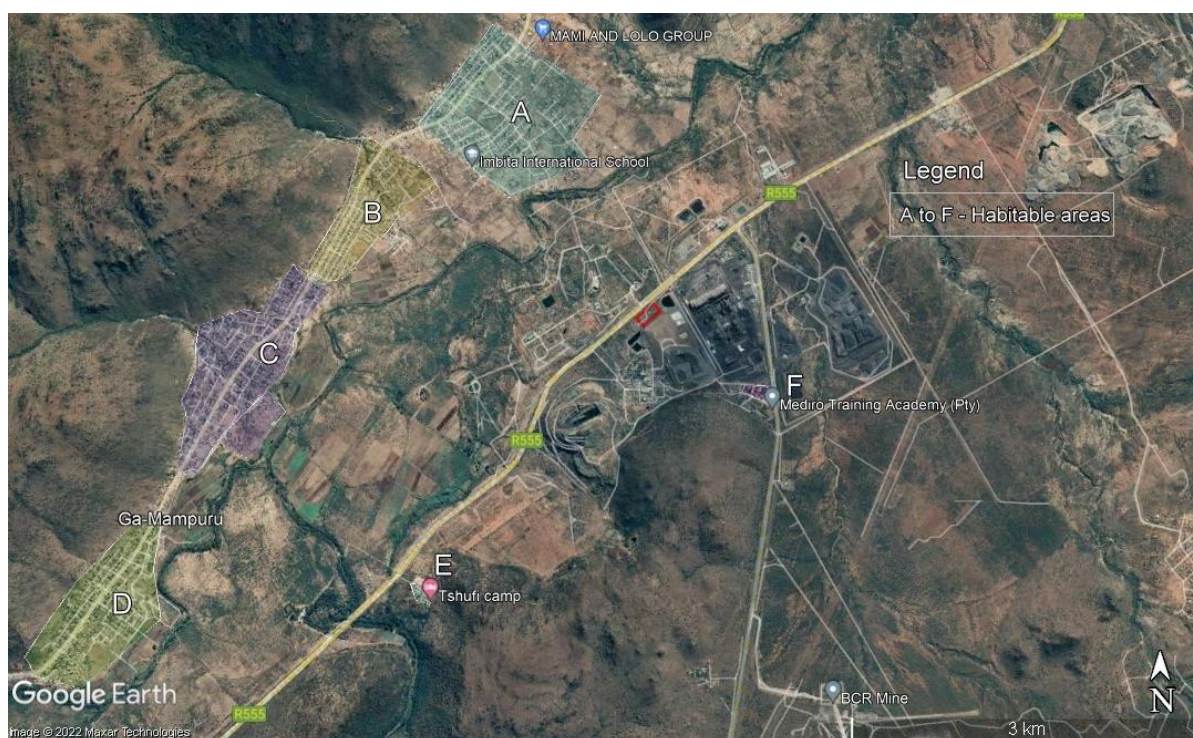


Figure 50: Noise receptors in the vicinity of the proposed ECF project footprint

The criterion for assessing the magnitude of a noise impact is illustrated in Table 29.

Table 29: Noise intrusion level criteria

INCREASE Δ -DBA	ASSESSMENT OF IMPACT MAGNITUDE	COLOR CODE
$0 < \Delta \leq 1$	Not audible	
$1 < \Delta \leq 3$	Very Low	
$3 < \Delta \leq 5$	Low	
$5 < \Delta \leq 10$	Medium	
$10 < \Delta \leq 15$	High	
$15 < \Delta$	Very High	

The noise intrusion levels during the construction phase are given in Table 30 and the threshold value of 7.0 dBA will not be exceeded and the noise intrusion level will be insignificant.

Table 30: Noise intrusion levels (in dBA) during construction phase

NOISE RECEPTOR	CLEARING AND GRUBBING OF TOPSOIL AND VEGETATION AT THE ECF PAD	CONSTRUCTION ACTIVITIES OF THE ECF PAD	CONSTRUCTION ACTIVITIES AT THE ECF PAD	INSTALLATION OF THE CONTAINERS, PIPES, AND FLARE	CONSTRUCTION ACTIVITIES OF THE OFFICES/OPERATOR'S AREA	CUMULATIVE LEVELS	CUMULATIVE NOISE LEVEL - DAYTIME	INTRUSION NOISE LEVEL - DAYTIME
----------------	--	--	--	--	--	-------------------	----------------------------------	---------------------------------

A	19.9	19.9	19.4	18.9	16.9	26.2	55.0	0.0
B	16.1	16.1	15.6	15.1	13.1	22.4	55.0	0.0
C	13.4	13.4	12.9	12.4	10.4	19.7	55.0	0.0
D	9.5	9.5	9.0	8.5	6.5	15.9	55.0	0.0
Mediro training facility	22.2	22.2	21.7	21.2	19.2	28.4	60.7	0.0
Tshufi camp	13.5	13.5	13.0	12.5	10.5	19.8	46.2	0.0
North-western boundary	46.6	46.6	46.1	45.6	43.6	52.8	67.5	0.2

The noise contours and the subsequent noise intrusion levels at the abutting noise receptors during the operational phase of the project at the different areas and at the abutting noise sensitive areas are illustrated in Figure 51. The threshold value of 7.0dBA will not be exceeded and due to the traffic noise and seasonal agricultural activities the noise intrusion will be below 0.5dBA during the day and night which is insignificant. The noise intrusion along the north-western boundary will be low and within the 7.0dBA threshold value. The calculated cumulative noise levels during the operational phase at the noise receptors are given in Table 31.

Table 31: Cumulative noise levels (dBA) during the operational phase

NOISE RECEPTOR	NOISE FROM THE ECF PAD	GENERATION OF ELECTRICITY	EMERGENCY RELEASE VALVE	RECIPROCATION ENGINES	PUMPING OF COOLING WATER	OFFICE /OPERATOR'S ROOM	CUMULATIVE LEVELS	CUMULATIVE NOISE LEVEL - DAYTIME	CUMULATIVE NOISE LEVEL - NIGHT-TIME	INTRUSION NOISE LEVEL - DAYTIME	INTRUSION NOISE LEVEL - NIGHT-TIME
A	31.9	21.4	31.4	31.9	26.4	6.4	37.1	55.1	45.6	0.1	0.6
B	28.1	17.6	27.6	28.1	22.6	2.6	33.2	55.0	45.3	0.0	0.3
C	25.4	14.9	24.9	25.4	19.9	-0.1	30.6	55.0	45.2	0.0	0.2
D	21.5	11.0	21.0	21.5	16.0	-4.0	26.7	55.0	45.1	0.0	0.1
Mediro training facility	34.2	23.7	33.7	34.2	28.7	8.7	39.3	60.7	56.8	0.0	0.1
Tshufi camp	25.5	15.0	25.0	25.5	20.0	0.0	30.6	46.3	44.0	0.1	0.2
North-western boundary	58.6	48.1	58.1	58.6	53.1	33.1	63.7	68.9	66.4	1.6	3.3

The noise intrusion levels during the rehabilitation phase are given in Table 12 and the threshold value of 7.0dBA will not be exceeded and the noise intrusion level will be insignificant.

NOISE RECEPTOR	REMOVAL OF INFRA-STRUCTURE	PLANTING OF GRASS	CUMULATIVE LEVELS	CUMULATIVE NOISE LEVEL - DAYTIME	INTRUSION NOISE LEVEL - DAYTIME
A	29.9	16.4	30.2	55.0	0.0

B	26.1	12.6	26.4	55.0	0.0
C	23.4	9.9	23.8	55.0	0.0
D	19.5	6.0	20.1	55.0	0.0
Mediro training facility	32.2	18.7	32.4	60.7	0.0
Tshufi camp	23.5	10.0	23.8	46.2	0.0
North-western boundary	56.6	43.1	56.8	67.7	0.4

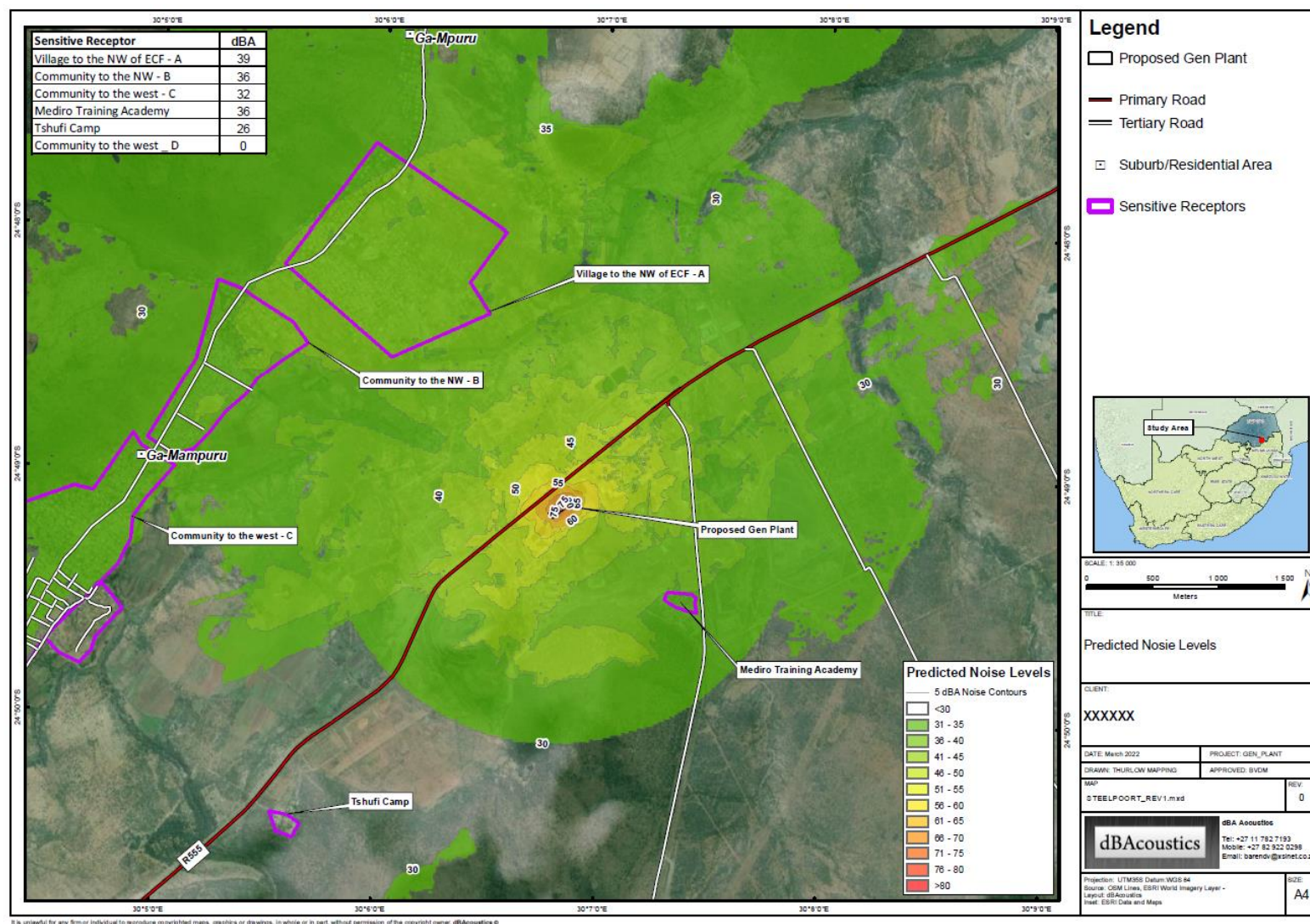


Figure 51: Noise contours during the operational phase

6.8.2 IMPACT STATEMENT

The noise intrusion levels from the proposed ECF project will be insignificant during the construction and rehabilitation phases. An increase is expected along the north-western boundary for the operational phase at 1.6dBA during the day and 3.3dBA during the night, therefore below the threshold level of 7.0dBA that is considered to be classified as a noise disturbance i.t.o the Noise Control Regulations, 1994.

There will be a shift in the prevailing ambient noise level in the immediate vicinity of the proposed development but at a distance, the intrusion level will be minimal and in line with the Noise Control Regulations, 1994. People who may work or visit the proposed ECF project area will experience an increase in the prevailing ambient noise level in the vicinity of the site. The noise increase at the residential properties will be insignificant.

6.8.3 OPINION TO ISSUE EA

The potential noise impact from the proposed ECP Project will be low with all the mitigatory measures in place and authorisation for the ECP Project may be granted from an environmental noise point of view.

6.9 TRAFFIC IMPACT

Siyazi Limpopo Consulting Services (Pty) Ltd was appointed by Netzero (Pty) Ltd to conduct the required Site Traffic Assessment in line with the General Required Assessment Protocols (GN 320 GG 43110 dated 20 March 2020) and Appendix 6 of the EIA regulations for the proposed development.

A Baseline Traffic Study (BTS) took place in order to verify the sensitivity associated with the effect the proposed development will have on the current situation. The main purpose of the BTS and desktop analysis was:

- To determine the status quo of the relevant road network adjacent the proposed project.
- To determine and identify any potential constraints for the proposed project.
- To determine the need for a full Traffic Impact Assessment from a traffic engineering point of view.

Figure 52 provides the locality of the proposed project in relation to other activities in the vicinity, including the location of the intersection under investigation as part of this study.

Table 32 provides a summary of information on the proposed project in terms of the planned construction, operations, and timelines. It is important to take note that the anticipated timeline as depicted by the last-mentioned table provides an estimated timeline in terms of months and/or years for the construction and operational phases and does not depict the exact month and/or year that construction and operations are planned.

The following sections only summarises the outcomes of the assessment and the full report is attached as **Appendix M**.

POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES	
			LATITUDE	LONGITUDE
A	Existing intersection	Road R555 and the existing Smelter Access Road (Proposed project Access Alternative 1)	S 24°49'16.05"	E 30° 6'30.98"
				

Figure 52: Locality of the proposed development and relevant intersection under investigation

Table 32: Summary of the extend of the proposed project for the respective phases

DESCRIPTION	PHASE	
	CONSTRUCTION	OPERATIONAL
Duration of phase	21 months with a 8 month pause in construction between month 9 and 17. Actual month for construction activity = 13 months	± 20 years
Expected number of heavy vehicles delivering consumables and plant materials per day	Max 40 per day	Max 2 per day
Expected percentage of heavy vehicles delivering consumables or plant materials during traffic peak times	20%	50%
Number of construction staff per day	Max 55 at peak	Not relevant
Number of shifts for construction staff per day	1 shift per day	Not relevant
Number of workers per day	Not relevant	9 Technicians 2 Security staff (2 at day, 2 at night) 1 Admin clerk 1 Cleaning staff
Where staff are anticipated to reside	Within the Greater Tubatse and Makhuduthamaga Local Municipalities	
Abnormal vehicles delivering large components	Once-off events	Once-off events
Access road to proposed project	From Road R555 via existing Smelter Access Road (Point A), OR From Road R555 via a new access intersection (Point C)	Same as for Construction Phase
Calculated number of vehicle trips to be generated by the proposed project during AM or PM peak hours	AM Peak: 25 (In: 15, Out: 11) PM Peak: 25 (In: 11, Out: 15)	AM Peak: 8 (In: 6, Out: 2) PM Peak: 8 (In: 2, Out: 6)

6.9.1 OUTCOME OF DATA COLLECTION AND INVESTIGATION

6.9.1.1 Status Quo of Land Use, as well as road network characteristics

The relevant property of the proposed project is currently vacant and borders the existing Lion Ferrochrome Smelter Complex on the western side. For the purpose of this TIA, it is assumed that:

- The vehicle traffic absorption rate (rate at which existing developments attract vehicular traffic) by all other types of completed developments will maintain the same status for the next five years.
- That the average rate of growth of vehicle traffic in the area under investigation that is not relevant to the Proposed Project (background traffic) between the 2022 to 2027 scenarios was anticipated at 3% per annum.

Figure 53 provides the existing road network layout for the area under investigation.

Table 33 contains information related to the existing and proposed intersections under investigation.

Table 34 provides information concerning the relevant road sections under investigation and includes the following:

- Relevant road section.
- Picture of road section.
- Existing class of road.
- Proposed class of road.
- Road reserve widths.
- Lane widths.
- Median widths (if relevant).

Table 35 and Table 36 provide information on typical road characteristics and access management requirements as per the guideline COTO TRH26 “South African Road Classification and Access Management Manual, Version 1.0, August 2012” Rural areas.

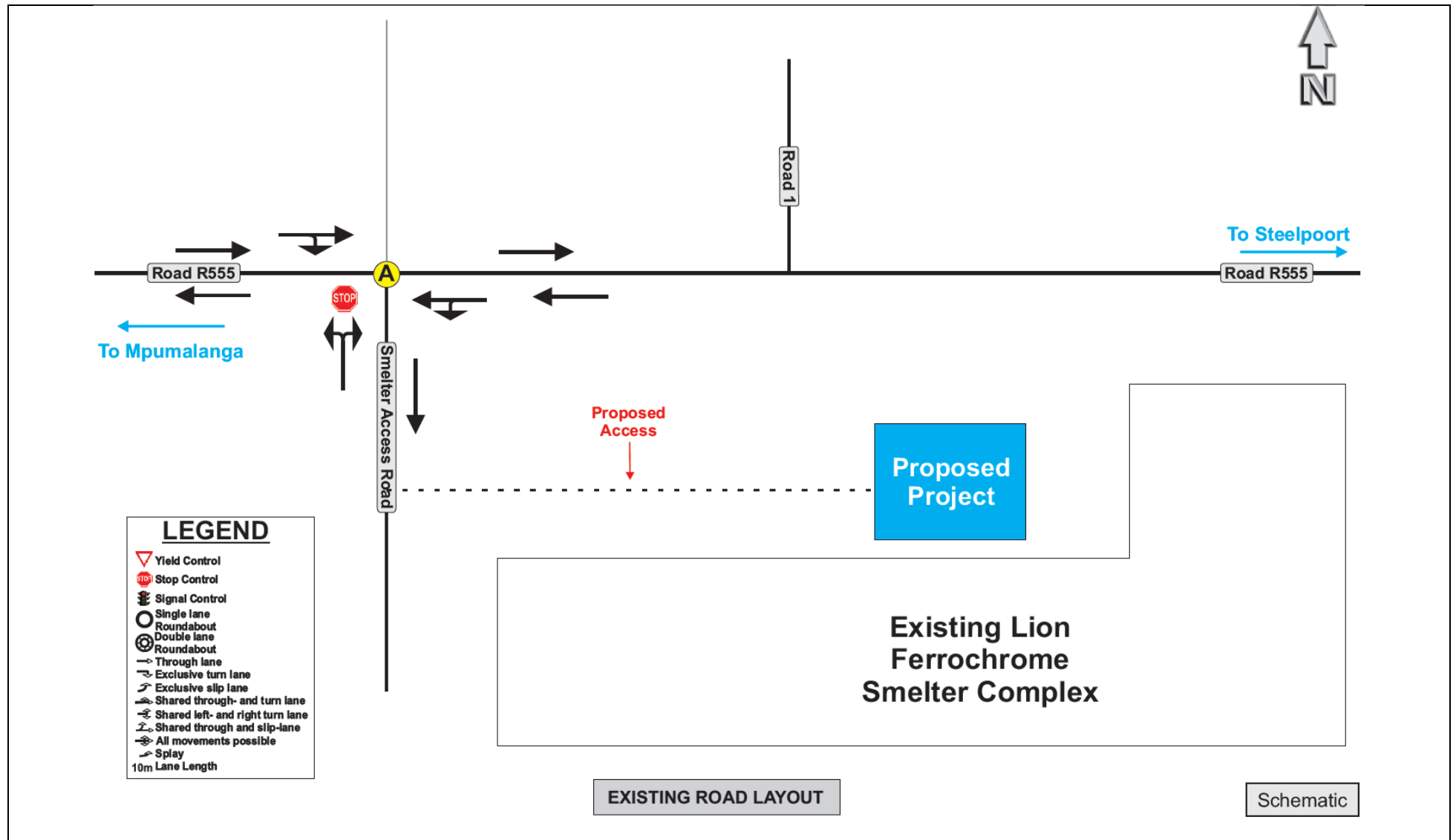


Figure 53: Existing Road network layout

Table 33: Summary of intersection control at existing intersections under investigation



POINT	DESCRIPTION	INTERSECTION CONTROL	PEDESTRIAN ACTIVITIES	INTERSECTION PHOTO
A	Road R555 / Smelter Access Road (Proposed Project Access Alternative 1)	Free flow along Road R555	No Pedestrian activity observed during surveys	

Table 34: Summary of road characteristics

RELEVANT ROAD SECTION	PICTURE OF ROAD SECTION	ASSUMED EXISTING FUNCTIONAL CLASS OF ROAD			POSSIBLE FUTURE CLASS OF ROAD			Road Authority	Road Reserve (M)	Number of Lanes	Lane Width	Type of Surface	Median	Anticipated Traffic Growth	Speed Limit
<u>Road Section 1</u> Road R555 National Road linking Mpumalanga to Steelpoort and ultimately to Road R37, and Makhuduthama		<u>Assumed Primary</u> <u>Function:</u> Mobility			<u>Assumed Proposed</u> <u>Function:</u> Mobility			SANRAL	±40m	One lane per direction	3.5m wide	Asphalt	None.	3%	60km/h
Class	Class No.	Route Number	Class	Class No.	Route Number										
Major Arterial	U2	R	Major Arterial	U2	R										
<u>Description:</u> Highway			<u>Description:</u> Highway												


ga Local Municipality at Steel Bridge		<u>Spacing between Intersections:</u> 800m ±20%	<u>Spacing between Intersections:</u> 800m ±20%												
<u>Road Section 3</u> Smelter Access Road		<u>Assumed Primary Function:</u> Mobility			<u>Assumed Proposed Function:</u> Mobility			Private Access Road	±20m	One lane per direction	3.5m wide	Asphalt	None.	N/a	40km/h
		Class	Class No.	Route Number	Class	Class No.	Route Number.								
		Local Road	U5a	N/a	Local Road	U5a	N/a								
		<u>Description:</u> Commercial Access Street			<u>Description:</u> Commercial Access Street										
		<u>Spacing between Intersections:</u> N/a			<u>Spacing between Intersections:</u> N/a										

Table 35: Urban functional road classification (COTO TRH26 – South African Road Classification and Access Management Manual Version 1.0 August 2012)

FUNCTION			DESCRIPTION		MOBILITY				TRAFFIC	
BASIC FUNCTION	ALTERNATE FUNCTIONAL DESCRIPTION	DETERMINING FUNCTION	CLASS NO (U_)	CLASS NAME	THROUGH TRAFFIC COMPONENT	DISTANCE BETWEEN PARALLEL ROADS (km)	% OF BUILT KM	REACH OF CONNECTIVITY	EXPECTED RANGE OF ADT (AVERAGE DAILY TRAFFIC)	% OF TRAVEL VEH-KM
Mobility	Vehicle priority, vehicle only, long distance, through, high order, high speed, numbered, commercial, economic, strategic; route,	Movement is dominant, through traffic is dominant, the majority of traffic does not originate or terminate in the immediate vicinity, the function of the road	U1	Principal arterial (freeway)	Exclusively	5 - 10km	5 - 10% Classes U1 and U2	> 20km	40 000 - 120 000+	40 - 65% Classes U1 and U2
			U2	Major arterial	Predominant	1.5 - 5.0km			20 000 - 60 000	

	arterial road or highway	is to carry high volumes of traffic between urban areas.	U3	Minor arterial	Major	0.8 - 2.0km	15 - 25% Classes U1, U2 and U3	> 10km	10 000 - 40 000	65 - 80% Classes U1, U2 and U3
Access / Activity	Access, mixed pedestrian and vehicle traffic, short distance, low order, lower speed, community / farm, road or street.	Access, turning and crossing movements are allowed, the majority of traffic has an origin or destination in the district, the function of the road is to provide a safe environment for vehicles and pedestrians using access points.	U4a	Collector street, commercial	Discourage		5 - 10%	> 2km	< 25 000	5 - 10%
			U4b	Collector street, residential	Discourage			< 2 to 3km	< 10 000	
			U5a	Local street, commercial	Prevent		65 - 80%	< 1km	< 5 000	10 - 30%
			U5b	Local street, residential	Prevent			< 0.5km (1km Max)	< 1 000	
			U6a	Walkway, pedestrian priority	Ban					
			U6b	Walkway, pedestrian only	Ban					

Table 36: Urban access management requirements and features (COTO TRH26 - South African road classification and access management manual version 1.0 August 2012)

BASIC FUNCTION	DESCRIPTION		REQUIREMENTS					TYPICAL FEATURES (Use appropriate context sensitive standards for design)								
	CLASS NO (U_)	CLASS NAME	DESIGN TOPOLOGY	ROUTE NO,	INTERSECTION SPACING	ACCESS TO PROPERTY	PARKING	SPEED km/h	INTERSECTION CONTROL	TYPICAL CROSS SECTION	ROADWAY / LANE WIDTH	ROAD RESERVE WIDTH	PUBLIC TRANSPORT AND PEDESTRIAN CROSSINGS	PEDESTRIAN FOOTWAYS	CYCLE LANES	TRAFFIC CALMING
Mobility	U1	Principal arterial	Expressway	Yes (M/R/N)	2,4km (1.6km - 3.6km)	Not allowed */**	No	100 - 120	Interchange	4/6/8 lane freeway	3.3 - 3.7m lanes	60 - 120m (60m)	No	No	No	No
	U2	Major arterial	Highway	Yes (M/R)	800m (±15%)	Not allowed */**	No	80	Co-ordinated traffic signal, interchange	4/6 lane divided. Kerbed	3.3 - 3.6m lanes	38 - 62m (40m)	Yes at intersections	Off road	Yes - widen roadway	No
	U3	Minor arterial	Main road	Yes (M)	600m (±20%)	Not allowed */**	No	70	Co-ordinated traffic signal, roundabout	4 lane divided or undivided, kerbed	3.3 - 3.5m lanes	25 - 40m (30m)	Yes at intersections	Yes	Yes - widen roadway	No

Access / Activity	U4 a	Collector Street, commercial	Commercial major collector	No (A for temp. Routing)	> 150m	Yes (larger properties)	Yes if conditional allow	60	Traffic signal, roundabout or priority	4 lane , median at pedestrian		20 - 40m (25 m)	Yes at intersections or midblock	Yes	Yes, widen roadway or	Median for pedestrians,
-------------------	------	------------------------------	----------------------------	--------------------------	--------	-------------------------	--------------------------	----	--	-------------------------------	--	-----------------	----------------------------------	-----	-----------------------	-------------------------

										crossing s, bouleva rd, CBD one-way					on verge	curved roadway
	U4 b	Collector street, resident ail	Residenti al minor collector	No	> 150m	Yes	Yes if appropri ate	50	Roundabo ut, mini- circle or priority	2/3 lane undivide d	6-9m roadw ay, < 3.3m lanes	16 - 30m (20 m)	Yes anywhere	Yes	Yes, on road or verge	Raised pedestria n, median, narrow lanes
	U5 a	Local street, comm er cial	Commer cial access street	No		Yes	Yes if condition s allow	40	Priority	2 lane plus parking		15 - 25m (22 m)	If applicable , anywhere	Normally yes	Use roadw ay	Raised pedestria n crossing
	U5 b	Local street, residenti al	Local residenti al street	No		Yes	Yes on verge	40	Mini- circle, priority or none	1/2 lane mounta ble kerb	3.0 - 5.5m roadw ay (two way)	10 - 16m (14 m)	If applicable , anywhere	Not normally , pedestri ans can use roadway	Use roadw ay	Yes, ut should not be necessary
	U6 a	Walkway , non- motorize d priority	Pedestria n priority	No	500m maxim um	Yes	Yes if parking lot on woonerf	15	None, pedestria ns have right of way	Surfaced			If applicable , anywhere	Yes or use roadway	Rare	Yes

	U6 b	Walkway , non- motorize d priority	Pedestria n only	No	500m maxim um	Yes	No vehicles	peds. 80m / minu te	None, pedestria n signal	Block paving		6m		Yes	Yes	
--	---------	---	---------------------	----	---------------------	-----	----------------	---------------------------------	--------------------------------	-----------------	--	----	--	-----	-----	--

* Access to properties sufficiently large to warrant a private intersection / interchange can be considered if access spacing requirements met and there is no future need for public road.

** Partial and marginal access at reduced spacing allowed to relieve congestion, reduce excessive travel distance or remove the need for full intersections.

** Low volume farm gate and tourist access (less than 10 vehicles per day) can be considered if no alternative exists.

6.9.1.2 Traffic Count

To gain a better understanding of the existing traffic patterns and movements adjacent to the proposed project, a 12-hour manual traffic count was conducted at the relevant intersections under investigation. It is standard traffic engineering practice to conduct at least 12-hour manual traffic counts, as close as possible to a month-end Friday when traffic movement is expected to be at its highest.

The relevant 12-hour manual traffic count was conducted on Friday 26 November 2021 at the following points:

- **Point A:** Intersection of Road R555 and Smelter Access Road.

The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 26 November 2021 between 06:00 and 18:00.

The respective peak-hour flows for the traffic count at the relevant intersections were identified as indicated in Table 37 below.

Table 37: Peak hour periods at the relevant intersections

POINT	INTERSECTION	AM PEAK		PM PEAK	
		TIME INTERVAL	NUMBER OF VEHICLES	TIME INTERVAL	NUMBER OF VEHICLES
A	Road R555 and Smelter Access Road	06:45 to 07:45	432	14:15 to 15:15	602

Figure 54 indicates the hourly traffic pattern, per 15-minute interval, for all modes of vehicles at the relevant intersection between 06:00 and 18:00 on 26 November 2021.

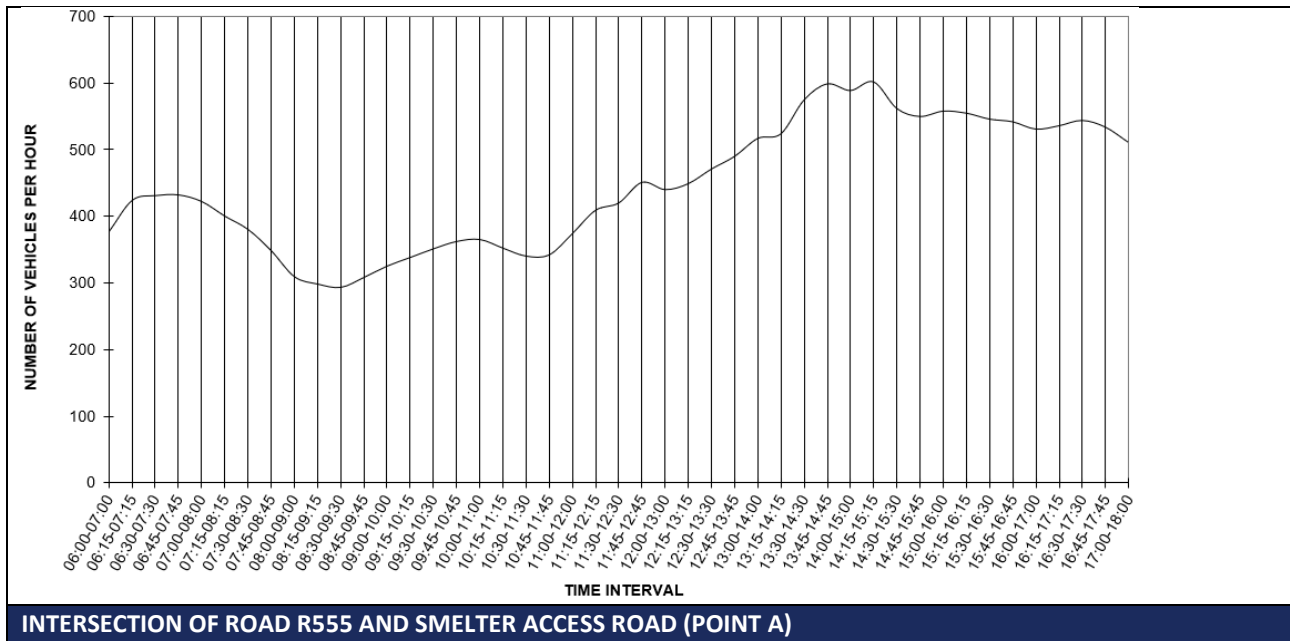


Figure 54: Hourly traffic pattern per 15 – minute interval for all modes of vehicles (06:00 to 18:00) at the relevant intersections

6.9.1.3 Future Land Use and Road Characteristics

At the time of conducting this study, there were no known approved latent developments within the area under investigation that would have a significant impact on the relevant road network adjacent to the proposed project.

Table 38 indicate the trip generation rates and the number of vehicle trips which are expected to be generated due to the proposed activities of the proposed project for the construction phase, while Table 39 provide the same for the operational phase.

The trip generation rates are based on the “COTO TMH17, South African Trip Data Manual Version 1.01, September 2013”, information provided by the project team and assumptions made based on professional experience where information was not available.

Table 38: Trip generation rates and expected number of vehicles trips to be generated due to the proposed project and the distribution of vehicle trips (construction phase)

ITEM	COMPONENT	NUM WORKERS PER DAY	% WORKERS ACTIVE DURING PEAK HOUR	NUM WORKERS ACTIVE PER PEAK HOUR		NUM TRUCKS PER DAY	% TRUCKS ACTIVE DURING PEAK HOUR	NUM TRUCKS ACTIVE DURING PEAK HOUR		ASSUMED AVE. NUM PERSONS PER VEH	COMMENTS		TRIP GENERATION CALCULATIONS FOR PEAK HOUR							FINAL TRIP INFORMATION FOR TRAFFIC ENGINEERING CALCULATIONS			
													IF INWARD MOVEMENT IS RELEVANT VALUE = 1	NUM VEH TRIPS FOR INWARDS DIRECTION	IF OUTWARD MOVEMENT IS RELEVANT VALUE = 1	NUM VEH TRIPS FOR OUTWARDS DIRECTION	TOTAL NUM VEH TRIPS GENERATED DURING PEAK HOUR (IN & OUT)	CALCULATED TRIP GENERATION RATE PER VEH DURING PEAK HOUR		TRIP DIST. %		TRIP GENERATION	
																				In	Out	In	Out
AM Peak Hour																							
1.	Construction workers (using private transport = 20%)	17	100%	17						4,0	Trips per Worker (4 Persons per Vehicle)		1	4	0	0	4	0,25		100%	0%	4	0
2.	Construction workers (Transaported via hired transport = 70%)	39	100%	39						15,0	15 persons per vehicle (Vehicle deliver workers and leave site empty)		1	3	1	3	5	0,13		50%	50%	3	3
3.	Heavy vehicles delivering consumables and plant materials per day (Worst Case Scenario)					40	20%	8		1,0	Delivery vehicles expected during peak periods as worst case		1	8	1	8	16	2,00		50%	50%	8	8
TOTAL																	25					15	11
PM Peak Hour																							
1.	Construction workers (using private transport = 20%)	17	100%	17						4,0	Trips per Worker (4 Persons per Vehicle)		0	0	1	4	4	0,25		0%	100%	0	4
2.	Construction workers (Transaported via hired transport = 70%)	39	100%	39						15,0	15 persons per vehicle (Vehicle collect workers and leave site full)		1	3	1	3	5	0,13		50%	50%	3	3
3.	Heavy vehicles delivering consumables and plant materials per day (Worst Case Scenario)					40	20%	8		1,0	Delivery vehicles expected during peak periods as worst case		1	8	1	8	16	2,00		50%	50%	8	8

Table 39: Trip generation rates and expected number of vehicle trips to be generated due to the proposed project distribution of vehicle trips (operational phase)

Item	Component	Num Workers per Day	% Workers active during	Num Workers Active per	Num Trucks Per Day	% Trucks active during	Num Trucks active during	Calc Column	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations	
											If Inward Movement	Num Veh	If Outward Movement	Num Veh Trips for	Total Num Veh Trips	Calculated Trip	Trip Dist. %	Trip Generation

			Peak Hour	Peak Hour			Peak Hour	Peak Hour					is relevant Value = 1	Trips for Inwards Direction	is relevant Value = 1	Outwards Direction	Generated during Peak Hour (In & Out)	Generation Rate per Veh during Peak Hour		In	Out	In	Out	
AM Peak Hour																								
1.	Technicians	6	100%	6					6		4,0	Trips per Worker (4 Persons per Vehicle).		1	2	0	0	2	0,25		100%	0%	2	0
2.	Security Staff	2	100%	2					2		4,0	Trips per Worker (4 Persons per Vehicle). Day shift in, night shift out)		1	1	1	1	2	1,00		50%	50%	1	1
3.	Admin Clerck	1	100%	1					1		4,0	Trips per Worker (4 Persons per Vehicle).		1	1	0	0	1	1,00		100%	0%	1	0
4.	Cleaning Staff	1	100%	1					1		4,0	Trips per Worker (4 Persons per Vehicle).		1	1	0	0	1	1,00		100%	0%	1	0
5.	Heavy vehicles delivering consumables					2	50%	1	1		1,0	Delivery vehicles expected during peak periods as worst case scenario		1	1	1	1	2	2,00		50%	50%	1	1
TOTAL																	8						6	2
PM Peak Hour																								
1.	Technicians	6	100%	6					6		4,0	Trips per Worker (4 Persons per Vehicle).		0	0	1	2	2	0,25		0%	100%	0	2
2.	Security Staff	2	100%	2					2		4,0	Trips per Worker (4 Persons per Vehicle). Day shift in, night shift out)		1	1	1	1	2	1,00		50%	50%	1	1
3.	Admin Clerck	1	100%	1					1		4,0	Trips per Worker (4 Persons per Vehicle).		0	0	1	1	1	1,00		0%	100%	0	1
4.	Cleaning Staff	1	100%	1					1		4,0	Trips per Worker (4 Persons per Vehicle).		0	0	1	1	1	1,00		0%	100%	0	1
5.	Heavy vehicles delivering consumables					2	50%	1	1		1,0	Delivery vehicles expected during peak periods as worst case scenario		1	1	1	1	2	2,00		50%	50%	1	1
TOTAL																	8						2	6

Table 40: Available intersection stopping and decision sight distance at the existing intersection of road R555 and Smelter access road (point A)

RELEVANT PICTURE		
	Eastbound	Westbound
COORDINATES	S 24°49'16.05"	E 30° 6'30.98"
REQUIRED STOPPING SIGHT DISTANCE AT RECOMMENDED 60 KM/H	85m	85m
AVAILABLE STOPPING SIGHT DISTANCE	More than 85m	More than 85m
REQUIRED DECISION SIGHT DISTANCE AT 60 KM/H	170m	170m
AVAILABLE DECISION SIGHT DISTANCE	More than 170m	More than 170m

6.9.2 DETERMINATION OF THE LEVELS OF SERVICE AT THE RELEVANT INTERSECTIONS

The **SIDRA Intersection** software was used as an aid for the design and evaluation of the relevant intersections. The evaluations determine the intersection levels of service (LOS) which qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, manoeuvrability, delay, and safety.

The following intersections were evaluated as part of this investigation:

- **Point A:** Intersection of Road R555 and Smelter Access Road.

Table 41 provide a summary of the available reserve capacity on the various sections of roads that were investigated.

Table 41: Available reserve capacity for relevant road section without the proposed project

POINT	INTERSECTION	DIRECTION OF ROAD SECTION	CAPACITY PER LANE	NUMBER OF LANES	TOTAL CAPACITY	ACTUAL NUMBER OF VEHICLES		RESERVE CAPACITY AVAILABLE		ACTUAL NUMBER OF VEHICLES		RESERVE CAPACITY AVAILABLE	
						2021 EXISTING		2021 EXISTING		PROJECTED 2026 WITHOUT PROPOSED PROJECT		PROJECTED 2026 WITHOUT PROPOSED PROJECT	
						AM	PM	AM	PM	AM	PM	AM	PM
A	Intersection of Road R555 and Smelter Access Road	East (Road R555)	1100	1	1100	230	377	870	723	267	437	833	663
		South (Smelter Access)	Not applicable. Access Road.										
		West (Road R555)	1100	1	1100	180	318	920	782	209	369	891	731

Table 42: Summary of other traffic-related matters

DESCRIPTION OF ELEMENT	GENERAL COMMENTS	SPECIFIC ISSUES	ACTIONS REQUIRED
ROAD SAFETY MATTERS			
General road safety	<p>The following are typical elements related to the road network, which cause road safety problems in rural and urban areas, and which need to be addressed on a continuous basis:</p> <ul style="list-style-type: none"> a) Intersection layout, with specific reference to dedicated right-turn lanes, where there is heavy vehicle movement. b) Pedestrian movements (road crossings). c) Intersection alignment, such as staggered intersections. d) Insufficient public transport facilities. e) Access control for vehicle movement. f) Fencing to control animal movement. g) Lack of or deterioration of reflective road studs for visibility during the night at strategic points. h) Lack of pedestrian walkways to separate pedestrian and vehicle movements at strategic points. i) Lack of provision and quality of road markings. j) Lack of provision and quality of road signs. and k) Improper road safety training for workers as well as adjacent communities. 	<p>a) Points A and B does not have any dedicated right-turn or left-turn deceleration lanes and is a road safety concern.</p>	<p>a) As part of existing road conditions at Points A and B without the proposed projects, provision of dedicated right-turn and left-turn deceleration lanes is recommended from a road safety perspective.</p>

DESCRIPTION OF ELEMENT	GENERAL COMMENTS	SPECIFIC ISSUES	ACTIONS REQUIRED
NON-MOTORISED TRANSPORT			
Non-motorised transport	a) No pedestrian activity was observed during a site visit at the relevant intersections under investigation.	a) No issues without the proposed project.	a) None.
PUBLIC TRANSPORT			
Public transport	<p>a) Two types of public transport commuters are relevant to the area under investigation:</p> <ul style="list-style-type: none"> i) Firstly, workers who travel to and from the area. ii) Secondly, visitors to the area. <p>In general, public transport loading and off-loading within the area under investigation is established with dedicated areas for loading and off-loading passengers further west around the Lion Ferrochrome Smelter.</p> <p>Providing loading and off-loading laybys along Road R555 near Points A, B and C would be possible if required.</p>	a) None.	a) None.

6.9.3 IMPACT STATEMENT

The capacity calculations for the TIA were conducted for the years 2022 and 2027 respectively. The last-mentioned time frame is in line with Traffic Engineering guidelines and practice and determined by the expected number of vehicle trips that could potentially be generated during any specific peak hour by a specific development.

Owing to the type and nature of the proposed activities as part of the Proposed Project, it is expected that the Proposed Project will have a manageable impact on vehicle traffic during all phases.

It can be concluded that:

- In general, the existing road network and intersections under investigation is predicted to have a low sensitivity from a road capacity and intersection safety perspective.
- With the implementation of the Proposed Project, the sensitivity of the intersection under investigation (Point A) would increase to a medium sensitivity from an intersection safety perspective, due to the lack a dedicated right-turn lane on the western approach of Road R555.
- Implementing recommended mitigating measures as discussed in section 3 of this report, would improve the sensitivity at the intersection under investigation (Point A) from medium to low sensitivity.



Figure 55: Sensitive Road sections and intersections indicating existing sensitive areas and intersections without the proposed project.

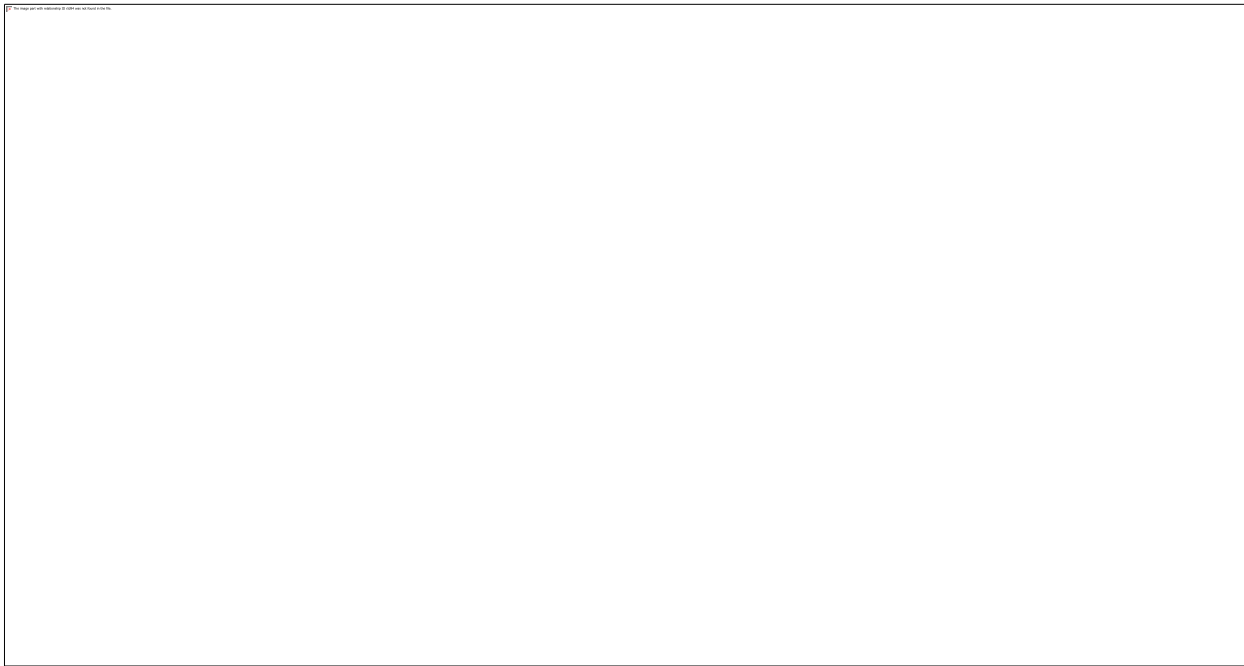


Figure 56: Sensitive Road sections and intersections indicating predicted sensitive areas and intersections, with the proposed project, without mitigation measures



Figure 57: Sensitive Road sections and intersections indicating predicted sensitive areas and intersections, with the proposed development, with mitigation measures

6.9.4 OPINION TO ISSUE EA

In conclusion of the findings as part of the investigations, Siyazi Limpopo Consulting (Pty) Ltd. is of the opinion that the proposed ECF project would have a manageable impact on the relevant roads network as long as the mitigating measures are implemented as recommended and is therefore recommended to be granted authorisation.

6.10 HEALTH ASSESSMENT

Infotox (Pty) Ltd was appointed by Netzero (Pty) Ltd to conduct the required Health Risk Assessment in line with the General Required Assessment Protocols (GN 320 GG 43110 dated 20 March 2020) and Appendix 6 of the EIA regulations for the proposed development.

Atmospheric emissions from the Glencore Lion Smelter Complex are regulated under Atmospheric Emission Licence Number SK17/1/8/5/AEL//GLENCORE/1 issued on 31 December 2020. Stack emission limits have been set for particular matter (PM), sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and carbon monoxide (CO) (the criteria pollutants). Community health risks are not determined directly by stack emission concentrations of the pollutants, but by the atmospheric concentrations at receptor locations (exposed communities).

To assess the health impact associated with the proposed development, it is often referred to as a burden of disease study, because the outcome is the avoided or added fraction of disease in the community, referred to as the attributable fraction (AF). In epidemiological terms, the AF represents the fraction of disease that can be prevented if exposure to the pollutant in question is avoided. Thus, in terms of the proposed development, the AF represents the fraction of the health effect that is avoided or added should it be implemented, in comparison to the current impact of the emissions of the existing Lion Smelter on the health effect.

The air pollutants of interest in the study are the criteria air pollutants PM_{2.5}, which is particulate matter in the 2.5 µm aerodynamic range, sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and carbon monoxide (CO). Since emissions of hexavalent chromium [Cr (VI)] are of interest at the processing plant, the substance is included in the community health risk assessment (HRA).

The following sections only summarises the outcomes of the assessment and the full report is attached as **Appendix N**.

6.10.1 ASSESSMENT OUTCOME SUMMARY

6.10.1.1 Exposure assessment

Modelled criteria pollutant concentrations are summarised in Table 43, with the calculated delta (Δ) concentrations (as described in Last et al. 2000), which are the concentration differences between scenarios 2 and 1. Negative delta concentrations (less than 0) indicate lower values modelled for scenario 2 and positive concentrations (more than 0) indicate higher concentrations modelled for scenario 2. Air concentrations of Cr (VI) are presented in Table 44.

Table 43: Criteria pollutant concentrations

SENSITIVE RECEPTOR	SCENARIO 1	SCENARIO 2	Δ
PM2.5 99TH PERCENTILE OF MAXIMUM 24-HR CONCENTRATIONS (μG/M³)			
Eastern Limb Training Center	21.515	21.224	-0.291
Ga-Matate	6.909	6.850	-0.060
Degoedeverwachten	6.112	6.078	-0.034
Tubatse Chrome Club	0.676	0.694	0.018
Tubatse ResArea	0.556	0.558	0.003
Residential Area-SE	0.337	0.336	-0.001
Farm House-S	5.424	5.358	-0.065
Tshufi Camp	5.212	5.390	0.177
Ga-Nkgetheng	5.597	6.627	1.030
Farm House-SW	8.736	10.159	1.423
Residential Area-SW1	4.426	4.893	0.467
Residential Area-SW2	2.608	3.007	0.398
Ga-Manapane (Imbita School)	7.636	7.890	0.254
Residential Area-WNW	7.846	7.703	-0.143
Residential Area-NW	3.417	3.750	0.333
Residential Area-S (Mmahlagare School)	4.397	4.385	-0.013
PM2.5 annual averaged concentrations (μg/m³)			
Eastern Limb Training Center	2.659	2.647	-0.012
Ga-Matate	0.666	0.665	-0.001
Degoedeverwachten	0.550	0.588	0.039
Tubatse Chrome Club	0.083	0.086	0.002
Tubatse ResArea	0.061	0.061	0.000
Residential Area-SE	0.055	0.055	0.000
Farm House-S	0.353	0.351	-0.002
Tshufi Camp	1.122	1.146	0.024
Ga-Nkgetheng	1.196	1.414	0.218
Farm House-SW	2.021	2.303	0.282
Residential Area-SW1	0.856	0.938	0.082
Residential Area-SW2	0.599	0.662	0.063
Ga-Manapane (Imbita School)	1.028	1.096	0.068
Residential Area-WNW	0.894	0.970	0.076
Residential Area-NW	0.460	0.571	0.111
Residential Area-S (Mmahlagare School)	0.437	0.436	-0.001
SO₂ 99th percentile of maximum 24-hr concentrations (μg/m³)			

SENSITIVE RECEPTOR	SCENARIO 1	SCENARIO 2	Δ
Eastern Limb Training Center	45.331	40.067	-5.264
Ga-Matate	16.324	16.062	-0.262
Degoedeverwachten	14.652	17.987	3.335
Tubatse Chrome Club	1.925	2.220	0.294
Tubatse ResArea	1.399	1.406	0.007
Residential Area-SE	0.913	0.884	-0.029
Farm House-S	14.859	14.086	-0.773
Tshufi Camp	10.607	12.613	2.007
Ga-Nkgetheng	10.619	23.250	12.631
Farm House-SW	15.418	30.446	15.028
Residential Area-SW1	8.180	14.052	5.872
Residential Area-SW2	5.800	11.050	5.250
Ga-Manapane (Imbita School)	18.242	20.873	2.631
Residential Area-WNW	15.178	18.906	3.729
Residential Area-NW	8.064	17.845	9.781
Residential Area-S (Mmahlagare School)			
NO₂ 99th percentile of maximum 24-hr concentrations (µg/m³)			
Eastern Limb Training Center	111.686	105.755	-5.931
Ga-Matate	23.986	23.347	-0.640
Degoedeverwachten	31.818	37.123	5.304
Tubatse Chrome Club	2.996	3.600	0.603
Tubatse ResArea	1.903	1.841	-0.062
Residential Area-SE	1.322	1.075	-0.246
Farm House-S	16.445	15.216	-1.229
Tshufi Camp	20.237	23.111	2.874
Ga-Nkgetheng	25.223	44.243	19.020
Farm House-SW	44.234	66.905	22.672
Residential Area-SW1	15.479	25.072	9.593
Residential Area-SW2	11.835	20.139	8.304
Ga-Manapane (Imbita School)	38.196	43.490	5.294
Residential Area-WNW	47.982	48.252	0.270
Residential Area-NW	31.330	36.733	5.403
Residential Area-S (Mmahlagare School)	13.375	12.705	-0.670
CO 99th percentile of maximum 8-hr concentrations (µg/m³)			

SENSITIVE RECEPTOR	SCENARIO 1	SCENARIO 2	Δ
Eastern Limb Training Center	3 767.760	3 657.888	-109.872
Ga-Matate	1 856.511	1 816.491	-40.020
Degoedevechten	1 442.374	1 578.675	136.301
Tubatse Chrome Club	80.949	91.683	10.734
Tubatse ResArea	64.319	62.878	-1.441
Residential Area-SE	57.928	55.748	-2.180
Farm House-S	1 423.897	1 396.023	-27.874
Tshufi Camp	1 590.206	1 648.258	58.052
Ga-Nkgetheng	1 830.428	2 491.047	660.619
Farm House-SW	2 729.065	3 546.295	817.230
Residential Area-SW1	1 027.114	1 261.539	234.425
Residential Area-SW2	325.152	676.047	350.896
Ga-Manapane (Imbita School)	2 549.296	2 770.435	221.139
Residential Area-WNW	2 792.475	2 683.410	-109.065
Residential Area-NW	1 789.969	1 924.764	134.795
Residential Area-S (Mmahlagare School)	1 091.676	1077.272	-14.404

Table 44: Cr (VI) annual average air concentration

SENSITIVE RECEPTOR	SCENARIO 1	SCENARIO 2
	μG/M³	
Eastern Limb Training Center	0.00034	0.00034
Ga-Matate	0.00012	0.00012
Degoedevechten	0.00009	0.00009
Tubatse Chrome Club	0.00001	0.00001
Tubatse ResArea	0.00001	0.00001
Residential Area-SE	0.00001	0.00001
Farm House-S	0.00007	0.00007
Tshufi Camp	0.00016	0.00016
Ga-Nkgetheng	0.00014	0.00015
Farm House-SW	0.00019	0.00021
Residential Area-SW1	0.00011	0.00012
Residential Area-SW2	0.00009	0.00009
Ga-Manapane (Imbita School)	0.00015	0.00016
Residential Area-WNW	0.00011	0.00011
Residential Area-NW	0.00005	0.00006
Residential Area-S (Mmahlagare School)	0.00009	0.00009

6.10.1.2 Criteria pollutant HRA results and interpretation

6.10.1.2.1 Results

The avoided or added risk is expressed as the AFs of all-cause natural mortality and hospitalisation for cardiovascular and respiratory causes related to short-term exposure to PM_{2.5}, summarised in Table 45. The avoided or added AF of all-cause natural mortality in those older than 30 years of age and the avoided fraction of asthma incidence in those aged 4 to 17 years of age, related to long-term exposure to PM_{2.5}, are listed in Table 46.

Table 47 lists the avoided or added fraction of asthma exacerbation in exposed asthmatics of all ages, associated with the modelled changes in 24-hour SO₂ concentrations. Avoided risks of asthma-related emergency visits and hospitalisation associated with short-term exposure to NO₂ are presented in Table 48. Table 49 lists the avoided or added fraction of hospitalisation for myocardial infarction, associated with short-term exposure to CO.

AFs are presented in scientific notation. Therefore, 7.2E-06 is equal to 7.2×10^{-6} or 0.000007, etc. Negative values indicate avoided fractions of health effects attributable to emissions from Lion and positive values indicate fractions added in the scenario of ECP operation.

Table 45: AF's of mortality and hospital admissions associated with short-term exposure to PM_{2.5}

SENSITIVE RECEPTOR	MORTALITY	CARDIOVASCULAR HOSPITALIZATION	RESPIRATORY HOSPITALISATION
Eastern Limb Training Center	-2.9E-04	-2.9E-04	-3.2E-04
Ga-Matate	-6.0E-05	-6.0E-05	-6.6E-05
Degoedeverwachten	-3.4E-05	-3.4E-05	-3.8E-05
Tubatse Chrome Club	1.8E-05	1.8E-05	2.0E-05
Tubatse ResArea	2.7E-06	2.7E-06	3.0E-06
Residential Area-SE	-1.4E-06	-1.4E-06	-1.5E-06
Farm House-S	-6.6E-05	-6.5E-05	-7.2E-05
Tshufi Camp	1.8E-04	1.8E-04	2.0E-04
Ga-Nkgetheng	1.0E-03	1.0E-03	1.1E-03
Farm House-SW	1.4E-03	1.4E-03	1.6E-03
Residential Area-SW1	4.7E-04	4.7E-04	5.2E-04
Residential Area-SW2	4.0E-04	4.0E-04	4.4E-04
Ga-Manapane (Imbita School)	2.6E-04	2.5E-04	2.8E-04
Residential Area-WNW	-1.4E-04	-1.4E-04	-1.6E-04
Residential Area-NW	3.4E-04	3.3E-04	3.7E-04
Residential Area-S (Mmahlagare School)	-1.3E-05	-1.3E-05	-1.4E-05

Table 46: AF's of mortality and hospital admissions associated with long-term exposure to PM_{2.5}

SENSITIVE RECEPTOR	ALL-CAUSE (NATURAL) MORTALITY AGE 30+	ASTHMA INCIDENCE, AGES 4 TO 17
Eastern Limb Training Center	-8.3E-05	-2.0E-05
Ga-Matate	-3.5E-06	-8.7E-07
Degoedeverwachten	2.6E-04	6.4E-05
Tubatse Chrome Club	1.6E-05	4.0E-06
Tubatse ResArea	-5.4E-07	-1.3E-07
Residential Area-SE	-6.1E-07	-1.5E-07
Farm House-S	-1.6E-05	-4.0E-06
Tshufi Camp	1.6E-04	4.0E-05
Ga-Nkgetheng	1.5E-03	3.6E-04
Farm House-SW	1.9E-03	4.7E-04
Residential Area-SW1	5.6E-04	1.4E-04
Residential Area-SW2	4.3E-04	1.1E-04
Ga-Manapane (Imbita School)	4.6E-04	1.1E-04
Residential Area-WNW	5.1E-04	1.3E-04
Residential Area-NW	7.5E-04	1.9E-04
Residential Area-S (Mmahlagare School)	-6.8E-06	-1.7E-06

Table 47: AF's of asthma exacerbation associated with short-term exposure to SO₂

SENSITIVE RECEPTOR	AF (UNITLESS)
Eastern Limb Training Center	-5.9E-03
Ga-Matate	-2.9E-04
Degoedeverwachten	3.7E-03
Tubatse Chrome Club	3.3E-04
Tubatse ResArea	7.8E-06
Residential Area-SE	-3.2E-05
Farm House-S	-8.6E-04
Tshufi Camp	2.2E-03
Ga-Nkgetheng	1.4E-02
Farm House-SW	1.7E-02
Residential Area-SW1	6.5E-03
Residential Area-SW2	5.8E-03
Ga-Manapane (Imbita School)	2.9E-03
Residential Area-WNW	4.1E-03
Residential Area-NW	1.1E-02
Residential Area-S (Mmahlagare School)	-3.4E-04

Table 48: AF's of asthma-related emergency visits and hospitalisation associated with short-term exposure to NO₂

SENSITIVE RECEPTOR	AF (UNITLESS)
Eastern Limb Training Center	-8.3E-03
Ga-Matate	-9.0E-04
Degoedeverwachten	7.4E-03
Tubatse Chrome Club	8.4E-04
Tubatse ResArea	-8.7E-05
Residential Area-SE	-3.4E-04
Farm House-S	-1.7E-03
Tshufi Camp	4.0E-03
Ga-Nkgetheng	2.6E-02
Farm House-SW	3.1E-02
Residential Area-SW1	1.3E-02
Residential Area-SW2	1.2E-02
Ga-Manapane (Imbita School)	7.4E-03
Residential Area-WNW	3.8E-04
Residential Area-NW	7.5E-03
Residential Area-S (Mmahlagare School)	-9.4E-04

Table 49: AF's of myocardial infarction hospitalisation associated with short-term exposure to CO

SENSITIVE RECEPTOR	AF (UNITLESS)
Eastern Limb Training Center	-3.1E-04
Ga-Matate	-3.3E-05
Degoedeverwachten	2.8E-04
Tubatse Chrome Club	3.1E-05
Tubatse ResArea	-3.2E-06
Residential Area-SE	-1.3E-05
Farm House-S	-6.4E-05
Tshufi Camp	1.5E-04
Ga-Nkgetheng	9.9E-04
Farm House-SW	1.2E-03
Residential Area-SW1	5.0E-04
Residential Area-SW2	4.3E-04
Ga-Manapane (Imbita School)	2.8E-04
Residential Area-WNW	1.4E-05
Residential Area-NW	2.8E-04
Residential Area-S (Mmahlagare School)	-3.5E-05

6.10.1.2.2 Interpretation for criteria pollutants

The impact of the proposed development on health risks is not unidirectional. That is, positive and negative health risk AFs are noted for any one of the criteria pollutants PM_{2.5}, SO₂, NO₂ and CO. Thus, implementation of the proposed development does not cause either a consistent increase or decrease in the fraction of the health effect attributable to emissions from the existing smelting operation. However, whether positive or negative, most of the AFs are in the range less than 1 percent (%) and only occasionally in the range of 1 to 3 percent (%). Such AFs are for all practical purposes not significant and in the negligible range. In summary, none of the AFs reported in this section indicate any reason for concern with regard to human health risks associated with the air quality consequences of the implementation of the proposed development.

6.10.1.3 Cr (VI) HRA results and interpretation

6.10.1.3.1 Results

The Tier-1 comparison of modelled annual average Cr (VI) concentrations with the USEPA RSLs is presented in Table 50. The concentrations exceeding any of the RSLs are shaded and referred to the Tier-2 HRA. None of the modelled concentrations exceeded the non-cancer RSL, but the concentrations modelled for most of the sensitive receptors exceeded the RSL for cancer. Therefore, non-cancer risks are not included in the Tier-2 risk assessment. Receptors not indicated for referral to the Tier-2 HRA are not included in further discussions.

Table 50: Tier 1 assessment of modelled annual average air concentrations of Cr (VI)

SENSITIVE RECEPTOR	SCENARIO 1	SCENARIO 2
	μG/M³	
Non-cancer RSL = 0.1 μg/m³, cancer RSL = 0.000012 μg/m³ (1.2E-05 μg/m³)		
Eastern Limb Training Center	3.4E-04	3.4E-04
Ga-Matate	1.2E-04	1.2E-04
Degoedeverwachten	9.0E-05	9.0E-05
Tubatse Chrome Club	1.0E-05	1.0E-05
Tubatse ResArea	1.0E-05	1.0E-05
Residential Area-SE	1.0E-05	1.0E-05
Farm House-S	7.0E-05	7.0E-05
Tshufi Camp	1.6E-04	1.6E-04
Ga-Nkgetheng	1.4E-04	1.5E-04
Farm House-SW	1.9E-04	2.1E-04
Residential Area-SW1	1.1E-04	1.2E-04
Residential Area-SW2	9.0E-05	9.0E-05
Ga-Manapane (Imbita School)	1.5E-04	1.6E-04
Residential Area-WNW	1.1E-04	1.1E-04
Residential Area-NW	5.0E-05	6.0E-05
Residential Area-S (Mmahlagare School)	9.0E-05	9.0E-05

The Tier-2 HHRA entailed the calculation of cancer risks based on modelled Cr (VI) air concentrations and the USEPA UIR of $0.012 \text{ } (\mu\text{g}/\text{m}^3)^{-1}$. Cancer risks in air are calculated by simple multiplication of the modelled concentration with the UIR. The result is a unitless cancer risk presented in Table 51.

Table 51: Tier-2 Cr (VI) inhalation cancer-risk assessment

SENSITIVE RECEPTOR	SCENARIO 1	SCENARIO 2
	CANCER RISK (UNITLESS)	
UIR = 0.012 (µg/m³) ⁻¹		
Eastern Limb Training Center	4.1E-06	4.1E-06
Ga-Matate	1.4E-06	1.4E-06
Degoedeverwachten	1.1E-06	1.1E-06
Tubatse Chrome Club	Cancer risk conclusively excluded by the Tier-1 assessment	
Tubatse ResArea		
Residential Area-SE		
Farm House-S	8.4E-07	8.4E-07
Tshufi Camp	1.9E-06	1.9E-06
Ga-Nkgetheng	1.7E-06	1.8E-06
Farm House-SW	2.3E-06	2.5E-06
Residential Area-SW1	1.3E-06	1.4E-06
Residential Area-SW2	1.1E-06	1.1E-06
Ga-Manapane (Imbita School)	1.8E-06	1.9E-06
Residential Area-WNW	1.3E-06	1.3E-06
Residential Area-NW	6.0E-07	7.2E-07
Residential Area-S (Mmahlagare School)	1.1E-06	1.1E-06

6.10.1.3.2 Interpretation

The Tier-1 HHRA results conclusively exclude a risk of non-cancer effects of the respiratory system at all of the sensitive receptors included in the modelling domain. The Tier-1 HHRA also excluded a risk of cancer at a limited number of sensitive receptors, namely Tubatse Chrome Club, Tubatse ResArea and Residential Area-SE. Cr (VI) concentrations in air modelled at the remaining sensitive receptors were such that referral to a Tier-2 cancer HRA was indicated.

All of the calculated cancer risks (Table 51) are in the range of 1 to 4 in a million and lower (1×10^{-6} to 4×10^{-6} and lower). These risks are in the *de minimis* range. The USEPA generally uses 1 in 1 000 000 (1×10^{-6}) as a *de minimis* cancer risk level for policy development purposes, although regulatory actions are sometimes limited to instances where risk exceeds 1 in 100 000 (1×10^{-4}) (Casterina and Woodruff 2003). Acceptable cancer risks cannot be prescribed to communities, but unacceptable community risks are generally in the range of 1 in 10 000 and higher. Clearly, none of the sensitive receptor cancer risks are in this range. Thus, the calculated cancer risks are negligible and cannot be viewed as a reason for concern.

In summary, the impact of the existing smelting processing plant Scenario 1 and 2 emissions on health risks associated with exposure to Cr (VI) in air, in communities surrounding the smelter, is not of concern.

Implementation of the proposed development is not associated with a risk to health, whether cancer or non-cancer effects are considered, at any of the sensitive receptors included in the modelling domain.

6.10.2 IMPACT STATEMENT

Modelled changes in daily and annual PM_{2.5} ambient air concentrations and in daily SO₂, NO₂ and CO concentrations, due to the implementation of the ECF project, were used to assess changes in health risks in communities surrounding the existing Lion Smelter. Very small to negligible changes in health risks associated with inhalation of these criteria pollutants originating from the smelter are indicated. Therefore, there is not any reason for concern with regard to human health risks associated with the air quality consequences of the implementation of the ECP.

The impact of Lion ferrochrome processing plant Scenario 1 and 2 emissions on health risks associated with exposure to Cr (VI) in air, in communities surrounding the smelter, is not of concern. Implementation of the ECP is not associated with a risk to health, whether cancer or non-cancer effects are considered, at any of the sensitive receptors included in the modelling domain.

6.10.3 OPINION TO ISSUE AN EA

From a community health risk perspective, the proposed activity is acceptable, therefore the proposed activity should be authorised.

6.11 SOCIO-ECONOMIC

Batho Earth was appointed by Netzero (Pty) Ltd to conduct the required Socio-Economic Assessment in line with the General Required Assessment Protocols (GN 320 GG 43110 dated 20 March 2020) and Appendix 6 of the EIA regulations for the proposed development.

The study area was visited on 1 December 2021 with the aim of obtaining more information on the site characteristics and site sensitivity, local settlements and communities, and the social setting of the proposed project, and to acquire an overview of the socio-economic features of the study area and infrastructure proposed as part of the activities.

The following sections only summarises the outcomes of the assessment and the full report is attached as **Appendix O**.

6.11.1 GENERAL DESCRIPTION OF STUDY AREA FROM A SOCIAL PERSPECTIVE

The proposed site is located in the Limpopo Province of South Africa, approximately 240 km northeast of Johannesburg and 15 km southwest of Steelpoort adjacent the Glencore Lion Smelter Complex and just south of the R555. This road links Middelburg, Roosenekal, Steelpoort, and Burgersfort.

The study area falls within the Sekhukhune District Municipality and the Fetakgomo Tubatse Local Municipality. Large sections of land within the FTLM falls under the jurisdiction of Traditional Authorities, although the project site does not fall within tribal land.

6.11.1.1 Sekhukhune District

The Sekhukhune District Municipality (SDM) was established in December 2000. It consists of five Local Municipalities, namely Elias Motsoaledi, Ephraim Mogale, Greater Tubatse, Fetakgomo, and Makhuduthamaga Local Municipalities. The district is situated in the Limpopo province, to the northwest of

Mpumalanga and within the southern section of the Limpopo Province. The SDM covers an area of approximately 13 264 m². Most of the area is typical rural as only 5% of the Sekhukhune District's population lives in urban areas.

The main urban centres are Groblersdal, Marble Hall, Burgersfort, Jane Furse, Ohrigstad, Steelpoort and Driekop. Outside these major towns, one finds almost 605 villages which are generally sparsely populated and dispersed throughout the district (www.sekhukhunedistrict.gov.za).

Mining is a key contributor to the GGP of the district and the sector is seen as having tremendous potential for the immediate future.

6.11.1.2 Fetakgomo Tubatse Local Municipality

In 2016, the Fetakgomo Tubatse Local Municipality (FTLM) was formed as an amalgamation between the former Fetakgomo Local Municipality and the former Greater Tubatse Municipality. The area falls under the jurisdiction of the Sekhukhune District as indicated above.

According to the recent official demographic survey results (2016), the FTLM has a total population of 490 381 people (Statistics South Africa Community Survey, 2016).

The municipality comprises approximately 342 villages and is largely dominated by a rural landscape with only 6 (six) proclaimed townships. Like most rural municipalities in South Africa, the FTLM is characterised by a weak economic base, inadequate infrastructure, major service backlogs, dispersed human settlements and high poverty levels (FTLM: IDP: 2021).

The main economic sectors within FTLM include agriculture, mining and quarrying, trade, tourism, manufacturing, general government, community, social and personal services, catering and accommodation (FTLM: IDP: 2021).

6.11.1.3 The local study area

The Glencore Lion Smelter and proposed project site falls within Wards 27 of the Fetakgomo Tubatse Local Municipality within the Steelpoort Valley. The proposed site for the Energy Conversion project is directly south of the R555 and directly west of the Glencore Lion Smelter Complex and access road.

Steelpoort town is approximately 15 km from the proposed site to the northeast along the R555. Infrastructure associated with the Kennedy's Vale Mine is directly to the north of the site location and the R555. Other infrastructure in close proximity to the study area include roads, shafts, pipelines, conveyors, an electrical substation, transmission line servitudes and sewage plant (water care works).

The area and land-uses surrounding the proposed site is thus characterised by mining related activities and infrastructure, as well as mining associated activities. Various settlements are situated to the north of the proposed site, the R555 and the Steelpoort River.

The closest residential settlement of Ga-Manapane is between 1.75 to 2 km to the north of the proposed site. Various settlements were formed to the north of the Steelpoort River and to the south of the mountain range. These include Ga-Mampurur, Ga-Nkgetheng, Ga-Matate, Ga-Malekana and Ga-Masha. The R555 and Steelpoort River separate the homesteads from the mining complex and Energy Conversion Facility project area.

The location of the local settlements and towns within the area are listed in the following table:

Table 52: Local Settlements within the study area

FETAKGOMO TUBATSE LOCAL MUNICIPALITY	
SETTLEMENT / TOWNS	DIRECTION RELATED TO PROJECT SITE
Ga-Manapane	Northwest of site: $\pm 2-3$ km
Ga-Mampuru	West: $\pm 5-6$ km
Steelpoort	Northeast: ± 15 km
Ga-Matate	North: $\pm 4-5$ km
De Goede verwachting	North: ± 4 km
Ga-Nkgetheng	Northwest: ± 3 km
Nokaneng	Southwest: ± 8 km
Ga-Malekana	Southwest: ± 13 km
Ga-Masha	Southwest: ± 15 km

Other settlements further north and north-east include Ga-Mapodila, Ga-Moela, Ga-Sopanyana, Tukakgomo, Matshupe and Maputla. Thaba Moshate is further to the southwest and Dithamaga to the south.

Refer to Figure 58 below for more information on the settlements, the location of the proposed site (indicated in red) and land-uses.



Figure 58: Settlements within the study area

6.11.2 SOCIAL PROFILE

6.11.2.1 Population Figures

The following table provides an outline of the population figures in the local study area compared to those of the affected municipality, district and province.

Table 53: Population figures

POPULATION FIGURES					
AREA	POPULATION	PEOPLE PER KM ²	NUMBER OF HOUSEHOLDS	% UNDER 20 YEARS AGE GROUP	GENDER
Limpopo	5 799 990	46.1 km ²	1 601 083	44%	53% Female
Sekhukhune District	1 169 762	85.7 km ²	290 526	45%	53% Female
FTLM	489 902	85.9 km ²	125 363	42%	51% Female
Ward 27	12 527	18.9 km ²	2 727	48%	48% Female

Source: StatsSA: Community Survey 2016 and Census 2011 for ward based information

The population figures indicate a study area (Ward 27) which is not as densely populated compared to the rest of the FTLM. This can change in the future as Steelpoort and the surrounding area has been identified as a District Growth Point (FTLM: IDP: 2021). There is statistical evidence that the population within the FTLM is growing at an exponential rate, but that the growth is mainly concentrated around larger towns and settlements.

The percentage of youth under the age of 20 years comprises approximately half of the population sector within the affected ward. The provision of education, health and social services as well as employment creation within the municipality and especially within Ward 27, is thus critical over the long term.

The gender ratio in the province and local municipality indicates a situation where there is a large sector of migrant workers moving out of the area in search of employment. In Ward 27 this is slightly lower compared to the municipal and district statistics.

6.11.2.2 Population Stability

From the table below it is clear that the study area has a relative stable population with the majority of residents born in South Africa and having citizenship, even though the figures are a bit lower compared to the FTLM and District.

Table 54: Population Stability

POPULATION STABILITY		
AREA	BORN IN SOUTH AFRICA	CITIZENSHIP
Limpopo	97.6%	98%
Sekhukhune District	99%	99%
FTLM	98.8%	99%
Ward 27	91.1%	93%

Source: StatsSA: Community Survey 2016 and Census 2011 for ward based information

6.11.2.3 Education and Skills Levels

The table below provides an outline of the education levels within the study area.

Table 55: Education Levels

EDUCATION LEVELS				
AREA	NO SCHOOLING	SOME PRIMARY	GRADE 12	HIGHER EDUCATION
Limpopo	14%	9%	28%	6%
Sekhukhune District	16%	8%	26%	4%
FTLM	16%	7%	26%	4%
Ward 27	16%	7%	19%	1%

Source: StatsSA: Community Survey 2016 and Census 2011 for ward based information

Based on information above, the percentages of those achieving matric within the district and municipal areas are more or less similar. In Ward 27, however, there are lower levels of individuals that completed Grade 12 and significantly lower levels of individuals that have a higher education. Overall, the high levels of people with no schooling remain a concern, as well as the limited number of learners that completed their school education.

The high teacher/student ratios of 1:40 for primary schools and 1:35 for secondary schools are in line with the guidelines of the Department of Education, but does not necessarily assist with avoiding school drop-outs. A lack of sufficient higher education institutions within the local municipality can also be a contributing factor to the low number of graduates in the FTLM.

Although overall skills levels have increased over the years, a lack of relevant skills among locals can result in employers still recruiting outside the local municipal areas. This hampers the municipality's job creation efforts. Skills shortages are thus a challenge that needs to be overcome (FTLM: IDP: 2021).

6.11.2.4 Employment and Income

The table below indicates the employment and income levels within the area.

Table 56: Employment Profile

EMPLOYMENT AND INCOME LEVELS					
AREA	EMPLOYED	UNEMPLOYED	DISCOURAGED WORK-SEEKER	OTHER NON-ECONOMICALLY ACTIVE	ANNUAL HOUSEHOLD INCOME BELOW R40K
Limpopo	27.4%	17%	6%	49%	70%
Sekhukhune District	20.9%	22%	7%	50%	70%
FTLM	23%	25%	5%	47%	71%
Ward 27	22.1%	32%	3%	43%	65%

Source: StatsSA: Community Survey 2016 and Census 2011 for ward based information

The table shows the average income levels in the province, district, municipal area and affected ward. It must be noted that Ward 27 of the FTLM indicated a lower level of annual household income compared to the Sekhukhune District and the FTLM, even though there are different mining activities and associated employment opportunities within this area for select individuals.

The number of households without any form of income or very low levels of income remain of concern. The poverty levels within the province, municipal areas and study area therefore remain a significant socio-economic challenge.

Unemployment is a further source of concern, especially if the categories of “discouraged work-seekers” and “other non-economically active” are considered. Those falling within the “other” category can include individuals that are being supported by breadwinners working elsewhere or some relying on social grants, or some could be subsistence farmers or include women running the households and looking after dependants. These sectors of the population will still rely on the employed sections of the population.

The negative impact of Covid-19 on poorer households must also be considered. In addition, the state of the economy in South Africa could have contributed to an increase in the unemployment figures provided and could have significantly increased the poverty profile within the study area since the statistical surveys were conducted.

6.11.2.5 Safety, Security and Health

The nearest police stations within the larger study area include the following: Burgersfort, Sekhukhune, Maartenshoop, Driekop and Tubatse. Types of crime that must be dealt with include burglaries, thefts, car hijackings, sexual crimes, assaults and murder. As part of the public participation process for the IDP, car hijackings and robberies were listed as a major concern in Ward 27 (FTLM: IDP: 2021).

The FTLM has hospitals in Burgersfort, namely Dilokong and Mecklenberg hospitals. Various primary health care clinics are located throughout the municipality. In Ward 27, the Malekane and Kutullo areas receive a weekly mobile clinic, but all the villages required this service. During the IDP public participation processes, however, there were numerous requests for additional clinics that also operate at longer hours, as well as mobile clinics throughout the FTLM area (FTLM: IDP: 2020).

The health of local residents is further impacted on by air quality impacts associated with various mining activities, the illegal burning of waste, irregular waste removal, as well as illegal dumping.

In terms of the Covid-19 Pandemic, the Limpopo Department of Health, in cooperation with mining companies and NGO's, has implemented numerous programmes for setting up various accessible vaccine sites, mobile vaccine centres and undertaking campaigns in high densities areas and at mining areas.

6.11.2.6 Housing and Related Infrastructure

The infrastructure in the larger study area and within the FTLM is fairly poor, with major service backlogs that cannot meet the needs of the dispersed human settlements and high poverty levels. Large sections of the population, however, lives in formal dwellings, with limited land invasions and informal settlements. The latter are mainly concentrated around larger towns and settlements.

The majority of residents within the FTLM live in formal dwellings, which is approximately on par within the Sekhukhune District. The area where the proposed development is situated, have higher levels of households living within informal dwellings compared to the municipality and district.

Although most wards in FTLM have previously benefited from the RDP housing implementation, the overall housing backlog are approximately 16 755 units. Urbanisation, mainly in search of employment opportunities, as well as mining activities continue to put pressure on the need for housing within the Municipality (FTLM: IDP: 2021).

This need is increasing at an alarming rate due to the influx of people into the Burgersfort and Steelpoort areas. It can thus be assumed that there is a need for housing infrastructure in the study area. The IDP also noted that there is still an incomplete RDP Housing project in Ward 27 (FTLM: IDP: 2021).

The following table provides an outline of the percentage of households living in formal dwellings.

Table 57: Households and housing infrastructure

HOUSEHOLDS				
AREA	NO OF HOUSEHOLDS	HOUSEHOLDS IN FORMAL DWELLINGS	HOUSEHOLDS IN INFORMAL DWELLINGS	OTHER
Limpopo	1 601 083	80%	4.8%	15.2%
Sekhukhune District	290 526	77%	6.1%	16.9%
FTLM	125 363	76%	6.3%	17.7%
Ward 27	2 727	67%	22%	11%

Source: StatsSA: Community Survey 2016 and Census 2011 for ward based information

6.11.3 BASIC SERVICE DELIVERY

6.11.3.1 Water

FTLM can be seen as a water stressed municipality. According to the community survey of 2016, 62.7% of households received their water from a regional or local service provider. Only 22% of households have access to piped water in their yard and 23% used piped water on community stands. It was further indicated that only 62.7% of households have access to safe drinking water supply services.

Almost all the villages in the FTLM source water from boreholes, rivers, dams and tanks. The main reason for this situation is illegal water connections, limited communal and ageing infrastructure, drought, lack of financial resources, the topography of the area, as well as the number of informal and scattered settlements through the municipal area (FTLM: IDP: 2021).

Within Ward 27, 62% of the residents still received their water for household use from the river. Only 19,5% received their water from a regional service provider (StatsSA: Census 2011). It should be noted that progress has been made in terms of water provision in FTLM, but that 35,4% of households in FTLM still did not have access to safe drinking water supply service in 2016. The IDP further indicated that there are still severe challenges and water shortages within Ward 27 (FTLM: IDP: 2021)

6.11.3.2 Sanitation

Within Ward 27, 78% of the households still make use of pit latrines, with only 4% of these being Ventilated Improved Pit (VIP) latrines. Those without access to any sanitation type facility totals 11% which are almost double the rate compared to the Sekhukhune District. The FTLM also has a huge backlog in sanitation provision. In the FTLM, 84% of households still rely on the pit toilet system (Community Survey 2016). It

should thus be noted that various improvements could have been made since the survey results of 2011 and 2016 were published.

Challenges with regards to sanitation provision include, inter alia, the following:

- There is an insufficient basic level of sanitation services creating health and environmental challenges;
- There is a need for the upgrading of the existing sewage plants in the municipality;
- No adequate monitoring of sanitation projects is undertaken; and
- Water borne ablution facilities in all municipal and community facilities need to be attended to (FTLM: IDP: 2021).

6.11.3.3 Electricity

ESKOM is the electricity service provider to the FTLM. According to the Community Survey of 2016, 82% of households in the FTLM had access to in-house prepaid meters with 10% that had no access to any type of formal electricity provision. These households still rely on candles and paraffin (FTLM: IDP 2021).

A large section of the rural population thus has no, to very limited access, to electricity which impacts negatively on local economic development and community projects (FTLM: IDP: 2021).

6.11.3.4 Waste Collection

In FTLM only 10% of the population received a service from the municipality or private company. The majority of households rely on their own dumps. The widespread inadequacy of formal refuse removal services in the municipal area poses a health hazard to the rural communities and is particularly problematic to businesses (FTLM: IDP: 2020).

6.11.4 LOCAL ECONOMIC PROFILE

The FTLM economy is driven by mining and agriculture. Mining still presents the largest opportunity in the area and the mining activities and natural resources available in the area have created a definite potential to develop tourism and thereby to diversify the economic base of the municipality (FTLM: IDP: 2020).

The mining industry is furthermore the municipality's leading job creator and key economic growth driver. With all major mining houses fully represented in the municipality, locals pin their hopes for jobs and income security in this sector. The mining sector accounts for 34% of the Municipality's total GVA and 54% of the total labour force in the formal sector. The job absorption patterns during a 12-year review period in the sector shows that year 2012 witnessed the highest number of jobs (1833) created.

It is feared that the Covid-19 lockdown, which has already devastated rural communities, could have an even more dire effect on mine-affected communities. The Quarterly Labour Force Survey by Statistics SA revealed that Limpopo lost 236 000 jobs due to the Covid-19 pandemic and that all sectors of the economy suffered job losses with the exception of the agriculture sector, in which 16 000 jobs were created (www.mg.co.za).

The provincial government has set aside R3.5-billion to mitigate against the impact of Covid-19 on the economy and the population. Various projects are aimed at attracting investment into the agricultural sector. A project within the larger study area is the implementation of the Lebogakgomo Chicken Abattoir, which will, among other things, result in revitalisation of several broiler production projects. This will create 500 direct jobs within the value chain (www.mg.co.za).

The Limpopo Provincial Government identified the Fetakgomo-Tubatse area in Steelpoort for a Special Economic Zone (SEZ) development, which is proposed to be established at Dithamaga Trust in Ward 27. The initiative started as a joint venture between mining operators in the area, in which Glencore played a major role. The establishment of the SEZ is driven by the projected mining and beneficiation forecasts of the Platinum Group of Metals (PGM). Such a zone can change the socio-economic characteristics in the region by accelerating the manufacturing base, promoting industrialisation and attracting investments. According to the Limpopo Economic Development Agency (LEDA), the Tubatse Special Economic Zone will impact positively on more than a million people in the province due to improved economic activities within the Dilokong Spatial Economic Initiative as well as improving economic progress within other districts and municipalities (FTLM: IDP: 2021).

The agriculture sector in the FTLM is still emerging and heavily under-invested. Lack of mechanisation makes smallholder farming one of the smallest contributors to the municipality's economic growth.

The manufacturing sector covers the manufacturing of goods, products and beverages. It also comprises the production, processing and preservation of meat, fish, fruit, vegetables, oils and dairy products; grain mill, starches and tobacco products; textile products; spinning, weaving; and petroleum products and nuclear fuel. This sector has a vast potential as job creator but is still in its infancy.

With regards to the tourism sector, it was noted that the unique selling benefits of local heritage sites and other tourism facilities in the municipality are not effectively profiled and marketed. The tourism sector is further being overshadowed by mining to the extent that more strategic focus is unevenly invested in the latter at its expense.

Investment opportunities in the FTLM include:

- mining investment;
- land availability;
- tourism;
- funding source from private sector; and
- job creation from infrastructure investment.

6.11.5 ANTICIPATED SOCIO-ECONOMIC IMPACTS

The following table outlines the potential impacts and possible risks associated with the proposed Energy Conversion Facility. These impacts and risks are based on existing baseline information. There is thus always an uncertainty with regards to the anticipated impact actually occurring, as well as the intensity thereof. Impact predictions have been made as accurately as possible based on the information available at the time of the study. Further studies would be required as part of the detailed phase of the project.

Table 58: Anticipated socio-economic impacts and risks associated with the proposed ECF

POTENTIAL IMPACT			
IMPACT / RISK	NATURE OF IMPACT	MANAGEMENT OBJECTIVE	MITIGATION EFFECT
SOCIO-ECONOMIC INTRUSIONS			
Mining related land-uses or similar land-uses are found in the immediate area. No	Neutral	Environmental management of site and detailed designs of	Can be avoided, managed or mitigated

POTENTIAL IMPACT			
IMPACT / RISK	NATURE OF IMPACT	MANAGEMENT OBJECTIVE	MITIGATION EFFECT
negative land-use impacts are foreseen		containers can limit any possible negative impacts.	
Increase in nuisance factors (possible noise and dust) during the construction phase.	Negative	Limit negative impacts of nuisance factors (intrusions, noise and dust). Pollution prevention of construction site.	Can be avoided, managed or mitigated
Limited impact on sense of place due to existing visual character and land-uses and proximity of residential settlements to the site	Possibly negative	Minimise negative impact of infrastructure and related impacts (visual impact and lighting).	Can be avoided, managed or mitigated
POPULATION CHANGES			
No formal influx of people and increase in households anticipated due to limited or no new direct employment opportunities created by the project, as well as the location of settlements to the site.	Neutral	Minimise any possible negative impacts through information sharing processes.	Can be avoided, managed or mitigated
No potential informal influx of large groupings, such as jobseekers in search of employment, is foreseen due to limited extent of project construction and operation, as well as the proximity of settlements to the project site.	Possibly negative	Minimise any possible negative impacts related to informal population influx as a direct result of the proposed project in coordination with FTLM e.g. through information sharing processes.	Can be avoided, managed or mitigated
Possible lack of available skills due to implementation of new international technology resulting in continued outsourcing of skills during construction phase and possibly operational phase.	Negative	Source and maximise local skills and local procurement if and where possible.	Can be mitigated.
No change foreseen in the social fabric of the community as a result of the proposed project.	Neutral	None proposed	Can be avoided.
Possible increase in criminal activities associated with the proposed project are not anticipated as no increased population profile and movement of people are expected due to the	Neutral	None proposed	Can be avoided.

POTENTIAL IMPACT			
IMPACT / RISK	NATURE OF IMPACT	MANAGEMENT OBJECTIVE	MITIGATION EFFECT
implementation of the proposed ECF.			
EMPLOYMENT AND PROCUREMENT			
Possible social dissatisfaction with regards to no or limited job opportunities and local procurement associated with the proposed ECF.	Negative	Source and maximise local skills and local procurement if and where possible	Can be managed or mitigated
Unfulfilled community expectations in terms of employment creation could result in social conflict	Negative	Avoid creation of unrealistic expectations; implement transparent communication processes	Can be avoided, managed or mitigated
SOCIO-ENVIRONMENTAL IMPACTS AND RISKS			
The resource efficiency of the project can have positive impacts	Positive	Improvement in pollution prevention targets	Impact can be enhanced.
Potential decrease in health-related risks as the energy conversion can lessen the CO ₂ emissions that are currently impacting on the air quality in the area.	Positive	Implementation of project and environmental management will lessen any current negative impacts.	Impact can be enhanced.
Emissions and possible pollutants will be less and will result in fewer negative impacts on sensitive receptors and settlements.	Positive	Implementation of project and environmental management will lessen any current negative impacts.	Impact can be enhanced.
Informal influx of people as a result of the ECF is not expected, resulting in none to very limited potential increase in health-related risks such as transmission of diseases.	Neutral	None proposed	Can be avoided.
Increased community safety risks due to additional mining related infrastructure	Possibly Negative	Limit safety and health risks through design considerations, location of infrastructure and precautionary construction and operational management principles.	Can be avoided, managed or mitigated
SOCIO-ECONOMIC IMPACTS			
Limited to no positive impacts on local and regional economy as a result of very limited employment opportunities created.	Positive	Maximise local employment opportunities and procurement if and where possible	Can be enhanced

POTENTIAL IMPACT			
IMPACT / RISK	NATURE OF IMPACT	MANAGEMENT OBJECTIVE	MITIGATION EFFECT
Reduction in electricity required and purchased from the national electricity grid thereby relieving some pressure on the national electricity grid, and lessening the dependency on the grid, while lowering operational costs.	Positive	Limit dependency on the grid while lowering operational costs	Can be enhanced
Positive long-term impacts in reaching the reduction in total emissions footprint	Positive	Limit dependency on the grid while lowering operational costs Implementation of project and environmental management will lessen carbon emissions	Can be enhanced
Positive long-term impacts on local and regional economy as a result of continuation of the life of the smelter with subsequent indirect employment opportunities and downstream economic opportunities	Positive	Maximise local employment opportunities and procurement	Can be enhanced
Continued potential positive impact on local businesses already established in the area or region	Positive	Support the local businesses	Can be enhanced
Continued distribution of social funds	Positive	Maximise social fund related to the project to benefit locals	Can be enhanced
A decrease/termination in employment and community funds during and after decommissioning could negatively impact former beneficiaries	Negative	Minimise the negative impacts associated with decommissioning of smelter and ECF in the long term	Can be avoided, managed or mitigated
INFRASTRUCTURE AND SERVICE DELIVERY			
Road infrastructure is available to access the project site.	Neutral	Environmental management of site and detailed project designs can limit any possible negative impacts.	Can be avoided, managed or mitigated
Limited short-term risk of traffic accidents due to increased construction traffic flow on local roads in close proximity to the site.	Negative	Limit safety risks during transportation of personnel and construction material	Can be avoided, managed or mitigated
No additional pressure on existing health facilities and infrastructure (e.g. clinics, housing, water, electricity,	Neutral	None proposed	Can be avoided.

POTENTIAL IMPACT			
IMPACT / RISK	NATURE OF IMPACT	MANAGEMENT OBJECTIVE	MITIGATION EFFECT
roads) anticipated as no population increase is expected.			

6.11.6 COMPLIANCE STATEMENT

The socio-economic risks relate to intrusion impacts, job opportunities, some population change and associated risks, impacts on the sense of place, community safety risks, the resource efficiency, community health and decommissioning impacts. It is recommended that the following overarching risks and enhancement targets and objectives that were noted as part of the Social Management Plan be implemented.

Table 59: Overarching Risks and Mitigation/Enhancement Targets

IMPACT CATEGORY	RISKS	MITIGATION / ENHANCEMENT TARGETS / OBJECTIVES
Socio-Economic Intrusions	<ul style="list-style-type: none"> • Risk of traffic accidents due to increased vehicle movement, especially on the R555 and at the site entrance • Noise, dust and littering related to construction activities • Increase in nuisance factors could lead to negative perceptions related to the project 	<ul style="list-style-type: none"> • Reduce dust and noise during construction • Implement and adhere to the Air Quality Management Plan • Maintain infrastructure and services • No environmental pollution • No social conflict and protests
Job opportunities and economic impacts	<ul style="list-style-type: none"> • Limited opportunities for local participation in labour supply during the construction phase of the project • Limited opportunities for local procurement during construction and operation • Possible lack of available skills due to implementation of new international technology resulting in continued outsourcing of skills during construction and operational phases • Possible social dissatisfaction with regards to no or limited job opportunities and local procurement associated with the proposed ECF • Unfulfilled community expectations in terms of employment creation could result in social conflict • Possible inflow of jobseekers 	<ul style="list-style-type: none"> • Enhance local employment opportunities as far as possible to ensure benefits for targeted groups • Ensure transparent communication with regards to the procurement • Ensure efficient and transparent management of the project • Transfer of skills and capacity building during operational phase
Population Change	<ul style="list-style-type: none"> • Gathering of jobseekers at the construction site 	<ul style="list-style-type: none"> • Local labour receives preference where possible • Procurement and recruitment processes are transparent and clearly communicated

IMPACT CATEGORY	RISKS	MITIGATION / ENHANCEMENT TARGETS / OBJECTIVES
	<ul style="list-style-type: none"> • Movement of people in the area can increase criminal activity or opportunities for criminals 	
Sense of Place	<ul style="list-style-type: none"> • Impact on visual character is possible, but limited due to existing land-use in the area, and subsequent impact on sense of place • Possible visual impact on residents of settlements to the north of the site • Possible impact on air quality 	<ul style="list-style-type: none"> • Minimise negative visual impacts related to the project • Implement and adhere to Air Quality Management Plan
Community Safety Risks	<ul style="list-style-type: none"> • Possible, but limited risks in terms of increase in criminal activity • Unauthorised entry to the construction site with risks of accidents • Unauthorised entry to the facility during the operation with subsequent risks such as e.g. sabotage, damage to infrastructure and accidents 	<ul style="list-style-type: none"> • Minimise impacts on local community safety • No unauthorised access to the site/facility • No accidents • No social conflict • No protests
Resource efficiency and community health	<ul style="list-style-type: none"> • Impact on resource efficiency • Potential air quality impacts on sensitive receptors and settlements, possibly positive as energy conversion can lessen the CO₂ emissions 	<ul style="list-style-type: none"> • Limit dependency on the grid while lowering operational costs • Implementation of project and environmental management will lessen carbon emissions • Positive long-term impacts in reaching the reduction in total emissions footprint • Positive long-term impacts on local and regional economy as a result of continuation of the life of the smelter with subsequent indirect employment opportunities and downstream economic opportunities
Decommissioning	<ul style="list-style-type: none"> • Noise and dust pollution • Loss of employment opportunities • Loss of energy generation and lack in supply • Return to dependency on national electricity grid 	<ul style="list-style-type: none"> • Minimise intrusion impacts associated with decommissioning • No community complaints received • EMPr compliance

A further key requirement would be a transparent and comprehensive communication and participation process. A framework must be developed that would allow for meaningful engagements (consultation and participation) with the affected parties on an iterative basis, as well as the active participation of community representatives in the planning processes.

6.11.7 OPINION FOR ISSUING AN EA

Based on the low site sensitivity from a socio-economic perspective and the fact that the anticipated negative impacts can be mitigated, and positive impacts can be enhanced, it is recommended that the environmental authorisation of the project be allowed.

6.12 AIR QUALITY

EnviroNgaka (Pty) Ltd was appointed by Netzero (Pty) Ltd to conduct the required Air Quality Impact Assessment in line with the General Required Assessment Protocols (GN 320 GG 43110 dated 20 March 2020) and Appendix 6 of the EIA regulations for the proposed development.

In addition to the EIA regulations, Section 53(f) of the National Environmental Management: Air Quality Act (NEM:AQA), 2004 (Act No. 39 of 2004), the Department of Environmental Affairs (DEA) has developed and published a “Code of practice for air dispersion modelling in air quality management in South Africa” under GN533, “Regulations regarding air dispersion modelling, 2014” in Government Gazette No. 37804 on 11 July 2014. The Code of Practice is prescribed as the technical Code of Practice for air dispersion modelling which provides technical standards on the application of air dispersion models as contained in Appendix A of the aforementioned regulation. The Code of Practice for air dispersion modelling is applicable:

- a. in the development of an air quality management plan, as contemplated in Chapter 3 of the Act;
- b. in the development of a priority area air quality management plan, as contemplated in Section 19 of the Act;
- c. in the development of an atmospheric impact report, as contemplated in Section 30 of the Act; and
- d. in the development of a specialist air quality impact assessment study, as contemplated in Section 37(2)(b) of the Act;

In accordance with the application of the Code of Practice to an atmospheric impact report or a specialist air quality impact assessment study, the assessment was conducted in accordance with the prescribed format of an atmospheric impact report, as published by DEA on 11 October 2013 in Government Gazette No. 36904 under GN747 as the “Regulations prescribing the format of the atmospheric impact report” in terms of Section 53(o) read with Section 30 of the Act.

The following sections only summarises the outcomes of the assessment and the full report is attached as **Appendix N**.

6.12.1 DISPERSION MODELLING CONSIDERATIONS

In terms of Expected Emissions Sources, the existing Lion Smelter currently operates two dryers, four kilns and four closed submerged arc furnaces to produce ferrochrome. Several villages (residential areas) are located within 5km from Lion in various directions, which includes Ga-Mampuru, Ga-Phasa, Ga-Malikane, Eerste Geluk, Booysendal Camp, Matlala and Tubatse. Commercial/Industrial activities located within 5km include Spitskop Readymix and Eastern Chrome Mine.

Raw materials are dried and fed to the kilns for pre-treatment of the materials before it is fed into the furnaces. Carbon monoxide (CO) gas from the furnaces is used to supplement fuel requirements at the dryers and kilns where possible. Liquid metal is tapped and separated into hot ferrochrome metal slag at the furnaces. Final product is stockpiled and processed through the crushing and screening plant according to customer specifications.

In light of specific products produced, raw materials consumed and or specific process, with respect to ferrochrome, the smelter is currently licenced to operate the following Listed Activities in terms of Section 21 of NEM:AQA:

- Drying (Subcategory 4.1);
- Sinter Plants (Subcategory 4.5);
- Ferro-alloy Production (Subcategory 4.9);

The proposed ECF project are considered to be reciprocating engines and it is anticipated that the heat input will be greater than 10 MW thermal energy. This implies that the existing Air Emissions Licence (AEL) requires to be amended to include Subcategory 1.5 (Reciprocating Engines) in terms of Section 21 of NEM:AQA in order to operate the proposed energy conversion facility. This project does, however, not refer to an increase in production in terms of the existing operation.

Emission sources of the existing operation are primary point and potential fugitive sources from the processes referred to, with secondary sources from material processing, storage areas, handling and roads. Therefore, the primary pollutants from the emission sources considered relevant for the proposed development are listed in Table 60.

Table 60: Primary pollutants identified that will be applicable to the proposed development

POLLUTANTS CONSIDERED		NOTES	APPLICABILITY	CONSIDERED	MODELLED
PM	Classical air pollutant	Total Particulate Matter	Yes	Yes	PM ₁₀ & PM _{2.5}
PM ₁₀	Classical air pollutant	PM with an aerodynamic diameter of equal to or less than 10µm	Yes	Yes	Yes
PM _{2.5}	Classical air pollutant	PM with an aerodynamic diameter of equal to or less than 2.5µm	Yes	Yes	Yes
SO ₂	Classical air pollutant		Yes	Yes	Yes
NO _x (as NO ₂)	Classical air pollutant		Yes	Yes	Yes
CO	Organic air pollutant	Not a classical pollutant	Yes	Yes	Yes
Cr(VI)	Inorganic air pollutant	Not a classical pollutant	Yes	Yes	Yes

The objective of the Air Quality Impact Assessment (AQIA) is to identify and quantify the expected effect of existing smelting operation's current impact, emanating from atmospheric emissions on the surrounding ambient air quality as well as that which could be expected with the implementation of the ECF.

Therefore, two main scenarios were modelled throughout the assessment (see detailed AQIA report attached as Appendix P):

- **Scenario 1 - Baseline Conditions:** Impact assessment is done per the emissions of all primary pollutants at expected/actual concentrations against current full production capacity (AEL emission limits or achievable emissions); includes no modifications or improvements made to the current process / additional abatement of secondary fugitive emissions and includes the new secondary sources as defined with the 2019 authorisation application; and
- **Scenario 2 - Future Conditions:** Scenario 2 is an extension on Scenario 1 with the ECF plant added to assess the expected combined effect.

6.12.2 IMPACT STATEMENT

Results from the two scenarios were conclusive and highlighted the risk and potential negative impact of PM₁₀, PM_{2.5} and NO₂ emissions on the receiving environment for the baseline scenario (scenario 1). The associated impact area is localised and close to the boundary of the site, within a distance of approximately 0.5-1.5km. The impact for scenario 2 with the proposed ECF plant added to scenario 1, indicated that the ECF plant is ⁶ “unlikely” to impact negatively.

Based on the dispersion modelling results, exceedances for PM₁₀ and PM_{2.5} of the national ambient air quality standards are likely for the short time averages (24-hr) as well as the annual standards close to the boundary of the site. Exceedances for NO₂ of the national ambient air quality standards are likely for the short time averages (1-hr), as well as the annual standards close to be localised and close to the boundary of the site, within a distance of approximately 0.5-1.5km.

Based on the results of the study it is “unlikely” that the proposed additional ECF activity will increase the likelihood of aforementioned exceedances if executed/implemented under controlled conditions by management measures/actions and impact negatively on ambient air quality.

6.12.2.1 PM₁₀ & PM_{2.5}

The modelled outcome over a 24-hour average concluded the following:

- “likely” that the existing operations baseline contribution to the PM₁₀ and PM_{2.5} ambient air quality could lead to limited exceedances of the relevant standards which is “likely” to be localised and to occur close to the site boundary for PM₁₀ and PM_{2.5} respectively;
- “unlikely” that Scenario 2 under normal operation, will not notably increase/decrease the likelihood of exceedances of the PM₁₀ and PM_{2.5} ambient air quality standards;
- If no abatement or abatement controls for fugitive dust (PM) are implemented during the construction/decommissioning phases of the project, it is foreseen to be “likely” that the additional contribution, will increase the likelihood of exceedances of the PM₁₀ and PM_{2.5} ambient air quality standards; and
- If abatement or abatement controls for fugitive dust (PM) are implemented during the construction/decommissioning phases of the project, it is foreseen to be “unlikely” that the

⁶Likelihood, as defined in the AQIA, provides calibrated language for describing quantified uncertainty. It can be used to express a problematic estimate of the occurrence of a single event or outcome. A statement that an outcome is “likely” means that the probability of this outcome can range from ≥66% to 100% probability. This implies that all alternative outcomes are “unlikely” (0-30% probability).

additional contribution, will increase the likelihood of exceedances of the PM₁₀ and PM_{2.5} ambient air quality standards.

The modelled outcome for an annual average concluded the following:

- “**likely**” that the existing operation’s baseline contribution to the PM₁₀ and PM_{2.5} ambient air quality could lead to limited exceedances of the relevant standards and is “**likely**” to be **very localised** and to occur on-site and or close proximity to the site;
- “**unlikely**” that the additional contribution of the ECF sources per Scenario 2 under normal operation, will notably increase the likelihood of exceedances of the PM₁₀ and PM_{2.5} ambient air quality standard;
- If no abatement or abatement controls for fugitive dust (PM) are implemented during the construction/decommissioning phases of the project, it is foreseen to be “**likely**” that the additional contribution, will increase the likelihood of exceedances of the PM₁₀ and PM_{2.5} ambient air quality standards; and
- If abatement or abatement controls for fugitive dust (PM) are implemented during the construction/decommissioning phases of the project, it is foreseen to be “**unlikely**” that the additional contribution, will increase the likelihood of exceedances of the PM₁₀ and PM_{2.5} ambient air quality standards.

6.12.2.2 Dust Fallout (DFO):

The potential contribution from the existing operation to DFO levels is assessed on an ongoing basis and the effect of the secondary / fugitive sources are identified and managed by Site Management.

Compliance of these DFO levels with the National Dust Control Regulations (NDCR) (Government Notice 827, 01 November 2013) varies during the year and compliance of off-site locations is fairly good. It is also noted that other sources in the area are also contributing to DFO levels sampled by the Lion Smelter.

It is however also noted that the possibility of fugitive dust from secondary sources such as roads and storage facilities, is foreseen to increase significantly during spring and some winter months.

Based on the monitored DFO rates in close proximity to the existing smelter and within the boundary of the operation, elevated rates occur which could be negatively affected in the same manner as has been referenced earlier for PM₁₀ and PM_{2.5} ambient concentrations, which could lead to exceedance of the NDCR outside the boundary of the operation. The phases of the project for the proposed ECF which could negatively impact with significance are the construction and decommissioning phases if executed without proper dust mitigation / suppression and control measures.

6.12.2.3 SO₂

It is foreseen to be “**likely**” that the existing operations contribution to the SO₂ ambient air quality **falls within the relevant standards for all scenarios** and inclusive of all activities included in this study.

It is foreseen to be “**very likely**” that the proposed ECF sources will **not impact negatively** with respect to SO₂ ambient air quality.

6.12.2.4 NO₂

It is foreseen to be “**likely**” that the existing operation’s contribution to the NO₂ ambient air quality exceeds the relevant standards for a 1-hour and annual average near the operations.

It is foreseen to be “**very likely**” that the proposed new ECF will **not impact further** with respect to NO₂ ambient air quality.

6.12.2.5 CO

It is foreseen to be “**likely**” that the existing operation’s contribution to the CO ambient air quality **falls within the relevant standards**.

It is foreseen to be “**likely**” that the proposed new ECF will **not impact negatively** with respect to CO ambient air quality.

6.12.2.6 Hexavalent Chromium (Cr(VI))

In the absence of a South African Ambient Air Quality Standard, the WHO’s Unit Risk Factor of 0.04 (µg/m³)-1 was used as a reference.

It is foreseen to be “**likely**” that the existing operation’s contribution to the Cr(VI) ambient air quality is simulated to be such that the risk over populated areas is believed to be around 1 per 100 000, or lower.

It is foreseen to be “**very likely**” that the proposed new ECF will **not impact negatively** with respect to ambient Cr(VI) ambient air quality.

6.12.2.7 Greenhouse Gas emissions (GHG)

It is foreseen to be “**virtual certain**” (99 – 100 % probability) that the GHG emissions will be the same for both scenarios considered.

6.12.3 OPINION FOR ISSUING AN EA

It is the opinion of the specialist that the proposed project be authorised on the condition that all mitigation measures specified are being implemented and takes place within the allowable emissions standards.

6.13 SUMMARY OF SPECIALIST FINDINGS

Table 61: Summary of specialist findings

IMPACT STATEMENT	REFERENCE IN TERMS OF ADDRESSING RECOMMENDATIONS	OPINION FOR ISSUING OF EA
AGRICULTURAL COMPLIANCE STATEMENT		
The site consists of land which is subject to severe permanent limitations including the pedocutanic horizon as well as hard rock. It is therefore only suitable for occasional row cropping in long ley rotations, or for use under grazing. As such the site is classified as having a low agricultural potential.	Recommendations and mitigation measures identified by the Agricultural Compliance Statement (Appendix F), have been incorporated into the EMPr (see Tables 8 & 12).	As a result of the classification of the site to a low sensitivity for agricultural production it is the author's opinion that the project should go ahead.
LANDSCAPE AND VISUAL IMPACT ASSESSMENT		
Overall, the post mitigation significance of the visual impacts is expected to be low . Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed ECF.	Recommendations and mitigation measures identified by the Landscape and Visual Impact Assessment (Appendix G), have been incorporated into the EMPr (see Tables 8 & 14).	Considering all factors, it is recommended that the development of the facility as proposed be supported subject to the implementation of the recommended mitigation measures and management programme.
ARCHAEOLOGICAL AND PALAEOLOGY IMPACT ASSESSMENT		
No heritage sites of significance are located within the impact area and therefore no adverse impact to heritage resources is expected. Impacts of the project on heritage resources is expected to be low during all phases of the development.	Recommendations and mitigation measures identified by the Archaeological and Palaeontological Impact Assessment (Appendix H), have been incorporated into the EMPr (see Tables 8 & 16).	The project can commence provided that the recommendations in Appendix H are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval.
TERRESTRIAL BIODIVERSITY, PLANT AND ANIMAL SPECIES COMPLIANCE STATEMENT		
The " medium to low sensitivity" for the plant species, " medium-low sensitivity" animal species, and " low sensitivity" terrestrial biodiversity sensitivity is confirmed. The vegetation structure and species composition of the two habitats have been completely altered as such, has a very low conservation value and ecological sensitivity from both a faunal and floral perspective.	Recommendations and mitigation measures identified by the Compliance Statement (Appendix I), have been incorporated into the EMPr (see Tables 8 & 10).	No fatal flaws are evident for the proposed project. It is the opinion of the specialists that the project, may be favourably considered for authorisation.
AQUATIC BIODIVERSITY COMPLIANCE STATEMENT		
Due to the unlikelihood of the presence of the identified endangered species within the site boundary of the proposed development, the outcome of the site	Recommendations and mitigation measures identified by the Compliance Statement (Appendix J), have been incorporated into the EMPr (see Tables 8 & 11).	Provided proposed recommendations are implemented, it is the opinion of the specialist that there are no fatal flaws for the proposed activities.

verification concurred with the “ low sensitivity” as identified by the screening tool.		
HYDROLOGICAL ASSESSMENT		
The risk assessment for both construction and post-construction phases of the project is considered low , with mostly reversible and manageable impacts.	Recommendations and mitigation measures identified by the Hydrological Assessment and Conceptual Storm Water Plan (Appendix K), have been incorporated into the EMPr (see Tables 8 & 13).	This hydrological assessment cannot find any grounds or identify high hydrological risks to not proceed with the development. This is grounded on the assumption that the proposed mitigation measures, CSWMP, EMPr and EIA recommendations are implemented during the construction and operational phase of the development.
NOISE IMPACT COMPLIANCE STATEMENT		
The potential noise impact from the proposed ECP Project will be low with all the mitigatory measures in place.	Recommendations and mitigation measures identified by the Compliance Statement (Appendix L), have been incorporated into the EMPr (see Tables 8 & 15).	Authorisation for the ECP Project may be granted from an environmental noise point of view.
TRAFFIC IMPACT ASSESSMENT		
The potential traffic impact from the proposed ECP Project will be low with all the mitigatory measures in place.	Recommendations and mitigation measures identified by the Traffic Assessment (Appendix M), have been incorporated into the EMPr (see Tables 8 & 19).	Authorisation for the ECP Project may be granted from a traffic point of view.
HEALTH IMPACT ASSESSMENT		
The respiratory and cardiovascular related health affects associated with the determined pollutants associated with the proposed development has been determined to be low .	Recommendations and mitigation measures identified by the Health Risk Assessment (Appendix N) and Air Quality Impact Assessment (Appendix P), have been incorporated into the EMPr (see Tables 8 & 17).	From a community health risk perspective, the proposed activity is acceptable, therefore the proposed activity should be authorised.
SOCIO-ECONOMIC IMPACT ASSESSMENT		
A low site sensitivity from a socio-economic perspective with the anticipated negative impacts mitigated and positive impacts enhanced.	Recommendations and mitigation measures identified by the Social Assessment (Appendix O), have been incorporated into the EMPr (see Tables 8 & 18).	It is recommended that the environmental authorisation of the project be allowed.
AIR QUALITY IMPACT ASSESSMENT		
Based on the modelled outcome, the contribution of the proposed development to exceeding the legislative air quality standards, is overall considered to be low .	Recommendations and mitigation measures identified by the Air Quality Impact Assessment (Appendix P), have been incorporated into the EMPr (see Tables 8 & 9).	

7 IMPACT AND RISK ASSESSMENT

7.1 IMPACT AND RISK ASSESSMENT METHODOLOGY

The significance (quantification) of potential environmental impacts identified during the Basic Assessment have been determined using a ranking scale, based on the following (terminology has been taken from the Guideline Documentation on EIA Regulations, of the Department of Environmental Affairs and Tourism, April 1998):

Occurrence

- Probability of occurrence (how likely is it that the impact may occur?)
- Duration of occurrence (how long may it last?)

Severity

- Magnitude (severity) of impact (will the impact be of high, moderate or low severity?)
- Scale/extent of impact (will the impact affect the national, regional or local environment, or only that of the site?)

Each of these factors has been assessed for each potential impact using the ranking scales represented by Table 62.

Table 62: Ranking scale of the four factors considered to determine significance rating

PROBABILITY	DURATION
1 - very improbable (probably will not happen)	1 - of a very short duration (0–1 years)
2 - improbable (some possibility, but low likelihood)	2 - of a short duration (2–5 years)
3 - probable (distinct possibility)	3 - medium-term (5–15 years)
4 - highly probable (most likely)	4 - long term (> 15 years)
5 - definite (impact will occur regardless of any prevention measures)	5 - permanent
EXTENT	MAGNITUDE
1 - limited to the site	0 - small and will have no effect on the environment
2 - limited to the local area	2 - minor and will not result in an impact on processes
3 - limited to the region	4 - low and will cause a slight impact on processes
4 - will be national	6 - moderate and will result in processes continuing but in a modified way
5 - will be international	8 - high (processes are altered to the extent that they temporarily cease)
	10 - very high and results in complete destruction of patterns and permanent cessation of processes

The environmental significance of each potential impact is assessed using the following formula:

$$\text{Significance Points (SP)} = (\text{Magnitude} + \text{Duration} + \text{Extent}) \times \text{Probability}$$

The maximum value is 100 Significance Points (SP). Potential environmental impacts were rated as high, moderate or low significance on the following basis:

- < 30 significance points = **LOW** environmental significance.
- 31- 60 significance points = **MODERATE** environmental significance
- 60 significance points = **HIGH** environmental significance

7.2 ASSESSMENT OF IDENTIFIED POTENTIAL IMPACTS AND RISKS

7.2.1 PLANNING PHASE

Table 63: Potential impacts and risks identified during the planning phase of the proposed development

PLANNING & PRE-CONSTRUCTION PHASE												
ASPECT	AIR QUALITY & CLIMATE											
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY				
<div>Design capacity determination</div> <div>Site footprint & location</div>	<div>Degradation of air quality</div> <div><u>Direct impact:</u></div> <div><ul style="list-style-type: none">Primary pollutants associated with the with the proposed facility poses a risk to contribute to the overall degradation of air quality.</div> <div><u>Indirect impact:</u></div> <div><ul style="list-style-type: none">Although there will not be an increase in the overall GHG emissions, additional emission points lead to the redistribution of emissions, potentially enlarging the dispersion footprint albeit at a potentially lower concentration.</div> <div><u>Cumulative impact:</u></div> <div><ul style="list-style-type: none">Enlargement of the emissions footprint at a lower concentration.</div>		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED			
										Compliance with the minimum emissions standards set out by NEMAQA, the potential impact/risk can be effectively controlled.		
										DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE		
		PRE-MITIGATION	5	2	8	5	75		The proposed development will not increase the overall GHG emissions associated with the existing smelting operations.			
										DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED		
		POST-MITIGATION	5	1	0	5	30		Emissions of primary pollutants can be mitigated (controlled) in the following ways: <ul style="list-style-type: none">Implementation of adequate abatement and mitigation technology to improve the control efficiency of Air Pollution Control Equipment (APCE) and reduce the pollutants of concern;Development of a dust fallout monitoring and management plan;Frequent Inspections; andReporting and recording incidents related to air quality. Several recommendations resulted from the Air Quality Assessment (Appendix P). These recommendations are included in EMPr.			
									There are also several legislative requirements stipulated in the following regulations: <ul style="list-style-type: none">GN R. 283: National reporting regulations;GN R. 1210: National Ambient Air quality standards; andGN R. 897: National dust control regulations.			
ASPECT	TERRESTRIAL BIODIVERSITY											
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY				
<div>Site footprint & location</div>	<div>Degradation of terrestrial biodiversity</div> <div><u>Direct impact:</u></div> <div><ul style="list-style-type: none">An increased overall footprint of the proposed development.Positioning of the proposed facility in a high terrestrial sensitive area, poses a risk of altering the habitat of protected and endangered fauna and flora species.</div> <div><u>Indirect impact:</u></div> <div><ul style="list-style-type: none">Intrusion on the surrounding ecological support areas.</div>		D	E	M	P	S	Remedy	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED			
										Impacts can be remedied if all mitigation measures identified in the EMPr are implemented throughout the entire lifecycle of the proposed development.		
										DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE		
		PRE-MITIGATION	5	2	4	4	44		Following the assessment conducted by the appointed specialist, due to the site being previously disturbed, the proposed development poses an acceptably low impact.			
									However, should species of significant conservational concern be identified within the development footprint prior to construction, these species will be required to be removed and relocated if possible.			

	<ul style="list-style-type: none">Loss of protected and endangered fauna and flora species. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding ecological support and protected areas are affected and may lead to the degradation of the protected area’s ecology.	POST-MITIGATION	5	1	2	4	32		<p>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</p> <p>The identified impact/risk can be mitigated (controlled and or remedied) through:</p> <ul style="list-style-type: none">The implementation of a species search and rescue prior to the commencement of construction activities;Appointing a suitably qualified ECO prior to the commencement of any activities monitoring all vegetation clearance activities;Obtaining the required permits for the removal of protected species; andAwareness training of all contractors and permanent employees.
ASPECT	AQUATIC BIODIVERSITY								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Site footprint & location	<p><u>Disturbance to aquatic biodiversity</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Locating the proposed development within 500m of a wetland, poses a risk in altering the support regions into the wetland. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Alteration of wetland support zones poses the risk of alien invasive species the invade, leading to the deterioration of the nearby wetland system. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Alteration of aquatic ecology of direct affected watercourses as well as downstream watercourses.		D	E	M	P	S	Avoid	<p>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</p> <p>The proposed development is situated well outside the determined 32-meter buffer (as per Appendix J). The sensitivity of this wetland/natural drainage system, situated southwest of the proposed development, has been classified as “low” due to the ephemeral nature of the system, low sensitivity of the drainage line, and modified habitat integrity.</p>
		PRE-MITIGATION	5	2	4	2	22		<p>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</p> <p>By implementing the 32-meter buffer and management actions identified in the EMP, potential impacts on the aquatic biodiversity can be avoided.</p>
		POST-MITIGATION							<p>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</p> <p>The impact/risk to disturb the aquatic biodiversity can be avoided by implementing the following measures:</p> <ul style="list-style-type: none">Control through the implementation of storm water management and erosion control;Avoid impacts through adequately managing effluent and runoff;Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.
ASPECT	SOIL & AGRICULTURAL								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Site footprint & location	<p><u>Loss of agricultural land</u></p> <p><u>Direct impact:</u></p>		D	E	M	P	S	Remedy	<p>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</p> <p>During the site assessment (refer to Appendix F), portions of the preferred site have existing disturbances. The Grabow soil profile observed on site is no longer suitable for agricultural production as the original soil profile has been mixed and is no longer identifiable. The following three major observations were made:</p>

	<ul style="list-style-type: none"> Situating the proposed facility within areas identified as high sensitivity related to agricultural use may cause valuable land of agriculture and topsoil to be affected. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none"> Loss of arable land and fertile soil leads to the degradation of the overall agricultural potential for the surrounding community. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none"> Food scarcity and reduction in income generated from agricultural activities. 									<ul style="list-style-type: none"> The presence of a pedocutanic layer in the Palala soils is a clear textural contrast between the overlying neocarbonate layer. A pedocutanic horizon has a strong structure and is seen as a limitation to plant growth as well as the infiltration of stormwater, Soil depth for crop growth is limited within the project site as a result of the presence of the pedocutanic horizon as well as the presence of hard rock. Profiles varied from 400mm to 450mm, limiting the type of crop that can be grown within the site. The area is therefore more suited to grazing activities The permeability of the soils associated with the site was found to be restricted as a result of the Pedocutanic horizon, the presence of hard solid rock, as well as anthropogenic changes to the soi profiles through the construction of dirt roads. Soil permeability is identified as a limitation to agricultural productivity within the site. <p>As a result of the above limitation, the site is classified as having a low sensitivity to agricultural production.</p>
		PRE-MITIGATION	5	2	4	2	22			DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
										Due to the low agricultural potential, a “low” risk of the potential impacts on the current resource is expected.
		POST-MITIGATION	3	4	3	2	20			DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
										The potential impacts/risks can be further mitigated and or avoided by implementing the following measures:
										<ul style="list-style-type: none"> Control though soil conservation and management during the constructional and decommissioning phase of the proposed development; Avoid the loss of fertile soil by effectively implementing storm water management and erosion control throughout the entire lifecycle of the proposed development; Avoid contamination of soil resources through the development, implementation and review of incident management and emergency preparedness plans; and Remedy through effectively rehabilitating disturbed areas.
ASPECT	WATER RESOURCES									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING						MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Site footprint & location	Degradation of natural water resources									DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
	<u>Direct impact:</u>		D	E	M	P	S			Since there are no identified drainage lines situated directly on the preferred site, the risk associated with degradation of natural water resources can be affectively managed (see Appendix K).
	<ul style="list-style-type: none"> Locating the proposed development within proximity to a natural drainage line or wetland, poses the risk of associated activities increasing the overall sediment load into the water resource. 	PRE-MITIGATION	5	2	6	3	39			DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
	<u>Indirect impact:</u>									The effective implementation of a storm water management and erosion control plan will reduce the potential impact/risk to degrade the surface water quality of nearby natural drainage lines.
	<ul style="list-style-type: none"> An increased sediment load decreases the overall water quality of surface water resources. 	POST-MITIGATION	3	2	2	3	21	Control		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
	<u>Cumulative impact:</u>									The impact/risk to degrade the natural water resources can be managed (controlled) by implementing the following measures:
	<ul style="list-style-type: none"> Alteration of aquatic ecology of direct affected watercourses as well as downstream watercourses. Loss of unique biodiversity features. 									<ul style="list-style-type: none"> Control through the implementation of storm water management and erosion control; Avoid impacts through adequately managing effluent and runoff; Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;

										<ul style="list-style-type: none">Water conservation through monitoring water use and quality throughout the entire life cycle of the proposed development;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.
ASPECT	TOPOGRAPHY AND VISUAL									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Site footprint & location	<p>Visual disturbance on sensitive visual receptor</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Locating the proposed development within close proximity to sensitive receptors poses a risk of the overall sense of place to the surrounding community. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Potential increase of community unrest and complaints. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of production due to community strikes.		D	E	M	P	S	Remedy	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										By implementing an effective rehabilitation plan during decommissioning of the proposed development, visual disturbance on sensitive visual receptors can be remedies to such an extend that the potential impact/risk may be reversed.
		PRE-MITIGATION	5	2	4	3	33		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									Implementing the management measures identified in the EMPr will reduce the visual impact from moderate to low significance.	
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
									Visual disturbances on sensitive visual receptors can be managed (remedied) through the implementation of the following measures:	
								<ul style="list-style-type: none">Adherence with management measures identified in the EMPr; andImplementing an effective rehabilitation plan during decommissioning of the proposed project.		
ASPECT	NOISE									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Site footprint & location	<p>Noise generation</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Locating the proposed development within close proximity to sensitive receptors poses a risk of the overall sense of place to the surrounding community.Degradation of employees and community hearing health. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Potential increase of community unrest and complaints.Hearing loss of employees and community members. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of production due to community strikes.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										The risk assessment done by the appointed specialist (see Appendix L) revealed that the threshold value of 7.0dBA will not be exceeded during the day and/or night- time periods.
		PRE-MITIGATION	4	2	6	3	36		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									Continuous monitoring as per the recommendation of the specialist and monitoring programme specified in the EMPr, will allow for the potential impacts/risks to be suitably managed to a low significance.	
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
									Environmental noise levels can be managed (controlled) by ensuring the following:	
								<ul style="list-style-type: none">Implementation of the monitoring programme as specified in the EMPr; andEnsuring sufficient noise screening measures should any specific activity exceed the 85 dBA threshold.		
ASPECT	HERITAGE AND PALAEOLOGY									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Site footprint & location	Loss of heritage and cultural resources		D	E	M	P	S	< > 0 -	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	

	<p><u>Direct impact:</u></p> <ul style="list-style-type: none">Site selection near or within close proximity to sites of historical and cultural importance leading to the destruction of heritage resources or graves. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Loss of heritage and history for the future generation of the affected community. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Community unrest.Permanent loss of sites of historical and cultural significance.	PRE-MITIGATION	5	1	4	2	20		As per the Heritage Assessment (see Appendix H), no heritage sites of significance were identified to be located within the development footprint of the proposed development. The impacts/risks identified are expected to be low during all phases of the development.
		POST-MITIGATION	3	3	3	2	18		<p>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</p> <p>Any additional effects to subsurface heritage resources can be successfully mitigated by implementing a chance find procedure and monitoring of the study area prior to the commencement of construction activities.</p> <p>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</p> <p>Potential impacts/risk to heritage and cultural resources can be successfully <i>mitigated (avoided)</i> by implementing the following:</p> <ul style="list-style-type: none">Management actions identified in the EMPr; andDeveloping a chance find procedure during all phases of the proposed development.
ASPECT	HEALTH AND SAFETY								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
	<p><u>Health effect of pollutants on community/employees</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Different human behaviours deal with different situations and if there is not a simplified system of managing health and safety risk, situations resulting loss or injury of human life may be a result.Exposure of concentrations of PM_{2.5}, SO₂, NO₂, and CO over a period of time poses the risk of respiratory and cardiovascular diseases.Long term exposure to Chrome (VI) has been associated with lung cancer. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Increase in injury on duty or disabling injuries of employees.Exposure to potentially hazardous materials. This considers the environmental health determinants linked to the project and related activities. Noise, water, and air pollution (indoor and outdoor) as well as visual impacts will be considered in this biophysical category. It can also include exposure to heavy metals and hazardous chemical substances and other compounds, solvents or spills and releases from road traffic and exposure to mal odours. Pesticides, fertilizers, road dust, air pollution (indoor and outdoor, related to vehicles, cooking, heating, or other forms of combustion or incineration), landfill refuse or incineration ash, and any other project-related solvents, paints, oils or cleaning agents, by-products, or release events.Loss of productivity due to investigations into injuries or fatalities.Influx of local cases of respiratory and cardiovascular diseases in the area.Increase of cases of lung cancer. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of human life.		D	E	M	P	S		<p>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</p> <p>Appendix N has determined that no significant health risks are expected from the proposed development.</p> <p>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</p> <p>The risks of respiratory and cardiovascular diseases associated with the predetermined pollutants has been determined to be low.</p> <p>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</p> <p>Implementation of the recommendations made by the air quality specialist will avoid any expected health risks associated with the emissions pollutants.</p> <p>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</p> <p>Potential impacts/risk to the health and safety can be <i>avoided</i> by implementing the following:</p> <ul style="list-style-type: none">Recommendations made by the Air Quality Impact Assessment (Appendix P); andDevelop and implement the Health, Safety, Environment, and Quality (HSEQ) management Plan throughout the entire life cycle of the proposed development.
		PRE-MITIGATION	1	2	8	2	22		
		POST-MITIGATION	1	1	4	2	12	Avoid	
ASPECT	TRAFFIC MANAGEMENT								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Site footprint & location	Increased pressure on local roads/degradation of road infrastructure		D	E	M	P	S	U O C W	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED

	<u>Direct impact:</u> <ul style="list-style-type: none"> Access to and from the proposed development leads to the increased pressure on existing road infrastructure. <u>Indirect impact:</u> <ul style="list-style-type: none"> Increased pressure on existing road infrastructures and municipalities to maintain infrastructures. <u>Cumulative impact:</u> <ul style="list-style-type: none"> Degradation of public transport infrastructure. 							<p>As per Appendix M, it was concluded that due to the type and nature of the proposed ECF project, it is expected that there will be a manageable impact on vehicle traffic during all phases.</p> <p><i>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</i></p> <p>The intersection of Road R555 and Existing Smelter Access Road is an existing intersection which was constructed many years ago and is currently provides access to maintenance activities at the existing Lion Smelter only. Improvements from a road safety perspective is required.</p> <p><i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i></p> <p>Potential impacts/risk can be successfully managed (control) by implementing the following:</p> <ul style="list-style-type: none"> Management actions identified in the EMPr; and Implement the proposed improvements as per Appendix M.
		PRE-MITIGATION	1	2	4	4	28	
		POST-MITIGATION	4	2	3	2	18	

7.2.2 CONSTRUCTION PHASE

Table 64: Potential impacts and risks identified during the construction phase of the project

CONSTRUCTION PHASE												
ASPECT	AIR QUALITY & CLIMATE											
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY				
Site clearing: - Laydown area (temporary and permanent) - Offices and parking -Substation Removal of topsoil and stockpiling Material stockpiling Backfilling and levelling Importing of material to site Movement of construction plant and equipment Foundation excavation	<u>Degradation of air quality/Fugitive dust emissions</u>							Control	<i>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</i>			
	<u>Direct impact:</u> <ul style="list-style-type: none">Road construction, preparation of laydown areas and the construction of infrastructures involves the removal of rock and earth by grading or digging during construction.Vegetation is removed, grading and paving takes place using a range of road construction equipment. This often leads to the generation of fugitive dust comprising TSP, PM₁₀ and PM_{2.5} from the dirt roads.Removal of topsoil and stockpiling causes the generation of fugitive emissions.Dust plumes caused by wind and weather from material stockpiles releasing particles, PM₁₀ and PM_{2.5}.Movement of construction plant and equipment on unpaved road surfaces causes dust emissions.		D	E	M	P	S		Compliance with the minimum emissions standards set out by NEMAQA, the potential impact/risk can be effectively controlled.			
		PRE-MITIGATION	1	2	4	5	35		<i>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</i>			
		POST-MITIGATION							<i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i>			
	<u>Indirect impact:</u> <ul style="list-style-type: none">Continuous exposure to high levels of dust fallout may lead to unhealthy environment for employees and surrounding communities.		1	1	2	5	20		Fugitive dust generation can be mitigated (controlled) in the following ways: <ul style="list-style-type: none">Development of a dust fallout monitoring and management plan;Frequent Inspections; andReporting and recording incidents related to air quality.			
	<u>Cumulative impact:</u> <ul style="list-style-type: none">Continuous generation of fugitive and ambient dust generation during construction activities poses a high risk in the overall degradation of local air quality conditions posing a health risk to both the human and ecological surroundings.									Several recommendations resulted from the Air Quality Assessment (Appendix P). These recommendations are included in EMPr. There are also several legislative requirements stipulated in the following regulations: <ul style="list-style-type: none">GN R. 283: National reporting regulations;GN R. 1210: National Ambient Air quality standards; andGN R. 897: National dust control regulations.		
ASPECT	TERRESTRIAL BIODIVERSITY											

ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
<div>Site clearing: - Laydown area (temporary and permanent) - Offices and parking -Substation</div>	<u>Disturbance to terrestrial biodiversity</u>		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
	<u>Direct Impact:</u>								Impacts can be remedied if all mitigation measures identified in the EMPr are implemented throughout the entire lifecycle of the proposed development.
	<ul style="list-style-type: none">Clearing the area for construction of infrastructures leads to the loss of vegetation and habitats of macro and micro-organisms.The loss of vegetation also affects the surrounding Fauna and Flora.Increased human-animal conflict and accidental killings.	PRE-MITIGATION	3	2	6	5	55		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
	<u>Indirect Impact:</u>								Following the assessment conducted by the appointed specialist, due to the site being previously disturbed, the proposed development poses an acceptably low impact.
	<ul style="list-style-type: none">If cleared areas are not rehabilitated properly or storm water control features installed are not constructed according to a designed storm water management model, these areas are prone to erosion.	POST-MITIGATION	2	1	4	5	35		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
	<u>Cumulative Impact:</u>								The disturbance to terrestrial biodiversity can be mitigated (controlled and or remedied) in the following ways: <ul style="list-style-type: none">Control through implementing a search and rescue programme;Controlled through implementing a vegetation management plan;Remedy through concurrent rehabilitation;Avoid loss through conservation;Ensuring the development footprint is kept to an absolute minimum. Several recommendations resulted from the Terrestrial Biodiversity Compliance Statement (Appendix I). These recommendations are included in the EMPr and must be implemented throughout the entire life cycle of the proposed development.
<div>Site clearing</div> <div>Removal of topsoil and stockpiling</div> <div>Material Stockpiling</div> <div>Backfilling and levelling</div> <div>Importing of material to site</div>	<u>Influx of alien and invasive species</u>		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
	<u>Direct Impact:</u>								Alien and invasive species can be effectively managed when pre-construction mitigation measures are implemented. Prior to commencing with any construction activities, any existing species must be removed and controlled.
	<ul style="list-style-type: none">Site clearing for lay down areas and the ECF facility exposes the un-vegetated area to the influx of alien invasive vegetation causing irreversible damage to the native fauna and flora species and loss of habitats.	PRE-MITIGATION	3	3	6	4	48		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
	<u>Indirect Impact:</u>								Failing to implement an effective alien and invasive management plan throughout the entire life cycle of the proposed development may have a high impact on the overall degradation of supporting terrestrial habitat surrounding the proposed site.
	<ul style="list-style-type: none">Disturbed areas are likely to act as seed areas that will ultimately facilitate the invasion of nearby watercourses and riparian areas.Alien species generally out-compete indigenous species for water, light, space and nutrients as they are adaptable to changing conditions and are able to easily invade a wide range of ecological niches, posing an ecological threat as they alter habitat structure, lower biodiversity (both number and “quality” of species), change nutrient cycling and productivity, and modify food webs.	POST-MITIGATION	2	1	4	3	21		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
	<u>Cumulative Impact:</u>								The influx of alien and invasive species can be managed (controlled) in the following ways: <ul style="list-style-type: none">Implementation and review of the existing Lion Smelter’s alien and invasive specie management plan;Implementing effective control measures to prevent the spread of alien and invasive species; andImplementing the management actions identified in the EMPr.
<div>Temporary hazardous substance storage</div>	<u>Increased fire risk</u>		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
	<u>Direct Impact:</u>								By avoiding a incident related to fire by implementing the correct fire prevention measures, this risk can be completely avoided.
			3	1	8	2	24		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE

	<ul style="list-style-type: none">The improper storage of hazardous substances poses a risk of chemical fires. In the event of a chemical fire the impact to the surrounding environment is significant. Fires may lead to the loss of ecosystems, damage to properties and fatalities.Altered ecological regimes (fire), ecological processes, contamination of nearby sensitive (wetland) habitat. <p><u>Indirect Impact:</u></p> <ul style="list-style-type: none">Site clearing caused by the devastation of fires exposes un-vegetated area to the influx of alien invasive vegetation causing Irreversible damage to the native fauna and flora species and loss of habitats. <p><u>Cumulative Impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding ecological support and protected areas are affected and may lead to the degradation of the protected area’s ecology.	PRE-MITIGATION							In the unlikely event that a chemical fire does take place during the life of the proposed development, significant loss of terrestrial biodiversity may be experienced. However, with the identified management measures identified in the EMPr, this risk can be avoided.
		POST-MITIGATION	1	1	8	1		10	<p><i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i></p> <p>Fire risks associated to the temporary hazardous substance storage can be avoided in the following ways:</p> <ul style="list-style-type: none">Implementing and maintaining a hazardous substance management plan throughout the entire Lifecycle of the proposed development;Implementing and maintaining an emergency preparedness management plan;Ensuring that all staff handling hazardous substances are trained and aware of the risks associated with the hazardous substance stored or used on site;Always ensuring the availability of a trained fire fighter; andRegularly inspecting and testing fire prevention equipment.
ASPECT	AQUATIC BIODIVERSITY								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Vehicular activity on roads	<p><u>Sedimentation and siltation of watercourses</u></p> <p><u>Direct Impact:</u></p> <ul style="list-style-type: none">Constructing access roads through drainage lines may cause sedimentation and siltation of watercourses if not managed properly.Improper or ineffective storm water runoff management features poses a risk of contributing to the sedimentation and siltation of watercourses. <p><u>Indirect Impact:</u></p> <ul style="list-style-type: none">Storm water runoff of dirt roads and un-vegetated areas may cause sedimentation and siltation of nearby watercourses. <p><u>Cumulative Impact:</u></p> <ul style="list-style-type: none">Alteration of aquatic ecology of direct affected watercourses as well as downstream watercourses.Loss of unique biodiversity features.		D	E	M	P	S	Control	<p><i>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</i></p> <p>The proposed development is situated well outside the determined 32-meter buffer (as per Appendix J). The sensitivity of this wetland/natural drainage system, situated southwest of the proposed development, has been classified as “low” due to the ephemeral nature of the system, low sensitivity of the drainage line, and modified habitat integrity.</p>
		PRE-MITIGATION	4	2	4	3	30		<p><i>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</i></p> <p>By implementing the 32-meter buffer and management actions identified in the EMPr, potential impacts on the aquatic biodiversity can be avoided.</p>
									<p><i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i></p> <p>The impact/risk to disturb the aquatic biodiversity can be avoided by implementing the following measures:</p>
		POST-MITIGATION	4	1	2	3	21		<ul style="list-style-type: none">Control through the implementation of storm water management and erosion control;Avoid impacts through adequately managing effluent and runoff;Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.
ASPECT	SOIL & AGRICULTURAL								

ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
<div>Site clearing</div> <div>Removal of topsoil and stockpiling</div> <div>Backfilling and levelling</div> <div>Material stockpiling</div> <div>Foundation excavation</div>	<div>Degradation of soil resources</div> <div>Direct Impact:</div> <div><div>As part of the construction activities related to roads and earthworks associated to the ECF project, valuable topsoil's will be removed. Improper management of topsoil or fertile soil may cause the loss of flora micro-ecosystems and cause the degradation of soil quality.</div><div>Improper backfilling of topsoil during shaping activities may lead to further loss of valuable topsoil's.</div></div> <div>Indirect Impact:</div> <div><div>Degradation of soil quality risk difficulty in the re-establishment of vegetation during rehabilitation.</div><div>Loss of fertile soil will require costly import of fertile soils for rehabilitation, increasing the risk of importing non-indigenous seeds and establishing invasive vegetation competing with native vegetation.</div><div>Continuous exposure to hydrocarbon leaks poses a risk to the degradation of the surrounding soil resources.</div><div>Unvegetated areas are prone to erosion formation.</div></div> <div>Cumulative Impact:</div> <div><div>Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.</div><div>Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.</div><div>The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology.</div></div>		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
									During the site assessment (refer to Appendix F), portions of the preferred site have existing disturbances. The Grabow soil profile observed on site is no longer suitable for agricultural production as the original soil profile has been mixed and is no longer identifiable. The following three major observations were made:
									<div><div>The presence of a pedocutanic layer in the Palala soils is a clear textural contras between the overlying neocarbonate layer. A pedocutanic horizon has a strong structure and is seen as a limitation to plant growth as well as the infiltration of stormwater,</div><div>Soil depth for crop growth is limited within the project site as a result of the presence of the pedocutanic horizon as well as the presence of hard rock. Profiles varied from 400mm to 450mm, limiting the type of crop that can be grown within the site. The area is therefore more suited to grazing activities</div><div>The permeability of the soils associated with the site was found to be restricted as a result of the Pedocutanic horizon, the presence of hard solid rock, as well as anthropogenic changes to the soi profiles through the construction of dirt roads. Soil permeability is identified as a limitation to agricultural productivity within the site.</div></div> <div>As a result of the above limitation, the site is classified as having a low sensitivity to agricultural production.</div>
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									Due to the low agricultural potential, a “low” risk of the potential impacts on the current resource is expected.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
								The potential impacts/risks can be further mitigated and or avoided by implementing the following measures:	
								<div><div>Control though soil conservation and management during the constructional and decommissioning phase of the proposed development;</div><div>Avoid the loss of fertile soil by effectively implementing storm water management and erosion control throughout the entire lifecycle of the proposed development;</div><div>Avoid contamination of soil resources through the development, implementation and review of incident management and emergency preparedness plans; and</div><div>Remedy through effectively rehabilitating disturbed areas.</div></div>	
<div>Movement of construction plant and equipment</div> <div>Temporary service bay</div> <div>Concrete work</div>	<div>Hydrocarbon/soil contamination</div> <div>Direct impact:</div> <div><div>The continuous spills of hydrocarbons and hazardous substances poses a environmental risk to the surrounding soil quality. The degradation of the soil quality will cause the loss of habitat or healthy environment for micro ecosystems.</div><div>Continuous leaking or lack of maintenance poses a risk to contaminating the surrounding soils and degrading the soil quality. This will affect the micro-ecosystems in a negative manner.</div></div> <div>Indirect impact:</div> <div><div>Degradation of soil quality risk difficulty in the re-establishment of vegetation during rehabilitation.</div></div>		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
									By avoiding incidents related to spilling of hydrocarbons and concrete during the construction phase, the potential of contamination can be effectively managed.
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									The implementation of management actions identified in the EMPr will avoid the loss of fertile soil due to contamination related to incidents.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									The potential impacts/risks can be further mitigated and or avoided by implementing the following measures:
								<div><div>Avoid contamination of soil resources through the development, implementation and review of incident management and emergency preparedness plans; and</div><div>Remedy through effectively rehabilitating disturbed areas.</div></div>	

	<ul style="list-style-type: none">Loss of fertile soil will require costly import of fertile soils for rehabilitation, increasing the risk of importing non-indigenous seeds and establishing invasive vegetation competing with native vegetation.Continuous exposure to hydrocarbon leaks poses a risk to the degradation of the surrounding soil resources.Unvegetated areas are prone to erosion formation. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology.									
ASPECT	WATER RESOURCES									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Site clearing Removal of topsoil and stockpiling Material stockpiling Backfilling and levelling	<u>Erosion and sedimentation/uncontrolled storm water</u> <u>Direct Impact:</u> <ul style="list-style-type: none">Un-vegetated areas exposed to weathering for an extended period will lead to erosion. Erosion prone areas has a high risk of losing fertile soil caused by flash floods. The loss of fertile soil will result in the loss of important micro ecosystems. <u>Indirect Impact:</u> <ul style="list-style-type: none">Improper management of storm water may lead to erosion along the access routes and construction sites. This may lead to the loss of fertile soil and in its turn effect the micro-ecosystems of the surrounding environment. <u>Cumulative Impact:</u> <ul style="list-style-type: none">Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										Since there are no identified drainage lines situated directly on the preferred site, the risk associated with degradation of natural water resources can be affectively managed (see Appendix K).
		PRE-MITIGATION	1	1	6	4	32		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
										The effective implementation of a storm water management and erosion control plan will reduce the potential impact/risk to degrade the surface water quality of nearby natural drainage lines.
										DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
										The impact/risk to degrade the natural water resources can be managed (controlled) by implementing the following measures: <ul style="list-style-type: none">Control through the implementation of storm water management and erosion control;Avoid impacts through adequately managing effluent and runoff;Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;Water conservation through monitoring water use and quality throughout the entire life cycle of the proposed development;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.
Site clearing Removal of topsoil and stockpiling Material stockpiling Backfilling and levelling Concrete work	<u>Water resource contamination</u> <u>Direct Impact:</u> <ul style="list-style-type: none">Construction activities within close proximity of drainage lines may cause sedimentation and siltation of watercourses if not managed properly.Improper or ineffective storm water runoff management features poses a risk of contributing to the sedimentation and siltation of watercourses.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										Since there are no identified drainage lines situated directly on the preferred site, the risk associated with degradation of natural water resources can be affectively managed (see Appendix K).
		PRE-MITIGATION	1	1	6	4	32		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
										The effective implementation of a storm water management and erosion control plan will reduce the potential impact/risk to degrade the surface water quality of nearby natural drainage lines.
			1	1	4	3	18		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	

Importing of material on site	<ul style="list-style-type: none"> The use of heavy machinery within the construction footprint will lead to soil compaction, which increases the runoff of water over the topsoil and the reduction in stormwater infiltration into the soil profile, therefore increasing the likelihood of erosion gully formation and the deposition of sediment within associated watercourses. <p><u>Indirect Impact:</u></p> <ul style="list-style-type: none"> Various impacts have been attributed to sedimentation of aquatic ecosystems, including reduction of light penetration (resulting in reduction in photosynthesis and subsequently, productivity), alteration of foraging dynamics of both carnivores and herbivores, impacting on predator and prey relationships, clogging of gills, rendering the watercourse unfit for various aquatic organisms, truncating and shifting the trophic pyramid, absorption of nutrients onto suspended particles, rendering them unavailable and thereby reducing the productivity of the watercourse, and filling of interstitial spaces, thereby destroying habitat for macro invertebrates and vertebrates owing to sedimentation, etc. <p><u>Cumulative Impact:</u></p> <ul style="list-style-type: none"> Alteration of aquatic ecology of direct affected watercourses as well as downstream watercourses. Loss of unique biodiversity features. The proposed activity is expected to impact on national protected areas targets as well as provincial freshwater conservation targets, both of which are expected to be cumulative if the impact is to be considered with other regional impacts that have or are expected to have on such areas. 	POST-MITIGATION							The impact/risk to degrade the natural water resources can be managed (controlled) by implementing the following measures:
Movement of construction plant and equipment	<p><u>Hydrocarbon contamination</u></p> <p><u>Direct Impact:</u></p> <ul style="list-style-type: none"> Throughout the construction phase construction equipment are used. This poses a risk of hydrocarbon spills if equipment is not maintained. Depending on the size of the spill the level of contamination may vary from insignificant to significant and may affect the surrounding water quality (both surface and sub-surface) as well as the soil quality. 		D	E	M	P	S		DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
Temporary service bay		PRE-MITIGATION	1	2	4	4	28		Since there are no identified drainage lines situated directly on the preferred site, the risk associated with degradation of natural water resources can be affectively managed (see Appendix K).
			1	1	2	4	16		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									The effective implementation of a storm water management and erosion control plan will reduce the potential impact/risk to degrade the surface water quality of nearby natural drainage lines.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED

	<ul style="list-style-type: none">Storm water from dirty areas such as the temporary service bays etc. poses a risk to hydrocarbon containing effluent to contaminate water resources. Depending on the level of contamination the risk may vary from insignificant to significant and may affect the surrounding water quality (both surface and sub-surface) as well as the soil quality. <p><u>Indirect Impact:</u></p> <ul style="list-style-type: none">An increase in pollutants will lead to changes in the water quality of the wetlands and watercourses, affecting their ability to act as ecological corridors within the development landscape. <p><u>Cumulative Impact:</u></p> <ul style="list-style-type: none">The linked nature of the wetland systems to downstream water resources will result in pollutants being carried downstream from the construction site having consequences on further downstream users.	POST-MITIGATION							The impact/risk to degrade the natural water resources can be managed (controlled) by implementing the following measures:	<ul style="list-style-type: none">Control through the implementation of storm water management and erosion control;Avoid impacts through adequately managing effluent and runoff;Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;Water conservation through monitoring water use and quality throughout the entire life cycle of the proposed development;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.
ASPECT	TOPOGRAPHY AND VISUAL									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Site clearing- Laydown area (temporary and permanent) -Offices and parking -Substation Removal of topsoil and stockpiling Backfilling and levelling	Topography and visual alteration <u>Direct Impact:</u> <ul style="list-style-type: none">Vegetation stripping during site clearing and topsoil removal activities will alter the visual environment and topography.Construction of infrastructures and facilities will alter the topography and visual environment.Visual impact of construction activities on sensitive visual receptors near the proposed ECF project.Visual impact on observers and residents at homesteads within a 2 - 3km radius of the proposed ECF project.Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the mine proposed ECF project.Potential visual impact of operational, safety and security lighting of the facility at night on observers near the proposed ECF project.Visual impact of the ancillary infrastructure during the operational phase on observers near the structures. <u>Indirect Impact:</u> <ul style="list-style-type: none">An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. <p><u>Cumulative Impact:</u></p> <ul style="list-style-type: none">Potential permanent scarring of the landscape if no rehabilitation is undertaken.The potential cumulative visual impact of the mining activities on the visual quality of the landscape.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										By implementing an effective rehabilitation plan during decommissioning of the proposed development, visual disturbance on sensitive visual receptors can be remedies to such an extend that the potential impact/risk may be reversed.
		PRE-MITIGATION	4	2	6	3	36		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									Implementing the management measures identified in the EMPr will reduce the visual impact from moderate to low significance.	
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
		POST-MITIGATION	4	2	4	2	20		Visual disturbances on sensitive visual receptors can be managed (remedied) through the implementation of the following measures:	<ul style="list-style-type: none">Adherence with management measures identified in the EMPr; andImplementing an effective rehabilitation plan during decommissioning of the proposed project.
ASPECT	NOISE									

ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY			
Site clearing -Laydown area (temporary and permanent) -Offices and parking -Substation Removal of topsoil and stockpiling Foundation excavation Backfilling and levelling Movement of construction plant and equipment	Noise generation <u>Direct impact:</u> <ul style="list-style-type: none">Increased noise levels at potentially sensitive receptors exceeding criteria of the Noise Control Regulations legislation (NCR) and SANS guidelines.The use of construction equipment during site clearing and topsoil stripping may cause noise during the construction phase. If equipment is not maintained and serviced consistently high levels of noise may result throughout the construction and operational phase. <u>Indirect impact:</u> <ul style="list-style-type: none">Changing ambient sound levels could increase annoyance and potential complaints. <u>Cumulative impact:</u> <ul style="list-style-type: none">Changing ambient sound levels could change the acceptable land use capability.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED		
											The risk assessment done by the appointed specialist (see Appendix L) revealed that the threshold value of 7.0dBA will not be exceeded during the day and/or night- time periods.
		PRE-MITIGATION	2	2	4	3	24		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE		
										Continuous monitoring as per the recommendation of the specialist and monitoring programme specified in the EMPr, will allow for the potential impacts/risks to be suitably managed to a low significance.	
										DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
										Environmental noise levels can be managed (controlled) by ensuring the following: <ul style="list-style-type: none">Implementation of the monitoring programme as specified in the EMPr; andEnsuring sufficient noise screening measures should any specific activity exceed the 85 dBA threshold.	
POST-MITIGATION	2	2	4	2	16						

ASPECT	HERITAGE AND PALAEOLOGY										
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY			
Site clearing: - Laydown area (temporary and permanent) -Offices and parking -Substation Foundation excavation	Loss of heritage and cultural resources <u>Direct impact:</u> <ul style="list-style-type: none">Construction activities may potentially disturb sites of historical and cultural sites or graves. <u>Indirect impact:</u> <ul style="list-style-type: none">Loss of heritage and history for the future generation of the affected community. <u>Cumulative impact:</u> <ul style="list-style-type: none">Although surface sites can be avoided or mitigated, there is a chance that completely buried sites would still be impacted on, but this cannot be quantified.		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED		
											As per the Heritage Assessment (see Appendix H), no heritage sites of significance were identified to be located within the development footprint of the proposed development. The impacts/risks identified are expected to be low during all phases of the development.
		PRE-MITIGATION	5	2	8	3	45		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE		
										Any additional effects to subsurface heritage resources can be successfully mitigated by implementing a chance find procedure and monitoring of the study area prior to the commencement of construction activities.	
										DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
										Potential impacts/risk to heritage and cultural resources can be successfully mitigated (avoided) by implementing the following: <ul style="list-style-type: none">Management actions identified in the EMPr; andDeveloping a chance find procedure during all phases of the proposed development.	
POST-MITIGATION	5	1	4	3	30						

ASPECT	HEALTH AND SAFETY										
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY			
Employment of workers All construction activities	Health effect of pollutants on community/employees <u>Direct impact:</u> <ul style="list-style-type: none">Different human behaviours deal with different situations and if there is not a simplified system of managing health and safety risk, situations resulting loss or injury of human life may be a result.		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED		
											Appendix N has determined that no significant health risks are expected from the proposed development.
		PRE-MITIGATION	1	2	8	2	22		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE		
										The risks of respiratory and cardiovascular diseases associated with the predetermined pollutants has been determined to be low.	
										DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	

	<ul style="list-style-type: none"> Exposure of concentrations of PM_{2.5}, SO₂, NO₂, and CO over a period of time poses the risk of respiratory and cardiovascular diseases. Long term exposure to Chrome (VI) has been associated with lung cancer. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none"> Increase in injury on duty or disabling injuries of employees. Exposure to potentially hazardous materials. This considers the environmental health determinants linked to the project and related activities. Noise, water, and air pollution (indoor and outdoor) as well as visual impacts will be considered in this biophysical category. It can also include exposure to heavy metals and hazardous chemical substances and other compounds, solvents or spills and releases from road traffic and exposure to mal odours. Pesticides, fertilizers, road dust, air pollution (indoor and outdoor, related to vehicles, cooking, heating, or other forms of combustion or incineration), landfill refuse or incineration ash, and any other project-related solvents, paints, oils or cleaning agents, by-products, or release events. Loss of productivity due to investigations into injuries or fatalities. Influx of local cases of respiratory and cardiovascular diseases in the area. Increase of cases of lung cancer. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none"> Loss of human life. 	POST-MITIGATION	1	1	4	2	12		Potential impacts/risk to the health and safety can be avoided by implementing the following:
ASPECT	SOCIO-ECONOMIC								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Employment of workers and procurement of construction materials	<p><u>Socio-economic intrusions/Job opportunities and economic impacts/Population change/Sense of place/Community safety risks/Resource efficiency and community health</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none"> Possible negative socio-economic intrusions. Impact on localised individuals and groups in terms of employment and local procurement opportunities. Possible increase in criminal activities due to people movement in the area during construction phase. Resource efficiency is improved and optimised Health related impacts. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none"> The increasing population will put pressure on the local municipality to provide services such as sewage, drinking water, waste management, electricity etc. Conflicting cultural and spiritual believes and standards. Limited opportunities for local participation in labour supply during the construction phase of the project Limited opportunities for local procurement during construction and operation. 		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	1	2	8	4	44		The positive and negative impacts associated to the socio-economic impacts/risks can be managed. By effectively implementing the management measures identified in the EMP, the economic expectation of the surrounding communities can be controlled.
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
		POST-MITIGATION	1	1	4	4	24		With any new development there is a positive and negative impact on the socio-economic environment. During the life cycle of the proposed development a number of impact/risk is anticipated. Once the proposed development has been decommissioned the first obvious impact/risk is the short to medium term loss of income of employees, most likely locally employed. However, this risk can be managed by equipping communities with skills and abilities to adapt in preparation for decommissioning adding to the positive impacts the proposed development may have.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									The positive and negative impacts associated to the socio-economic impacts/risks can be managed (controlled) through the effective planning and management of the following:

	<ul style="list-style-type: none">Possible lack of available skills due to implementation of new international technology resulting in continued outsourcing of skills during construction and operational phases.Possible social dissatisfaction with regards to no or limited job opportunities and local procurement associated with the proposed ECF.Unfulfilled community expectations in terms of employment creation could result in social conflictPossible inflow of jobseekers.Construction activities could change the nature of the local area with increased traffic, influx of people, and presence of machinery and activities in the area.Movement of people in the area can increase criminal activity or opportunities for criminals. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Poor service delivery of municipal infrastructures.Community unrest.Job creation for local and district communities.Local economic development.Reduced access to livelihood resources.Change in sense of place.							<ul style="list-style-type: none">Control through pre-construction planning and development of workers code of conduct, employment procurement policies and a skills development policy;Ongoing open communication and expectation management of the local communities;Management of social-economic intrusions;Control through the management of job opportunities and skills development throughout the life cycle of the proposed development;Management of population changes; andManagement of community safety.		
ASPECT	TRAFFIC MANAGEMENT									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Movement of construction plant and equipment Installation of PBC & CGC	<p><u>Increased pressure on local roads/degradation of road infrastructure</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Influx of construction vehicles puts pressure on the public transport infrastructures. During the construction phase of the proposed activity an increase in vehicle movement in the area will be expected. This poses a potential increase in vehicle, pedestrian, and livestock accidents. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Increased pressure on existing road infrastructures and municipalities to maintain infrastructures. <p><u>Cumulative impact:</u></p> <p>Degradation of public transport infrastructure.</p>		D	E	M	P	S	Control	<i>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</i>	
										As per Appendix M, it was concluded that due to the type and nature of the proposed ECF project, it is expected that there will be a manageable impact on vehicle traffic during all phases.
										<i>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</i>
										The intersection of Road R555 and Existing Smelter Access Road is an existing intersection which was constructed many years ago and is currently provides access to maintenance activities at the existing Lion Smelter only. Improvements from a road safety perspective is required.
										<i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i>
								Potential impacts/risk can be successfully managed (control) by implementing the following:		
								<ul style="list-style-type: none">Management actions identified in the EMP; and Implement the proposed improvements as per Appendix M.		
ASPECT	WASTE MANAGEMENT									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Temporary office & sanitation Construction waste management	<p><u>Waste generation/Increased pressure on municipal service delivery/Littering and illegal dumping</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Littering throughout the construction and operational phase poses the risk of the visual environment to be affected negatively. The storing of waste onsite for an extended time may cause the formation of leachate that will affect the soil and water quality of the surrounding environment in a negative way.		D	E	M	P	S	Avoid	<i>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</i>	
										Implementation of the national waste management hierarchy (prevention, re-use, recycling, recovery and lastly disposal) will managed the identified protentional waste related impacts/risk associated with the proposed development.
										<i>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</i>
										Implementation and aligning management actions with the existing Lion operational Waste Management Plan reduces the significant effect of waste on the environment.
										<i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i>

	<ul style="list-style-type: none">An increase in waste generation with disposal as the management measure increases the current strain on the municipal infrastructures.Accidental spills or incorrect disposal of effluent from the chemical toilets used by the construction employees poses the risk of contaminating the surrounding natural environment. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Exposure of leachate to the natural environment poses a health risk to the surrounding fauna and flora habitats as well as human health.Due to the lack of capacity within the municipal landfill, the risk of illegally dumping general waste arises. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.	POST-MITIGATION						The impacts/risks associated with waste generation due to the proposed development can be managed (avoided and or controlled) through the implementation of the following measures: <ul style="list-style-type: none">Avoid potential impact/risk through effectively implementing the existing Waste Management Plan and monitoring programme;Avoid incident related to waste management activities by developing.Implementing, and maintaining incident management and emergency preparedness plan; andControl waste generation through record keeping.	
Temporary service bay	<u>Wastewater effluent</u> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Improper management of effluent from the construction site related to the ECF project leads to the contamination of the surrounding natural environment. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Contaminated effluent causes the degradation of soil and surface water quality.An increase in pollutants will lead to changes in the water quality of the wetlands and watercourses, affecting their ability to act as ecological corridors within the development landscape. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">The linked nature of the wetland systems to downstream water resources will result in pollutants being carried downstream from the construction site having consequences on further downstream users.		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
									Implementation of the national waste management hierarchy (prevention, re-use, recycling, recovery and lastly disposal) will managed the identified protentional waste related impacts/risk associated with the proposed development.
		PRE-MITIGATION	1	2	4	3	21		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									Implementation and aligning management actions with the existing Lion operational Waste Management Plan reduces the significant effect of waste on the environment.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
		POST-MITIGATION	1	1	2	3	12		The impacts/risks associated with waste generation due to the proposed development can be managed (avoided and or controlled) through the implementation of the following measures: <ul style="list-style-type: none">Avoid potential impact/risk through effectively implementing the existing Waste Management Plan and monitoring programme;Avoid incident related to waste management activities by developing.Implementing, and maintaining incident management and emergency preparedness plan; andControl waste generation through record keeping.

7.2.3 OPERATIONAL PHASE

Table 65: Potential impacts and risk identified during the operational phase of the proposed development

OPERATIONAL PHASE												
ASPECT	AIR QUALITY & CLIMATE											
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY				
<div>Operation of PBU & CGC</div> <div>Operation of main substation & back-up generator</div> <div>Site offices, ablution facilities & kitchen</div>	<div><u>Degradation of air quality</u></div> <div><u>Direct impact:</u></div> <div><ul style="list-style-type: none">Primary pollutants associated with the with the proposed facility poses a risk to contribute to the overall degradation of air quality.</div> <div><u>Indirect impact:</u></div> <div><ul style="list-style-type: none">Although there will not be an increase in the overall GHG emissions, additional emission points lead to the redistribution of emissions, potentially enlarging the dispersion footprint albeit at a potentially lower concentration.</div> <div><u>Cumulative impact:</u></div> <div><ul style="list-style-type: none">Enlargement of the emissions footprint at a lower concentration.</div>		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED			
										Compliance with the minimum emissions standards set out by NEMAQA, the potential impact/risk can be effectively controlled.		
		PRE-MITIGATION	5	2	8	5	75		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE			
									The proposed development will not increase the overall GHG emissions associated with the existing smelting operations.			
		POST-MITIGATION	5	1	0	5	30		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED			
								Fugitive dust generation can be controlled in the following ways: (1) Development of a dust fallout monitoring and management plan; (2) Frequent Inspections; and (3) Reporting and recording incidents related to air quality. Several recommendations resulted from the Air Quality Assessment (Appendix P). These recommendations are included in EMPr. There are also several legislative requirements stipulated in the following regulations: <ul style="list-style-type: none">GN R. 283: National reporting regulations;GN R. 1210: National Ambient Air quality standards; andGN R. 897: National dust control regulations.				
ASPECT	TERRESTRIAL BIODIVERSITY											
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY				
<div>Access control & security fencing</div>	<div><u>Limiting faunal movement</u></div> <div><u>Direct impact:</u></div> <div><ul style="list-style-type: none">Fencing of the proposed ECF project will alter the existing faunal movement patterns.</div> <div><u>Indirect impact:</u></div> <div><ul style="list-style-type: none">Alteration to the existing faunal patterns associated with for example breeding, nesting, and grazing or hunting.</div> <div><u>Cumulative impact:</u></div> <div><ul style="list-style-type: none">Alteration of faunal movement of surrounding areas, i.e. additional predators within nearby ecological support areas, pressure on the carrying capacity of the surrounding areas etc.</div>		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED			
										Impacts can be remedied if all mitigation measures identified in the EMPr are implemented throughout the entire lifecycle of the proposed development.		
		PRE-MITIGATION	4	1	4	4	36		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE			
									Following the assessment conducted by the appointed specialist, due to the site being previously disturbed, the proposed development poses an acceptably low impact.			
		POST-MITIGATION	4	1	2	3	21		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED			
								The disturbance to terrestrial biodiversity can be mitigated (controlled and or remedied) in the following ways: <ul style="list-style-type: none">Control through implementing a search and rescue programme;Controlled through implementing a vegetation management plan;Remedy through concurrent rehabilitation;Avoid loss through conservation;Ensuring the development footprint is kept to an absolute minimum.				

								Several recommendations resulted from the Terrestrial Biodiversity Compliance Statement (Appendix I). These recommendations are included in the EMPr and must be implemented throughout the entire life cycle of the proposed development.		
Access control & security fencing Hazardous substance storage & Nitrogen bulk storage	<p><u>Increased risk for chemical/field fire</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Accidental veldt fires spreading due to lack of fire breaks.Loss of human life.The improper storage of hazardous substances poses a risk of chemical fires. In the event of a chemical fire the impact to the surrounding environment is significant. Fires may lead to the loss of ecosystems, damage to properties and fatalities.Altered ecological regimes (fire), ecological processes, contamination of nearby sensitive (wetland) habitat. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and animal life due to uncontrollable veldt fires spreading past the controlled area of the ECF facility due to the lack of fire breaks.Damage infrastructure and the power generation facility.Site clearing caused by the devastation of fires exposes un-vegetated area to the influx of alien invasive vegetation causing Irreversible damage to the native fauna and flora species and loss of habitats. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.Financial strain on the operations due to remediation actions required and infrastructure repairs.		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										By avoiding a incident related to fire by implementing the correct fire prevention measures, this risk can be completely avoided.
		PRE-MITIGATION	3	2	8	3	45			DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
										In the unlikely event that a chemical fire does take place during the life of the proposed development, significant loss of terrestrial biodiversity may be experienced. However, with the identified management measures identified in the EMPr, this risk can be avoided.
										DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
								Fire risks associated to the temporary hazardous substance storage can be avoided in the following ways:		
								<ul style="list-style-type: none">Implementing and maintaining a hazardous substance management plan throughout the entire Lifecycle of the proposed development;Implementing and maintaining an emergency preparedness management plan;Ensuring that all staff handling hazardous substances are trained and aware of the risks associated with the hazardous substance stored or used on site;Always ensuring the availability of a trained fire fighter; andRegularly inspecting and testing fire prevention equipment.		
ASPECT	AQUATIC BIODIVERSITY									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Placement of topsoil & revegetation Rehabilitation of disturbed areas Storm water management	<p><u>Sedimentation and siltation of watercourses</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Placement of topsoil nearby natural drainage lines poses the risk of sedimentation and siltation to watercourses. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Various impacts have been attributed to sedimentation of aquatic ecosystems, including reduction of light penetration (resulting in reduction in photosynthesis and subsequently, productivity), alteration of foraging dynamics of both carnivores and herbivores, impacting on predator and prey relationships, clogging of gills, rendering the watercourse unfit for various aquatic organisms, truncating and shifting the trophic pyramid, absorption of nutrients onto suspended particles, rendering them unavailable and thereby reducing the productivity of the watercourse, and filling of interstitial spaces,		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										The proposed development is situated well outside the determined 32-meter buffer (as per Appendix J). The sensitivity of this wetland/natural drainage system, situated southwest of the proposed development, has been classified as “low” due to the ephemeral nature of the system, low sensitivity of the drainage line, and modified habitat integrity.
		PRE-MITIGATION	2	2	6	4	40			DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
										By implementing the 32-meter buffer and management actions identified in the EMPr, potential impacts on the aquatic biodiversity can be avoided.
										DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
								The impact/risk to disturb the aquatic biodiversity can be avoided by implementing the following measures:		
								<ul style="list-style-type: none">Control through the implementation of storm water management and erosion control;Avoid impacts through adequately managing effluent and runoff;		

	<p>thereby destroying habitat for macro invertebrates and vertebrates owing to sedimentation, etc.</p> <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Alteration of aquatic ecology of direct affected watercourses as well as downstream watercourses.Loss of unique biodiversity features.The proposed activity is expected to impact on national protected areas targets as well as provincial freshwater conservation targets, both of which are expected to be cumulative if the impact is to be considered with other regional impacts that have or are expected to have on such areas.							<ul style="list-style-type: none">Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.		
ASPECT	SOIL & AGRICULTURAL									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
<p>Operation of main substation & back-up generator</p> <p>Hazardous substance storage & No bulk storage</p>	<p>Hydrocarbon/soil contamination</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Throughout the operational phase hazardous substances are used. This poses a risk of hydrocarbon spills if equipment is not maintained. Depending on the size of the spill the level of contamination may vary from insignificant to significant and may affect the surrounding water quality (both surface and sub-surface) as well as the soil quality.Storm water from dirty areas such as the stores, back-up generator and the PBC & CGC facility, poses a risk to hydrocarbon containing effluent to contaminate water resources. Depending on the level of contamination the risk may vary from insignificant to significant and may affect the surrounding water quality (both surface and sub-surface) as well as the soil quality. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Degradation of soil quality risk difficulty in the re-establishment of vegetation during rehabilitation.Loss of fertile soil will require costly import of fertile soils for rehabilitation, increasing the risk of importing non-indigenous seeds and establishing invasive vegetation competing with native vegetation.Continuous exposure to hydrocarbon leaks poses a risk to the degradation of the surrounding soil resources.Unvegetated areas are prone to erosion formation. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology.		D	E	M	P	S	Avoid	<i>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</i>	
									By avoiding incidents related to spilling of hydrocarbons and concrete during the construction phase, the potential of contamination can be effectively managed.	
		PRE-MITIGATION	1	1	2	4	16		<i>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</i>	
									The implementation of management actions identified in the EMPr will avoid the loss of fertile soil due to contamination related to incidents.	
									<i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i>	
									The potential impacts/risks can be further mitigated and or avoided by implementing the following measures:	
								<ul style="list-style-type: none">Avoid the loss of fertile soil by effectively implementing storm water management and erosion control throughout the entire lifecycle of the proposed development;Avoid contamination of soil resources through the development, implementation and review of incident management and emergency preparedness plans; andRemedy through effectively rehabilitating disturbed areas.		
ASPECT	WATER RESOURCES									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Operation of PBU & CGC	Water usage/Contamination and degradation of water resources		D	E	M	P	S	< > o -	<i>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</i>	

<div>Water storage and Domestic use</div> <div>Storm water management</div>	<div><u>Direct Impact:</u></div> <div><ul style="list-style-type: none">Improper or ineffective storm water runoff management features poses a risk of contributing to the sedimentation and siltation of watercourses.Deposition of materials foreign to the natural environment resulting from contaminated effluent poses a risk in degrading the surface water quality resource.Wastage of water due to poor water use management activities.</div> <div><u>Indirect Impact:</u></div> <div><ul style="list-style-type: none">An increase in pollutants will lead to changes in the water quality of the wetlands and watercourses, affecting their ability to act as ecological corridors within the development landscape.Improper management of storm water may lead to erosion along the access routes and construction sites. This may lead to the loss of fertile soil and in its turn effect the micro-ecosystems of the surrounding environment.</div> <div><u>Cumulative Impact:</u></div> <div><ul style="list-style-type: none">Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology.</div>								<div>Since there are no identified drainage lines situated directly on the preferred site, the risk associated with degradation of natural water resources can be affectively managed (see Appendix K).</div> <div>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</div> <div>The effective implementation of a storm water management and erosion control plan will reduce the potential impact/risk to degrade the surface water quality of nearby natural drainage lines.</div> <div>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</div> <div>The impact/risk to degrade the natural water resources can be managed (controlled) by implementing the following measures:</div> <div><ul style="list-style-type: none">Control through the implementation of storm water management and erosion control;Avoid impacts through adequately managing effluent and runoff;Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;Water conservation through monitoring water use and quality throughout the entire life cycle of the proposed development;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.</div>	
		PRE-MITIGATION	4	2	6	4	48			
		POST-MITIGATION	4	1	2	3	21			
ASPECT	TOPOGRAPHY AND VISUAL									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
<div>All operational activities</div>	<div><u>Visual disturbance on sensitive visual receptors/Lighting impacts</u></div> <div><u>Direct impact:</u></div> <div><ul style="list-style-type: none">Visual impact on observers travelling along the R555 main road within a 0.5km radius of the ECF structures.Visual impact on observers within a 0.5 – 1.5km radius of the ECF structures.Lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions and which are visible over long distances.Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the number of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. It is possible that the ECF may contribute to the effect of sky glow within the region.</div> <div><u>Indirect impact:</u></div> <div><ul style="list-style-type: none">An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.</div> <div><u>Cumulative impact:</u></div>		D	E	M	P	S	<div>Control</div>	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
		PRE-MITIGATION	4	2	6	3	36		By implementing an effective rehabilitation plan during decommissioning of the proposed development, visual disturbance on sensitive visual receptors can be remedies to such an extend that the potential impact/risk may be reversed.	
		POST-MITIGATION	4	2	4	2	20		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									Implementing the management measures identified in the EMPr will reduce the visual impact from moderate to low significance.	
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
Visual disturbances on sensitive visual receptors can be managed (remedied) through the implementation of the following measures:										
<ul style="list-style-type: none">Adherence with management measures identified in the EMPr; andImplementing an effective rehabilitation plan during decommissioning of the proposed project.										

	<ul style="list-style-type: none"> Potential permanent scarring of the landscape if no rehabilitation is undertaken. The potential cumulative visual impact of the mining activities on the visual quality of the landscape. 								
ASPECT	NOISE								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Operation of PBU & CGC Operation of main substation & back-up generator	Noise generation <u>Direct impact:</u> <ul style="list-style-type: none"> Increased noise levels at potentially sensitive receptors exceeding criteria of the Noise Control Regulations legislation (NCR) and SANS guidelines. The operation of the PBU and CGC as well as the back-up generators will result in the generation of high noise levels. Noise generation as a result of the emergency release valve. <u>Indirect impact:</u> <ul style="list-style-type: none"> Changing ambient sound levels could increase annoyance and potential complaints. <u>Cumulative impact:</u> <ul style="list-style-type: none"> Changing ambient sound levels could change the acceptable land use capability. 		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	4	2	6	3	36		The risk assessment done by the appointed specialist (see Appendix L) revealed that the threshold value of 7.0dBA will not be exceeded during the day and/or night- time periods.
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									Continuous monitoring as per the recommendation of the specialist and monitoring programme specified in the EMPr, will allow for the potential impacts/risks to be suitably managed to a low significance.
		POST-MITIGATION	4	2	4	3	30		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									Environmental noise levels can be managed (controlled) by ensuring the following: <ul style="list-style-type: none"> Implementation of the monitoring programme as specified in the EMPr; and Ensuring sufficient noise screening measures should any specific activity exceed the 85 dBA threshold.
ASPECT	HEALTH AND SAFETY								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Employment of workers All construction activities	Health effect of pollutants on community/employees <u>Direct impact:</u> <ul style="list-style-type: none"> Different human behaviours deal with different situations and if there is not a simplified system of managing health and safety risk, situations resulting loss or injury of human life may be a result. Exposure of concentrations of PM_{2.5}, SO₂, NO₂, and CO over a period of time poses the risk of respiratory and cardiovascular diseases. Long term exposure to Chrome (VI) has been associated with lung cancer. <u>Indirect impact:</u> <ul style="list-style-type: none"> Increase in injury on duty or disabling injuries of employees. Exposure to potentially hazardous materials. This considers the environmental health determinants linked to the project and related activities. Noise, water, and air pollution (indoor and outdoor) as well as visual impacts will be considered in this biophysical category. It can also include exposure to heavy metals and hazardous chemical substances and other compounds, solvents or spills and releases from road traffic and exposure to mal odours. Pesticides, fertilizers, road dust, air pollution (indoor and outdoor, related to vehicles, cooking, heating, or other forms of combustion or incineration), landfill refuse or incineration ash, and any other project-related solvents, paints, oils or cleaning agents, by-products, or release events. Loss of productivity due to investigations into injuries or fatalities. Influx of local cases of respiratory and cardiovascular diseases in the area. Increase of cases of lung cancer. 		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	1	2	8	2	22		Appendix N has determined that no significant health risks are expected from the proposed development.
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									The risks of respiratory and cardiovascular diseases associated with the predetermined pollutants has been determined to be low.
		POST-MITIGATION	1	1	4	2	12		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									Potential impacts/risk to the health and safety can be avoided by implementing the following: <ul style="list-style-type: none"> Recommendations made by the Air Quality Impact Assessment (Appendix P); and Develop and implement the Health, Safety, Environment, and Quality (HSEQ) management Plan throughout the entire life cycle of the proposed development.

	<p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of human life.									
ASPECT	SOCIO-ECONOMIC									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Employment of workers during the operational phase	<p><u>Socio-economic intrusions/Job opportunities and economic impacts/Population change/Sense of place/Community safety risks/Resource efficiency and community health</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Possible negative socio-economic intrusions.Impact on localised individuals and groups in terms of employment and local procurement opportunities.Possible increase in criminal activities due to people movement in the area during construction phase.Resource efficiency is improved and optimised Health related impacts. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">The increasing population will put pressure on the local municipality to provide services such as sewage, drinking water, waste management, electricity etc.Conflicting cultural and spiritual believes and standards.Limited opportunities for local participation in labour supply during the construction phase of the projectLimited opportunities for local procurement during construction and operation.Possible lack of available skills due to implementation of new international technology resulting in continued outsourcing of skills during construction and operational phases.Possible social dissatisfaction with regards to no or limited job opportunities and local procurement associated with the proposed ECF.Unfulfilled community expectations in terms of employment creation could result in social conflictPossible inflow of jobseekers.Construction activities could change the nature of the local area with increased traffic, influx of people, and presence of machinery and activities in the area.Movement of people in the area can increase criminal activity or opportunities for criminals. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Poor service delivery of municipal infrastructures.Community unrest.Job creation for local and district communities.Local economic development.Reduced access to livelihood resources.Change in sense of place.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
		PRE-MITIGATION	4	2	4	4	40		The positive and negative impacts associated to the socio-economic impacts/risks can be manged. By effectively implementing the management measures identified in the EMPr, the economic expectation of the surrounding communities can be controlled.	
		POST-MITIGATION	4	1	4	4	36		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									With any new development there is a positive and negative impact on the socio-economic environment. During the life cycle of the proposed development a number of impact/risk is anticipated. Once the proposed development has been decommissioned the first obvious impact/risk is the short to medium term loss of income of employees, most likely locally employed.	
									However, this risk can be managed by equipping communities with skills and abilities to adapt in preparation for decommissioning adding to the positive impacts the proposed development may have.	
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
The positive and negative impacts associated to the socio-economic impacts/risks can be managed (controlled) through the effective planning and management of the following:										
<ul style="list-style-type: none">Control through pre-construction planning and development of workers code of conduct, employment procurement policies and a skills development policy;Ongoing open communication and expectation management of the local communities;Management of social-economic intrusions;Control through the management of job opportunities and skills development throughout the life cycle of the proposed development;Management of population changes; andManagement of community safety.										
ASPECT	TRAFFIC MANAGEMENT									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
	<u>Increased pressure on local roads/degradation of road infrastructure</u>		D	E	M	P	S	U O C J	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	

Transporting of material on public roads	<p><u>Direct impact:</u></p> <ul style="list-style-type: none">Influx of vehicles of operational employees puts pressure on the public transport infrastructures. This poses a potential increase in vehicle, pedestrian, and livestock accidents. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Increased pressure on existing road infrastructures and municipalities to maintain infrastructures. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Degradation of public transport infrastructure.							As per Appendix M, it was concluded that due to the type and nature of the proposed ECF project, it is expected that there will be a manageable impact on vehicle traffic during all phases.	
		PRE-MITIGATION	1	2	4	4	28		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
		POST-MITIGATION	4	2	3	2	18		The intersection of Road R555 and Existing Smelter Access Road is an existing intersection which was constructed many years ago and is currently provides access to maintenance activities at the existing Lion Smelter only. Improvements from a road safety perspective is required.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									Potential impacts/risk can be successfully managed (control) by implementing the following:
								<ul style="list-style-type: none">Management actions identified in the EMP; and Implement the proposed improvements as per Appendix M.	
ASPECT	WASTE MANAGEMENT								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Site offices, ablution facilities & kitchen	<p>Illegal dumping/littering</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Littering throughout the construction and operational phase poses the risk of the visual environment to be affected negatively. The storing of waste onsite for an extended time may cause the formation of leachate that will affect the soil and water quality of the surrounding environment in a negative way.An increase in waste generation with disposal as the management measure increases the current strain on the municipal infrastructures.Accidental spills or incorrect disposal of effluent from the chemical toilets used by the construction employees poses the risk of contaminating the surrounding natural environment. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Exposure of leachate to the natural environment poses a health risk to the surrounding fauna and flora habitats as well as human health.Due to the lack of capacity within the municipal landfill, the risk of illegally dumping general waste arises. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	4	2	4	4	40		Implementation of the national waste management hierarchy (prevention, re-use, recycling, recovery and lastly disposal) will managed the identified protentional waste related impacts/risk associated with the proposed development.
		POST-MITIGATION							DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									Implementation and aligning management actions with the existing Lion operational Waste Management Plan reduces the significant effect of waste on the environment.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
							The impacts/risks associated with waste generation due to the proposed development can be managed (avoided and or controlled) through the implementation of the following measures:		
							<ul style="list-style-type: none">Avoid potential impact/risk through effectively implementing the existing Waste Management Plan and monitoring programme;Avoid incident related to waste management activities by developing.Implementing, and maintaining incident management and emergency preparedness plan; andControl waste generation through record keeping.		
Site offices, ablution facilities & kitchen Operation of PBU & CGC	<p>PBU/Sewage effluent</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Improper management of PBU/sewage effluent during the operational phase related to the ECF project leads to the contamination of the surrounding natural environment. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Contaminated effluent causes the degradation of soil and surface water quality.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	4	2	6	4	48		The use of existing sewage infrastructure will reduce the impact/risk associated with sewage effluent during the operational phase. In addition, ensuring the implementation of a closed management system designed according to the waste stream risk classification for the PBU & CGC condensate will ensure the effective management thereof.
		POST-MITIGATION							DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									Constructing the required containment facilities and transport system for the PBU and CGC condensate as per engineering designs will mitigate the potential contamination risk associated to the waste stream.

	<ul style="list-style-type: none">An increase in pollutants will lead to changes in the water quality of the wetlands and watercourses, affecting their ability to act as ecological corridors within the development landscape. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">The linked nature of the wetland systems to downstream water resources will result in pollutants being carried downstream from the construction site having consequences on further downstream users.	POST-MITIGATION	4	1	2	3	21		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									The potential impacts/risks associated to the management of sewage and PBU/CGC effluent can be managed (controlled) by implementing the following measures: <ul style="list-style-type: none">Ensuring the adequate design and construction of sewage effluent management infrastructure to tie in with the existing sewage infrastructure; andEnsuring the PBU/CGC effluent management and transport system are designed, by a suitably qualified and experienced civil engineer, as per the waste stream classification.

7.2.4 CLOSURE/DECOMMISSIONING PHASE

Table 66: Potential impacts and risks identified during the closure/decommissioning phase of the proposed development

CLOSURE PHASE									
ASPECT	AIR QUALITY & CLIMATE								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Removal of mobile PBU & CGC Demolishing sub-station Movement of demolishing equipment Placement of topsoil & revegetation Rehabilitation of disturbed areas	<p>Degradation of air quality/Fugitive dust emissions</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none"> Activities associated with closure (demolition, ripping, grading and topsoil placing) often leads to the generation of fugitive dust comprising TSP, PM₁₀ and PM_{2.5}. Placement of topsoil causes the generation of fugitive emissions. Dust plumes caused by wind and weather from unvegetated areas release particles, PM₁₀ and PM_{2.5}. Movement of construction plant and equipment on unpaved road surfaces causes dust emissions. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none"> Continuous exposure to high levels of dust fallout may lead to unhealthy environment for employees and surrounding communities. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none"> Continuous generation of fugitive and ambient dust generation during construction activities poses a high risk in the overall degradation of local air quality conditions posing a health risk to both the human and ecological surroundings. 		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	1	2	4	5	35		Compliance with the minimum emissions standards set out by NEMAQA, the potential impact/risk can be effectively controlled.
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									The proposed development will not increase the overall GHG emissions associated with the existing smelting operations.
		POST-MITIGATION	1	1	2	5	20		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									<p>Fugitive dust generation can be controlled in the following ways:</p> <ul style="list-style-type: none"> Development of a dust fallout monitoring and management plan; Frequent Inspections; and Reporting and recording incidents related to air quality. <p>Several recommendations resulted from the Air Quality Assessment (Appendix P). These recommendations are included in EMPr.</p> <p>There are also several legislative requirements stipulated in the following regulations:</p> <ul style="list-style-type: none"> GN R. 283: National reporting regulations; GN R. 1210: National Ambient Air quality standards; and GN R. 897: National dust control regulations.

ASPECT		TERRESTRIAL BIODIVERSITY						MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING							
Removal of mobile PBU & CGC Placement of topsoil & revegetation Rehabilitation of disturbed areas	<u>Vegetation loss</u> <u>Direct impact:</u> <ul style="list-style-type: none"> Clearing the area for the removal of infrastructures leads to the loss of vegetation and habitats of macro and micro-organisms. The loss of vegetation also affects the surrounding Fauna and Flora. Increased human-animal conflict and accidental killings. <u>Indirect impact:</u> <ul style="list-style-type: none"> If cleared areas are not rehabilitated properly or storm water control features installed are not constructed according to a designed storm water management model, these areas are prone to erosion. <u>Cumulative impact:</u> <ul style="list-style-type: none"> Loss of vegetation and habitat leads to the overall degradation of the terrestrial ecology. Critical support regions to surrounding ecological support and protected areas are affected and may lead to the degradation of the protected area's ecology. 		D	E	M	P	S	Remedy	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	1	1	6	4	32		Impacts can be remedied if all mitigation measures identified in the EMP are implemented throughout the entire lifecycle of the proposed development.
		POST-MITIGATION	1	1	2	3	12		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									Following the assessment conducted by the appointed specialist, due to the site being previously disturbed, the proposed development poses an acceptably low impact.
Placement of topsoil & revegetation Rehabilitation of disturbed areas	<u>Influx of alien and invasive vegetation</u> <u>Direct impact:</u> <ul style="list-style-type: none"> Topsoil placed during rehabilitation containing alien invasive seeds exposes the un-vegetated area to the influx of alien invasive vegetation causing irreversible damage to the native fauna and flora species and loss of habitats. <u>Indirect impact:</u> <ul style="list-style-type: none"> Disturbed areas are likely to act as seed areas that will ultimately facilitate the invasion of nearby watercourses and riparian areas. Alien species generally out-compete indigenous species for water, light, space and nutrients as they are adaptable to changing conditions and are able to easily invade a wide range of ecological niches, posing an ecological threat as they alter habitat structure, lower biodiversity (both number and "quality" of species), change nutrient cycling and productivity, and modify food webs. <u>Cumulative impact:</u> <ul style="list-style-type: none"> Loss of vegetation and habitat leads to the overall degradation of the terrestrial ecology. Critical support regions to surrounding ecological support and protected areas are affected and may lead to the degradation of the protected area's ecology. 		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	3	2	6	4	44		Alien and invasive species can be effectively managed when pre-construction mitigation measures are implemented. Prior to commencing with any construction activities, any existing species must be removed and controlled.
		POST-MITIGATION	1	1	4	4	24		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									Failing to implement an effective alien and invasive management plan throughout the entire life cycle of the proposed development may have a high impact on the overall degradation of supporting terrestrial habitat surrounding the proposed site.
Placement of topsoil & revegetation Rehabilitation of disturbed areas	<u>Influx of alien and invasive vegetation</u> <u>Direct impact:</u> <ul style="list-style-type: none"> Topsoil placed during rehabilitation containing alien invasive seeds exposes the un-vegetated area to the influx of alien invasive vegetation causing irreversible damage to the native fauna and flora species and loss of habitats. <u>Indirect impact:</u> <ul style="list-style-type: none"> Disturbed areas are likely to act as seed areas that will ultimately facilitate the invasion of nearby watercourses and riparian areas. Alien species generally out-compete indigenous species for water, light, space and nutrients as they are adaptable to changing conditions and are able to easily invade a wide range of ecological niches, posing an ecological threat as they alter habitat structure, lower biodiversity (both number and "quality" of species), change nutrient cycling and productivity, and modify food webs. <u>Cumulative impact:</u> <ul style="list-style-type: none"> Loss of vegetation and habitat leads to the overall degradation of the terrestrial ecology. Critical support regions to surrounding ecological support and protected areas are affected and may lead to the degradation of the protected area's ecology. 		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
		PRE-MITIGATION	3	2	6	4	44		The influx of alien and invasive species can be managed (controlled) in the following ways:
		POST-MITIGATION	1	1	4	4	24		<ul style="list-style-type: none"> Implementation and review of the existing Lion Smelter's alien and invasive species management plan; Implementing effective control measures to prevent the spread of alien and invasive species; and Implementing the management actions identified in the EMP.
									Several recommendations resulted from the Terrestrial Biodiversity Compliance Statement (Appendix I). These recommendations are included in the EMP and must be implemented throughout the entire life cycle of the proposed development.

Demolishing of hazardous storage facility	<p>Increased chemical/field fire risk</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">The improper storage of hazardous substances poses a risk of chemical fires. In the event of a chemical fire the impact to the surrounding environment is significant. Fires may lead to the loss of ecosystems, damage to properties and fatalities.Altered ecological regimes (fire), ecological processes, contamination of nearby sensitive (wetland) habitat. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Site clearing caused by the devastation of fires exposes un-vegetated area to the influx of alien invasive vegetation causing Irreversible damage to the native fauna and flora species and loss of habitats.Damage infrastructure and the power generation facility. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.Financial strain on the operations due to remediation actions required and infrastructure repairs.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
									By avoiding a incident related to fire by implementing the correct fire prevention measures, this risk can be completely avoided.
		PRE-MITIGATION	3	2	8	2	26		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									In the unlikely event that a chemical fire does take place during the life of the proposed development, significant loss of terrestrial biodiversity may be experienced. However, with the identified management measures identified in the EMPr, this risk can be avoided.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									Fire risks associated to the temporary hazardous substance storage can be avoided in the following ways:
									<ul style="list-style-type: none">Implementing and maintaining a hazardous substance management plan throughout the entire Lifecycle of the proposed development;Implementing and maintaining an emergency preparedness management plan;Ensuring that all staff handling hazardous substances are trained and aware of the risks associated with the hazardous substance stored or used on site;Always ensuring the availability of a trained fire fighter; and Regularly inspecting and testing fire prevention equipment.
ASPECT	AQUATIC BIODIVERSITY								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Placement of topsoil & revegetation	<p>Sedimentation and siltation of watercourses</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Placement of topsoil nearby natural drainage lines poses the risk of sedimentation and siltation to watercourses. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Various impacts have been attributed to sedimentation of aquatic ecosystems, including reduction of light penetration (resulting in reduction in photosynthesis and subsequently, productivity), alteration of foraging dynamics of both carnivores and herbivores, impacting on predator and prey relationships, clogging of gills, rendering the watercourse unfit for various aquatic organisms, truncating and shifting the trophic pyramid, absorption of nutrients onto suspended particles, rendering them unavailable and thereby reducing the productivity of the watercourse, and filling of interstitial spaces, thereby destroying habitat for macro invertebrates and vertebrates owing to sedimentation, etc. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Alteration of aquatic ecology of direct affected watercourses as well as downstream watercourses.Loss of unique biodiversity features.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
									The proposed development is situated well outside the determined 32-meter buffer (as per Appendix J). The sensitivity of this wetland/natural drainage system, situated southwest of the proposed development, has been classified as “low” due to the ephemeral nature of the system, low sensitivity of the drainage line, and modified habitat integrity.
		PRE-MITIGATION	2	2	6	4	40		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									By implementing the 32-meter buffer and management actions identified in the EMPr, potential impacts on the aquatic biodiversity can be avoided.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
									The impact/risk to disturb the aquatic biodiversity can be avoided by implementing the following measures:
									<ul style="list-style-type: none">Control through the implementation of storm water management and erosion control;Avoid impacts through adequately managing effluent and runoff;Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans;Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; andRemedy through the effective implementation of rehabilitation measures.

	<ul style="list-style-type: none"> The proposed activity is expected to impact on national protected areas targets as well as provincial freshwater conservation targets, both of which are expected to be cumulative if the impact is to be considered with other regional impacts that have or are expected to have on such areas. 								
ASPECT	SOIL & AGRICULTURAL								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Removal of PBU & CGC Demolishing of hazardous storage facility Demolishing of sub station Movement of demolishing equipment	<u>Hydrocarbon/soil contamination</u> <u>Direct impact:</u> <ul style="list-style-type: none"> The continuous spills of hydrocarbons and hazardous substances poses a environmental risk to the surrounding soil quality. The degradation of the soil quality will cause the loss of habitat or healthy environment for micro ecosystems. Continuous leaking or lack of maintenance poses a risk to contaminating the surrounding soils and degrading the soil quality. This will affect the micro-ecosystems in a negative manner. <u>Indirect impact:</u> <ul style="list-style-type: none"> Degradation of soil quality risk difficulty in the re-establishment of vegetation during rehabilitation. Loss of fertile soil will require costly import of fertile soils for rehabilitation, increasing the risk of importing non-indigenous seeds and establishing invasive vegetation competing with native vegetation. Continuous exposure to hydrocarbon leaks poses a risk to the degradation of the surrounding soil resources. Unvegetated areas are prone to erosion formation. <u>Cumulative impact:</u> <ul style="list-style-type: none"> Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology. Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area's ecology. The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology. 		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
		PRE-MITIGATION	2	1	6	4	36		By avoiding incidents related to spilling of hydrocarbons and concrete during the construction phase, the potential of contamination can be effectively managed.
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE
									The implementation of management actions identified in the EMPr will avoid the loss of fertile soil due to contamination related to incidents.
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED
		POST-MITIGATION	1	1	2	3	12		<p>The potential impacts/risks can be further mitigated and or avoided by implementing the following measures:</p> <ul style="list-style-type: none"> Avoid the loss of fertile soil by effectively implementing storm water management and erosion control throughout the entire lifecycle of the proposed development; Avoid contamination of soil resources through the development, implementation and review of incident management and emergency preparedness plans; and Remedy through effectively rehabilitating disturbed areas.
Placement of topsoil & revegetation	<u>Degradation of soil resources</u> <u>Direct impact:</u> <ul style="list-style-type: none"> Placement of infertile topsoil's poses a risk of vegetation not being able to re-establish. Exposed unvegetated soils causes further loss of fertile soils. <u>Indirect impact:</u> <ul style="list-style-type: none"> Degradation of soil quality risk difficulty in the re-establishment of vegetation during rehabilitation. 		D	E	M	P	S	Remedy	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED
									<p>During the site assessment (refer to Appendix F), portions of the preferred site have existing disturbances. The Grabow soil profile observed on site is no longer suitable for agricultural production as the original soil profile has been mixed and is no longer identifiable. The following three major observations were made:</p> <ul style="list-style-type: none"> The presence of a pedocutanic layer in the Palala soils is a clear textural contrast between the overlying neocarbonate layer. A pedocutanic horizon has a strong structure and is seen as a limitation to plant growth as well as the infiltration of stormwater, Soil depth for crop growth is limited within the project site as a result of the presence of the pedocutanic horizon as well as the presence of hard rock. Profiles varied from 400mm

	<ul style="list-style-type: none">Loss of fertile soil will require costly import of fertile soils for rehabilitation, increasing the risk of importing non-indigenous seeds and establishing invasive vegetation competing with native vegetation.Continuous exposure to hydrocarbon leaks poses a risk to the degradation of the surrounding soil resources.Unvegetated areas are prone to erosion formation. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology.Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area’s ecology.The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology.								<p>to 450mm, limiting the type of crop that can be grown within the site. The area is therefore more suited to grazing activities</p> <ul style="list-style-type: none">The permeability of the soils associated with the site was found to be restricted as a result of the Pedocutanic horizon, the presence of hard solid rock, as well as anthropogenic changes to the soi profiles through the construction of dirt roads. Soil permeability is identified as a limitation to agricultural productivity within the site. <p>As a result of the above limitation, the site is classified as having a low sensitivity to agricultural production.</p> <p><i>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</i></p> <p>Due to the low agricultural potential, a “low” risk of the potential impacts on the current resource is expected.</p> <p><i>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</i></p> <p>The potential impacts/risks can be further <i>mitigated and or avoided</i> by implementing the following measures:</p> <ul style="list-style-type: none">Control though soil conservation and management during the constructional and decommissioning phase of the proposed development;Avoid the loss of fertile soil by effectively implementing storm water management and erosion control throughout the entire lifecycle of the proposed development;Avoid contamination of soil resources through the development, implementation and review of incident management and emergency preparedness plans; and <p>Remedy through effectively rehabilitating disturbed areas.</p>	
ASPECT	WATER RESOURCES									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Placement of topsoil & revegetation	<p><u>Erosion and sedimentation</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Un-vegetated areas exposed to weathering for an extended period will lead to erosion. Erosion prone areas has a high risk of losing fertile soil caused by flash floods. The loss of fertile soil will result in the loss of important micro ecosystems. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Improper management of storm water may lead to erosion along the access routes and construction sites. This may lead to the loss of fertile soil and in its turn effect the micro-ecosystems of the surrounding environment. <p><u>Cumulative impact:</u></p>		D	E	M	P	S	Remedy	<i>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</i>	
		PRE-MITIGATION	4	2	6	4	48			
		POST-MITIGATION	2	1	4	4	28			
Rehabilitation of disturbed areas										
Storm water management										

	<ul style="list-style-type: none"> Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology. Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area's ecology. The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology. 								<ul style="list-style-type: none"> Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans; Water conservation through monitoring water use and quality throughout the entire life cycle of the proposed development; Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; and Remedy through the effective implementation of rehabilitation measures.
Placement of topsoil & revegetation Rehabilitation of disturbed areas	Alteration of drainage systems <u>Direct impact:</u> <ul style="list-style-type: none"> Poor shaping and landscaping activities during topsoil placement and rehabilitation may lead to the forming of ponds or alter existing natural drainage systems. <u>Indirect impact:</u> <ul style="list-style-type: none"> Poor storm water management or alteration of rehabilitated areas may lead to a risk of erosion formation. Altered drainage systems poses a risk in effecting downstream user. <u>Cumulative impact:</u> <ul style="list-style-type: none"> Loss of vegetation and habitat, due to the degradation in soil quality, leads to the overall degradation of the terrestrial ecology. Critical support regions to surrounding protected areas are affected and may lead to the degradation of the protected area's ecology. The formation of erosion gullies may lead to the change in the drainage patterns, negatively impacting the surrounding aquatic biodiversity and poses a risk of affecting the catchment ecology. 		D	E	M	P	S		DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED Since there are no identified drainage lines situated directly on the preferred site, the risk associated with degradation of natural water resources can be affectively managed (see Appendix K). DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE The effective implementation of a storm water management and erosion control plan will reduce the potential impact/risk to degrade the surface water quality of nearby natural drainage lines. DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED The impact/risk to degrade the natural water resources can be managed (controlled) by implementing the following measures: <ul style="list-style-type: none"> Control through the implementation of storm water management and erosion control; Avoid impacts through adequately managing effluent and runoff; Avoid accidental release through the development, implementation, and review of incident management and emergency preparedness plans; Water conservation through monitoring water use and quality throughout the entire life cycle of the proposed development; Control through the continuing awareness training of all personal throughout the entire life cycle of the proposed development; and Remedy through the effective implementation of rehabilitation measures.
		PRE-MITIGATION	5	2	6	3		39	
		POST-MITIGATION	2	1	4	4		28	Remedy
ASPECT	TOPOGRAPHY AND VISUAL								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY	
Rehabilitation of disturbed areas	Visual and topography disturbance <u>Direct impact:</u> <ul style="list-style-type: none"> Unnatural shaping of the landscape following demolishing of infrastructure altering the topography and visual environment. Visual impact of decommissioning activities on sensitive visual receptors near the proposed ECF project. Visual impact on observers and residents at homesteads within a 2 - 3km radius of the proposed ECF project. Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the mine proposed ECF project <u>Indirect impact:</u> <ul style="list-style-type: none"> An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. <u>Cumulative impact:</u>		D	E	M	P	S		DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED By implementing an effective rehabilitation plan during decommissioning of the proposed development, visual disturbance on sensitive visual receptors can be remedies to such an extend that the potential impact/risk may be reversed. DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE Implementing the management measures identified in the EMPr will reduce the visual impact from moderate to low significance. DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED Visual disturbances on sensitive visual receptors can be managed (remedied) through the implementation of the following measures: <ul style="list-style-type: none"> Adherence with management measures identified in the EMPr; and Implementing an effective rehabilitation plan during decommissioning of the proposed project.
		PRE-MITIGATION	5	2	4	4		44	
		POST-MITIGATION	4	2	2	2		16	Remedy

	<ul style="list-style-type: none">Potential permanent scarring of the landscape if no rehabilitation is undertaken.The potential cumulative visual impact of the mining activities on the visual quality of the landscape.									
ASPECT	NOISE									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Removal of mobile PBU & CGC Demolishing activities Movement of demolishing equipment	Noise generation <u>Direct impact:</u> <ul style="list-style-type: none">Increased noise levels at potentially sensitive receptors exceeding criteria of the Noise Control Regulations legislation (NCR) and SANS guidelines.The demolition of all unwanted facilities at the time of decommissioning will result in the generation of high noise levels. <u>Indirect impact:</u> <ul style="list-style-type: none">Changing ambient sound levels could increase annoyance and potential complaints. <u>Cumulative impact:</u> <ul style="list-style-type: none">Changing ambient sound levels could change the acceptable land use capability.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
										The risk assessment done by the appointed specialist (see Appendix L) revealed that the threshold value of 7.0dBA will not be exceeded during the day and/or night- time periods.
		PRE-MITIGATION	2	2	4	3	24		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									Continuous monitoring as per the recommendation of the specialist and monitoring programme specified in the EMPr, will allow for the potential impacts/risks to be suitably managed to a low significance.	
		POST-MITIGATION	2	2	4	2	16		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
									Environmental noise levels can be managed (controlled) by ensuring the following: <ul style="list-style-type: none">Implementation of the monitoring programme as specified in the EMPr; andEnsuring sufficient noise screening measures should any specific activity exceed the 85 dBA threshold.	
ASPECT	HEALTH AND SAFETY									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Employment of workers All demolishing related activities	Health effect of pollutants on community/employees <u>Direct impact:</u> <ul style="list-style-type: none">Different human behaviours deal with different situations and if there is not a simplified system of managing health and safety risk, situations resulting loss or injury of human life may be a result.Exposure of concentrations of PM_{2.5}, SO₂, NO₂, and CO over a period of time poses the risk of respiratory and cardiovascular diseases.Long term exposure to Chrome (VI) has been associated with lung cancer. <u>Indirect impact:</u> <ul style="list-style-type: none">Increase in injury on duty or disabling injuries of employees.Exposure to potentially hazardous materials. This considers the environmental health determinants linked to the project and related activities. Noise, water, and air pollution (indoor and outdoor) as well as visual impacts will be considered in this biophysical category. It can also include exposure to heavy metals and hazardous chemical substances and other compounds, solvents or spills and releases from road traffic and exposure to mal odours. Pesticides, fertilizers, road dust, air pollution (indoor and outdoor, related to vehicles, cooking, heating, or other forms of combustion or incineration), landfill refuse or incineration ash, and any other project-related solvents, paints, oils or cleaning agents, by-products, or release events.Loss of productivity due to investigations into injuries or fatalities.		D	E	M	P	S	Avoid	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
		PRE-MITIGATION	1	2	8	2	22		Appendix N has determined that no significant health risks are expected from the proposed development.	
									DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									The risks of respiratory and cardiovascular diseases associated with the predetermined pollutants has been determined to be low.	
		POST-MITIGATION	1	1	4	2	12		DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
									Potential impacts/risk to the health and safety can be avoided by implementing the following: <ul style="list-style-type: none">Recommendations made by the Air Quality Impact Assessment (Appendix P); andDevelop and implement the Health, Safety, Environment, and Quality (HSEQ) management Plan throughout the entire life cycle of the proposed development.	

	<ul style="list-style-type: none">Influx of local cases of respiratory and cardiovascular diseases in the area.Increase of cases of lung cancer. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Loss of human life.									
ASPECT	SOCIO-ECONOMIC									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Employment of workers during closure and decommissioning	<p>Loss of permanent jobs</p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Intrusion impacts as a result of decommissioning of infrastructure.Short term job creation during decommissioning activities. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Loss of permanent employment opportunities. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Increased unemployment within the local area.		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
		PRE-MITIGATION	3	2	4	5	45		The positive and negative impacts associated to the socio-economic impacts/risks can be managed. By effectively implementing the management measures identified in the EMPr, the economic expectation of the surrounding communities can be controlled.	
		POST-MITIGATION	2	1	4	4	28		DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE	
									With any new development there is a positive and negative impact on the socio-economic environment. During the life cycle of the proposed development a number of impact/risk is anticipated. Once the proposed development has been decommissioned the first obvious impact/risk is the short to medium term loss of income of employees, most likely locally employed. However, this risk can be managed by equipping communities with skills and abilities to adapt in preparation for decommissioning adding to the positive impacts the proposed development may have.	
									DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED	
									The positive and negative impacts associated to the socio-economic impacts/risks can be managed (controlled) through the effective planning and management of the following:	
									<ul style="list-style-type: none">Control through pre-construction planning and development of workers code of conduct, employment procurement policies and a skills development policy;Ongoing open communication and expectation management of the local communities;Management of social-economic intrusions;Control through the management of job opportunities and skills development throughout the life cycle of the proposed development;Management of population changes; andManagement of community safety.	
ASPECT	TRAFFIC MANAGEMENT									
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING					MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY		
Movement of demolishing equipment	<p>Increased pressure on local roads/degradation of road infrastructure</p> <p><u>Direct impact:</u></p>		D	E	M	P	S	Control	DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED	
			As per Appendix M, it was concluded that due to the type and nature of the proposed ECF project, it is expected that there will be a manageable impact on vehicle traffic during all phases.							

	<ul style="list-style-type: none">Influx of decommissioning vehicles puts pressure on the public transport infrastructures. During the construction phase of the proposed activity an increase in vehicle movement in the area will be expected. This poses a potential increase in vehicle, pedestrian, and livestock accidents. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Increased pressure on existing road infrastructures and municipalities to maintain infrastructures. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">Degradation of public transport infrastructure.	PRE-MITIGATION	1	2	4	4	28		<p>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</p> <p>The intersection of Road R555 and Existing Smelter Access Road is an existing intersection which was constructed many years ago and is currently provides access to maintenance activities at the existing Lion Smelter only. Improvements from a road safety perspective is required.</p> <p>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</p> <p>Potential impacts/risk can be successfully managed (control) by implementing the following:</p> <ul style="list-style-type: none">Management actions identified in the EMPr; andImplement the proposed improvements as per Appendix M.
ASPECT	WASTE MANAGEMENT								
ACTIVITIES	POTENTIAL IMPACT/RISK	SIGNIFICANCE RATING						MITIGATION TYPE	MANAGEMENT AND/OR MITIGATION EXTEND SUMMARY
Demolishing activities	<p><u>Illegal dumping/Littering/Pressure on municipal infrastructure</u></p> <p><u>Direct impact:</u></p> <ul style="list-style-type: none">Littering throughout the decommissioning phase poses the risk of the visual environment to be affected negatively. The storing of waste onsite for an extended time may cause the formation of leachate that will affect the soil and water quality of the surrounding environment in a negative way.An increase in waste generation, particularly the generation of building rubble following demolition, with disposal as the management measure increases the current strain on the municipal infrastructures.Accidental spills or incorrect disposal of effluent from the chemical toilets used by the construction employees poses the risk of contaminating the surrounding natural environment.An increased volume of hazardous waste from demolishing the hazardous substances and waste storage facilities. <p><u>Indirect impact:</u></p> <ul style="list-style-type: none">Contaminated effluent causes the degradation of soil and surface water quality.An increase in pollutants will lead to changes in the water quality of the wetlands and watercourses, affecting their ability to act as ecological corridors within the development landscape. <p><u>Cumulative impact:</u></p> <ul style="list-style-type: none">The linked nature of the wetland systems to downstream water resources will result in pollutants being carried downstream from the construction site having consequences on further downstream users.		D	E	M	P	S		<p>DEGREE TO WHICH IMPACT/RISK CAN BE REVERSED</p> <p>Implementation of the national waste management hierarchy (prevention, re-use, recycling, recovery and lastly disposal) will managed the identified protentional waste related impacts/risk associated with the proposed development.</p> <p>DEGREE TO WHICH IMPACT/RISK MAY CAUSE IRREPLACEABLE LOSS OF RESOURCE</p> <p>Implementation and aligning management actions with the existing Lion operational Waste Management Plan reduces the significant effect of waste on the environment.</p> <p>DEGREE TO WHICH IMPACT/RISK CAN BE AVOIDED, MANAGED OR MITIGATED</p> <p>The impacts/risks associated with waste generation due to the proposed development can be managed (avoided and or controlled) through the implementation of the following measures:</p> <ul style="list-style-type: none">Avoid potential impact/risk through effectively implementing the existing Waste Management Plan and monitoring programme;Avoid incident related to waste management activities by developing.Implementing, and maintaining incident management and emergency preparedness plan; andControl waste generation through record keeping.
		PRE-MITIGATION	2	2	6	4	40		
		POST-MITIGATION	1	1	4	3	18	Control	

8 DETAILS ON THE PUBLIC PARTICIPATION PROCESS

In addition to the EIA regulations, the Public Participation guideline in terms of NEMA EIA regulations (DEA, 2017) was used to determine the level of Public Participation associated with this BA process.

A Public Participation Process report was developed to provide the detail of the process and records implemented throughout the duration of the BA process. The records of the process is attached as **Appendix E**.

For the purpose of this report the following sections summarises the process followed, and comments received.

8.1 SUMMARY OF PROCESS FOLLOWED

8.1.1 LISTING THE I&AP

Following the appointment of Netzero (Pty) Ltd, a formal I&AP database was compiled which was updated/expanded throughout the entire BA process.

The relevant regulations define I&AP's as:

“Any person, group of persons or organisation interested in, or affected by an activity and any organ of state that may have jurisdiction over any aspect of the activity.”

As per the DWS guidelines, I&AP's were deemed as the following:

- Host Communities;
- Traditional Land Owners;
- Title Deed Land Owners;
- Traditional Authority;
- Land Claimants;
- Lawful Land Occupier;
- Any other person on adjacent or even non-adjacent land whose socio-economic conditions may be directly affected by the proposed project;
- The Local Municipality (including Ward Councilors);
- The Regional Municipality;
- The Department of Rural Development and Land Reform;
- The Department of Economic Development, Environment and Tourism;
- The Department of Water Affairs;
- The Department of Mineral Resources;
- The Department of Environmental Affairs; and
- The relevant Government Agencies and Institutions responsible for the various aspects of the environment and for infrastructure.

Taking the before mentioned into consideration, as well as the existing list of I&AP from the Lion Smelter operations, the formal I&AP database used in association with the proposed development is attached as part of the detailed Public Participation Process (PPP) report (**Appendix E**).

8.1.2 PRE-APPLICATION MEETINGS WITH CA'S

A pre-application meeting was held on 21 January 2022 with both Limpopo's Department of Economic Development, Environment, and Tourism (LEDET) and the Sekhukhune District Municipality (SDM), in relation to the integrated application for Environmental Authorisation (EA) and the amendment to the Lion Smelter's existing Air Emissions Licence (AEL).

The purpose of the meeting was to introduce the proposed development and associated potential listed activities in order to obtain advice from the CA's with regards to the way forward in terms of the formal application process. In this meeting it was highlighted that it is the intention of the applicant to initiate an integrated application.

Following the formal pre-application meeting, the required application forms for the EA was completed and submitted to LEDET on 16 March 2022. A letter of receipt of the EA application is recorded on 25 March 2022.

8.1.3 NOTIFICATIONS

After initiating the process to conduct the required Basic Assessment (BA) process, various steps were taken to notify the provisionally identified I&AP of the intent of the applicant to commence with the process to apply for an EA.

The methods taken to notify the potential I&AP are described in the sections to follow:

8.1.3.1 Site Notices

Due to the location of the proposed development, site notices (size A2 and laminated) both in English and Sepedi, was placed on 23 February 2022 at the following locations, within the accessible boundary of the existing Lion Smelter operation:

- Gate 1;
- Gate 5; and
- Gate 3.

In addition to these notices, additional English and Sepedi notices in sizes A3, were strategically placed around the vicinity of the affected farm portions to inform the general public of the proposed project and PPP. These notices were also placed on 23 February 2022 at the following locations:

- Pick and Pay Steelpoort;
- Mapodile Public Library;
- Ga Phasha Local Government Office;
- Burgersfort Library;
- Burgersfort Police Station; and
- Fetagomo Tubatse Local Municipality, Head Offices (Burgersfort).

Following community unrest that took place since the original placement of the notices, the notices were inspected, and replaced where required, on 24, 25 and 28 March 2022 respectively.

Additional English and Sepedi site notices (A3) were placed on 13 and 14 April 2022 at various locations, including the notice of the public meeting to be held on 21 April 2022.

8.1.3.2 Newspaper Advertisements

To inform a broad spectrum of individuals who might want to register as I&APs, newspaper advertisement was placed in the Steelburger newspaper and Sekhukhune times newspaper.

Advertisements was placed as follows:

- Notice of intent to apply for EA was placed in the Steelburger on 3 March 2022; and
- Notification of application for EA and invitation to the public meeting to be held on 21 April 2022 was placed in both the Steelburger and Sekhukhune Times on 14 April 2022.

8.1.3.3 Written Notices

Various written notices were distributed to the existing list of potential I&AP as recorded during previous processes. The notices were distributed using an established communication forum via email and through the offices of the Glencore Business Hub.

Specifically included in the distribution list are the following, but not limited to, persons:

- Bakgatla Ba Moshehla Community, land claimants as per GN 167 GG 41473 dated 2 March 2018;
- Tribal authorities of the affected communities and surrounding communities;
- Ward councillors (Ward 2, 6, 27, 28, and 29);
- Sekhukhune Development Agency;
- FGTM officials relevant;
- Registered I&AP; and
- Community forums.

8.1.4 INFORMATION PROVIDED TO THE I&AP

Background Information Document (BID) was compiled and placed on the Netzero (Pty) Ltd website, a public domain, to be viewed by the potential I&AP. The link was shared via email with the existing I&AP. A hard copy was provided on request to persons not having access to the internet.

A copy of the draft BAR & EMPr was made available at the following locations:

- Digital copy on Netzero's public website for download; and
- One hard copy at the following requested locations:
 - Mapodile Library;
 - Dithamaga Magneso Hall;
 - Ga Phasha traditional authority office;
 - Ga Malekane traditional authority office;
 - Glencore Business Hub;
 - Ngoabe area;
 - Ga Rantho;
 - Ga Makua;
 - Ga Maepa;
 - Ga Ratau;
 - Maphopha;
 - Maseven;
 - Masha-Ntake;

- Masha-Nkotane;
- Mash-Phatane;
- Nokaneng;
- Kuttollo;
- Ga Mampuru; and
- Malekane-Mphayeng.

8.1.5 CONSULTATIONS

Various platforms were used for consultations with potential I&AP throughout the entire BA process. These platforms included, but were not limited to:

- Email correspondence;
- Public Meeting;
- Newspapers, i.e. Steelburger and Sekhukhune Times;
- Community Forums;
- Communications through the Glencore Business Hub; and
- Environmental Forums.

8.1.5.1 Public Meeting

A public meeting was held on 21 April 2022. The meeting was held at the Eastern Limb Training Facility.

A total of 98 people (including the Glencore, Netzero and Swedish Stirling team members) attended the meeting.

Netzero presented the outcome of the BA process and steps taken to date to involve the public to participate in the process.

Due to technical difficulty, the presentation prepared by Netzero, was printed, and handed out to the attendees.

The meeting was recorded (voice and video recording), and minutes of the meeting was captured and attached as record to this report.

The minutes of the meeting was distributed to attendees that provided email contact information.

Table 67: Photographic record of meeting that took place on 21 April 2022



Figure 59: Netzero presenting the findings of the BA process



Figure 60: Copies of the presentation handed out to attendees



Figure 61: Attendance registers being signed



Figure 62: Attendance at Eastern Limb Training facility

8.1.5.2 Landowner consultation

As per section **Error! Reference source not found.** of this report, the proposed development is situated on, now consolidated, farm Xtrata 630 KT. The registered owner, as per the registered title deed, is Glencore Operations South Africa (Pty) Ltd, formally known as **Xstrata South Africa (Pty) Ltd**.

However, it is noted that formal land claims have been gazetted as follows on portions of farm Spitskop 333 KT and Kennedy's Vale 361 KT (part of consolidated land):

- Notice 1184 of 2007 in Government Gazette of 1 September 2007 amending notice no. 828 of 2004 in Gazette No. 26344 dated 21 May 2004;
- GN 167 GG 41473 dated 2 March 2018; and
- GN 1194 GG 26496 of 2 July 2004.

Glencore lodged formal objections to the aforementioned Gazatted claims on the following dates:

- 14 December 2018; and
- 11 June 2018.

According to records, some of the claims Gazatted were investigated and are not being pursued but the bulk remain. There has been no correspondence from the regional Land Claims Commission since mid-2018 and

no indication on the progress of the claims. No final recommendation has been made in regard to the claims and none has been referred to the Land Claims Court.

8.1.5.3 30 day consultation period

A copy of the draft BAR and EMPr has been made available to the registered I&AP for the legislated 30-day commenting period.

Time period: 25 April 2022 to 1 June 2022

8.2 SUMMARY OF ISSUES RAISED BY I&AP

A Comment and Response Register (C&RR) was compiled as part of **Appendix E**. This register records matters of concern, questions, project support and suggestions provided by stakeholders during various consultation platforms (i.e. email correspondence and meetings) throughout the EA process. The C&RR also captures the responses provided by relevant parties in relation to any matters raised or queries posed.

The C&RR is an active and dynamic document, which is continuously updated throughout the process.

Table 68 provides a summary of comments received from the registered I&AP and the response provided by the EAP throughout the BA process.

Table 68: Summary of comments and response

INTERESTED AND AFFECTED PARTIES	DATE COMMENTS RECEIVED	ISSUES RAISED	EAPS RESPONSE	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED.
AFFECTED PARTIES				
LANDOWNER/S				
Glencore Operations South Africa (Pty) Ltd, previously known as Xtrata South Africa (Pty) Ltd, is the lawful landowners of the property.				
LAWFUL OCCUPIER/S OF THE LAND				
N/A				
LANDOWNERS OR LAWFUL OCCUPIERS ON ADJACENT PROPERTIES				
MUNICIPALITY				
COMMUNITIES				
DEPT. LAND AFFAIRS				
TRADITIONAL LEADERS				
DEPT. ENVIRONMENTAL AFFAIRS				
OTHER COMPETENT AUTHORITIES AFFECTED				
OTHER AFFECTED PARTIES				
Mr. Totolo Makola, Ga-Phasa Village, I&AP and land claimant	12 April 2022	<p>Mr. Makola submitted a registration and comment sheet via email raising the following:</p> <ol style="list-style-type: none"> He raised a concern regarding the current environmental compliance status and indicated that clean gas stacks are not always burning as well as excess stacks. Raw gas stacks are opening haphazardly. All these observed conditions emit clean carbon monoxide to the atmosphere. How will the new power plant operate when the furnaces have upset conditions? 	<p>EAP responded via email on 12 April 2022 stating that his comments and concerns is noted and that a formal response will be drafted in due course.</p> <p>Response to the questions raised during the public meeting was recorded and available as Appendix D2.1 to the Public Participation Report (Appendix E).</p> <p>Formal letter response submitted on 25 April 2022.</p>	Question addressed throughout the BAR and EMPr.

		<ol style="list-style-type: none"> 2. What improvements will the power plant bring in terms of environmental pollution? 3. What effects will the power plant have on the environment, fauna and flora? 4. What gases will the new power plant produce and where will those gases go? 5. What will happen when the power plant is on a breakdown or maintenance? <p>In addition, Mr Makola stated that he cannot grant Lion Smelter with a new AEL because in his opinion the operation does not fully comply with the current AEL.</p> <p>The following additional comments was raised during the public meeting held on 21 April 2022:</p> <ol style="list-style-type: none"> 6. What will happen during Eskom Loadshedding? 7. Requested clarity on the thresholds compared with to determine the noise impact, as it was only indicated in the presentation to be within the thresholds. 8. What guarantee is there that there will not be non-compliances with the new AEL? <p>What are the advantages and disadvantages of the new plant?</p>		
INTERESTED PARTIES				
Mr. Mokwala Tshepho Kgolongwane	9 March 2022	Mr. Kgolongwane stated his interest in job opportunities associated with the proposed development.	<p>EAP responded via email: Please take note that this platform is only for registering as an Interested and Affected Party associated to the proposed ECP project to participate in the legislated environmental process.</p> <p>All job application to be directed directly to our client, Glencore Lion Smelter.</p>	<p>Question addressed throughout the BAR and EMP.</p> <p>See Table 18 for measures to be implemented to address socio-economic impacts in the EMP.</p>
Mr. Given Mnisi	8 April 2022	Requested closing date for all I&AP to make their submissions.	<p>EAP responded via email: Thank you for your interest in the proposed development. You have been registered as a I&AP.</p> <p>At this stage, all I&AP are welcome to register. Once the documents are available for comment, we will communicate it to all registered I&AP and provide the timelines.</p>	

Kutullo Tsatsapane	14 April 2022	Received an application form in relation to a “Community based field researcher” as advertised by Glencore.	EAP forwarded the email to Mr. Vorster Maloka. It was indicated to Kutullo that the email used to submit this application is only reserved for the EIA process associated with the proposed ECF.
Mr. Robert Siebert	14 April 2022	Mr. Siebert indicated that he will be attending the public meeting to be held 21 April 2022 at the Eastern Limp Training Centre. In addition, he listed the potential services rendered by his organisation.	EAP responded via email: You are more than welcome to attend. Please take note, however, the purpose of the meeting will not be to discuss procurement related enquiries. The main purpose is to provide the Interested and Affected parties and members of the public information related to the attached. We invite comments related to the legislated environmental process. Please feel free to view the BID by following the link: https://www.nettzero.co.za/public-documents/
Mr. Twarisani Theophilus Rikhotso	19 April 2022	Email received stating his interest in the project as well as requesting if there is an option to attend the meeting online.	EAP responded via email stating that the meeting is not scheduled to be available via an online platform.
Mr. Ronny Mathabela	20 April 2022	Email received stating his interest as a service provider (Kwenane Construction & Projects).	EAP responded via email taking note of his registration.
Mr Jimmy ?	21 April 2022	What will be the benefit of the project in terms of job opportunities?	Mr. Vorster Maloka indicated that the procurement process will be like that of previous projects. There will be adverts for opportunities and people will be allowed with the opportunity to apply for the advertised position followed by a fair appointment process in line with the Glencore values.
Mr. Welcome Makua	21 April 2022	Mr. Makua requested that the reports (BAR and EMPr) be available at Ngoabe area so that everyone can access them. In addition, the following areas were also requested to be considered: Ga Rantho, Ga Makua, Ga Maepa, Ga Ratau, Maphopha, Maseven, Masha-Ntake, Masha-Nkotane, Mash-Phatane, Nokaneng, Kutullo, Ga Mampuru and Malekane-Mphayeng.	The request was noted.
Mr. Puti Tau	21 April 2022	Mr. Tau raised a concern about the current recruitment process. He explained by providing an example of where a lady called Nivea once told him that she was told she will never get hired. People from Ngoabe do submit CV's but they never get hired. Procurement and recruitment should be fair. What is it that will be done to fix the problem?	Mr. Vorster Maloka (VM) responded to the questions regarding recruitment: As indicated in the presentation, the project is not a labour intensive or large-scale project, in comparison with previous projects. VM further indicated that a meeting, outside of this one, will be scheduled the coming week to solve the issues raised with regards to recruitment.

			Mr. Ian Curry (IC) also addressed the question regarding recruitment: IC indicated that during the construction work of the proposed development, the main contractor will be required to contract local companies to do the earth works and civil work. All recruitment processes will be managed through the Glencore Business Hub and with the assistance of VM. During the operational phase of the project, there will be a maximum of six people employed to run the plant. The recruitment process has already been started to identify two local candidates that will be specifically trained to operate the first of its kind technology. One of the services that will be outsourced locally is security. It is anticipated that there will be two security guards per shift.	
Mr. Sydney Marsweshe	21 April 2022	Mr. Marsweshe indicated that he has a disability. He requested that people with disabilities be considered when recruiting.		
Mr. Manageng Mosehla	21 April 2022	Mr. Moselehla requested the exact location of the project.	The EAP confirmed that the project is located on farm previously (before consolidation) known as Kennedy's Vale 361 KT.	
Mr. Maxwell Mashabela	21 April 2022	Mr. Mahabela asked how will this project be beneficial if it will be run by Stirling Swedish? Is there any local procurement in terms of required components that will take place?	Mr. Vorster Maloka (VM) indicated that this project will be part of other facilities that are existing. There will be 2 students from local communities that will be trained as indicated by IC earlier. Basically, the plant will be run locally by trained people. IC also indicated that the components forming part of Swedish Stirling's technology is only produced in Sweden. However, other general components that is readily available will be procured locally.	
Mr. Jonas Mohlahlo	21 April 2022	Mr. Mohlahlo asked if the owner/occupier of the land where the proposed project is to be located has been consulted?	Mr. Vorster Maloka indicated that the land disputes and claims are currently under review by the competent authority and no outcome has been finalised on the claim.	
Mr. George Mosehla	21 April 2022	Mr. Mosehla asked a follow-up question regarding consultation with the land claimants and if there are any heritage symbols such as graves at the location? He indicated that a formal writing will be provided requesting a site visit before the commencement of the project.	The EAP referred to slide no. 47 and indicated that no heritage sites of significance have been identified to be located within the footprint of the proposed development. In relation to the request for a site visit, it is noted.	
Mr. Polygar Masha	21 April 2022	Mr. Masha asked if there will be any skills transferred?	Mr. Vorster Maloka indicated that there are currently 2 students, with math and science background, being recruited that will be trained by Swedish Stirling in Sweden as technicians.	
Mr. Welcome Makua	21 April 2022	Mr. Makua asked if there will be any light duty opportunities for people with disabilities?		

Mr. Ditshage Morota	21 April 2022	Mr. Morota asked how you are going to help the community structures?	Mr. Vorster Maloka indicated that he will schedule a meeting where he will address all the matters associated with job opportunities and procurement.	
Mr. Jacob Dikotope	21 April 2022	Mr. Dikotope asked if this project will only help students with maths and science?		
Me. Bella Mokgwadi	21 April 2022	Me. Mokgwadi asked that when there is allocation of jobs to also consider women?		

9 ENVIRONMENTAL IMPACT STATEMENT

9.1 SUMMARY OF IMPACT ASSESSMENT KEY FINDINGS & RECOMMENDATIONS

Table 69 provides the summary of the outcome of the impacts assessment conducted as well as provides the recommendations made by the appointed specialist and EAP.

Table 69: Summary of Impact Assessment outcome and recommendations

ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT OUTCOME	SUMMARY OF IMPACTS		MANAGEMENT OUTCOME FOR INCLUSION IN EMPR	CONDITIONS TO BE CONSIDERED IN THE EA
		POSITIVE	NEGATIVE		
AIR QUALITY & CLIMATE	Based on the modelled outcome, the contribution of the proposed development to exceeding the legislative air quality standards, is overall considered to be low .	From the AQIA, it is concluded that the proposed development is “ unlikely ” to impact negatively on the surrounding environment.		SPECIALIST RECOMMENDATION It is recommended that Site Management review the existing air quality / pollution management plan with consideration of the phased impact/risk assessment provided in and the possible management measures / actions for the air quality management plan as provided in Appendix P. These measures includes but are not limited to the following: <ul style="list-style-type: none"> Maintaining measures to minimise the release of abnormal emissions (raw gas and tapping/casting fugitives) to an absolute minimum since the impact thereof is potentially significant; Apply / perform efficient dust suppression techniques; Limiting vehicle movement and associated diesel consumption as far as possible; Manage speed of onsite vehicles to slow speeds, e.g. ≤20km/h; Perform adequate re-vegetation of potential areas; Capture and reduce as much fugitive emissions as is practicable; In addition to existing monitoring requirements, it is recommended to increase the existing Dust Fallout Monitoring network to include the following monitoring areas: <ul style="list-style-type: none"> East of the proposed TSF1 and TSF2 location; Far northeast perimeter of site, on the property on the opposite side off the R555 than the smelter; Northern perimeter of the same last mentioned property; and Western perimeter of the same last mentioned property. 	None specified.
				SPECIALIST RECOMMENDATION A number of generic management outcome measures were provided, and includes, but are not limited to, the following: <ul style="list-style-type: none"> Spatial footprint to be kept to a minimum during construction; Disturbance to indigenous vegetation to be kept to an absolute minimum; Existing access routes and walking ways should be utilised and the development of new roads to be avoided; Provincial protected species must be marked for rescue and relocation, or removal (where permit application would apply) before any vegetation removal commences; It is recommended that the supervisor of the vegetation clearing contractors receive adequate training as to the presence, identity, and management of species of conservation importance, and that a botanical specialist/ECO 	
TERRESTRIAL BIODIVERSITY	Medium to low sensitivity for the Plant and Animal Species. Low sensitivity Terrestrial Biodiversity.	Implementation of the proposed rehabilitation measures may enhance the current state of the ecology as the project is located on a previously disturbed area.	The proposed development is situated within an ecology considered to be endangered.		All prescribed mitigation measures and supporting recommendations must be considered by the issuing authority.

				<p>(Environmental Control Officer) be appointed during vegetation clearing to conduct monthly on-site audits of the vegetation clearing process;</p> <ul style="list-style-type: none"> Employees and contractors should be made aware of the presence of, and rules regarding fauna through suitable induction training and on-site signage; Alien and invasive plant (AIP) species should be managed using the existing mine AIP management plan. Removal AIPs should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the project area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread, or soils contaminated with AIP seeds during the construction phase; and the existing mine AIP Management/ Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional; and No dumping of litter, rubble or cleared vegetation on site should be allowed. 	
AQUATIC BIODIVERSITY	Low sensitivity related to Aquatic Biodiversity.	By implementing the management and monitoring measures identified in the developed EMPr, may potentially enhance the aquatic biodiversity status by implementing a rehabilitation schedule.	The proposed development is situated well outside the determined 32 m buffer from the identified wetland and natural drainage system (situated southwest from development). Should storm water not be managed as per the conceptual storm water management plan, activities may potentially lead to sedimentation and siltation of the natural system.	<p>SPECIALIST RECOMMENDATION</p> <p>The following, but not limited to, management outcomes are recommended:</p> <ul style="list-style-type: none"> Due to the nature of the aquatic systems associated with the project area and low risk to the downstream receiving environments, additional aquatic assessments are not required should adequate buffers be implemented and project footprint not change; An adaptive rehabilitation plan needs to be implemented from the onset of the project. This must be compiled with input from independent ecological specialists. Additionally, a rehabilitation plan is recommended for existing modifications within the drainage line, including implementing adequate erosion control, removal of tyres and the removal of concrete from the instream zone. These should be replaced by drought tolerant indigenous vegetation suited for erosion control; and An infrastructure monitoring and service plan must be compiled and implemented during the operational phase. This will include the monitoring of all stormwater discharge points, energy dissipation structures, and stability of watercourses in the project footprint. 	All development should remain outside the 32 m buffer from the identified wetland and natural drainage system situated southwest from the proposed development.
SOIL & AGRICULTURAL	The site is classified as having a low agricultural potential.	Implementation of the proposed rehabilitation measures may enhance the current state of the ecology as the project is located on a previously disturbed area.	<p>If not managed correctly, fertile soil may be lost during construction and decommissioning activities.</p> <p>The lack of implementing a spill prevention and emergency preparedness plan may lead to potentially contaminating soil resources.</p>	<p>SPECIALIST RECOMMENDATION</p> <p>Mitigation measures should be aimed at limiting the impact of soil erosion as well as soil contamination during the construction phase.</p>	No specific recommendation made.
WATER RESOURCES	The risk assessment for both construction and post-construction phases of the project is considered low , with mostly reversible and manageable impacts.	By implementing the management and monitoring measures identified in the developed EMPr, may potentially enhance the aquatic biodiversity status by implementing a rehabilitation schedule.	The proposed development is situated well outside the determined 32 m buffer from the identified wetland and natural drainage system (situated southwest from development). Should storm water not be managed as per the conceptual	<p>SPECIALIST RECOMMENDATION</p> <p>The following, but not limited to, management outcomes are recommended:</p> <ul style="list-style-type: none"> Ensure that stormwater discharge at least adheres to the National Water Act, Government Gazette No. 20526, 8 October 1999. Wastewater limit values applicable to discharge of wastewater into a water resource. All building wastes generated during construction on site (this is temporary waste i.e. building rubble, garden refuse, used oil and paint containers etc.) must be stored in designated areas that are isolated from drainage lines / known 	Designing and implementation of the storm water management plan.

			storm water management plan, activities may potentially lead to sedimentation and siltation of the natural system.	<p>flooding areas. Waste storage facilities should be covered to prevent dust and litter from leaving the containment area and rainwater accumulation.</p> <ul style="list-style-type: none"> There is some potential for erosion. Measures should be taken to ensure that this is minimized where possible. It is proposed that water quality monitoring be implemented as discussed in Section 4.8 (Appendix K) to monitor the impact of the development on the receiving environment as a result of stormwater discharge. 	
TOPOGRAPHY AND VISUAL	The post mitigation significance of the visual impacts is expected to be <i>low</i> .	Upon closure of the proposed development, the already disturbed landscape will be shaped and rehabilitated to a suitable land-use.	Locating the proposed development within close proximity to sensitive receptors poses a risk of the overall sense of place to the surrounding community.	SPECIALIST RECOMMENDATION	
				<p>The following mitigation is however possible:</p> <ul style="list-style-type: none"> It is recommended that vegetation cover (i.e. either natural or planted) immediately adjacent to the development footprint (and especially in between the ECF and the R555 road) be maintained, both during construction and operation of the proposed facility. This will minimise the visual impact resulting from areas denuded of vegetation and shield the facility from observers travelling along the R555. Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. The construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that clearing of vegetation is minimised where possible. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. Mitigation of lighting impacts includes the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the proposed ECF and ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include the following: <ul style="list-style-type: none"> Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights; Making use of minimum lumen or wattage in fixtures; Making use of down-lighters, or shielded fixtures; Making use of Low Pressure Sodium lighting or other types of low impact lighting. Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes. 	Develop and implement a rehabilitation plan following construction ensuring exposed areas are sufficiently vegetated to prevent erosion formation.

				<ul style="list-style-type: none">• Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:<ul style="list-style-type: none">○ Ensure that vegetation adjacent to the development footprint (if present) is not unnecessarily cleared or removed during the construction period.○ Reduce the construction period through careful logistical planning and productive implementation of resources wherever possible.○ Plan the placement of laydown areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.○ Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.○ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.○ Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).○ Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting wherever possible.○ Rehabilitate all disturbed areas (if present/if required) immediately after the completion of construction works.• During operation, the maintenance of the ECF and ancillary structures and infrastructure will ensure that the facility does not degrade, therefore avoiding aggravating the visual impact.• Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as and when required.• Once the facility has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated, unless a new authorisation is granted for the plant to continue a new cycle. An ecologist should be consulted to give input into rehabilitation specifications.• All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.• Secondary impacts anticipated as a result of the proposed ECF (i.e. visual character and sense of place) are not possible to mitigate. <p>Where sensitive visual receptors (if present) are likely to be affected it is recommended that the developer enter into negotiations with the property owners regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.</p>	
--	--	--	--	--	--

NOISE	The potential noise impact from the proposed ECP Project will be <i>low</i> with all the mitigatory measures in place.	The large variations in the meteorological conditions and the geographical relations between the proposed ECF activities and the noise sensitive receptors allow for the decrease in the noise as it propagates from the existing Lion Smelter.	Increased noise levels at potentially sensitive receptors exceeding criteria of the Noise Control Regulations legislation (NCR) and SANS guidelines.	SPECIALIST RECOMMENDATION	
				<p>The following mitigation measures must be implemented to ensure the potential impact are managed:</p> <ul style="list-style-type: none">Equipment and/or machinery which will be used must comply with the manufacturer’s specifications on acceptable noise levels and any noise sources above 85.0dBA to be acoustically screened off.Construction activities may only take place during daytime periods and provided that the prevailing ambient noise level along the mine boundaries will not be exceeded.Environmental noise monitoring on a monthly basis.Equipment and/or machinery which radiate noise levels above 85.0dBA to be acoustically screened off.Noise monitoring at the residential areas and the mine boundaries to be done monthly for a year after which the frequency can change to a quarterly basis;Actively manage the process and the noise management plan must be used to ensure compliance to the noise regulations and/or standards. The levels to be evaluated in terms of the threshold noise levels of 70.0dBA along the boundaries of the property;Machinery with low noise levels which complies with the manufacturer’s specifications to be used; andActivities to take place during daytime period only.	Noise levels associated with the operational phase must be managed and monitored on a monthly basis in line with the legislated threshold.
HERITAGE AND PALAEOLOGY	Impacts of the project on heritage resources is expected to be <i>low</i> during all phases of the development.	No features of significance observed at the preferred location.		<p>SPECIALIST RECOMMENDATION</p> <p>The following mitigation measures must be implemented to ensure the potential impact on heritage resources are managed:</p> <ul style="list-style-type: none">Implement a chance find procedure in case of uncovering any heritage finds or graves; andFrequent visual monitoring of construction activities by the appointed Environmental Control Officer (ECO).	<p>The following recommendations for EA apply:</p> <ul style="list-style-type: none">The proposed development may only proceed based on approval from the South African Heritage Resources Agency (SAHRA);Implementation of a chance find procedure for the project should any artifacts or graves be uncovered during any phase of the project; andMonitoring of earthworks by the ECO.
HEALTH AND SAFETY	The respiratory and cardiovascular related health effects associated with the determined pollutants associated with the proposed development has been determined to be <i>low</i> .	The potential health related impacts associated with the continuing of the proposed development has been determined to be insignificant.		<p>SPECIALIST RECOMMENDATION</p> <p>Implementation of the recommendations of the air quality specialist.</p>	None specified.
SOCIO-ECONOMIC	A <i>low</i> site sensitivity from a socio-economic perspective with the anticipated negative impacts mitigated and positive impacts enhanced.	Socio-economic intrusion, population change, and change in the sense of place.	Job opportunities and skills development opportunities throughout the entire life cycle.	<p>SPECIALIST RECOMMENDATION</p> <p>The following measures are recommended:</p> <ul style="list-style-type: none">Reduce dust and noise during construction;Implement and adhere to the Air Quality Management Plan;Maintain infrastructure and services;Enhance local employment opportunities as far as possible to ensure benefits for targeted groups;Ensure transparent communication with regards to the procurement;	A Social Management Plan must be implemented and integrated as part of the Environmental Management Programme (EMPr). A forum, including representatives from the project proponent and local key stakeholders (if not already established for mining and smelter operations) must be established. The aim of such a forum would be

				<ul style="list-style-type: none"> • Ensure efficient and transparent management of the project; • Transfer of skills and capacity building during operational phase; • Local labour receives preference where possible; • Procurement and recruitment processes are transparent and clearly communicated; • Minimise negative visual impacts related to the project ; • No unauthorised access to the site/facility; • Limit dependency on the grid while lowering operational costs; • Implementation of project and environmental management will lessen carbon emissions; • Positive long-term impacts in reaching the reduction in total emissions footprint; • Positive long-term impacts on local and regional economy as a result of continuation of the life of the smelter with subsequent indirect employment opportunities and downstream economic opportunities; • Minimise intrusion impacts associated with decommissioning; and • EMPr compliance. <p>A further key requirement would be a transparent and comprehensive communication and participation process. A framework must be developed that would allow for meaningful engagements (consultation and participation) with the affected parties on an iterative basis, as well as the active participation of community representatives in the planning processes.</p>	to meet quarterly to discuss socio-economic issues related to the proposed ECF and project implementation/management.
TRAFFIC MANAGEMENT	The potential traffic impact from the proposed ECP Project will be <i>low</i> with all the mitigatory measures in place.	Improvements of the current road intersection to improve road safety.	Increased pressure on local roads during construction activities.	<p>SPECIALIST RECOMMENDATION</p> <p>The intersection of Road R555 and Existing Smelter Access Road is an existing intersection and is currently provides access to maintenance activities at the existing Lion Smelter only. The smelter mainly gains access from Road D212 and therefore improvements to the intersection of Road R555 and Existing Smelter Access Road (Point A) without the proposed project is not justified, and due to the latest regulations and traffic engineering practice, improvements from a road safety perspective is required should the ECF project continue.</p> <p>These improvements include the following:</p> <ul style="list-style-type: none"> • East of the intersection on Road R555: A 60 meters Left-Turn Deceleration Lane and Free-Flow traffic control. • South of the intersection on the existing Smelter access: Stop for approaching traffic control. • West of the intersection on Road R555: A 60 meter Dedicated Right-Turn Lane. <p>The following recommendations are made in terms of other traffic engineering related matters with regards to the existing roads network, due to the Proposed Project:</p> <ul style="list-style-type: none"> • Provide reflective road studs at strategic points (LED if possible) to ensure the safe operation of the relevant intersections under investigation at night-time and during power outages. • Provide required road traffic signs for the relevant intersection. • Provide relevant road markings at relevant intersection under investigation (highway paint recommended). • Provide workers with training on road safety. • Road safety and awareness campaigns should be run at the proposed project. <p>In addition to the above recommendations, a formal application for intersection upgrading should be submitted to the South African National Roads Agency SOC Ltd</p>	<p>Road infrastructure improvements as recommended by the traffic engineer (Appendix M) must be implemented at the existing intersection of Road R555 and the Smelter Access Road.</p> <p>A formal application for intersection upgrading should be submitted to the South African National Roads Agency SOC Ltd (SANRAL) for approval purposes before any work is conducted within the road reserve of Road R555.</p>

				(SANRAL) for approval purposes before any work is conducted within the road reserve of Road R555.	
WASTE MANAGEMENT	Impacts associated with waste management can be effectively managed to a <i>low</i> significance.	Effective waste management through the implementation of the developed EMPr.	Potential pressure on existing municipal infrastructure during construction and decommissioning phase of the proposed development.	RECOMMENDATION	
				The following recommendations should be implemented: <ul style="list-style-type: none">• A Waste Management Plan to be developed and implemented in line with the existing management plan associated with the Lion Smelter operation;• Ensure the effective design of the PBU & CGC' condensate effluent management system according to waste stream classification; and• Prioritising the implementation of the waste management hierarchy, disposal being the last option.	Implement an effective design of the PBU & CGC condensate effluent management system as per the waste stream classification. Waste stream classification to be determined in line with relevant legislation.

9.2 FINAL SITE LAYOUT

The final site layout was determined following the outcome of the BA process. The layout plan is attached as Appendix B.

9.3 REASONED OPINION FOR AUTHORISATION

Nettzero (Pty) Ltd as the appointed EAP recommends that on the conditions that all the requirements, conditions, and measures listed in the developed EMPr and specialist assessments be adhered to, that there is no reason why this activity should not be authorised.

A number of conditions have been highlighted throughout this report.

To summarise, the following conditions are recommended to be included in the environmental authorisation:

General conditions

- Before the commencement of any activities, the proponent must appoint a suitably qualified and experienced ECO. An ECO must remain appointed throughout the life cycle of the proposed development.
- All comments and concerns raised by the registered I&AP be considered and incorporated into the final BAR and EMPr where applicable & practicable.
- A Community and Stakeholders forum must be established that is open to all interested and affected parties. The purpose of the forum is to communicate social and environmental performance on a quarterly (reporting of incidents, performance of implementing the EMPr and EA conditions), raise concerns, communicate construction schedules, and initiate collaborations.
- Conditions stipulated in the final EMPr to be adhered with.
- Conditions stipulated in all other permits or authorisations should be implemented.
- All recommendations made in the BAR and specialist studies be implemented throughout the entire life cycle of the development.
- All existing informal access roads must be utilised by the development. Any upgrades to the existing roads must not exceed the maximum width of 8m. Should the upgrade require a road reserve larger than 8m, authorisation subject to the relevant listed activities must be obtained.

Air quality management measures

- The existing Air Emissions Licence (AEL) to be amended to include the additional activity in terms of GN 893 GG 37054 dated 22 November 2013 (as amended) associated with the proposed development: Sub-category 1.5 Reciprocating Engines.

Terrestrial biodiversity protection measures

- Prior to any construction activities, the ECO (if suitably qualified) or appointed specialist (preferably SACNASP registered specialising in the field of ecology), must conduct a site inspection recording all potential protected or endangered fauna and flora species. A detailed register should be kept of these species indicating at least its location, condition and potential of relocation.

- Provincially protected (including species of conservational concern) must be marked for rescue and relocation, or removal (where permit application would then apply) before any vegetation removal commences.
- Obtain any additional environmental permits required from LEDA for the protected plant species that need to be translocated through the search and rescue exercise.
- Alien invasive species, in particular category 1b species that were identified within the study area, should be removed from the development footprint and immediate surrounds, prior to construction or soil disturbances.

Aquatic and surface water protection measures

- All development should remain outside the 32 m buffer from the identified wetland and natural drainage system situated southwest from the proposed development.
- A Storm Water Management plan must be designed (by a suitably qualified and experienced), implemented and maintained throughout the entire life cycle of the development.

Noise specific measures

- Noise levels associated with the operational phase must be managed and monitored monthly in line with the legislated threshold.

Heritage protection measures

- The proposed development may only proceed based on approval from the South African Heritage Resources Agency (SAHRA).
- Implementation of a chance find procedure for the project should any artifacts or graves be uncovered during any phase of the project.

Socio-economic impact management measures

- A Social Management Plan must be implemented and integrated as part of the Environmental Management Programme (EMPr).

Traffic impact management measures

- Road infrastructure improvements as recommended by the traffic engineer (Appendix M) must be implemented at the existing intersection of Road R555 and the Smelter Access Road.
- A formal application for intersection upgrading should be submitted to the South African National Roads Agency SOC Ltd (SANRAL) for approval purposes before any work is conducted within the road reserve of Road R555.

Waste management measures

- Implement an effective design of the PBU & CGC condensate effluent management system as per the waste stream classification. Waste stream classification to be determined in line with relevant legislation.

Auditing and reporting

- The appointed ECO must submit a quarterly compliance report during the construction phase and quarterly during the operational phase to the competent authority indicating performance against the measures specified in the EA and EMPr.
- An internal annual audit report assessing the effective implementation of the conditions of the EMPr and compliance thereof must also be submitted to the competent authority. An action plan indicating how the shortcomings and or non-conformities will be addressed must accompany the internal audit report.
- An independent external audit in line with regulation 34 of the EIA regulation must be conducted 6 months after the commencement of construction and again following the completion of construction activities. Thereafter, every two years during the operational phase of the development.

Closure requirements

- Prior to the commencement of closure (as defined by the regulations), the relevant required environmental authorisation must be applied for.
- A detailed Closure Plan as per Appendix 5 of the 2014 EIA regulations must accompany the application.
- Before the commencement of the ECF project, the proponent must confirm funds available for closure as specified in the required Closure Plan.

9.4 PERIOD FOR WHICH EA IS REQUIRED

As the operational phase of the proposed development directly relies on the existing Lion Smelter operations, the period for which the EA is required should align with the remaining life of the smelter. Theoretically, the smelting operation is expected to be in operation for at least another 45 years provided on-going maintenance, refurbishment and upgrading dependant on the economic feasibility.

Therefore, the EA is required for at least **45 years**.

9.5 FINANCIAL PROVISIONING FOR REHABILITATION, CLOSURE AND POST DECOMMISSIONING

With reference to the regulatory requirements to provide details on the financial provisioning for rehabilitation, closure and post decommissioning, at the time of completing this BAR, no regulations were published in terms of the proposed development.

As per Regulation 19 of the EIA regulations, a Closure Plan is required where the application for an EA relates to the closure of a facility.

In terms of Listing Notice 1, activity 31 (closure of existing facilities, structures, or infrastructure) was excluded as part of the application for the required EA.

As per the recommendations made in section 9.3 and the developed EMPr, it is required that a detailed Closure Plan, complying with the relevant regulations, must be developed and submitted as part of the process for obtaining the required EA at least 12 months prior to the ⁷closure of the ECF project.

⁷ The definition of closure in terms of this document means to take out of active service permanently or to dismantle partly or wholly, or permanent shutdown of a facility to the extent that it cannot be recommissioned.

The following general objectives must be considered when developing the required Closure Plan:

Table 70: Objectives of the closure plan

ASPECT	OBJECTIVE	PERFORMANCE INDICATOR	MONITORING MECHANISM
Physical stability	To remove and/or stabilise surface infrastructure.	<ul style="list-style-type: none"> • All rehabilitated disturbed areas that have the potential for wind and/or water erosion will be provided with a suitable vegetation cover to combat these aspects/forces; • Where localised material deficits occur, voids will be backfilled and shaped as pan like or naturally undulating structures so that beneficial land uses can be implemented; and • Monitoring is undertaken to demonstrate the success of the closure and rehabilitation measures implemented. 	<ul style="list-style-type: none"> • Auditing and reporting as specified in section 6. • Implementation of the monitoring programme specified in the EMPr.
Environmental quality	To ensure that local environmental quality is not adversely affected by possible physical impacts and contamination which may be arising from the rehabilitated areas.	<ul style="list-style-type: none"> • No environmental risks will remain post-closure. • Environmental impacts will be investigated and addressed at source. If not addressed at the source, the required intervention/mitigation measures will be implemented, preferably during operations, to limit the intervention required at closure; and • Ongoing monitoring will be undertaken to ensure the quality of the surface and groundwater remains within pre-mining quality ranges or at such quality that it suitably protects receptors. 	
Land capability/land-use	To re-instate suitable land capabilities over the rehabilitated portions.	<ul style="list-style-type: none"> • Where possible, land capability will be reinstated to match the pre-development land capabilities; • A functional post-development landscape is achieved inline with Industrial 2 zoning; • Invasive vegetation species will be eradicated to further enable achievement of the desired land 	

		<p>capability on rehabilitated areas, and functioning of riparian zones; and</p> <ul style="list-style-type: none"> Landforms are mostly free draining to maximise the surface water return into the catchment to reduce recharge and ensure connectivity of wetlands and functioning of riparian zones. 	
Biodiversity	To encourage, where appropriate (for example in corridors), the re-establishment of native vegetation on the rehabilitated areas such that the potentially affected terrestrial and or aquatic biodiversity is largely re-instated over time.	<ul style="list-style-type: none"> ⁸ Self-sustaining vegetation communities are established; and Invasive species that could threaten the reinstatement of the desired vegetation communities are actively eradicated. 	

9.6 INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

At the time completing this report, no additional information was required by the competent authority.

9.7 OTHER MATTERS REQUIRED IN TERMS OF SECTION 24 (4) (A) AND (B) OF NEMA

Throughout the required BA process, the EAP ensured that all requirements in terms of section 24 (4) (a) and (b) were addressed. Table 71 cross-references where it has been documented.

Table 71: Checklist indicating compliance with section 24 (a) and (b) of NEMA

NO.	REQUIREMENT	REPORT PAGE REFERENCE/COMMENT
24 (4)	Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment -	
(a)	must ensure, with respect to every application for an environmental authorisation -	Application for EA and AEL amendment by means of a BA process.
(i)	coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;	Application in terms of obtaining an EA and AEL with relevant departments.
(ii)	that the findings and recommendations flowing from an investigation, the general objectives of integrated environmental management laid down in this Act and the principles of environmental management set out in section 2 are taken into account in any decision made by an organ of state in relation to any proposed policy, programme, process, plan or project;	See the BAR and EMPr associated with this application.
(iii)	that a description of the environment likely to be significantly affected by the proposed activity is contained in such application;	See BAR section 7.
(iv)	investigation of the potential consequences for or impacts on the environment of the activity and assessment of the significance of those potential consequences or impacts; and	See BAR section 7 and Appendices F to P.
(b)	must include, with respect to every application for an environmental authorisation and where applicable-	

⁸ Able to continue in a healthy state, i.e. pre-development land capability, without interventions such as herbicide, water, and fertilizer applications, etc.

(i)	investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity;	See BAR section 5.
(ii)	investigation of mitigation measures to keep adverse consequences or impacts to a minimum;	See Appendices F to P and EMPr Tables 8 to 20.
(iii)	investigation, assessment and evaluation of the impact of any proposed listed or specified activity on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), excluding the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act;	See BAR section 6.4 and Appendix H.
(iv)	reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;	See BAR section 10.
(v)	investigation and formulation of arrangements for the monitoring and management of consequences for or impacts on the environment, and the assessment of the effectiveness of such arrangements after their implementation;	See EMPr Tables 21.
(vi)	consideration of environmental attributes identified in the compilation of information and maps contemplated in subsection (3); and	See BAR section 6 and Appendix B.
(vii)	provision for the adherence to requirements that are prescribed in a specific environmental management Act relevant to the listed or specified activity in question.	See BAR section 2.6 and Table 1.

10 ASSUMPTIONS, UNCERTAINTIES, AND GAPS IN KNOWLEDGE

Upon the appointment of Netzero (Pty) Ltd, the EAP collected all required information deemed necessary to conduct the required impact assessment.

All concluding remarks on the assessments is based on information provided by the proponent at the time finalising this BAR.

Table 72 summarises the assumptions, uncertainties, and or gaps in knowledge of the appointed specialist.

Table 72: Summary of assumptions, uncertainties, and gaps in knowledge for various aspects considered during the assessment process

SPECIALIST/ASPECT	ASSUMPTIONS/UNCERTAINTIES/GAPS IN KNOWLEDGE
AIR QUALITY & CLIMATE	The available information for the project was utilised to assess the potential impact to air quality over the study area by means of dispersion modelling, limited to the data available and noting that other sources, not included in the study, will contribute to / impact on the quality of the ambient air over the study area. It should also be noted that this is a theoretical / modelling assessment, and it should always be considered that there are several factors which influence the resulting uncertainty of such a study, as flagged/indicated by means of the comments made throughout the content of this report. In terms of the dispersion modelling uncertainties provided in Appendix P, the assumptions made, and the information contained in the report, the findings are made against a confidence rating of medium to high. Whilst all attempts are made to ensure objectivity and impartiality, the “assessment remains an act of judgement and can never escape the subjectivity inherent in attempting to define significance”.
TERRESTRIAL BIODIVERSITY	The following limitations should be noted for the assessment: <ul style="list-style-type: none"> Only a single-season one day survey was conducted for the respective studies, this would constitute an early wet season survey; and This assessment has not assessed any temporal trends for the project.
AQUATIC BIODIVERSITY	The following limitations should be noted for the assessment: <ul style="list-style-type: none"> A single season survey was conducted for the respective study, which would constitute a wet season survey; No surface water was present during the survey at the site assessed, and therefore the results of the aquatic survey are limited to desktop findings, literature review, and assessment of habitat observed on site and deductions from aerial imagery; and This assessment has not assessed any temporal trends for the project.

SOIL & AGRICULTURAL	<p>Soil mapping was inferred from extrapolations from the auger sampling points, whose locations were recorded on GPS coordinate waypoints with an accuracy of 3m to 6m. The boundaries of the soil forms delineated within the site are based on these waypoint locations. However, it is impossible to achieve 100% purity in soil mapping, the delineated soil map units could include other soil type(s) as the boundaries between the mapped soils are not sharp but rather gradual in reality.</p> <p>Soil fertility status was not undertaken in this assessment.</p>
WATER RESOURCES	<p>The following assumptions pertain to the CSWMP:</p> <ul style="list-style-type: none"> • The PWR BLOKS will have a dedicated secondary containment receptible underneath it for the capture of potentially contaminated water, which will be handled separately and not as part of the overall stormwater system (not part of this assessment); • No runoff will occur from the proposed development surface area (i.e. the pavement area), and all runoff will be captured at a central point and released to the appropriate stormwater system (as recommended by this report); and • The ALOS DTM used to delineate the sub-catchments are of sufficient resolution to accurately describe the runoff from the site.
TOPOGRAPHY AND VISUAL	<p>This assessment was undertaken during the planning stage of the project and is based on information available at that time.</p>
NOISE	<p>The following assumptions were used in the noise impact assessment:</p> <ul style="list-style-type: none"> • The noise calculations were based on the location of the ECF project at its position as illustrated in Figure 4; • Noise calculations were based as if the construction and rehabilitation phases will take place during the day and the operational phase during the day and night; • The report is based on project information provided by the client; • The noise calculations were based on the following noise levels per activity: <ul style="list-style-type: none"> ○ Clearing and stripping of topsoil and vegetation at the ECF Pad – 85.0dBA; ○ Construction of the ECF Pad – 85.5dBA; ○ Construction activities at the ECF pad – 81.0dBA; ○ Installation of the containers and the pipes and flare – 84.0dBA; ○ Construction activities of the offices/operator's area – 82.0dBA; ○ Noise from the ECF Pad – 100.5dBA; ○ Generation of electricity by the generators – 90.0dBA; ○ Emergency release valve – 100.0dBA; ○ Reciprocation engines – 100.0dBA; ○ Pumping of cooling water – 95.0dBA; and ○ Office/Operator room – 75.0dBA.
HERITAGE AND PALAEOLOGY	<p>The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded and the possible occurrence of graves and other cultural material cannot be excluded. Appendix H only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.</p>
HEALTH RISK ASSESSMENT (HRA)	<p>The HRA in this report is based on modelled ambient air concentrations of PM2.5, SO2, NO2, CO and Cr (VI) provided by the AQIA (Appendix P). The centrepin of the quantification of the health risk assessment is the relative risk (RR) ratio, used to calculate the likely health effect response following on a modelled exposure to the pollutant of interest. The RRs were derived from large international epidemiological studies reviewed by international regulatory and scientific agencies, namely the USEPA and the WHO, and from strong epidemiological studies using the systematic review and meta-analysis methodology.</p> <p>Uncertainty in the results of the study is vested in the use of RRs mostly based on studies in developed countries, since RRs applicable to a developing country such as South Africa were not available. However, the estimates presented in this report are the most accurate that are currently achievable. The ideal source of RRs for risk quantification would be South African epidemiological studies, since socio-economic factors unique to South Africa might influence the estimated outcomes. However, a sufficient database of such epidemiological studies is not currently available in South Africa. Nonetheless, the use of RRs determined in systematic review and meta-analysis studies mitigates this limitation, as the systematic reviews are not limited to westernised or developed countries only. Thus, it is not expected that the potential influence of these factors would significantly affect the outcome of the assessments, and the interpretations presented in this report are the most valid that can be achieved in view of the acknowledged limitations.</p>

	<p>Risks associated with short-term exposure are presented as AFs, calculated on the basis of the 99th percentile of daily concentrations, which is considered a highly conservative upper estimate of the daily exposure concentrations for HRA purposes. The 99th percentile represents the concentration exceeded by only 1 per cent of the modelled days, which would be at most 3 to 4 days in a 365-day period.</p> <p>The Cr (VI) risk assessment is presented with confidence, as it is based on the toxicity values applied by major international health risk assessment and regulatory agencies. The tiered approach used for the assessment is internationally accepted and the HRA paradigm applied by INFOTOX is considered best practice for community HRAs in the international scientific risk assessment community.</p>
SOCIO-ECONOMIC	<p>With regards to the Baseline Social Assessment and Social Screening undertaken, the following should be noted:</p> <ul style="list-style-type: none"> • The assessment did not include consultations with stakeholders and potentially affected parties. At the time of the finalisation of the study, the public participation process associated with the BA Process did not yet commence • The social assessment aims to identify possible socio-economic impacts that could occur in future. These impacts are based on existing baseline information. There is thus always an uncertainty with regards to the anticipated impact actually occurring, as well as the intensity thereof. Impact predictions have been made as accurately as possible based on the information available at the time of the study. • Sources consulted are not exhaustive and additional information can still come to the fore to influence the contents, findings, ratings and conclusions made. • Socio-economic baseline information was mainly based on official statistics from StatsSA, as well as municipal documentation. Sub-municipal data was only available for 2011. The lack of more recent official socio-economic data is therefore seen as a limiting factor, although it is not anticipated to influence the outcome of the report. • In certain instances, statistics from the StatsSA Census of 2011 on sub-municipal level (ward based) were compared with information from the Community Survey of 2016 on municipal, district and provincial level. This was undertaken to determine a trend comparison and will not influence the outcome of the report's findings with regards to the possible socio-economic impacts associated with the proposed project. • Technical and other information provided by the EAP is assumed to be correct.
TRAFFIC MANAGEMENT	<p>For the purpose of this traffic impact assessment, it is assumed that:</p> <ul style="list-style-type: none"> • The vehicle traffic absorption rate (rate at which existing developments attract vehicular traffic) by all other types of completed developments will maintain the same status for the next five years. • That the average rate of growth of vehicle traffic in the area under investigation that is not relevant to the Proposed Project (background traffic) between the 2022 to 2027 scenarios was anticipated at 3% per annum.

11 UNDERTAKING BY EAP

I, **Anandi Alers the appointed EAP (registration no. 2019/1514)**, appointed in terms of the provisions of NEMA and the EIA regulation, hereby confirms the following:

- As far as my knowledge goes, the information provided in the BAR, the EMP, as well as the supporting specialist reports are correct.
- All comments and inputs from the stakeholders and registered I&AP's, as well as the responses thereof, were included and considered in BAR & EMP (see Appendix E).
- All inputs and recommendations from Specialist Reports, including but not restricted to baseline descriptions, impact significance ratings, proposed impact management measures, as well as monitoring proposals, were duly, where practicable, included in the EIAR and EMP.
- Do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014.

All information provided associated to the BA process required is based on the expertise and interpretation of the relevant legislation of the EAP in compliance with Regulation 13 of the EIA regulations (GNR. 982 of 2014, as amended).

NAME	DECLARATION SIGNATURE	DATE
Anandi Alers		25 March 2022

APPENDIX A – SCREENING REPORT

APPENDIX B – LOCALITY MAP AND SITE LAYOUT

APPENDIX C – SITE SENSITIVITY VERIFICATION REPORT

APPENDIX D – EAP DECLARATION AND CV

APPENDIX E – PUBLIC PARTICIPATION PROCESS REPORT

APPENDIX F – AGRICULTURAL COMPLIANCE STATEMENT

APPENDIX G – LANDSCAPE AND VISUAL IMPACT ASSESSMENT

APPENDIX H – ARCHAEOLOGICAL AND PALAEOLOGICAL IMPACT ASSESSMENT

APPENDIX I – TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

APPENDIX J – AQUATIC BIODIVERSITY COMPLIANCE STATEMENT

APPENDIX K – HYDROLOGICAL AND GEOHYDROLOGICAL ASSESSMENT

APPENDIX L – NOISE COMPLIANCE STATEMENT

APPENDIX M – SITE TRAFFIC IMPACT ASSESSMENT

APPENDIX N – HEALTH RISK ASSESSMENT

APPENDIX O – SOCIO-ECONOMIC COMPLIANCE STATEMENT

APPENDIX P – AIR QUALITY IMPACT ASSESSMENT

