Tronox KZN Sands (Pty) Ltd

FINAL BASIC ASSESSMENT REPORT AND FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

Fairbreeze Mine Extension into Heleza Moya Farm

DMRE REF: KZN30/5/1/2A/2/123 MR
APRIL 2024

PUBLIC

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

FINAL

BASIC ASSESSMENT REPORT

AND

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: Tronox KZN Sands (Pty) Ltd
TEL NO: +27 35 902 700
FAX NO: N/A
POSTAL ADDRESS: Private Bag X20010, Empangeni, 3880
PHYSICAL ADDRESS: R34 Melmoth Rd, Empangeni, 3880, Kwa-Zulu Natal, South Africa

FILE REFERENCE NUMBER SAMRAD: KZN30/5/1/2/2/123MR

1. IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report, in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16 (3) (b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the Competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out

below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

2. OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

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 managed, avoided or mitigated;

(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 manage, avoid or mitigate identified impacts; and

1. (iii) identify residual risks that need to be managed and monitored.

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 41104206

OUR REF. NO. DMRE REF: KZN30/5/1/2A/2/123 MR

DATE: APRIL 2024

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 361 1300

WSP.com

QUALITY CONTROL

Issue/revision	Draft BAR	Final BAR
Date	20 November 2023	22 April 2024
Prepared by	Sihle Dambuza	Sihle Dambuza
Signature		
Prepared by	Tiffany Seema	Tiffany Seema
Signature		
Checked by	Phindile Mashau	Phindile Mashau
Signature		
Authorised by	Brent Baxter	Brent Baxter
Signature		
Project number	41104206	
Report number	41104206-359520-14	
File reference	\\corp.pbwan.net\za\Central_Data\Projects\41100xxx\41104206 - Fairbreeze Mine Extension\41 PA\01-Reports\02-Final	

CONTENTS

TABLES

FIGURES

APPENDICES

GLOSSARY

Abbreviation	Definition
AEL	Atmospheric Emissions Licence
ACRU	Agricultural Catchments Research Unit
AIS	Alien Invasive Species
AOO	Area of Occupancy
BI	Biodiversity Importance
BA	Basic Assessment
BAR	Basic Assessment Report
CA	Competent authority
CBA	Critical Biodiversity Area
CPC	Central Processing Plant
CRR	Comments and Responses Report
dB(A)	Decibel
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EDTEA	Economic Development, Tourism and Environmental Affairs
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EOO	Extent of Occurrence
FBA	Fairbreeze A
FBB	Fairbreeze B

Abbreviation	Definition
FBC	Fairbreeze C
FBCX	Fairbreeze C extension
GA	General Authorisation
GDP	Gross Domestic Product
GN R.	Government Notice Regulation
ha	Hectares
HMC	Heavy Mineral Concentrate
I&APs	Interested and Affected Parties
IBA	Important Biodiversity Area
IDP	Integrated Development Plan
IFC	International Finance Corporation
KZN	KwaZulu-Natal
KZN BSP	KwaZulu-Natal Biodiversity Sector Plan
LDV	Light Duty Vehicle
LoM	Life of Mine
MPA	Maputaland-Pondoland-Albany
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MRA	Mining Right Area
MSP	Mineral Separation Plant
MSRSF	Mega Sebeka Residue Storage Facility/Everglades
NAAQS	National Ambient Air Quality Standards
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act 39 of 2004
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMPAA	National Environmental Management Protected Areas Act (No. 57 of 2003)
NEMWA	National Environmental Management: Waste Act (Act No. 59 of 1998)

Abbreviation	Definition
NFEPA	Freshwater Ecosystem Priority Area
NHRA	National Heritage Resource Act (Act No. 25 of 1999)
NPAES	National Protected Area Expansion Strategy 2010
NWA	National Water Act, 1998 (Act No. 36 of 1998)
OHSA	Occupational Health and Safety Act (No. 85 of 1993)
PPP	Public Participation Process
PWP	Primary Wet Plant
Run of Mine	RoM
RSF	Residue Storage Facility
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SAWS	South African Weather Service
SCC	Species of Conservation Concern
SDF	Spatial Development Frameworks
SDGs	Sustainability Development Goals
SG	Surveyor General
SLP	Social and Labour Plan
SWSA	Strategic Water Source Areas
S&EIA	Scoping and Environmental Impact Assessment
tph	tons per hour
VRWD	Valley Return Water Dam
WHO	World Health Organisations
WRF	Weather Research and Forecasting
WSP	WSP Group Africa (Pty) Ltd
WULA	Water Use Authorisation Application

Abbreviation	Definition
WUL	Water Use Licence

EXECUTIVE SUMMARY

WSP Group Africa (Pty) Ltd), an independent Environmental Assessment Practitioner (EAP), was appointed by Tronox KZN Sands (Pty) (Tronox) to conduct the required Environmental Authorisation (EA) application for the proposed Fairbreeze Mine Extension into Heleza Moya Farm (Project). The EA application for the inclusion of Heleza Moya Farm into the Fairbreeze Mine Mining Right Area must be submitted to the Competent Authority (CA), which is the Department of Mineral Resources and Energy (DMRE), supported by a Basic Assessment (BA) process. The draft Basic Assessment Report (BAR) was made available for public review to provide Interested and Affected Parties (I&APs) the opportunity to comment on the Project. The due date for comments on the draft BAR and EMPr was **19 January 2024**. Comments received during the public review period were acknowledged and recorded in the final BAR and EMPr that is submitted to the DMRE, for decision-making

Introduction and Project Background:

Tronox has operated the Fairbreeze Mine, located south-west of Mtunzini, for nearly 10 years. The mine comprises of four approved mining areas (Pits A, B, C and C-Extension), an onsite Primary Wet Plant (PWP) and a fines Residue Storage Facility (RSF). Heavy mineral concentrate from the PWP containing ilmenite, zircon, rutile and other mining co-products, is transported by road to the Tronox KZN Sands, Central Processing Complex (CPC) in Empangeni, which includes a Mineral Separation Plant (MSP) and a smelter where titanium dioxide and pig iron are produced. In 2022, Tronox acquired the 118-hectare (ha) Heleza Moya property, located between the Fairbreeze PWP and the Pit B mining area, and incorporated this property into the Fairbreeze Mine.

Tronox intends to make an application to extend their mineral sands mining into parts of Heleza Moya Farm to enable this area to be mined together with the approved Pit B orebody which lies on the immediate north and west of Heleza Moya. The Heleza Moya property is located on the Remainder of Portion 3 of Lot Emoyeni No. 9105, uMlalazi Local Municipality within the King Cetshwayo District Municipality, Kwazulu-Natal Province. Mining activities involve preparing the area by removing vegetation and stripping the topsoil, a layer extending 300 mm from the earth's surface, rich in organic matter and crucial for biological soil activity. The topsoil will be stockpiled before ore extraction, utilizing the Hydraulic Monitoring method, involving high-pressure water to cut and loosen in-situ sand. This method, operational at the FBB pit, will persist as the pit expands to include the Heleza Moya ore body.

The extracted heavy minerals will undergo separation at the Primary Wet Plant (PWP) before being transported to Tronox CPC for refinement. Slimes from the PWP will be directed to a licensed Residue Storage Facility (RSF), while tailings will be pumped back to the mining area for backfilling, contributing to rehabilitation efforts for pre-mining land capability.

To extend mining activities to the Heleza Moya area, relocation of certain mining components, including pump stations and high-pressure water lines, will be necessary. Backfilling and

rehabilitation will occur upon completing ore extraction in a designated area, ensuring a comprehensive restoration process for mined-out sections. Sand tails and return water pipelines will be installed in post-mining areas, often on previously mined terrain.

Project Rehabilitation and Future Land Use:

Tronox will maintain good rehabilitation practices in line with the approved EMPr and leveraging from lessons learnt for aiming to achieve pre-mining agricultural land use. Upon completion of mining in a specific region, active rehabilitation, involving back-filling with sand tailings, will commence. Sand will be directly pumped from the PWP to the void area. The process water, utilized for sand transport, will gravitate to the lowest point in the mining void, collected, and then returned to the PWP for re-use. Post-mining, sand tails and return process water pipelines will be installed, either on previously mined terrain or along the perimeter, guided by practical on-site considerations.

Once the mining void is back-filled, the surface area will undergo mechanical contouring to ensure that the slopes seamlessly integrate with the existing landscape. The topsoil stockpiled before mining will be reinstated, and the area will be vegetated following the established rehabilitation process in the current Fairbreeze Mine areas and as recommended in the existing EMPr. Maintenance and aftercare of revegetated areas will persist for a minimum of 3 years after closure, aligning with the approved EMPr. Specific rehabilitation measures for certain components will be considered if they deviate from generic EMPr recommendations.

The proposed mining process for Heleza Moya involves the hydraulic mining method for extracting ROM material. The Heavy Mineral Concentrate (HMC) resulting from this process will be transported to the Tronox CPC for further beneficiation.

Thus, it is the primary aim of rehabilitation, in the context of this document, to:

- Reduce the actual or potential environmental threats.
- Reduce the potential risks so that unacceptable risks identified in this Basic Assessment Report (BAR) are reduced to acceptable levels.
- Protect the future liability of the land by re-establishing a sustainable land use.

Project Background and Motivation:

The following points below summarise the project motivations:

- Fairbreeze Mine will be reaching the end of its life span within the next fifteen years and Tronox's previous mining operation, Hillendale, is currently in the mine closure stage of its life. Therefore, expanding the Fairbreeze mining area will contribute to increasing the material output and thus optimising reclamation at Fairbreeze within this life span. This will also ensure optimal extraction of mineral resources within the Fairbreeze orebody. Thereafter, Tronox will continue its mining operations at the proposed Port Dunford Mine.
- According to the uMlalalazi Local Municipality's Integrated Development Plan (IDP) (uMlalazi Local Municipality, 2020) and the King Cetshwayo District Municipality's Spatial Development Framework (SDF) (King Cetshwayo District Municipality, 2021) (IDP) mining is identified as a strategic economic sector due to the landscape of the region and therefore provides the municipality with a competitive advantage in this sector.
- The IDP mentions that the heavy mineral count in the Coastal Dune also presents an opportunity for formal employment for the youth within the mining sector. Furthermore, Tronox is named as

one of the districts 'mining giants' and as a flagship mining company due to its scale of operation. This largely benefits the Gross National Product (GDP)

- The expansion will also secure continued feed to the CPC in Empangeni for the next seventeen years and allow for continued supply to customers. The expansion will also assist in realising sustained economic benefits for:
  - The national GDP;
  - Communities that benefit from the Social and Labour Plan (SLP); and
  - Tronox in general.

Project Alternatives:

The following sections below provide a short summary of the project alternatives that were assessed within this Basic Assessment process.

The location of the Proposed Project

Fairbreeze already owns the mining right to the land surrounding the Heleza Moya Farm and currently mining in the area. Therefore, there can be no alternative sites.

The type of activities to be undertaken

The only optional activity for Fairbreeze is to continue mining in the Fairbreeze mine and expand into the Heleza Farm. Therefore, there can be no alternative activities undertaken by Tronox.

The technology to be used

The mining method that is "Preferred" is ***Hydraulic Mining*** as opposed to ***Mechanical Dredging***.

The mining activities, in its operational phase, is expected to implement recycling policies and measures for optimal utilisation of resources and minimisation of waste generation. The high-pressure water lines would also need to be extended from the current FBB area onto Heleza Moya to power the hydraulic monitors. The Fairbreeze area is supplied with electrical power from the Eskom electricity grid.

The Design and Layout of the Activity

The positioning of the infrastructure was considered based on the access to the reserves, environmental sensitives and existing haul roads. The location also considered the PWP location regarding ease of access and efficiency. The position of 88 kV powerline was also considered in the decision to place the infrastructure.

With the above considered the preferred infrastructure position was selected. The preferred infrastructure position also allows the opportunity to realise economies of scale as the infrastructure will be oved from FBB, thus increasing output with the same infrastructure.

The proposed infrastructure location is also accessible through existing routes that ultimately transport product to the CPC.

The No-Go Alternative

The Option of the project not proceeding would mean that the environmental and social status would remain the same as it is currently. This implies that both negative and positive impacts would not take place. As such, the short-term negative impacts on the environment would not transpire;

equally so, the long-term positive impacts such as economic development, skills development, and the availability of land for a beneficial future land use would not occur.

Environmental Impacts of the Heleza Moya Project

The table below, also included as **Appendix E**, represents a summary of the significance of impacts identified during the project lifetime for each environmental aspect. Impacts are expected to occur predominantly during the construction and operation phases, and to a lesser extent during decommissioning and closure. The following positive benefits are expected:

- Job Security for staff and contractors currently contracted or employed by Tronox;
- Skills Development for those employed for the project; and
- Economic growth and contribution to the economy.

ACTIVITY	POTENTIAL IMPACT	Magnitude	Duration	Scale	Probability	Significance	Significance without Mitigation	Magnitude	Duration	Scale	Probability	Significance	Significance with Mitigation
Construction Phase													
Heritage and Palaeontology													
Excavations	Unearthing of graves	4	2	1	2	14	Low	2	2	1	2	10	Low
Air Quality													
Site establishment, bulk earthworks, development, relocation of required service infrastructure on the site	Generation of dust, PM_{10} and PM2.5 on sensitive receptors	6	2	2	3	30	Moderate	4	2	1	2	14	Low
Noise													
Site clearance	Noise increase at the boundary of the mine footprint and at the abutting residential areas	2	3	1	1	6	Low	2	3	1	0	0	Low
Civil construction and construction activities at the footprint	Noise increase at the boundary of the mine footprint	2	3	1	1	6	Low	2	3	1	0	0	Low
Assembly of conveyor sections and the belt	Noise increase at the boundary of the mine footprint	2	3	1	1	6	Low	2	3	1	0	0	Low
Constructions of the haul road	Noise increase at the boundary of the mine footprint	2	3	1	1	6	Low	2	3	1	0	0	Low
Social													
Continuation of the Fairbreeze Mine	Continued economic revenue	2	3	3	3	24	Low	4	4	4	4	48	Moderate
Continuation of the Fairbreeze Mine	Extension of training programs	4	3	4	4	44	Moderate	4	4	4	4	48	Moderate
Continuation of the Fairbreeze Mine	Extension to the employment of staff at the mine	4	3	4	4	44	Moderate	4	4	4	4	48	Moderate
Vegetation clearing and bulk earth works	Loss and disturbance of fauna habitat	3	1	4	4	32	Moderate	2	1	1	2	8	Low
Vegetation clearing and bulk earth works	Injury, mortality and disturbance of fauna	3	1	4	4	32	Moderate	2	1	1	2	8	Low
Vegetation clearing and bulk earth works	Establishment and spread of alien invasive species resulting in degradation of fauna habitat.	4	2	4	4	40	Moderate	2	1	2	2	10	Low
Terrestrial Flora													
Vegetation clearing and earth works	Loss and Disturbance of Flora Habitat	5	2	5	5	60	Moderate	4	1	4	4	36	Moderate
Habitat fragmentation and soil compaction	Disruption of Ecosystem Processes due to Project Infrastructure	3	2	4	3	27	Low	2	2	2	2	12	Low
Vegetation clearing and earth works	Establishment and Spread of Alien Invasive Species	5	2	4	4	44	Moderate	2	1	2	2	10	Low

ACTIVITY	POTENTIAL IMPACT	Magnitude	Duration	Scale	Probability	Significance	Significance without Mitigation	Magnitude	Duration	Scale	Probability	Significance	Significance with Mitigation
Vegetation clearing and earth works	Loss of Flora Species of Conservation Concern	5	2	5	4	48	Moderate	3	1	4	3	24	Low
Surface water													
Clearing of vegetation for construction	Erosion and sedimentation due to clearing of vegetation and construction activities	6	2	3	4	44	Moderate	3	2	2	4	28	Low
Visual													
Earthworks and site establishment	Visibility and visual exposure	1	1	1	1	3	Low	1	1	1	1	3	Low
Operational Phase													
Air Quality													
Mining, progressive backfilling and rehabilitation and ongoing support activities	Generation of dust, PM_{10} and $PM_{2.5}$ on sensitive receptors	4	4	1	2	18	Low	2	4	1	1	7	Low
Terrestrial Fauna													
▪ Vehicle collisions along access roads during day-to-day maintenance activities. ▪ Increased hunting and snaring as a result of improved accessibility associated with the proposed access road network	Injury, mortality disturbance of fauna	5	2	5	3	36	Moderate	3	1	2	2	12	Low
▪ Vehicle collisions along access roads during day-to-day maintenance activities. ▪ Increased hunting and snaring as a result of improved accessibility associated with the proposed access road network.	Establishment and spread of alien invasive species	4	2	4	3	30	Moderate	2	1	2	2	10	Low
Terrestrial Flora													

ACTIVITY	POTENTIAL IMPACT	Magnitude	Duration	Scale	Probability	Significance	Significance without Mitigation	Magnitude	Duration	Scale	Probability	Significance	Significance with Mitigation
Operational earthworks and soil management activities, resulting in disturbance of terrestrial ecosystems and species	Establishment and spread of alien invasive species	4	2	4	3	30	Moderate	2	1	2	2	10	Low
Social													
Skills development program	Skill transfer and development	2	3	3	3	24	Low	4	4	4	4	48	Moderate
Continuation of the Fairbreeze Mine	Impacts of dust and noise	2	3	3	2	16	Low	2	1	1	2	8	Low
Surface Water													
Change of flow regime in Amanzimnyama and Siyaya Rivers	Reduction in baseflows impacting on water users and ecology	1	2	2	5	25	Low	1	2	2	5	25	Low
Impact on water quality of streams draining and flowing adjacent to the mine	Deterioration of water quality in receiving streams due to mining activities.	1	2	2	4	20	Low	1	2	2	4	20	Low
Surface Water – Estuary													
Earthworks, site establishment and the use of plant vehicles & machinery	Hazardous substance spills during mining operations	8	3	1	2	24	Low	4	1	1	1	6	Low
Transportation of exposed sediment into the estuary and wetland areas	Water Quality Impacts Associated with Sedimentation	1	1	1	3	9	Low	1	1	1	1	3	Low
Removal of vegetation and the clearing of land	Reduction in Baseflows into the Estuary	1	1	1	4	12	Low	1	1	1	3	9	Low
Habitat change within the catchments of the Siyaya Estuary includes forestry and agriculture (specifically Eucalyptus plantations and sugar cane plantations), minerals mining and a small portion of low-density urban area	Cumulative Impact of Heleza Moya Extension on the Siyaya Estuary	1	4	1	3	18	Low	1	2	1	2	8	Low
Decommissioning and Closure Phase													
Terrestrial Flora													
Dismantling and clearing away of infrastructure	Establishment and spread of alien invasive species	4	2	4	4	40	Moderate	2	1	2	2	10	Low
Surface Water													
Change in flow regime in Amanzimnyama and Siyaya	Reduced flow impacting the water users and ecology. Potentially impacting the Siyaya Estuary	1	5	3	4	36	Moderate	1	5	3	3	27	Low

Conclusions

An impact assessment has been undertaken using qualified specialists, which incorporates extensive consultation with and participation of interested and affected parties. Applying the hierarchical approach to impact management, alternatives were firstly considered to avoid negative impacts, but where avoidance was not possible, to better mitigate and manage negative impacts. Where impacts were found to be potentially significant, various mitigation measures to manage and monitor the impacts of the project have been proposed.

The findings of the impact assessment have shown that the Project would conclusively result in certain negative impacts during the construction and operational phases on the environment, however, specialist studies indicated that the project should proceed in light of the overall benefits. Impacts are largely Moderate (negative) in significance, being mitigated to Low (negative) Significance.

The scientific specialist mitigations measures have been included in this BAR and the EMPr report to reduce the significance of all the identified negative impacts. Most of the negative impacts from the proposed Project can be reduced through the implementation of mitigation measures. Based on the information contained in this report, it is the opinion of the EAP that the negative environmental impacts resulting from the Project can be mitigated to within acceptable limits and that the project should be authorised. This opinion holds provided all the recommendations proposed in the specialist studies and the BA and EMPr report, as well as legislative requirements, are implemented and adhered to.

In conclusion, the EAP is of the reasoned opinion that the project should be authorised to proceed provided that the conditions of this BAR and the mitigation measures and objectives proposed by the EMPr are implemented by Tronox.

Contact name: Phindile Mashau

Contact details: +27 11 552 4300 | phindile.mashau@wsp.com

1 INTRODUCTION AND BACKGROUND

Tronox KZN Sands (Pty) Ltd (Tronox) (hereafter Tronox) has operated the Fairbreeze Mine, located south-west of Mtunzini, for nearly 10 years. The mine comprises of four approved mining areas (Pits A, B, C and C-Extension), an onsite Primary Wet Plant (PWP) and a fines Residue Storage Facility (RSF). Heavy mineral concentrate from the PWP containing ilmenite, zircon, rutile and other mining co-products, is transported by road to the Tronox KZN Sands, Central Processing Complex (CPC) in Empangeni, which includes a Mineral Separation Plant (MSP) and a smelter where titanium dioxide and pig iron are produced. In 2022, Tronox acquired the 118-hectare (ha) Heleza Moya property, located between the Fairbreeze PWP and the Pit B mining area, and incorporated this property into the Fairbreeze Mining Rights Area (MRA). Tronox is now making application to extend their mineral sands mining into parts of Heleza Moya to enable this area to be mined together with the approved Pit B orebody which lies on the immediate north and west of Heleza Moya. The Heleza Moya property is located on the Remainder of Portion 3 of Lot Emoyeni No. 9105, uMlalazi Local Municipality within the King Cetshwayo District Municipality, Kwazulu-Natal Province.

There are existing related Environmental Authorisations (EAs) in place for the Fairbreeze Mine and they are outlined further in this report. However, Tronox now plans to extend its Fairbreeze mining operations to include a surface right known as Heleza Moya (Project). The Heleza Moya tenement falls within the approved Fairbreeze mining right (MR) and was recently acquired through a sale agreement. Having concluded the sale agreement with the owner, Tronox now plans to incorporate this area into its active mine plan as it lies immediately adjacent to mineable reserves.

WSP Group Africa (Pty) Ltd) (herein referred to as WSP), an independent Environmental Assessment Practitioner (EAP), was appointed by Tronox to undertake the required environmental permitting process for the proposed Project.

In terms of the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended) (Government Notice (GN) R.324 – GN R.327), Tronox must apply for an EA for the proposed activities to the Competent Authority (CA), which is the Department of Mineral Resources and Energy (DMRE), supported by a Basic Assessment (BA) process. This entails the compilation of a Basic Assessment Report (BAR) and an Environmental Management Programme (EMPr) describing how the environmental impacts of the proposed infrastructure and activities will be managed and mitigated.

The draft BAR was made available for public review to provide Interested and Affected Parties (I&APs) the opportunity to comment on the project.

The due date for comments on the draft BAR and EMPr was **19 January 2024**. Comments received during the public review period will be acknowledged and recorded in the final BAR (this report) and EMPr that is submitted to the DMRE, for decision-making.

2 CONTACT PERSON AND CORRESPONDENCE ADDRESS

2.1 DETAILS OF THE PROPONENT

Table 2-1 provides details of the contact person at Tronox.

Table 2-1 – Details of the proponent

Details	Description
Company Name	Tronox KZN Sands (Pty) Ltd
Company Registration:	1987/001627/07
Physical Address:	R34 Melmoth Road, Empangeni, 3880
Postal Address:	Private Bag X20010, Empangeni, 3880
Telephone Number:	+27 035 902 7000
Contact Person Details:	
Contact Person:	Isaac Ndhlazi
Telephone:	+27 35 902 7364
Email:	isaac.ndhlazi@tronox.com

2.2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

WSP is one of the world's leading engineering professional services consulting firms. It is dedicated to local communities and propelled by international brainpower. WSP has technical experts and strategic advisors including engineers, technicians, scientists, architects, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. WSP designs lasting solutions in the Transportation & Infrastructure, Property & Buildings, Environment, Industry, Resources (including Mining and Oil & Gas) and Energy sectors, as well as offers project and program delivery and advisory services. With more than 50 000 talented people globally, WSP engineers projects that will help societies grow for lifetimes to come.

In Africa, WSP, Environment & Energy, is a leading environmental consultancy with a broad range of expertise and over 24 years' experience in the regional market. As part of a global business, it provides the marketplace with a dynamic blend of local knowledge and global expertise.

WSP offers independent, insightful and professional advice to clients to achieve a balance between environmental protection, social desirability and economic development.

WSP has a reputation for delivery and excellence and provides a diverse range of integrated and innovative solutions to both public and private sector clients across the industrial, mining, infrastructure and financial sectors. The details of the EAP are listed in Table 2-2.

Table 2-2 – Details of the EAP

Details	Description
Company:	WSP Group Africa (Pty) Ltd
Company Registration:	1999/008928/07
Physical Address:	Building 1, Magwa Crescent West, Maxwell Office Park, Waterfall City, Midrand, 1685
Postal Address:	P.O. Box 6001, Halfway House
Environmental Assessment Practitioner:	Phindile Mashau
EAP Registrations/Associations:	Professional EAP, EAPASA Reg No. 2019/1731
Telephone:	+27 11 552 4300
Email:	phindile.mashau@wsp.com

2.2.1 EXPERTISE OF THE EAP

2.2.1.1 The qualifications of the EAP

- BSc. (Honours) Environmental Management; and
- BSc. Environmental Management - Chemistry Stream.

2.2.1.2 Summary of past experience

Phindile has been working in the environmental management field from 2014 where she has been involved in alternative energy applications and selected energy permitting projects, as well as health and environmental compliance. Her experience within the Environmental Management field is focused on Impact Assessment, Permitting, Environmental Health and Safety (EHS) Auditing and Public Participation.

Selected project experience includes undertaking permitting processes for Hydro-Power Plants, Offshore Exploration Drilling, Power Lines, Data Centres and various Infrastructure projects.

Her countries of experience include South Africa, Namibia, Nigeria, Lesotho, Kingdom of Saudi Arabia, Zambia and Mozambique with local legislation as well as World Bank Framework, IFC Principles, Equator Principles and KfW Development Bank Guidelines.

2.2.2 DETAILS OF THE SPECIALIST TEAM

Table 2-3 - Team for specialist studies

Name	Study
Brian Magongoa	Stakeholder Engagement
Steve Horak	Social Impact Assessment
Novania Reddy	Air Quality Impact Statement

Name	Study
Kirsten Collet	Noise Impact Statement
Andrew Zinn	Ecological Impact Assessment: Terrestrial Fauna and Flora
Karen King	Soils and Agricultural Potential
Jenna Lavin	Heritage and Palaeontological Screening
Simon Lorentz, Ismail Mahomed	Groundwater Model, Impact Assessment and Water Balance
Trevor Coleman	Surface Water Impact Assessment
Johan Bothma	Visual Impact Statement
Tracy Skinner	GIS/Remote Sensing
Orapeleng Mosito	Mine Closure and Rehabilitation Plan
Dr. Jessica Dawson, Megan Jackson, Dr. Bary Clark	Estuarine Compliance Statement

2.3 DECLARATION OF INDEPENDENCE

WSP has no vested interest in the Project and hereby declares its independence as required by the EIA Regulations of 2014 (as amended).

2.4 BASIC ASSESSMENT REPORT STRUCTURE

As per the EIA Regulations of 2014 (as amended), Appendix 1 of Government Notice Regulation (GN R.) 982 identifies the legislated requirements that must be contained within a BAR for the CA to consider and come to a decision on the application. Table 2-4 below details where the required information is located within the final BAR (this report).

Table 2-4 - Legal Requirements as detailed in Appendix 1 of GN R. 982 of the 2014 EIA Regulations (as amended)

Appendix 1 of GN R. 326	Description	Relevant Report Section
3(1) (a)	Details of the EAP who prepared the report and the expertise of the EAP, including a curriculum vitae	Section 2.2
3(1) (b)	The location of the activity	Section 3.2
3(1) (c)	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale	Section 3.3
3(1) (d)	A description of the scope of the proposed activity	Section 0
3(1) (e)	A description of the policy and legislative context within which the development is proposed	Section 4
3(1) (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location	Section 6

Appendix 1 of GN R. 326	Description	Relevant Report Section
3(1) (g)	A motivation for the preferred site, activity and technology alternative	Section 9
3(1) (h)	A full description of the process followed to reach the proposed alternative within the site	Section 9
3(1) (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	Section 5.5
3(1) (j)	An assessment of each identified potentially significant impact and risk	Section 10
3(1) (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 11
3(1) (l)	An environmental impact statement	Section 11
3(1) (m)	Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the Environmental Management Programme (EMPr).	Section 10 and Appendix E
3(1) (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 13
3(1) (o)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	Section 12
3(1) (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 13
3(1) (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 conducted, and the post construction monitoring requirements finalised	N/A
3(1) (r)	An undertaking under oath or affirmation by the EAP	Section 15
3(1) (s)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	Section 10.12
3(1) (t)	Any specific information that may be required by the competent authority	N/A
3(1) (u)	Any other matters required in terms of section 24(4)(a) and (b) of the Act	N/A

3 PROJECT DESCRIPTION

3.1 OVERVIEW OF FAIRBREEZE MINE

The proposed Project is for the mining of mineralised coastal sands at the Fairbreeze Mine, including, ilmenite, zircon, rutile and other mining co-products. The target product destination includes various end users. The heavy minerals extracted from the sand are used to produce the following:

- Titanium dioxide (TiO_2) pigment which is used in paints, plastics, paper laminates, ink and the food market;
- Titanium metal;
- Welding consumables;
- Titanium feedstocks used in the manufacture of brake pads, roof tiles and in the glass industry; and
- Zircon used for the manufacturing of ceramics, foundry, refractory, zirconia and other zircon chemicals.

There are four ore bodies presently forming part of the Fairbreeze Mine, known as:

- Fairbreeze A (FBA);
- Fairbreeze B (FBB);
- Fairbreeze C (FBC); and
- Fairbreeze C extension (FBCX).

It is Tronox's intention to expand the FBB ore body which is currently being mined to include economically viable mineralised areas within the Heleza Moya property. Figure 3-1 illustrates the extent of the area that will be disturbed by the proposed mining activities and associated support infrastructure at the Heleza Moya Farm.

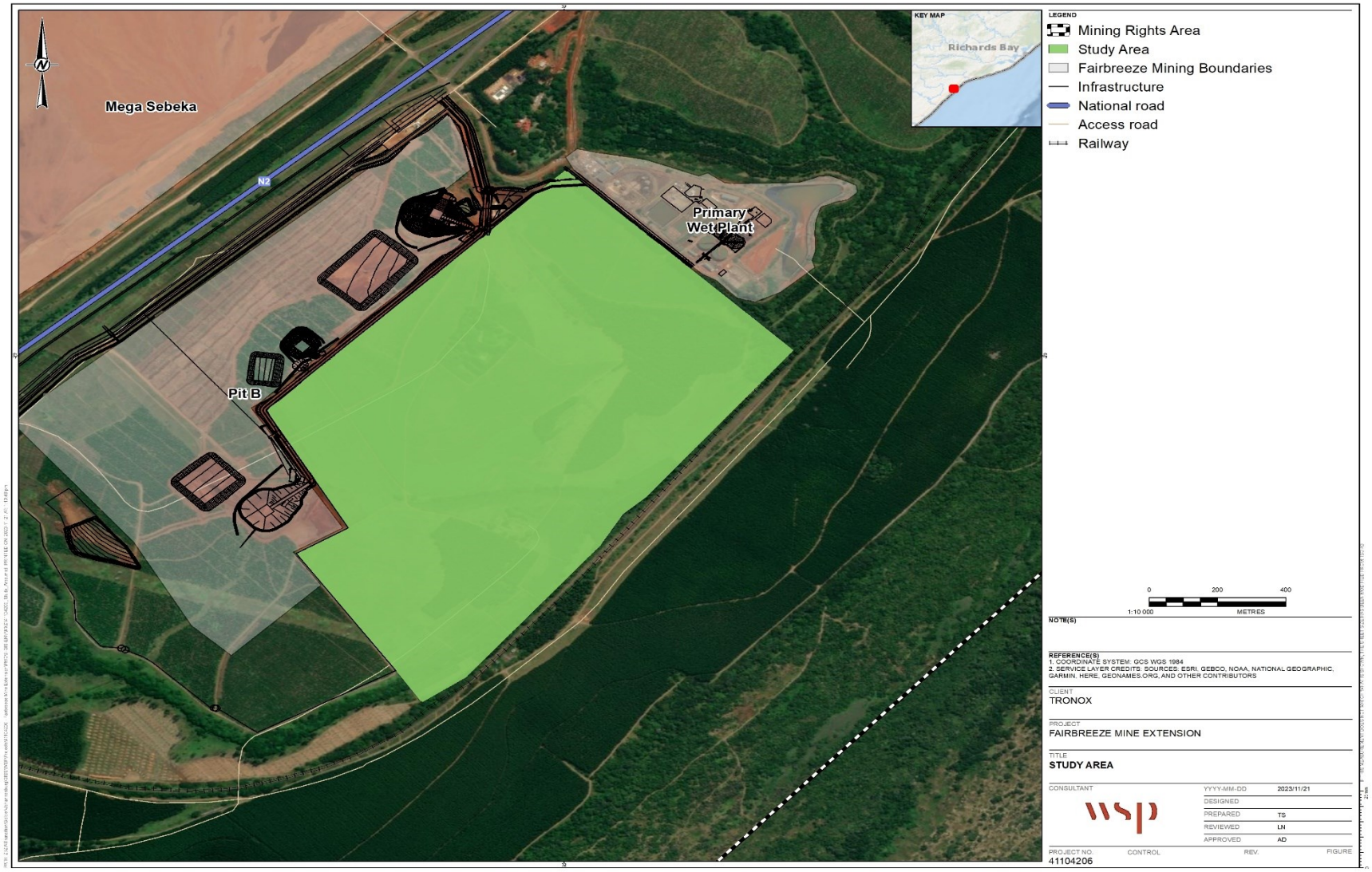


Figure 3-1 - Proposed mining area within the Heleza Moya Farm

The required mineral beneficiation and infrastructure to support the mining activity and fleet is already in place and authorised under the Fairbreeze EA (DMRE Ref: KZN 30/5/1/2/2/123 MR) and includes water supply, power supply, on and off ramps at the N2 highway, a processing plant and tails processing infrastructure.

The remaining Life of Mine (LoM) at Fairbreeze Mine associated with all four ore bodies mentioned above is estimated to be 15 years (i.e., 2037) at a mining rate of 2 160 tons per hour (tph). The proposed expansion of FBB (Heleza Moya) will increase the LoM by 2 years (i.e., 2039).

3.2 LOCATION OF THE ACTIVITY

The proposed Project area is in the uMlalazi Local Municipality that falls under the King Cetshwayo District Municipality in the province of KwaZulu-Natal. The mining rights area is also bound to the east by the uMlalazi Nature Reserve and Mondi plantations (Figure 3-2).

The property information related to Heleza Moya Farm is provided in Table 3-1 and Figure 3-3. The property was under the ownership of Heleza Moya Farming (Pty) Ltd, however Tronox has now acquired this farm portion. The total footprint of the current Fairbreeze mining lease area is approximately 4 120 hectares (ha) and Heleza Moya will add approximately 118.6 ha to the mining footprint, where 64.15 ha of this mineral resource has been identified as the mineable reserve with an identified topsoil and laydown area of 9.4 ha. The economical portion and proposed mining area is located towards the northern boundary of the Heleza Moya Farm (along the FBB orebody).

Table 3-1 – Description of the affected property

Farm Name	Heleza Moya
Application area	118.6 ha
Magisterial District	uMlalazi Local Municipality, King Cetshwayo District Municipality
Distance and direction from the nearest town	The Fairbreeze Mine is located immediately south of Mtunzini town and extends southwards for approximately 12 km west of the N2 highway
ERF details	Remainder of Portion 3 of Lot 88 Emoyeni No. 9105
21-digit surveyor general code for each farm portion	**SG Office** | **Major Region** | **Minor Region** | **Erf / Farm Number** | **Portion Number** **N** 0 F U 0 0 0 0 0 0 0 0 9 1 0 5 0 0 0 0 3

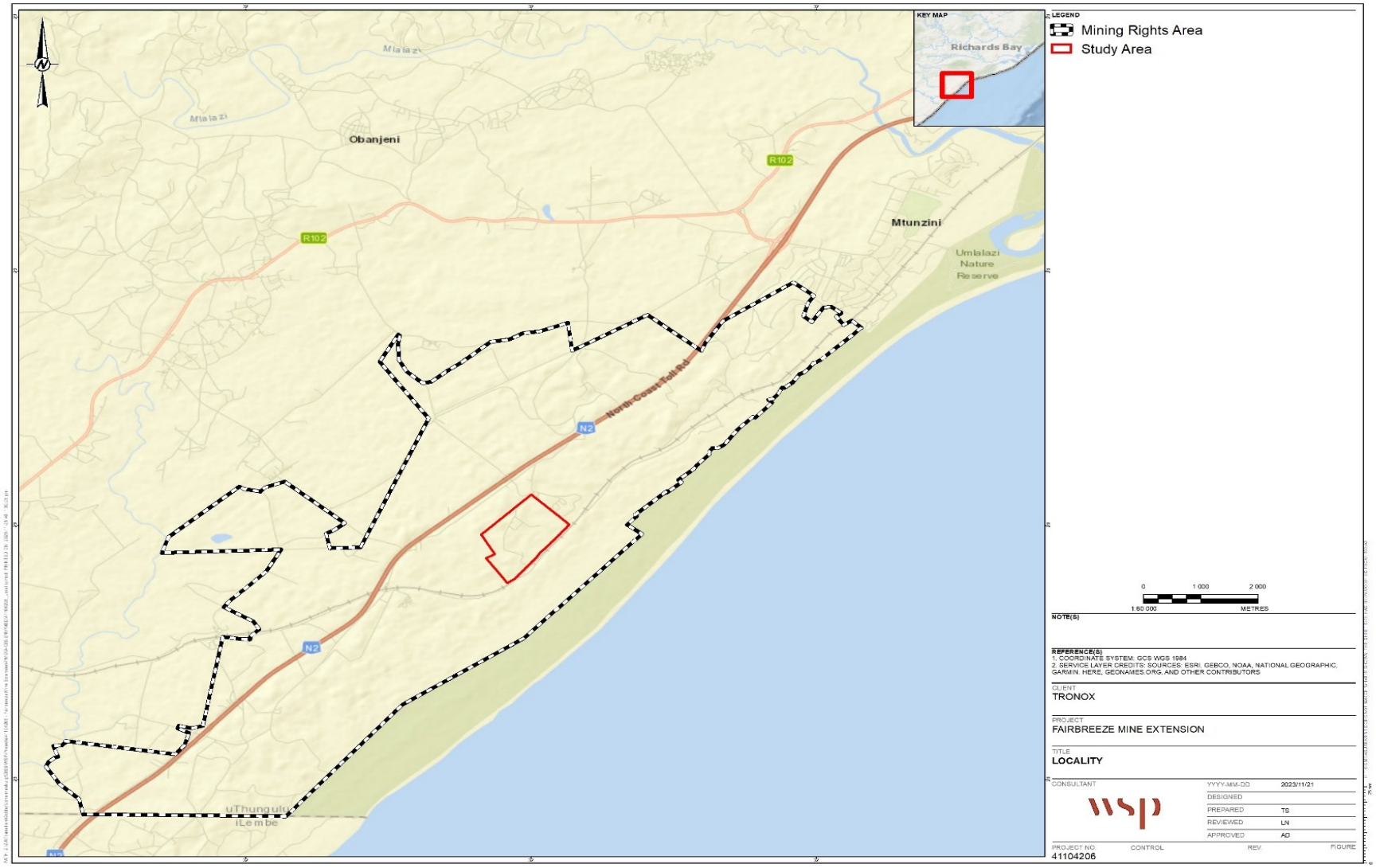


Figure 3-2 - Locality of the Project

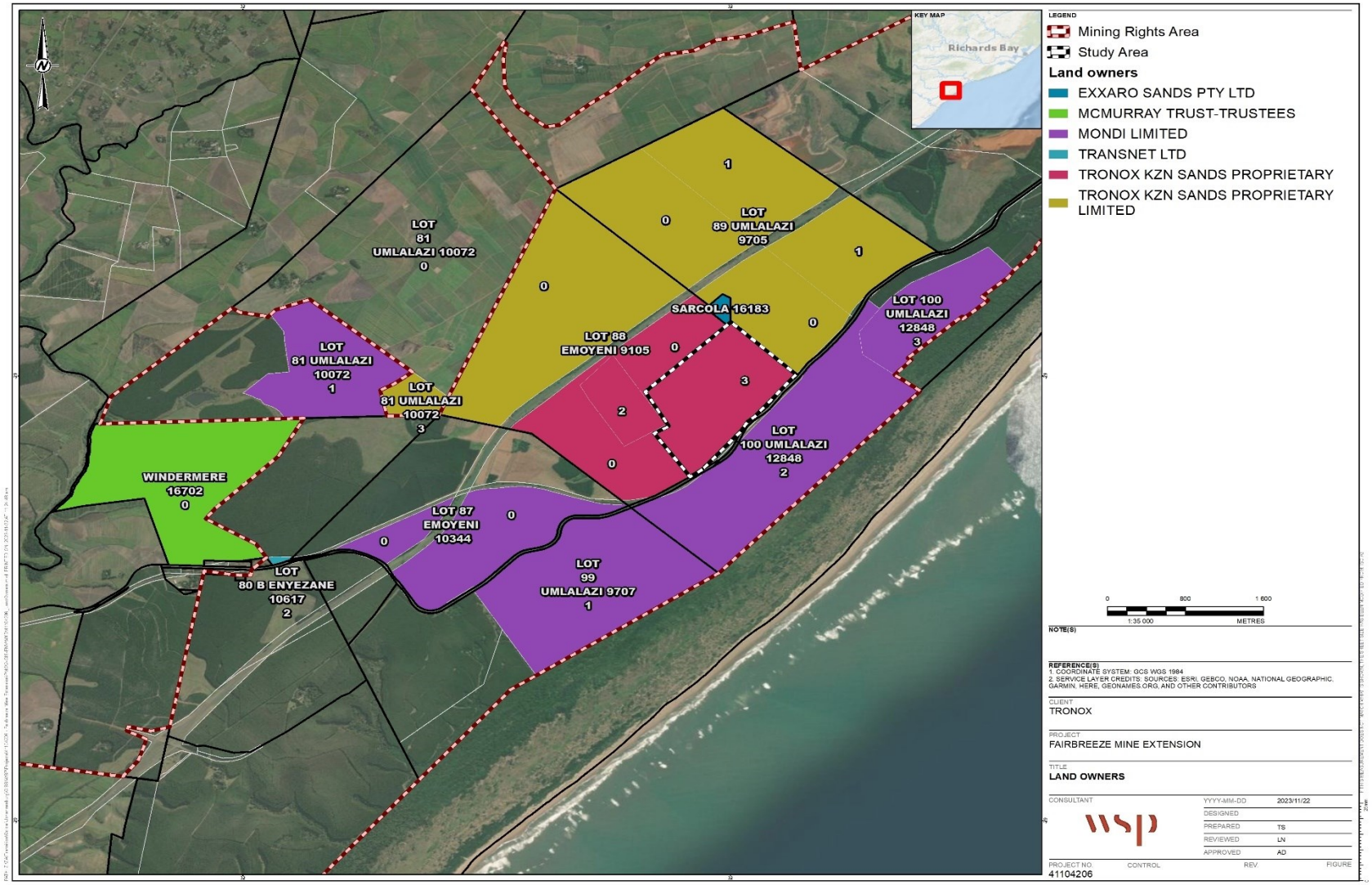


Figure 3-3 - Landowner MapLandowners of the project area

3.3 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

This section provides an overview of the description of the activities to be undertaken and where infrastructure will be placed, as well as the triggered listed activities.

3.3.1 MINING ACTIVITIES

The detailed steps required for the mining of material from the ore body include the preparation of the mining area through the removal of vegetation and the stripping of topsoil. Specific topsoil stockpile areas have been identified and will be managed as per the current practice at Fairbreeze as defined by the existing amended EMPr (DC28/0036/2010).

The topsoil to be stripped is regarded as the uppermost surface layer of soil; it typically extends to a depth of 300 mm from the earth's surface. It has the highest concentration of organic matter and microorganisms and is where most of the earth's biological soil activity occurs, including plant growth. It is composed of mineral particles, organic matter, water and air. In preparation for mining, a 300 mm layer of topsoil will be stripped prior to the mining of ore. The material will be hauled to the designated topsoil stockpile.

The mining method employed at Fairbreeze Mine is Hydraulic Monitoring (Figure 3-4). A jet of high-pressure water is aimed at a mining face, thereby cutting into and loosening *the in-situ* sand so that it collapses onto the floor. The water acts as a carrier medium for the run of mine (ROM) sand, due to the high clay fines content contained in the ROM. The slurry generated by the monitors, flows to a collection sump where oversize material is removed, and the slurry is then pumped towards the Primary Wet Plant (PWP) through a system of booster pumps. The varying grade and slimes content requires the mining of different faces concurrently to reduce large variations. Up to six monitors and three pump stations (with a collection sump) will operate to produce rates of up to 2 160 tonnes per hour. This hydraulic mining method which is in use at the FBB pit will continue as the pit is extended to include the Heleza Moya ore body.

At the PWP the heavy minerals will be separated from the sand, silt and clay fractions. The heavy mineral concentrate will then be trucked to Tronox CPC at Empangeni for refinement. The fine discard or slimes material from the PWP will be pumped to an existing licenced Residue Storage Facility (RSF); while the coarse discard or tailings will be pumped back to the mining area to backfill the mining void. The mined-out areas will be rehabilitated to achieve a pre-mining land capability.

To move from the FBB mining area onto the Heleza Moya area, some of the mining components will need to be relocated. These components include the mining pump stations which are installed by excavating the ore body mechanically and installing the pump stations such that the ROM slurry can flow to the collection sumps under gravity. The high-pressure water lines would also need to be extended from the current FBB area onto Heleza Moya to power the hydraulic monitors.

Backfilling of the mined-out areas will be undertaken once mining in an ore body (or part thereof) is completed, and the backfilling infrastructure is in place. Sand tails and return water pipelines will also be installed in areas post mining, either located on previously mined footprint or along the perimeter of the mining footprint, based on practical on-site considerations. Backfilling will be undertaken with coarse dewatered sand that will be

returned from the PWP and distributed with the open-end method. Backfilling will be undertaken so that no mining void remains, but the post-mining surface will be lower than the original surface due to the removal of the slimes component from the sand.

Once the mining area is backfilled it will be contoured mechanically to assure slopes blend into the current landscape. The topsoil stockpiled before the mining will be returned and the area will be vegetated as per the rehabilitation process implemented on the current Fairbreeze Mine areas.

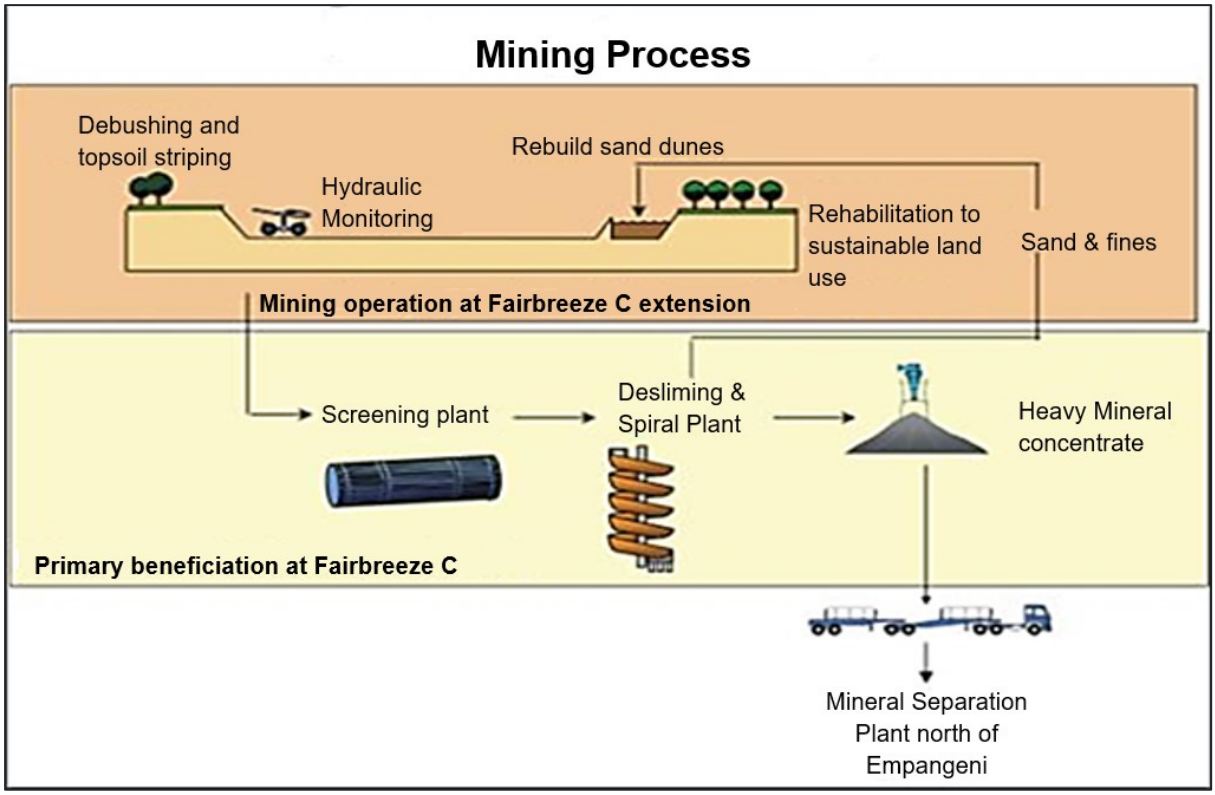


Figure 3-4 - Hydraulic mining method implemented at Fairbreeze Mine

3.3.2 FINE TAILINGS MANAGEMENT

The slurry will flow to a pump station from where it will be pumped to the existing PWP. The PWP is located immediately adjacent to the Heleza Moja area (see Figure 3-5). At the PWP the heavy minerals will be separated from the sand, fines often referred to as slimes. The heavy mineral concentrate will then be trucked by road to Tronox CPC at Empangeni for refinement. The fine discard or slimes material from the PWP will be pumped to an existing RSF; while the coarse discard or tailings will be pumped back to the mining area to backfill the mining void.

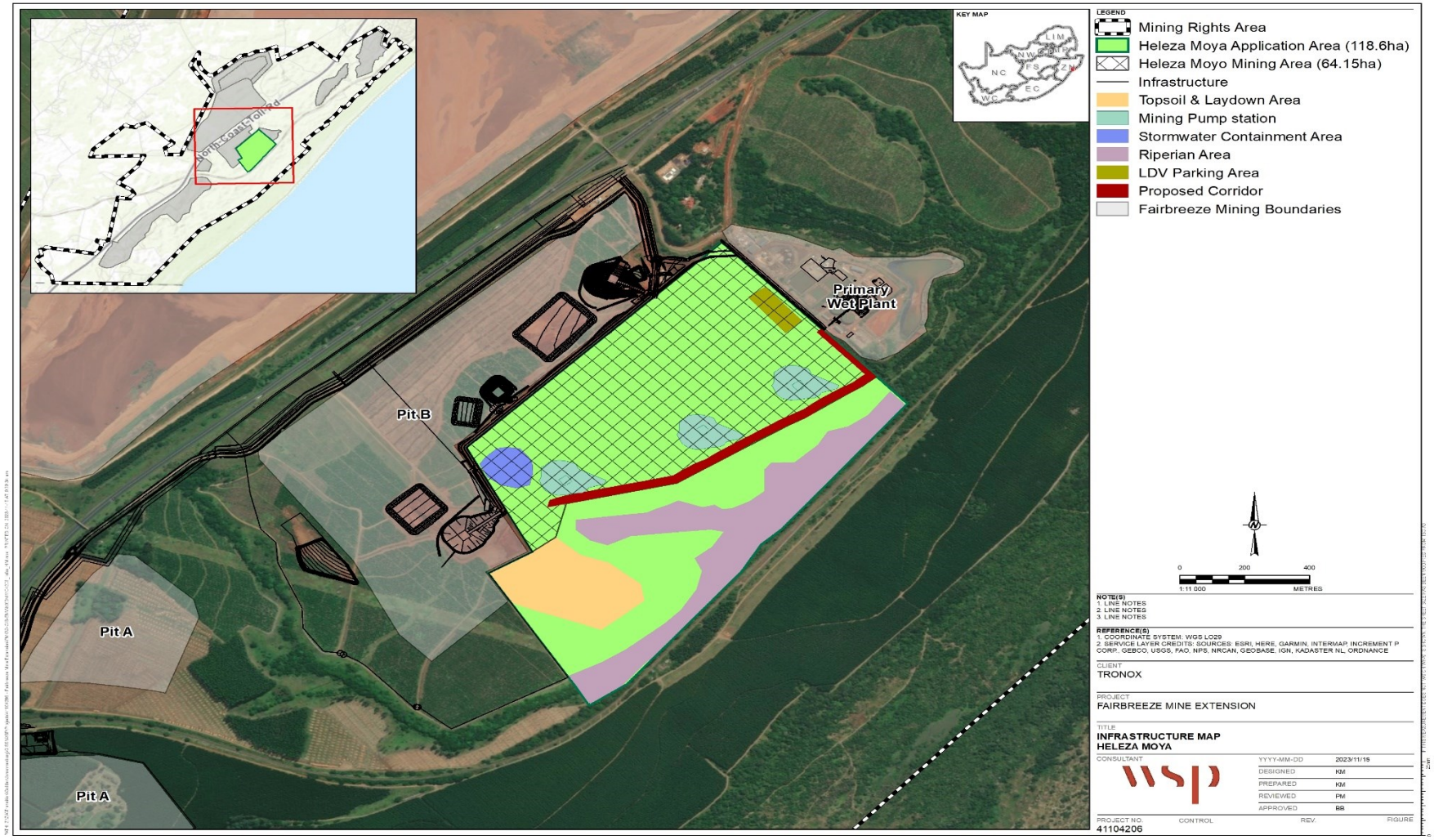


Figure 3-5 – Proposed infrastructure for the project

3.3.3 REHABILITATION AND CLOSURE

The mined-out areas will be rehabilitated with the aim of achieving a pre-mining land capability. Once mining is completed in an area, backfilling of the area with sand tailing will commence, i.e., active rehabilitation. Sand will be pumped directly from the processing plant to the void area. The process water used to transport the sand, after deposition will gravitate to a low point in the mining void from where it will be collected and returned to the PWP for re-use. Sand tails and return process water pipelines will therefore be installed in areas post mining either located on previously mined footprint or along the perimeter of the mining footprint based on practical on-site considerations.

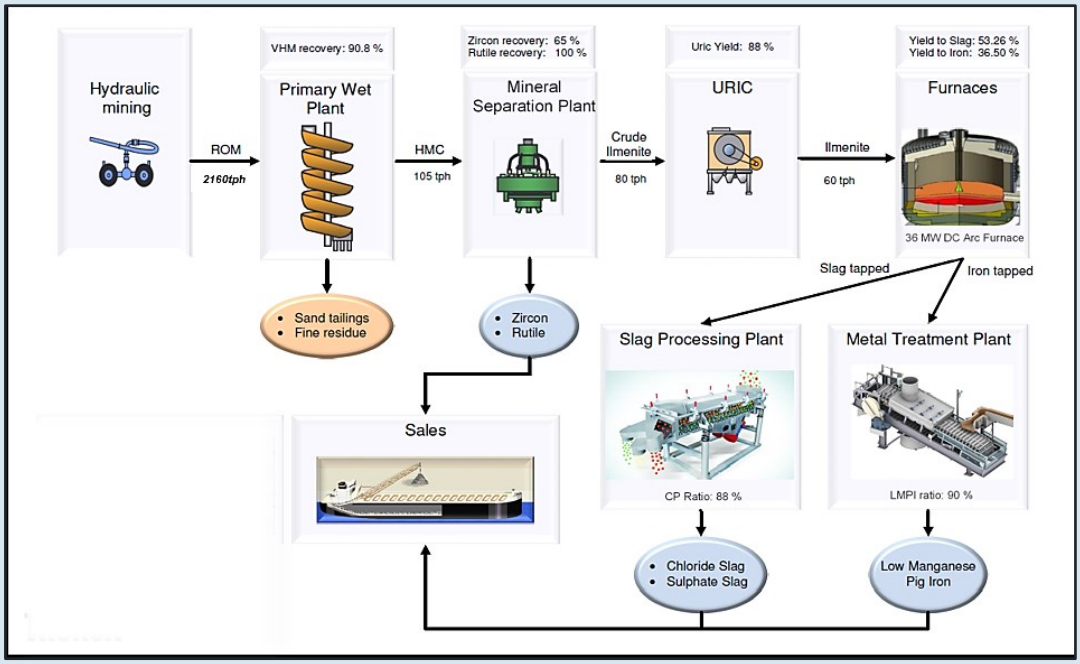
Once the mining area is backfilled it will be contoured mechanically to assure slopes blend into the current landscape characteristics. The topsoil stockpiled before the mining will be returned and the area will be vegetated as per the rehabilitation process implemented on the current Fairbreeze Mine areas and as recommended in the current EMPr. Maintenance and after care of the revegetated areas will be implemented for a minimum of 3 years after closure in accordance with the approved EMPr to ensure that pre-mining land capability is achieved. Furthermore, rehabilitation measures for specific components will be considered should it differ to the generic EMPr recommendations.

3.4 SUMMARY OF THE ACTIVITIES TO BE UNDERTAKEN

An overview of the activities and the activity infrastructure proposed for Heleza Moya Farm is provided in the table below.

Table 3-2 – Mining operation

Aspect	Description
Location	The mining operations will be located on Remainder of Portion 3 of Lot Emoyeni No. 9105
Mining rate	2 160 tph
Mining process	The proposed mining process will involve Heleza Moya ROM material being mined using hydraulic mining method. The heavy mineral concentrate (HMC) will be trucked to the Tronox CPC for further beneficiation process
Mining programme	Mining is intended for a 15-year period, between 2024 and 2039
Mineral processing	The hydraulically reclaimed ROM slurry will be pumped to the existing Fairbreeze PWP for processing. The heavy mineral concentrate will then be trucked by road to Tronox CPC at Empangeni for refinement. The fine discard or slimes material from the PWP will be pumped to an existing RSF while the coarse discard or tailings will be pumped back to the mining area to backfill the mining void.

Aspect	Description
	
Project layout and infrastructure	Equipment from the FBB ore body will be relocated and used at Heleza Moya. In addition, the following infrastructure and areas will also be further implemented to accommodate mining operations at Heleza Moya (Figure 3-5): ▪ Haul roads; ▪ Designated Light Duty Vehicle (LDV) parking; ▪ Corridor (3.6 ha) (Heleza Moya to PWP); ▪ Topsoil stockpile (40 m x 40 m x10 m) and laydown area (9.4 ha) ▪ Three pump stations along the corridor; and ▪ Stormwater management infrastructure.
Associated infrastructure	Power supply: Eskom's existing 88kV powerline supplies electricity to the buildings that are currently located on the property. No additional powerlines will be required for the operation of Heleza Moya. Water supply: Water is currently obtained from Mthlathuze water, there is a pipeline from Hillendale mine to Fairbreeze Mine for the supply of water.
Employment requirements	It is currently estimated that the employment opportunities available will remain the same as the current Fairbreeze mine operation, However, contractors will be used in site establishment and site preparation for Heleza Moya.

The following activities are anticipated for each phase of the project:

- Construction phase:
  - Obtaining the rights to the mine the land;
  - Prior to site establishment all authorisations need to be in place;
  - Bulk earthworks;
  - Development and relocation of required service infrastructure on the site;
  - Development of access roads;
  - Site establishment;
  - Topsoil stripping; and
  - Construction of project components.
- Operational phase:
  - Mining to commence;
  - Progressive backfilling and rehabilitation to take place. Anticipated that 2-4 years post the commencement of mining in a block, this area will be subject to rehabilitation;
  - Ongoing processing and supporting activities; and
  - Disposal of wastes from the mining process.
- Decommissioning phase:
  - Plant to be demolished and materials to be removed;
  - Termination of all services to the area; and
  - Rehabilitation of all areas to be completed sufficiently to meet relevant commitments of the closure plan.
- Closure and post closure
  - Ongoing monitoring of post-closure impacts and success of rehabilitation as required in terms of the closure plan.

4 POLICY AND LEGISLATIVE CONTEXT

Tronox Fairbreeze Mine operates under the legislative requirements of the NEMA, Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), National Environmental Management: Waste Act (Act No. 59 of 1998) (NEM:WA) and the National Water Act (Act No. 36 of 1998) (NWA). The legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process, which may be applicable or have relevance to the Project are described in the ensuing sections.

4.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT NO. 108 OF 1996)

Section 24 of the Constitution of South Africa (Act No. 108 of 1996) states the following with respect to the environment:
"Everyone has the right -

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

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

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

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

The legislation briefly described in the below sections has been promulgated in response to this very constitutional right.

4.2 NATIONAL ENVIRONMENT MANAGEMENT ACT (ACT NO. 107 OF 1998)

Chapter 2 of NEMA sets out a range of environmental and social principles that are to be applied by all organs of state when taking decisions that significantly affect the environment. Included amongst the key principles is that all developments must be socially, economically and environmentally sustainable. It requires that environmental management place people and their needs at the forefront of its concerns, and serve their physical, psychological, developmental, cultural and social interests equitably. The NEMA also provides for the participation of I&APs and stipulates that decisions must consider the interests, needs and values of all of them.

Chapter 5 of the NEMA outlines the general objectives and implementation of Integrated Environmental Management (IEM), which provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. Section 24 of the NEMA provides a framework for the granting of an EA. To give effect to the general objectives of IEM, the potential impacts on the environment of listed activities must be considered, investigated, assessed and reported on to the CA. Section 24 (4) provides the minimum

requirements for procedures for the investigation, assessment and communication of the potential impacts of activities.

The EIA Regulations of 2014 (as amended) promulgated in terms of Chapter 5 of the NEMA and published in GN R.982, provide for the control of certain listed activities. These activities are listed in GN R.983 (Listing Notice 1), R984 (Listing Notice 2) and R985 (Listing Notice 3) of 4 December 2014 (as amended) and are prohibited until an EA has been obtained from the CA. The Minister of Forestry, Fisheries and the Environment is responsible for the granting or refusing of an EA for the application to undertake the proposed activities in terms of the NEMA. Such EA, which may be granted subject to conditions, will only be considered once there has been compliance with GN No. R982. For the proposed Project, the responsibility for processing applications has been delegated to the DMRE.

The existing Tronox operations are authorised in terms of NEMA regulations as follows:

- EA issued by the KZN Department of Agriculture and Environmental Affairs (DAEA) (now KZN EDTEA) on 12 July 2012 (EA Ref. No.: DC28/0036/2010); and
- EMPr issued in terms of the MPRDA (EMPr DMRE Ref: KZN30/5/1/2/2/123 MR).

For the proposed Project, listed activities triggered as per the EIA Regulations of 2014 (as amended) are listed on Table 4-1.

4.2.1 LISTED AND SPECIFIED ACTIVITIES

The EIA Regulations of 2014 (as amended) set out the procedures and documentation that needs to be complied with when applying for an EA. A BA process must be undertaken if the authorisation applied for is in respect of an activity or activities included in Listing Notice 1 and/or 3; while a full Scoping and Environmental Impact Assessment (S&EIA) process must be undertaken if the authorisation applied for is in respect of an activity or activities included in Listing Notice 2).

A description of the triggered listed activity under the NEMA associated with the proposed Project is provided in Table 4-1.

Table 4-1 - NEMA listed activities triggered by the Project

Listed Activity	Description	Applicability
Listing Notice 1 (GN R. 983 (2014), as amended by GN R. 327), Activity 21D	Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 (S102) of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment.	The proposed activity will require a mining permit from DMRE to mine the mineralized sand dunes deposit in the Richards Bay area, KwaZulu-Natal. A S102 application will be submitted to include Heleza Moya Farm into the mining right.

4.2.2 LISTED ACTIVITIES PREVIOUSLY AUTHORISED AT FAIRBREEZE MINE

The various listed activities associated with the Tronox Fairbreeze Mine operations are authorised through an existing EA authorised in terms of the NEMA's EIA Regulations of 2010 (GN R.543).

Since the regulations have subsequently been amended, a comparison is made between these activities and the EIA Regulations of 2014 (GN R.326) in **Appendix F**.

In terms of Section 24P of NEMA, where prescribed, an applicant for an EA relating to prospecting, exploration, mining or production, must, before the CA issues an EA, determine the financial provision, which is required for undertaking progressive rehabilitation, decommissioning, closure and post-closure activities. Financial Provisions were previously determined in terms of Section 41 the MPRDA, and post implementation of the 'One Environmental System' in terms of the NEMA. The Regulations pertaining to Financial Provision (GN R.1147 of 2015, as amended) set out the methods for determining and making Financial Provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts caused by the development of the proposed activities. Financial Provision for the proposed activities at Heleza Moya will also be required.

4.3 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT NO. 28 OF 2002)

The MPRDA is the principal legislation governing prospecting and mining, as well as the exploration and production of oil and natural gas. The Act provides for the equitable access to and sustainable development of mineral and petroleum resources. The MPRDA Regulations (GN R.527 of 2004) provide for the application for and issuing of Reconnaissance Permits, Prospecting Rights, Exploration Rights, Mining Rights and Prospecting Rights.

In terms of Section 22 of the MPRDA, a MR is required to mine a mineral resource, supported by a detailed mining work programme (MWP) and social and labour plan (SLP). Tronox already has a MR, MWP and SLP in place for Fairbreeze Mine. However, as per Section 102 of the MPRDA, a MR may not be amended or varied without the written consent of the Minister. Therefore, a S102 application has been submitted to amend the mining right and mining work programme to include Heleza Moya. Furthermore, Tronox has updated their Fairbreeze SLP to include Heleza Moya.

4.4 NATIONAL WASTE MANAGEMENT ACT (ACT NO. 59 OF 2008)

The National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM:WA) regulates all aspects of waste management and has an emphasis on waste avoidance and minimisation. The NEM:WA creates a system for listing and licensing waste management activities which may have a detrimental effect on the environment. Residues arising from mining are regulated in terms of the NEM:WA. Listed waste management activities (GN R.921, November 2013, amended by GN R.633) above certain thresholds are subject to an impact assessment and licensing process prior to being commenced, undertaken or conducted. The assessment and reporting process in support of a WML application must be undertaken in accordance with the EIA Regulations of 2014 (as amended). These regulations define the requirements for the submission; processing, consideration and decision of applications for the authorisation of listed activities. Activities listed in Category A require a BA process; while activities listed in Category B require a S&EIA process for authorities to consider an application in terms of NEM:WA.

Since the Fairbreeze Mine activities were authorised prior to 2015, all mine waste associated with Fairbreeze Mine is authorised under the existing EMPr. Fine residue will be stored at the licenced Mega Sebeka Residue Storage Facility (MSRSF)/Everglades.

There are no new waste management activities in respect of which a waste management licence is required for the proposed Project.

4.5 NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Chapter 4 of the National Water Act, 1998 (Act 36 of 1998) (NWA) requires proponents of proposed developments to submit applications to the CA (namely, the Regional Office of the Department of Water and Sanitation (DWS)) where a water use listed under Section 21 of the NWA is triggered. Water Use is defined broadly by the Act and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities, i.e., namely activities which impact detrimentally on a water resource, alteration of a watercourse, removing water underground for certain purposes and recreation. An application for a Water Use Licence (WUL) or General Authorisation (GA) must be undertaken in accordance with the regulations of GN R.267 of 2017, prior to the construction phase of the project commencing.

A WUL issued by the then Department of Water Affairs (DWA) is already in place for the Fairbreeze Mine operations (Licence No. 06/W13B/CGI/2229). The WUL authorises the following water uses:

- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(i): Altering the bed, banks course or characteristics of a watercourse; and
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource.

The proposed activities will trigger the need for an amendment of the existing WUL.

4.6 OTHER LEGISLATION

In accordance with the EIA Regulations of 2014 (as amended), all legislation and guidelines that have been considered in the EIA process must be documented. In addition to the EIA Regulations of 2014 (as amended), the sections below provide a summary of other applicable legislation.

4.6.1 NATIONAL HERITAGE RESOURCES ACT (ACT NO. 25 OF 1999)

The National Heritage Resources Act (Act No. 25 of 1999) (NHRA) is the primary statute regulating the protection and management of South Africa's heritage resources. The NHRA aims to promote good management of the national estate and ensures community participation in the protection of national heritage resources and involves all three levels of government (national, provincial and local) in the management of the country's national heritage.

A variety of formal protection measures are provided for in the NHRA, ranging from national and provincial heritage sites, protected areas, provisional protection, inclusion on the heritage register of a province, heritage areas and heritage objects legal protection of paleontological and archaeological sites (including rock art) and meteorites, burial grounds and graves, and the protection of structures older than 60 years and public monuments and memorials. Section 38 of the NHRA provides that the heritage resources authority be notified, and the necessary assessment undertaken, where a development that exceeds 5 000 m^2 is proposed. Since the proposed development exceeds 5 000 m^2, a Heritage and Palaeontological Screening has been undertaken.

4.6.2 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004)

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) provides for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection.

NEM:BA regulates restricted activities that may harm listed threatened or protected species or activities that encourage the spread of alien or invasive species. NEM:BA also makes provision for the publication of bioregional plans and the listing of ecosystems and species that are threatened or in need of protection.

Within the published bioregional (spatial) plan, terrestrial and aquatic features that are critical for conserving biodiversity and maintaining ecosystem functioning are indicated as Critical Biodiversity Areas (CBAs). Bioregional plans provide the guidelines for avoiding the loss or degradation of natural habitat in CBAs with the aim of informing EIAs and land-use planning, including Environmental Management Frameworks (EMFs), Spatial Development Frameworks (SDFs) and Integrated Development Plans (IDPs).

Chapter 3 of the "Guideline regarding the determination of bioregions and the preparation of and publication of bioregional plans" requires environmental decision-makers who are required by NEMA to apply the NEMA Section 2 principles in their decision-making to consider, amongst other things, sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems, which require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure. CBAs identified in a bioregional plan should be such areas and should, therefore, be considered by decision-makers during the decision-making process. Thus, bioregional plans should be considered by CAs in their decision-making regarding an application for EAs.

Alien and Invasive Species Regulations (GN R 598 of 2014), as well as the Alien and Invasive Species List (GN R 864 of 2016), have been published to regulate the monitoring, control and eradication for listed invasive species. The Regulations are effective from 1 October 2014, and it is therefore necessary for all landowners on whose land alien and invasive species occur to make the necessary arrangements to be compliant with these Regulations. This may include studies to identify the existence of alien and invasive species, the determination of the category in the Alien and Invasive Species List and the implementation of programmes to combat or control such species. During site rehabilitation cognisance would be given to the management of alien and invasive species.

4.6.3 NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003 (ACT 57 OF 2003 AS AMENDED)

The National Environmental Management Protected Areas Act (Act No. 57 of 2003) (NEM: PAA) concerns the protection and conservation of ecologically viable areas representative of South Africa's diversity and its natural landscapes and seascapes, and includes inter alia:

- The establishment of a national register of all national, provincial and local protected areas;
- The management of those areas in accordance with national standards; and
- Inter-governmental co-operation and public consultation in matters concerning protected areas.

Sections 48 to 53 of the NEM: PAA lists restricted activities that may not be conducted in a protected area. Section 49 states that activities in protected areas are regulated or restricted to the extent prescribed by:

- Regulations made under Section 86 of the Act;
- Regulations made under Section 87, in the case of provincial and local protected areas;
- By-laws made by the relevant municipality, in the case of local protected areas; and
- Internal rules made by the managing authority of the area under Section 52.

The project does not fall within any protected areas.

4.6.4 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT (ACT 39 OF 2004)

The National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) regulates all aspects of air quality, including:

- Prevention of pollution and environmental degradation;
- Providing for national norms and standards (through a National Framework for Air Quality Management), regulating air quality monitoring, management and control; and
- Licensing of activities that result in atmospheric emissions and have or may have a significant detrimental effect on the environment.

In terms of Section 22 of NEM:AQA no person may conduct a listed activity (as per GN R.893, 22 November 2013) without an Atmospheric Emission Licence (AEL).

The NEM:AQA has reviewed, categorised and documented all industrial processes that have an adverse impact on ambient air quality and categorised them as Listed Activities. They are all captured in Section 21 of the NEM:AQA (commonly referred to as the “Section 21 Listed Activities”). The following are categories of Listed Activities which proponents must check against to find out if they require applying for an AEL. The following are ten categories that comprise the Section 21 Listed Activities:

Table 4-2: Industrial processes that have an adverse impact on ambient air quality as listed in Section 21 of NEM:AQA

CATEGORY	BROAD ACTIVITY DESCRIPTION
1	Combustion installations
2	Petroleum Industry, the production of gaseous and liquid fuels as well as petrochemicals from crude oil, coal, gas or biomass.
3	Carbonisation and coal gasification
4	Metallurgical industry.
5	Mineral processing, storage and handling.
6	Organic chemicals industry.

CATEGORY	BROAD ACTIVITY DESCRIPTION
7	Inorganic chemicals industry.
8	Disposal of hazardous and general waste.
9	Pulp and paper manufacturing activities, including by-products recovery.
10	Animal matter processing.

The proposed Project will not trigger the requirement for an AEL.

4.6.4.1 Ambient Air Quality Standards

The then Minister of Water and Environmental Affairs published the national ambient air quality standards (NAAQS) for common pollutants as detailed in Table 4-3 in December 2009.

Table 4-3 - National Ambient Air Quality Standards - GN 1210:2009

Pollutant	Averaging period	Concentration (µg/m^3)	Frequency of Exceedance	Compliance Date
Particulate Matter (PM_{10})	24-hours	75	4	1 January 2015
	1 Year	40	0	1 January 2015
Nitrogen Dioxide (NO_2)	1-hour	200	88	Immediate
	1 Year	40	0	Immediate
Sulphur Dioxide (SO_2)	10-min (running)	500	526	Immediate
	1-hour	3_50	88	Immediate
	24-hours	125	4	Immediate
	1 Year	50	0	Immediate
Carbon Monoxide (CO)	1-hour	30	88	Immediate
	8-hours (running)^	10	11	Immediate
$PM_{2.5}$	24 hours	40	4	Immediate
	24 hours	25	4	1 January 2030
	1 Year	20	0	Immediate
	1 Year	15	0	1 January 2030
Lead (Pb)	1 Year	0.5	0	Immediate
Ozone (O_3)	8 hours (running)	120	11	Immediate
Benzene (C_6H_6)	1 year	5	0	Immediate

4.6.4.2 National Dust Control Regulations

The National Dust Control Regulations were published on 25th May 2018, Government Gazette no. 41650. The dustfall standard, applicable to this study, defines acceptable dust fallout rates in terms of the presence of residential and non-residential areas (Table 4-4).

Table 4-4 – Acceptable dust fallout rates

Restriction areas	Dustfall rate (mg/m2/day over a 30-day average)	Permitted frequency of exceedance
Residential areas	Dust fall < 600	Two per annum (not in sequential months)
Non-residential areas	600 < Dust fall < 1 200	Two per annum (not in sequential months)

4.6.5 NATIONAL ENVIRONMENTAL MANAGEMENT: INTEGRATED COASTAL MANAGEMENT ACT, 2008

The National Environmental Management: Integrated Coastal Management Act, 2008 (Act 24 of 2008) (NEM: ICMA) aims to establish a system of integrated coastal and estuarine management in South Africa, including norms, standards and policies, in order to promote the conservation of the coastal environment, and maintain the natural attributes of coastal landscapes and seascapes, and to ensure that development and the use of natural resources within the coastal zone is socially and economically justifiable and ecologically sustainable. Environmental management and authorisation requirements, as included in NEMA, are supported by the NEM: ICMA but provides for additional controls specifically within the coastal environment.

The project area does not fall within any protected areas or within a coastal protected zone (i.e., within 1 km of the high water mark). However potential impacts arising from the proposed activities have been considered in this BAR given that the proposed project falls within the catchment zone and close to the wetlands which feed into the Amanzimnyama, and subsequently the Siyaya Estuary.

Therefore, a specialist marine and estuarine consultant has expressed an opinion on the potential impact to the Siyaya Estuary as a result of the inclusion of Heleza Moya to the Fairbreeze mine. Refer to Appendix C12 for the Estuarine Compliance Statement.

4.6.6 SOUTH AFRICAN NATIONAL STANDARD FOR NOISE

The South African National Standard (SANS) Method for Environmental Noise Impact Assessment (SANS 10328:2008) makes provision for evaluating the noise impacts of a proposed development. It is an umbrella document and makes many references to SANS 10103:2008. The measurement and rating of environmental noise with respect to annoyance and to speech communication (SANS 10103:2008).

The SANS 10103 Code of Practice provides typical ambient noise rating levels (LReq,T) in various districts. The outdoor ambient noise levels recommended for the districts are shown in Table 4.5 below.

It is probable that the noise is annoying or otherwise intrusive to the community or to a group of persons if the rating level of the ambient noise under investigation exceeds the applicable rating level of the residual noise (determined in the absence of the specific noise under investigation), or the typical rating level for the ambient noise for the applicable environment given in Table 4-5.

Table 4-5 - Typical Rating Levels for Ambient Noise

Type of district	Equivalent continuous rating level (Lreq.T) for noise (dB(A))					
	Outdoors			Indoors, with open windows		
	Day night $L_{R,dn}$	Day time $L_{Req,d}$	Night time $L_{Req,n}$	Day night $L_{R,dn}$	Day time $L_{Req,d}$	Night time $L_{Req,n}$
a) Rural Districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

SANS 10103 provides criteria for evaluating the community or group response to a noise source as detailed in Table 4-6.

Table 4-6 – SANS 10103 Categories of community or group response

Excess, $\Delta L_{Req,T}$ dB(A)	Category	Description
0 to 10	Little	Sporadic complaints
5 to 15	Medium	Widespread complaints
10 to 20	Strong	Threats of community or group action
>15	Very Strong	Vigorous community or group action

SANS 10103 provides three methods for determining the excess level ($\Delta L_{Req,T}$) of a proposed development:

- $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the Residual noise (determined in the absence of the Rated noise, i.e. the specific noise under investigation);
- $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical Rating level for the applicable district as determined from Table 4-6 (above) from SANS 10103: 2008; or
- $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.

4.6.7 INTERNATIONAL STANDARDS AND GUIDELINES – ENVIRONMENTAL NOISE

The World Health Organisations (WHO) together with the Organization for Economic Co-ordination and Development (OECD) have developed guidelines based on the effects of the exposure to environmental noise. WHO recommends a standard guideline value for average outdoor noise levels of 55 dB(A) is applied during the daytime to prevent significant interference with the normal activities of local communities. The relevant night-time noise level is 45 dB(A). WHO further recommends that, during the night-time, the maximum level of any single event should not exceed 60 dB(A) to avoid sleep disruption. Specific ambient guidelines are also set for dwellings, bedrooms and schools. These levels are presented in Table 4-7.

Table 4-7 – WHO Guidelines for ambient sound levels

Environment	Ambient sound level L_{Aeq}			
	Day Time		Night-Time	
	Indoor	Outdoor	Indoor	Outdoor
Dwellings	50	50	-	-
Bedrooms	-	-	30	45
Schools	35	55	-	-

The WHO specifies that an environmental noise impact analysis is required before implementing any project that would significantly increase the level of environmental noise in a community (WHO, 1999). Significant increase is considered a noise level increase of greater than 5 dB(A).

The World Bank Group developed a program in pollution management so as to ensure that the projects they finance in developing countries are environmentally sound. Noise is one of the pollutants covered by their policy. It specifies that noise levels measured at noise receptors, located outside the project's property boundary, should not be 3 dB(A) greater than the background noise levels, or exceed the noise levels depicted in Table 4.5.

The International Finance Corporation (IFC) Environmental, Health, and Safety (EHS) Guidelines for noise management (IFC, 2007) adopt the WHO Guidelines for Community Noise (WHO, 1999) presented in Table 4-8. Noise impacts should not exceed these levels or result in a maximum increase in background levels of 3 dB (A) at the nearest receptor location off-site.

Table 4-8 – IFC Ambient noise guidelines (IFC, 2007)

Receptor	Maximum allowable ambient noise	
	1-hour LAeq (dB(A))	
	Day-time	Night-time
	07:00 – 22:00	22:00 – 07:00
Residential/ institutional/ educational	55	45
Industrial/ commercial	70	70
Note: L_{Aeq} values are not specified for rural areas.		

4.6.8 ADDITIONAL LEGISLATION AND GUIDELINES

Table 4-9 describes all other legislations and guidelines considered for the Project.

Table 4-9 – Additional applicable legislation and guidelines

APPLICABLE LEGISLATION AND GUIDELINES WERE USED TO COMPILE THE REPORT	RELEVANCE
World Heritage Convention Act, 1999 (No. 49 of 1999) (WHCA) The World Heritage Convention Act, 1999 (No. 49 of 1999) (WHCA) provides for the incorporation of the World Heritage Convention into South African law, enables the establishment of World Heritage Sites and provides for the	This Act was taken into consideration in the BA process.

APPLICABLE LEGISLATION AND GUIDELINES WERE USED TO COMPILE THE REPORT	RELEVANCE
management thereof to safeguard the integrity of World Heritage Sites. World Heritage Sites are recognised as a protected area in terms of Section 9 of the NEM:PAA. No world heritage resource sites are found within the project area.	
Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) (SPLUMA) The SPLUMA was promulgated in May 2015. SPLUMA is a framework act for all spatial planning and land use management legislation in South Africa. It seeks to promote consistency and uniformity in procedures and decision-making in this field. SPLUMA will also assist municipalities to address historical spatial imbalances and integrating of the principles of sustainable development into land use and planning regulatory tools and legislative instruments.	The proposed Project took the SPLUMA into consideration. The area falls within an Agricultural Zone. Therefore, a zoning application will be required for the Project.
Carbon Tax Act (Act No. 15 of 2019) The Carbon Tax Act (Act No. 15 of 2019) is aimed at mitigating greenhouse gas emissions by implementing a carbon tax. The Carbon Tax Act (Act No. 15 of 2019) in South Africa establishes a carbon tax on entities exceeding greenhouse gas emission thresholds. It encourages emissions reduction through tax liabilities, tax-free allowances, and offsets. The tax revenues are directed toward supporting emission reduction efforts and vulnerable communities. The act reflects South Africa's commitment to addressing climate change by placing a price on carbon emissions.	This Act was taken into consideration in the BA process.
Promotion of Access to Information Act, 2000 (Act No. 2 of 2000) (PAIA) The PAIA gives effect to the constitutional right of access to any information held by the state and any information that is held by another person and that is required for the exercise or protection of any rights, and to provide for matters connected therewith.	The requirements of the Act have been and will continue to be considered when assessing and involving the public and registered interested and affected parties.
Protection of Personal Information Act, 2013 (Act No. 4 of 2013) (POPI)	The POPI Act was considered in the management of stakeholder information for the project.

APPLICABLE LEGISLATION AND GUIDELINES WERE USED TO COMPILE THE REPORT	RELEVANCE
The POPI Act sets out the minimum standards regarding accessing and 'processing' of any personal information belonging to another. The Act defines 'processing' as collecting, receiving, recording, organizing, retrieving, or the use, distribution or sharing of any such information.	
Occupational Health and Safety Act,1993 (Act No. 85 of 1993) (OHS), and Major Hazard Installation Regulations of 2019 The OHS Act provides for the health and safety of persons at work and the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work. According to this Act, every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees.	The construction and operation of the proposed Project will include activities that are deemed as hazardous and/or a risk to the health and safety of the personnel employed on the project. Such hazards/risks should be managed in accordance with the relevant requirements of the Act.
Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HSA) The HSA, was promulgated in order to provide for the control of substances which may cause injury, ill-health, or death. Substances are defined as hazardous if their inherent nature is toxic, corrosive, irritant, strongly sensitising, flammable and pressure (under certain circumstances) which may injure ill-health, or death in humans. The Act provides for the division of hazardous substances or products into four (4) groups in relation to the degree of danger, the prohibition and control of the importation, manufacture, sale, use, operation, application, and disposal of such substances. These groups are as follows: • Group 1: includes all hazardous substances defined in the Act; • Group 2: includes mixtures of Group 1 substances; • Group 3: includes substances found in certain electronic products (i.e., a product with an electronic circuit); and • Group 4: includes all radioactive substances.	According to the HSA, the use or sale of Group I, II and III hazardous substances is prohibited. Should the use of these substances be required for the proposed Project, a permit application should be submitted to the Department of Health (DoH), in terms of the Act.
Public Participation in terms of NEMA, EIA Regulations (2017) The purpose of this guideline is to ensure that an adequate public participation process is undertaken for the BA process.	These guidelines were considered and applied for the Public Participation Process of the project.

APPLICABLE LEGISLATION AND GUIDELINES WERE USED TO COMPILE THE REPORT	RELEVANCE
Guideline on need and desirability in terms of the EIA Regulations of 2014 (as amended) These guidelines inform the consideration of the need and desirability aspects of the proposed Project.	These guidelines were considered and applied when considering the needs and desirability of the project.

4.6.9 MUNICIPAL BY-LAWS

All of the project-relevant uMlalazi municipal by-laws that are applicable to the proposed activities have been considered.

5 BASIC ASSESSMENT PROCESS

5.1 OBJECTIVES OF THE BASIC ASSESSMENT PROCESS AS PER THE PROCEDURAL FRAMEWORK

As defined in Appendix 1 of the EIA Regulations, 2014 (as amended), published under GN R.982, the objective of the impact assessment process is to, through a consultative process:

- 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;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focuses on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites;
- To rate the risk of impact of the proposed activity and technology alternatives on these aspects to determine—
    - The nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
    - The degree to which these impacts—
        - Can be reversed;
        - May cause irreplaceable loss of resources; and
        - Can be avoided, managed, or mitigated.
- 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–
    - Identify and motivate a preferred site, activity and technology alternative;
    - Identify suitable measures to avoid, manage or mitigate identified impacts; and
    - Identify residual risks that need to be managed and monitored.

5.2 DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT WEB-BASED ENVIRONMENTAL SCREENING TOOL

The Department of Forestry, Fisheries and the Environment (DFFE) has developed the National Web-based Environmental Screening Tool to flag areas of potential environmental sensitivity related to a site as well as a development footprint and produces the screening report required in terms of regulation 16 (1)(v) of the EIA Regulations of 2014 (as amended). *The Notice of the requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended (GN R.960 of July 2019)* states that the submission of a report generated from the national web-based environmental screening tool, as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations, 2014, published under GN. R.982 in Government Gazette No. 38282 of 4 December 2014, as amended, is compulsory when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the EIA Regulations, 2014 (as amended) as of 04 October 2019.

The Screening Report generated by the National Web-based Environmental Screening Tool contains a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development footprint and the most environmentally sensitive features on the footprint based on the footprint sensitivity screening results for the application classification that was selected.

A screening report for the proposed Project was generated on the 18th of January 2023 and is attached as **Appendix D**. The Screening Report for the project identified various sensitivities for the site. The report also generated a list of specialist assessments that should form part of the BA process based on the development type and the environmental sensitivity of the site. Assessment Protocols in the report provide minimum information to be included in a specialist report to facilitate decision-making.

Table 5-1 below provides a summary of the sensitivities identified for the development footprint.

Table 5-1 – Sensitivities identified in the DFFE Screening Report

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Animal Species Theme			X	
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme		X		
Civil Aviation Theme			X	
Defence Theme				X
Palaeontology Theme		X		
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Based on the selected classification and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments were identified for inclusion in the BAR by the Screening Tool:

- Agricultural Impact Assessment;
- Archaeological and Cultural Heritage Impact Assessment;
- Landscape/Visual Impact Assessment
- Palaeontology Impact Assessment;
- Terrestrial Biodiversity Impact Assessment;
- Aquatic Biodiversity Impact Assessment;
- Hydrology Impact Assessment;
- Noise Impact Assessment;
- Radioactivity Impact Assessment;

- Traffic Impact Assessment;
- Geotechnical Impact Assessment;
- Climate Impact Assessment;
- Socio-Economic Impact Assessment;
- Plant Species Impact Assessment;
- Animal Species Impact Assessment;
- Health Impact Assessment;
- Ambient Air Quality Impact Assessment; and
- Seismicity Impact Assessment.

5.2.1 MOTIVATION FOR SPECIALIST STUDIES

The report recognises that "it is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the footprint situation."

The following specialist assessments have been commissioned for the project despite not being identified by the Screening Report because of the nature of the Project:

- Environmental Risk Assessment and Mine Closure Plan Assessment.

The following specialist assessments have been commissioned for the project as identified by the Screening Report:

- Noise Impact Assessment;
- Hydrology Impact Assessment;
- Soil and Agricultural Potential Soil Study;
- Ambient Air Quality Impact Assessment;
- Terrestrial Biodiversity Impact Assessment;
- Socio-Economic Impact Assessment;
- Landscape/Visual Impact Assessment
- Archaeological, Cultural Heritage and Palaeontological Impact Assessment; and
- Geohydrological Impact Assessment.

In addition, on review of the draft Basic Assessment Report that was placed in the public domain, Ezemvelo KwaZulu Natal Wildlife (EKZNW) requested that the potential impact on the Siyaya Estuary be evaluated by a recognised estuarine specialist. The EAP had taken the view that an evaluation of impact on the estuary would only be undertaken in the event that significant change in flow or quality of water in the Amanzamnyama stream was identified through the integrated hydrology study (which found no significant impact on the stream). However, in response to the request from EKZNW an estuarine specialist was commissioned to prepare a statement of potential impact on the Siyaya Estuary and an Estuarine Compliance Statement is included as an appendix to the Final Basic Assessment Report.

The following specialist assessments have not been commissioned for the project based on the environmental sensitivities identified by the Screening Report:

- **Aquatic Biodiversity Impact Assessment**

An aquatic biodiversity study was undertaken by Tronox in July 2011 and delineated the nearest wetland (a channelled valley-bottom) to be more than 500 m south of the intended mining area within the Heleza Moya footprint (Figure 5-1). This assessment will not be conducted.

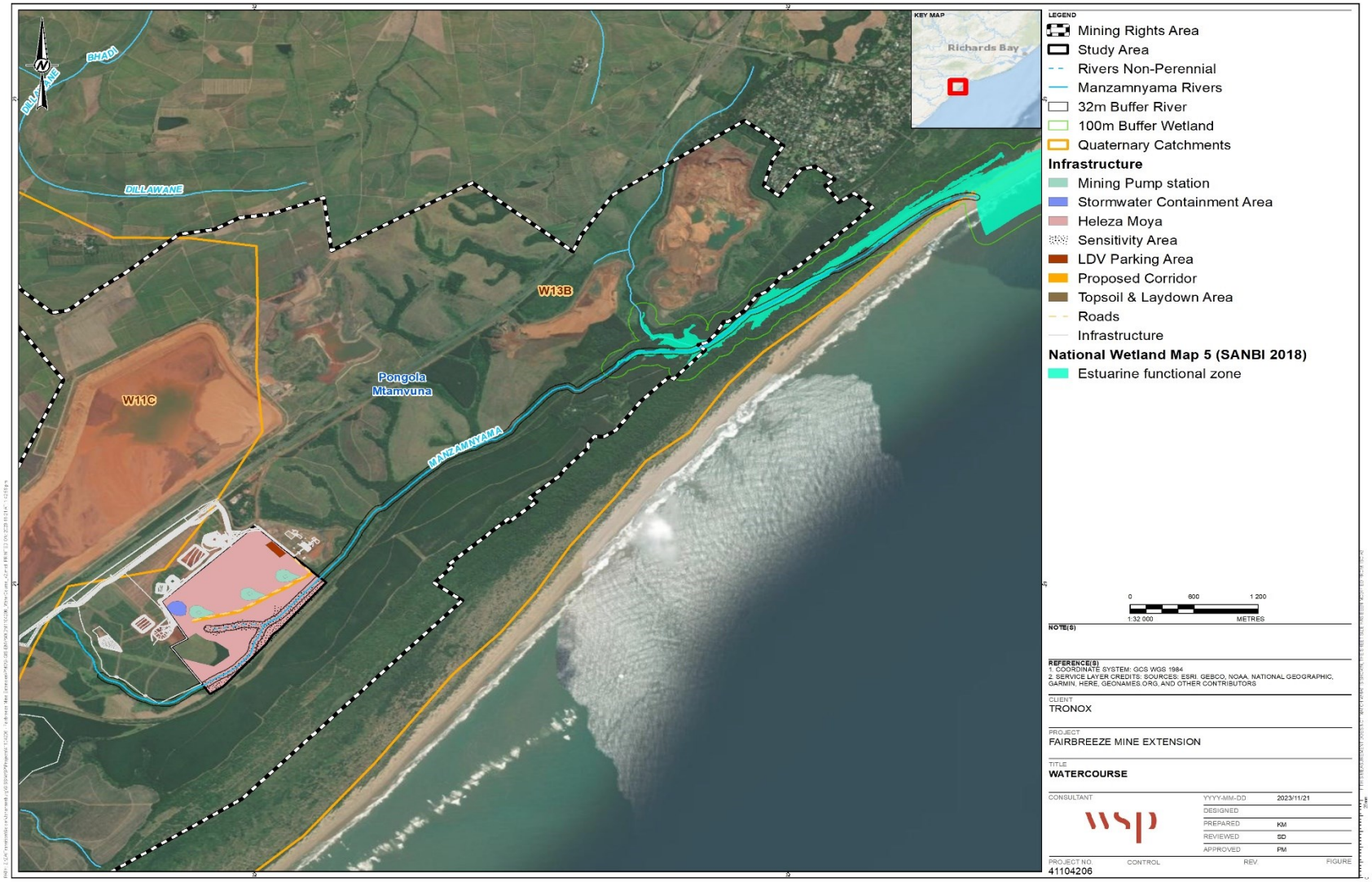


Figure 5-1 - Watercourses within the vicinity of the proposed Project

- **Radioactivity Impact Assessment:**

There was no radioactivity impact assessment undertaken because prior to the initiation of construction, a radiation survey will be undertaken to determine the radioactive baseline at Heleza Moya. This will inform Tronox on the required management and protective measures required for the safety of its employees or any individuals with potential to exposure. Moreover, part of the induction programme at Fairbreeze Mine covers environment and radiation related training for all staff, involving the introduction of personnel to the Safety Health and Environment (SHE) policy and its implications, relevant legislation, areas where radioactivity is encountered on site and the basic rules when entering contaminated areas, incident reporting the roles of the environment/radiation department, as well as the environmental management system. The environmental management system is covered in more detail as part of the company's International Organisation for Standardisation (ISO) system. This training is used to provide all employees with insight into the functioning of the system and the role that each employee plays in the management and maintenance of this system. Lastly, since the radioactivity levels of the RSFs will be below the National Nuclear Reactor (NNR) clearance levels, institutional control measures are considered to be unlikely to be applied to the RSFs where the residue material will be deposited. Therefore, this assessment was deemed not applicable.

- **Traffic Impact Assessment:**

The proposed Project does not entail any major construction activities as existing infrastructure will simply be relocated and used at Heleza Moya. In addition, mining at Heleza Moya will be an extension of ore body FBB so the trucking volumes to the CPC for refinement will remain as current. Therefore, this assessment was deemed not applicable.

- **Climate Impact Assessment:**

The proposed Project is not expected to release harmful emissions to surrounding areas as it will not entail any combustion activities. However, air quality impacts from the hydraulic monitoring process have been assessed. Therefore, this assessment was deemed not applicable.

- **Geotechnical/Seismicity Impact Assessment:**

This assessment was not considered to be a requirement as there will not be any major civil construction for the proposed Project. Therefore, the only extensive excavations will be from the hydraulic monitoring at the pit areas. Existing geotechnical information available for the site will be used to inform designs for the infrastructural components. In relation to seismicity, the mining method proposed is hydraulic monitoring, i.e., blasting will not be undertaken. Therefore, this assessment was deemed not applicable.

Specialist assessments were conducted in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in GN R.320 of 20 March 2020 and in GN R.1150 of 30 October 2020 (i.e., "the Protocols").

5.3 APPLICATION FOR ENVIRONMENTAL AUTHORISATION

The application phase consisted of a pre-application consultation with the DMRE and subsequently completing the appropriate application form, as well as the submission and registration of the application for an EA with the DMRE. Two pre-application meetings were held with DMRE on the

24th of February 2023 and 21st of September 2023. The application form was submitted to the DMRE on 16 October 2023. The draft BAR was also submitted to the DMRE on 22 November 2023.

5.4 BASELINE ENVIRONMENTAL ASSESSMENT

The description of the environmental attributes of the Project area and its surroundings were compiled through a combination of desktop reviews and site investigations. Desktop reviews made use of available information including existing reports, aerial imagery, and mapping.

5.5 IMPACT ASSESSMENT METHODOLOGY

5.5.1 ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed Project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3], as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in Table 5-2**.**

Table 5-2 – Impact Assessment Criterion and Scoring System

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E)	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National	International: Across

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
The geographical extent of the impact on a given environmental receptor				scope or level	borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
Impact Significance Rating					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

5.5.2 IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option

should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 5-2 below.

Avoidance / Prevention	Refers to considering options in project location, nature, scale, layout, technology and phasing to **avoid** environmental and social impacts. Although this is the best option, it will not always be feasible and then the next steps become critical.
Mitigation / Reduction	Refers to considering alternatives in the project location, scale, layout, technology and phasing that would **minimize** environmental and social impacts. Every effort should be made to minimize impacts where there are environmental and social constraints.
Rehabilitation / Restoration	Refers to the **restoration or rehabilitation** of areas where impacts were unavoidable, and measures are taken to return impacted areas to an agreed land use after the activity/project. Restoration, or even rehabilitation, might not be achievable, or the risk of achieving it might be very high. Additionally, it might fall short of replicating the diversity and complexity of the natural system. Residual negative impacts will invariably still need to be compensated or offset.
Compensation / Offset	Refers to measures over and above restoration to remedy the residual (remaining and unavoidable) negative environmental and social impacts. When every effort has been made to avoid, minimize and rehabilitate remaining impacts to a degree of no net loss, **compensation/offsets** provide a mechanism to remedy significant negative impacts.
No - Go	Refers to 'fatal flaw' in the proposed project or specifically a proposed project in an area that cannot be offset, because the development will impact strategically important ecosystem services or jeopardize the ability to meet biodiversity target. This is a **fatal flaw** and should result in the project being rejected.

Figure 5-2 - Mitigation sequence/heirachy

The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

5.6 ASSUMPTIONS AND LIMITATIONS

General assumptions and limitations:

- The EAP hereby confirms that they have undertaken to obtain project information from the client that is deemed to be accurate and representative of the project;
- A site visit has been undertaken to better understand the project and ensure that the information provided by the client is correct, based on site conditions observed;
- The EAP hereby confirms their independence and understands the responsibility they hold in ensuring all comments received are accurately replicated and responded to within the EIA documentation;
- The comments received in response to the public participation process, will be representative of comments from the broader community; and
- Based on the pre-application meeting and subsequent minutes, the CA has not requested additional specialist studies to decide regarding the application.

6 NEED AND DESIRABILITY FOR THE PROJECT

The DFFE's *Guideline on Need and Desirability* (GN R.891 of 2014) emphasises that while national strategies and policies are important for the development of the economy, they also need to address strategic issues such as climate, food security and the sustainability of natural resource supply and the condition of South Africa's ecosystem services. It is for this reason that the overarching framework for assessing the need and desirability of developments is adopted at policy - level by identifying and promoting the activities/industries/developments that civil society needs. The guidelines also note that at the project level (e.g., within the BA process), the "need" and "desirability" of a project should be reflected in the content of local and regional plans, frameworks and strategies.

Considering the above, the purpose of this part of the report is to outline the necessity and desirability of the proposed Project, highlighting how it fits into the strategic framework of global, national, regional and local development policies and programmes, as well as wider societal requirements (where applicable).

6.1 DIRECT BENEFITS OF THE PROJECT

Fairbreeze Mine will be reaching the end of its life span within the next fifteen years and Tronox's previous mining operation, Hillendale, is currently in the mine closure stage of its life. Therefore, expanding the Fairbreeze mining area will contribute to increasing the material output and thus optimising reclamation at Fairbreeze within this life span. Thereafter, Tronox will continue its mining operations at the proposed Port Dunford Mine.

According to the uMlalalazi Local Municipality's Integrated Development Plan (IDP) (Umlalazi Local Municipality, 2020) mining is identified as a strategic economic sector due to the landscape of the region and therefore provides the municipality with a competitive advantage in this sector. Additionally, the IDP mentions that the heavy mineral count in the Coastal Dune also presents an opportunity for formal employment for the youth within the mining sector.

The King Cetshwayo District Municipality's Spatial Development Framework (SDF) (King Cetshwayo District Municipality, 2021) indicates that mining is an important sector within the municipality as it largely contributes to the municipality's economic growth. Furthermore, Tronox is named as one of the districts 'mining giants' and as a flagship mining company due to its scale of operation.

In summary, the Fairbreeze Mine expansion is aligned to the vision of the municipality's IDP and the district's SDF. The expansion will also secure continued feed to the CPC in Empangeni for the next seventeen years and allow for continued supply to customers. The expansion will also assist in realising sustained economic benefits for:

- The national gross domestic product (GDP);
- Communities that benefit from the SLP; and
- Tronox in general.

6.1.1 PRODUCT DESTINATION

The Fairbreeze Mine produces heavy mineral sand from several deposits. The mined ore is treated at the PWP to produce heavy mineral concentrates (HMCs). The HMCs are then trucked to the Empangeni CPC where the final products produced are titanium dioxide slag, rutile, zircon,

leucoxene and high purity iron that is sold mainly internationally (99%) and locally (1%). The titanium dioxide slag is used as feedstock to the pigment industry; zircon is used in the ceramic industry while rutile and leucoxene is also used in the pigment industry with a significant fraction also used in the manufacture of welding rods. Pig iron is used mainly in the motor manufacturing industry and for speciality castings. The authorisation of the proposed Project would ensure the continued supply of final products that are essential to various end-user markets.

6.1.2 EXTENSION OF EMPLOYMENT AT FAIRBREEZE MINE

According to the SLP (Tronox KZN Sands, 2023-2027), the workforce (Fairbreeze Mine plus support staff) is 459 permanent employees, consisting of 345 males and 114 females. It is estimated that each employee has an average of five dependants, which gives a total of 2,295 non-employees directly dependent on wages from the business (Tronox KZN Sands, 2023-2027). The extension of the Fairbreeze Mine will allow some employees to continue with their contracts for two more years.

6.2 INTERNATIONAL POLICY AND PLANNING FRAMEWORKS

While there are no specific international policies that universally advocates for mining, several international agreements and frameworks recognise the importance of mining for economic development and sustainable growth. In this section, various international mining policies and frameworks that that acknowledge the significance of mining and are relevant to the project will be explored.

6.2.1 UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS (SDGS)

The Sustainability Development Goals (SDGs), especially Goal 8 and Goal 9, recognise the role of mining in industrial development, job creation, and economic growth.

Goal 8 aims to promote inclusive and sustainable economic growth, full and productive employment and decent work for all. The proposed Project would ensure that there will be job creation and retention during the various stages of the project lifecycle.

Goal 9 seeks to build resilient infrastructure, promote sustainable industrialisation and foster innovation. Economic growth, social development and climate action are heavily dependent on investments in infrastructure, sustainable industrial development and technological progress. In the face of a rapidly changing global economic landscape and increasing inequalities, sustained growth must include industrialisation that first, makes opportunities accessible to all people, and second, is supported by innovation and resilient infrastructure.

The proposed Project contributes towards the achievement of Goals 8 and 9 of the SDGs in creating employment opportunities and fostering industrial and technological development.

6.2.2 WORLD BANK MINING SECTOR POLICY, 2022

The World Bank supports the development of mining sectors in its member countries to promote economic growth, alleviate poverty, and create jobs, while also emphasising environmental and social sustainability.

The World Bank Mining Sector Policy is a set of guidelines and principles established by the World Bank to guide its involvement in mining projects in member countries. The policy aims to promote sustainable development in the mining sector by addressing environmental, social, and economic

challenges associated with mining activities. Here is a summary of what the World Bank Mining Sector Policy entails:

- **Sustainable Development:** The policy emphasises the importance of mining to promote economic growth, alleviate poverty, and create jobs. It seeks to ensure that mining activities contribute positively to the overall development of a country and its communities.
- **Environmental Protection:** The policy advocates for environmentally sustainable mining practices. It encourages the responsible management of natural resources, minimising environmental degradation, and promoting the efficient use of energy and water resources in mining operations.
- **Social Responsibility:** The policy emphasises the need for mining projects to respect the rights of local communities and indigenous peoples. It encourages meaningful consultation with affected communities, promotes their participation in decision-making processes, and aims to mitigate the negative social impacts of mining activities.
- **Governance and Regulation:** The policy supports the development of transparent and effective legal and regulatory frameworks for the mining sector. It advocates for good governance practices, including anti-corruption measures, to ensure that mining revenues are used for the benefit of the country and its people.
- **Health and Safety:** The policy promotes a safe and healthy working environment for miners. It encourages adherence to international health and safety standards to minimise accidents, injuries, and occupational health hazards in mining operations.
- **Capacity Building:** The policy emphasises the importance of building the capacity of governments, local institutions, and stakeholders to manage the mining sector effectively. This includes providing technical assistance, training, and knowledge sharing to enhance the skills and expertise necessary for sustainable mining practices.
- **Community Development:** The policy supports initiatives that promote the economic diversification of communities affected by mining activities. It encourages the development of infrastructure, education, and healthcare facilities to improve the overall well-being of local populations.

The proposed Project adheres to and promotes these principles.

6.2.3 AFRICAN MINING VISION, 2009

The African Mining Vision (AMV) is a policy framework developed by the African Union in 2009 to guide African countries in their pursuit of sustainable mining and mineral development. Here is a summary of the African Mining Vision policy objectives:

- **Economic Diversification:** The AMV emphasises the role of the mining in economic diversification. It encourages African countries to use their mineral resources as a catalyst for broader economic development, reducing dependence on a single resource for revenue.
- **Beneficiation and Value Addition:** The AMV advocates for the beneficiation of mineral resources within African countries. This means adding value to raw minerals before export, fostering local industries, and creating jobs within the continent.
- **Sustainable Development:** The policy emphasises sustainable mining practices, balancing economic development with environmental and social considerations. It encourages responsible exploitation of mineral resources to ensure long-term benefits for current and future generations.

- **Transparent Governance:** The AMV promotes transparent and accountable governance of the mining sector. It advocates for clear legal and regulatory frameworks, effective administration, and the prevention of corruption in mineral resource management.
- **Community Engagement:** The policy stresses the importance of engaging with local communities affected by mining activities. It encourages inclusive decision-making processes, respecting the rights and concerns of local populations, and ensuring that communities benefit from mining projects.
- **Infrastructure Development:** The AMV highlights the need for infrastructure development, such as roads, railways, and energy supply, to support the mining sector. Adequate infrastructure is essential for efficient mining operations and to facilitate the movement of goods and services.
- **Capacity Building:** The policy also highlights the importance of building local capacities in geological surveys, mining technology, environmental management, and other relevant areas. Developing local expertise is crucial for the sustainable development of the mining sector.
- **Research and Development:** The AMV encourages investment in research and development to promote innovation in mining technologies, environmental conservation, and mineral processing methods. Research-driven initiatives are seen as essential for the continuous improvement of the mining industry.

The Fairbreeze extension project would align with most of these objectives because it would contribute towards economic diversification in the uMlalazi Local Municipality, beneficiation and value addition through its mineral processing at the CPC, as well as community engagement and upliftment through the BA process and existing SLP, respectively.

6.3 NATIONAL POLICY AND PLANNING FRAMEWORKS

South Africa has several national policies and planning frameworks that promote sustainable mining and govern the mining industry. These policies are aimed at ensuring sustainable development, environmental protection, and social responsibility within the mining sector.

6.3.1 NATIONAL DEVELOPMENT PLAN, 2030

The South African National Development Plan (NDP) outlines the country's long-term vision and goals for sustainable development. While the NDP does not focus exclusively on the mining industry, it recognises the importance of mining as a key sector contributing to economic growth and job creation. Here are the key elements of the NDP 2030 related to the importance of the mining industry:

- **Economic Growth**: The NDP acknowledges mining as a significant contributor to economic growth in South Africa. It emphasises the need for the mining sector to expand sustainably, creating economic opportunities and generating revenue for the country.
- **Job Creation**: Mining is recognised as a major employer in South Africa. The NDP emphasises the importance of the mining industry in creating jobs, particularly in rural and historically disadvantaged areas. It aims to promote inclusive growth by ensuring that employment opportunities in mining are accessible to a broader section of the population.
- **Infrastructure Development**: The NDP underscores the importance of infrastructure development to support economic growth, including the mining sector. Investments in transportation, energy, and water infrastructure are vital for the efficient functioning of mining operations and the transportation of mineral resources.

- **Beneficiation and Value Addition**: The NDP promotes beneficiation, which involves adding value to raw minerals before export. By encouraging value addition within the country, the NDP aims to increase revenue, create jobs, and promote industrialisation, thereby making the mining sector more sustainable and diversified.
- **Environmental Sustainability:** While emphasising the economic importance of mining, the NDP also stresses the need for environmentally sustainable practices within the industry. Balancing economic growth with environmental conservation is a key consideration, ensuring that mining activities are conducted responsibly and do not harm the environment in the long term.
- **Inclusive Economic Participation**: The NDP advocates for the inclusion of historically disadvantaged groups, including black South Africans, in the mining sector. Policies such as Black Economic Empowerment (BEE) are aligned with the NDP's goal of promoting inclusive economic participation and reducing historical inequalities.
- **Research and Innovation:** The NDP highlights the importance of research and innovation in the mining sector. Encouraging research and the adoption of innovative technologies is seen as essential for improving efficiency, safety, and environmental sustainability in mining operations

The proposed Project is positioned within the ambit of the NDP in that it endeavours to continue with inclusive and sustainable mining practices which will result in the economic benefit of the region.

6.3.2 INDUSTRIAL POLICY ACTION PLAN (IPAP), 2018/19-2020/21

IPAP aims to promote industrialisation and enhance the competitiveness of South African industries, including mining. It includes initiatives to support local manufacturing and beneficiation of raw materials, encouraging value addition to mineral resources. While IPAP is not exclusively focused on mining, it includes several key points regarding the mining industry:

- **Beneficiation:** Similar to the policies previously discussed, IPAP encourages beneficiation, which involves adding value to raw minerals before export. In the context of mining, this means processing minerals within South Africa to create higher-value products. Beneficiation promotes industrialisation, job creation, and economic diversification.
- **Local Procurement:** IPAP emphasises the importance of local procurement, encouraging mining companies to source goods and services locally. This policy supports local businesses, stimulates economic growth in surrounding communities, and strengthens the domestic supply chain.
- **Infrastructure Development:** IPAP also highlights the need for infrastructure development, including transportation, energy, and water supply, to support the mining sector. Adequate infrastructure is essential for efficient mining operations, enabling the movement of goods, services, and labour.
- **Research and Development:** IPAP promotes research and development in the mining industry. Investing in research and development encourages innovation, improves mining technologies, enhances safety measures, and promotes sustainable practices within the sector.
- **Skills Development:** IPAP recognises the importance of skills development in the mining industry. Training and developing a skilled workforce are crucial for the sector's growth and competitiveness. Skilled workers contribute to increased productivity and the adoption of advanced mining technologies.

- **Environmental Sustainability:** While not explicitly stated in IPAP, the broader emphasis on sustainable industrial practices aligns with environmental concerns related to mining. Encouraging environmentally responsible mining practices is consistent with the overarching goals of sustainable industrialisation.
- **Job Creation:** Although not specifically outlined, IPAP's focus on promoting local industries indirectly supports job creation within the mining sector. By encouraging beneficiation, local procurement, and infrastructure development, IPAP contributes to employment opportunities in mining and related industries.

The proposed Project also adheres to the objectives of the IPAP which is similar to and inspired by the global policies which advocate for mining if undertaken sustainably.

6.4 REGIONAL, LOCAL POLICY AND PLANNING FRAMEWORKS

This part of the report discusses the policy and planning frameworks that are relevant to the Project at a regional level.

6.4.1 KWAZULU-NATAL PROVINCIAL GROWTH AND DEVELOPMENT STRATEGY AND PLAN, 2012 TO 2030

The KwaZulu-Natal Provincial Growth and Development Strategy and Plan (2012 to 2030) outlines the long-term vision and goals for economic and social development in the KwaZulu-Natal province of South Africa. The relevant objectives of the strategy and plan to the proposed Project include:

- **Economic Growth**: To promote sustainable economic growth in the province by attracting investments, fostering entrepreneurship, and creating an enabling environment for businesses to thrive.
- **Job Creation:** To generate employment opportunities by supporting labour-intensive industries, skills development, and training programs. The goal is to reduce unemployment rates and improve livelihoods for the people of KwaZulu-Natal.
- **Social Inclusion:** To promote social inclusion and address historical inequalities. This involves implementing policies and programs that empower marginalized communities, promote gender equality, and ensure that the benefits of development reach all segments of the population.

The project's construction and operation phases align with the goals of the KZN Provincial Growth and Development Strategy. This alignment arises because implementing the project will invigorate the local economy around Mtunzini. This economic boost will stem from generating job opportunities and business prospects for individuals residing within the project's vicinity.

The project will necessitate various ancillary services, which local Small Medium and Micro Enterprises (SMMEs) can provide during the construction phase. Services like waste management, sewage removal, security provision, staff transportation, and the supply of construction materials such as sand and cement can be delivered by SMMEs situated within the project area.

6.4.2 KING CETSHWAYO DISTRICT MUNICIPALITY INTEGRATED DEVELOPMENT PLAN, 2023 - 2024

The IDP of the King Cetshwayo District Municipality outlines the strategic objectives and concerns of the municipality, focusing on comprehensive development over a specific period. While the specific

details of the plan can vary, the main objectives and concerns relevant to the proposed Project include:

Concerns -

- **Unemployment:** Addressing high levels of unemployment by creating job opportunities and supporting skill development programs to enhance employability.
- **Poverty Alleviation:** Implementing initiatives to reduce poverty, improve income levels, and enhance the overall standard of living for residents.
- **Environmental Degradation:** Mitigating environmental degradation, conserving natural resources, and promoting sustainable environmental practices to protect the district's ecological balance**.**
- **Social Inequality:** Working towards reducing social inequalities by providing equal opportunities and access to resources for all residents, regardless of their socio-economic background.

Objectives -

- **Economic Development:** Encouraging economic growth, investment, and job creation within the district. This may involve initiatives to support local businesses, attract investors, and promote entrepreneurship.
- **Infrastructure Development:** Improving and expanding infrastructure such as roads, water supply, sanitation, energy, and public facilities. Infrastructure development is vital for enhancing the quality of life for residents and supporting economic activities.
- **Social Development:** Addressing social challenges, including poverty, education, healthcare, and housing. The plan may focus on initiatives to improve access to quality education, healthcare services, and affordable housing for residents.
- **Environmental Sustainability:** Promoting environmental conservation and sustainable development practices. This may involve efforts to manage natural resources, address climate change concerns, and promote eco-friendly initiatives.
- **Community Participation:** Encouraging active involvement and participation of community members in local governance and development processes. This may involve initiatives to engage with local communities, gather their input, and incorporate their needs and concerns into the development plans.

The King Cetshwayo District Municipality's IDP aims to address these concerns by obtaining the set-out objectives systematically, guiding the municipality's efforts in promoting holistic development and improving the overall quality of life for its residents. The proposed Project would contribute to towards their achievement.

6.4.3 UMLALAZI LOCAL MUNICIPALITY - INTEGRATED DEVELOPMENT PLAN 2022 - 2023

The main concerns and objectives of the uMlalazi Local Municipality's IDP mirror those of the regional municipality. The local municipalities stand out concerns related to the proposed Project are also high unemployment levels; poverty alleviation; environmental sustainability; and social development. The proposed Project would contribute towards solving these issues.

7 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

This section provides an overview of the public participation process (PPP) that will be undertaken as part of this BA process.

7.1 OBJECTIVES OF STAKEHOLDER ENGAGEMENT

The PPP was designed to provide information to, and receive feedback from, I&APs throughout the EMPr Amendment process, thus providing organisations and individuals and other stakeholders with an opportunity to raise concerns and provide comments and suggestions regarding the Project.

The principles that determine communication with society at large are included in the principles of the NEMA and are elaborated upon in General Notice 657, titled "Guideline 4: Public Participation" (Department of Environmental Affairs and Tourism, 19 May 2006), which states that: "*Public participation process means a process in which potential interested and affected parties (I&APs) are given an opportunity to comment on, or raise issues relevant to, specific matters*."

Opportunities for Comment

Documents will be available during the BA process to provide stakeholders with information, further opportunities to identify issues of concern and suggestions for enhanced benefits and to verify that the issues raised have been considered.

Public participation is an essential and regulatory requirement for the BA process and will be undertaken in terms of Chapter 6 of the EIA Regulations GN R.326. Public participation is a process that is intended to lead to a joint effort by stakeholders, technical specialists, the authorities and the proponent/developer who work together to produce better decisions than if they had acted independently.

The PPP is designed to provide sufficient and accessible information to I&APs in an objective manner and enable them to:

- Raise issues of concern and make suggestions for enhanced benefits.
- Verify that their issues have been recorded.
- Assist in identifying reasonable alternatives.
- Contribute relevant local information and traditional knowledge to the environmental assessment.
- Comment on the findings of the environmental impact assessment and the mitigation measures proposed.

Once the CA, the DESTEA, has announced its decision, I&APs will be notified of the outcome and the appeal procedure.

7.2 PUBLIC CONSULTATION PROCESS FOR THE BA PROCESS

7.2.1 IDENTIFICATION OF I&APS

A stakeholder database was developed for the project based on information supplied by Tronox and additional I&APs which had been identified by the project team. These included regulatory authorities, surrounding landowners and others. The full list has been attached as **Appendix B5**.

7.2.2 REGISTRATION OF I&APS

The NEMA Regulations distinguish between I&APs and registered I&APs.

I&APs, as contemplated in Section 24(4) (d) of the NEMA include: "(a) any person, group of persons or organisation interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity".

In terms of the Regulations:

"An EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

a) All persons who; have submitted written comments or attended meetings with the applicant or EAP;
b) All persons who; have requested the applicant or EAP managing the application, in writing, for their names to be placed on the register; and
c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

Stakeholders were encouraged to register as I&APs and participate in the consultation processes by completing the registration and comment sheet and returning it to the Public Participation Office.

Stakeholders who were involved in the initial consultation have been added to the register. The I&AP register will be updated throughout the BA process where necessary.

7.2.3 PROJECT ANNOUNCEMENT PHASE

The Project was announced on **22 November 2023**. Stakeholders were invited to participate in the BA process and PPP, as well as to pass on the information to friends/colleagues/neighbours who may be interested and to register as I&APs. An email reminding registered I&APs about the commenting period was sent out on 08 January 2024.

The Project was announced as follows:

- Distribution of the background information document and a letter of invitation to participate to all I&APs on the database, accompanied by a registration, comment and reply sheet that was mailed/emailed to the entire stakeholder database and hand delivered, where possible (**Appendix B5**).
- The above-mentioned documents were available at the public places listed below and posted to the WSP website: https://www.wsp.com/en-za/services/public-documents.

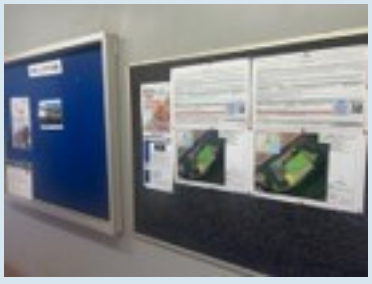
Table 7-1 – Public places where documentation was placed

Place	Coordinates
Mtunzini Library - 11 Hely Hutchinson Street, Mtunzini, 3867	28°57'7.89" S 31°45'27.94" E

A newspaper advertisement was published in the Eyethu Baywatch and the Zululand Observer.

Site notices were placed on the **15TH of November 2023** at the following locations and at visible places at the boundary of the property (refer to **Appendix B**):

Table 7-2 – Site notice locations

Place	Coordinates	Photos
Mtunzini Golf Club	28° 56' 40.50" S 31° 45' 39.32" E	
Mtunzini Spar	28° 57' 1.51" S 31° 45' 27.65" E	
Fairbreeze Main entrance	28° 59' 51.72" S 31° 42' 7.56" E	
Fairbreeze intersection with N2	29° 2' 28.68" S 31° 39' 5.796" E	
Heleza Moya entrance	29° 0' 37.4652" S 31° 42' 2.3976" E	

Place	Coordinates	Photos
Mondi Compound	29° 1' 0.102" S 31° 41' 35.61" E	

7.2.4 DRAFT BAR

The draft BAR was placed into the public domain for comment from **22 November 2023** to **19 January 2023**. The report was made available at the public places listed above and posted to the WSP website: https://www.wsp.com/en-za/services/public-documents.

The availability of the draft BAR was announced as follows:

- Distribution of a letters to registered I&APs, accompanied by a comment form (in English and Isizulu), inviting I&APs to comment on the draft BAR.
- Notification to registered I&APs of the availability of the draft BAR via SMS, email and letters.
- Posting the draft BAR, notification letter and comment form on the WSP website.
- The draft BAR has been made available at the public places listed in Table 7-1.

7.2.5 COMMENTS AND RESPONSES REPORT

All comments (and responses) received during the comment period from registered I&APs has been captured into a Comments and Responses Report (CRR) and is submitted with the final report to the CA.

7.2.6 FINAL BAR REPORT

The draft BAR has been updated based on comments received from I&APs during the public review period. The Final BAR is submitted to the CA.

7.2.7 NOTIFICATION OF DECISION

Once the CA has taken a decision about the Project, the Public Participation Office will notify I&APs of this decision and of the opportunity to appeal. This notification will be provided as follows:

- A letter will be sent, addressed to all registered I&APs, summarising the authority's decision and explaining how to lodge an appeal should they wish to.

8 BASELINE ENVIRONMENTAL ATTRIBUTES

This section of the report presents an overview of the environmental baseline and status quo of the project area at Fairbreeze. Information presented in this section is based on visual observations during the site reconnaissance visit, available desktop information, specialist studies and previous studies undertaken in the project area. Information was further obtained from the following specialist studies undertaken as part of this BA process:

- Social Impact Assessment
- Air Quality Impact Statement
- Noise Impact Statement
- Ecological Impact Assessment: Terrestrial Fauna and Flora
- Soils and Agricultural Potential
- Heritage and Palaeontological Screening
- Groundwater Model and Impact Assessment
- Surface Water Impact Assessment and Water Balance
- Visual Impact Statement
- GIS/Remote Sensing
- Mine Closure and Rehabilitation Plan.

8.1 MUNICIPALITIES AND SERVICES

8.1.1 MAGISTERIAL DISTRICT AND RELEVANT REGIONAL SERVICES COUNCIL AUTHORITY

- Province: KwaZulu-Natal;
- Magisterial District: Umlalazi; and
- District Municipality: Uthungulu.

8.1.2 DIRECTION AND DISTANCE TO NEIGHBOURING TOWNS

Due to the large extent of the mining areas at Fairbreeze, the distance calculation was done from the PWP location, which is approximately in the centre of the mine (Table 8-1). Distances are calculated in a direct line.

Table 8-1: Direction and distance to nearest towns

Town	Approximate direction	Direct line distance
Mtunzini	46°	3 km
Gingindlovu	254°	12 km
Felixton	43°	26 km
Eshowe	298°	26 km
Empangeni	34°	31 km
Richards Bay	51°	52 km
Durban	214°	116 km

8.1.3 SURFACE INFRASTRUCTURE

Other than the town of Mtunzini (to the northeast of the Fairbreeze site), surface infrastructure is restricted to that associated with farming and forestry activities i.e., farmsteads, gravel roads etc. The Fairbreeze Mine is situated immediately east and west of the N2 highway and the railway line from Durban to Empangeni runs between the coastline and the Fairbreeze deposit for most of the length. The railway line is west of the most southern portion of the FBA deposit. There are numerous light railways in the area for the transport of sugar cane. The infrastructure layout for Fairbreeze Mine is shown in Figure 3-5.

The Fairbreeze area is supplied with electrical power from the Eskom electricity grid. The Hudley substation is located to the south of the orebody and supplies power to the rail lines running to the east of the orebody.

8.2 CLIMATE AND METEOROLOGY

The KZN north coast is known for its warm, moist subtropical climate.

8.2.1 CLIMATE

The climate in the region is one of high rainfall and high evaporation and the annual evaporation is not always higher than the annual rainfall. The area is humid and hot in the summer and relatively warm in the winter. Rain falls mainly during the summer months (October to April). The rainfall, evaporation and extreme events are presented below.

Figure 8-1 presents the average, maximum and minimum temperatures, whilst Figure 8-2 presents the humidity and total monthly rainfall recorded using the Mtunzini station data for the 2020 to 2022 period. The region typically receives higher levels of rainfall during the warmer, summer (December to February) months, with drier conditions during the cooler, winter months (June, July and August). The total rainfall received for 2020, 2021 and 2022 was 1 037 mm, 1 591 mm and 1 208 mm, respectively. Temperatures ranged from a low of 2°C, 1°C and 2°C in 2020, 2021 and 2022, respectively in winter to a high of 41°C, 43°C and 39°C in 2020, 2021 and 2022, respectively in summer. The average relative humidity for 2020, 2021 and 2022 recorded was 75%, 76% and 76%, respectively.

Figure 8-3 presents the average, maximum and minimum temperatures, whilst Figure 8-4 presents the humidity and total monthly rainfall recorded using Weather Research and Forecasting (WRF) modelled data for the 2020 to 2022 period. The region typically receives higher levels of rainfall during the warmer, summer (December to February) months, with drier conditions during the cooler, winter months (June, July and August). The total rainfall received for 2020, 2021 and 2022 was 804 mm, 1 102 mm and 1 322 mm, respectively. Temperatures ranged from a low of 6°C, 6°C and 8°C in 2020, 2021 and 2022, respectively in winter to a high of 41°C, 40°C and 39°C in 2020, 2021 and 2022, respectively in summer. The average relative humidity for 2020, 2021 and 2022 recorded was 70%, 72% and 74%, respectively.

Both data sets produced similar ranged values and hence gives confidence that the WRF modelled data is an accurate representation for the dispersion mode.

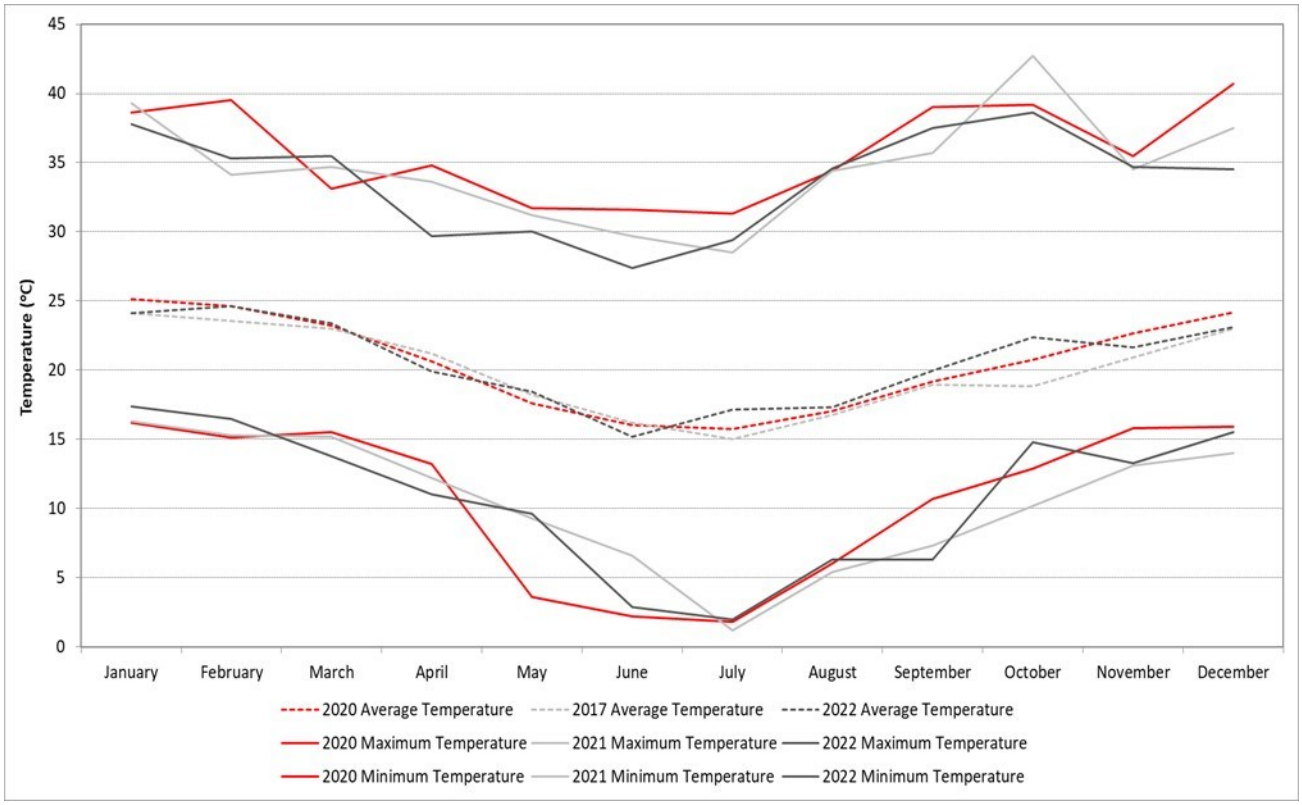


Figure 8-1 - Average, maximum and minimum monthly temperatures for the period January 2020 to December 2022 using the SAWS Mtunzini weather station data

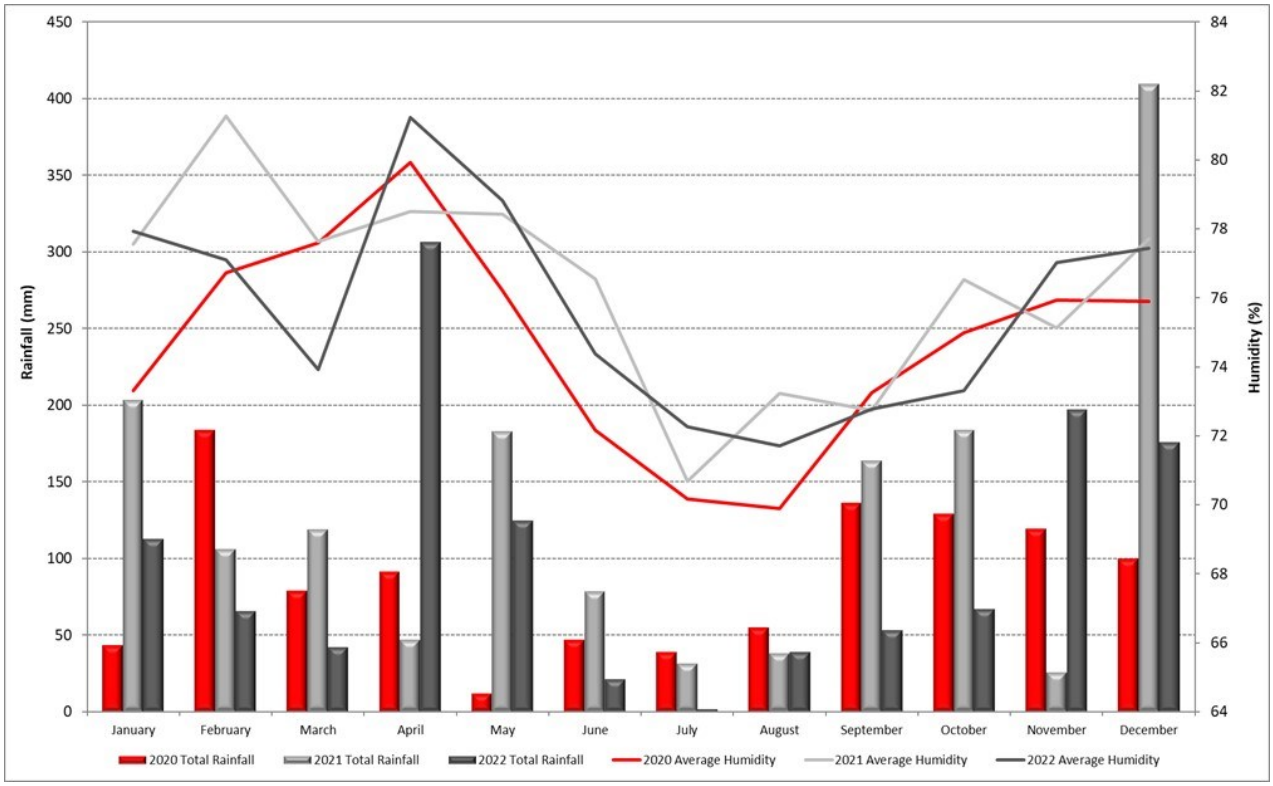


Figure 8-2 - Total monthly rainfall and average humidity for the period January 2020 to December 2022 using the SAWS Mtunzini weather station data

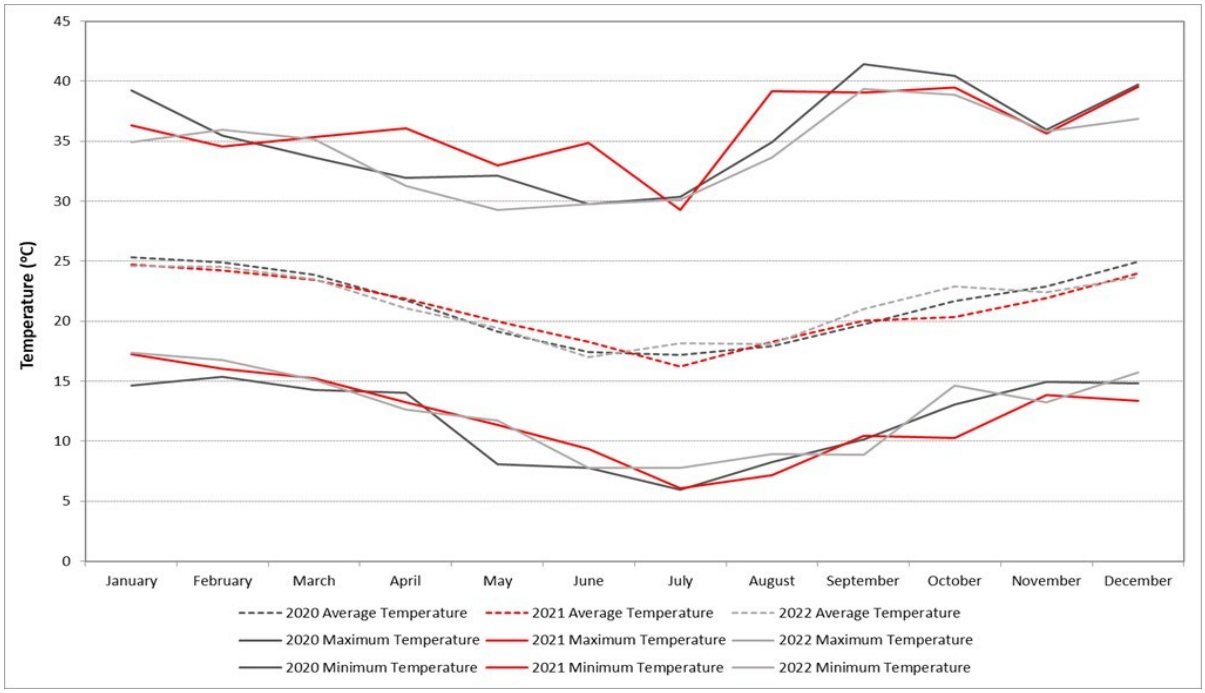


Figure 8-3 - Average, maximum and minimum monthly temperatures for the period January 2020 to December 2022 using modelled WRF data

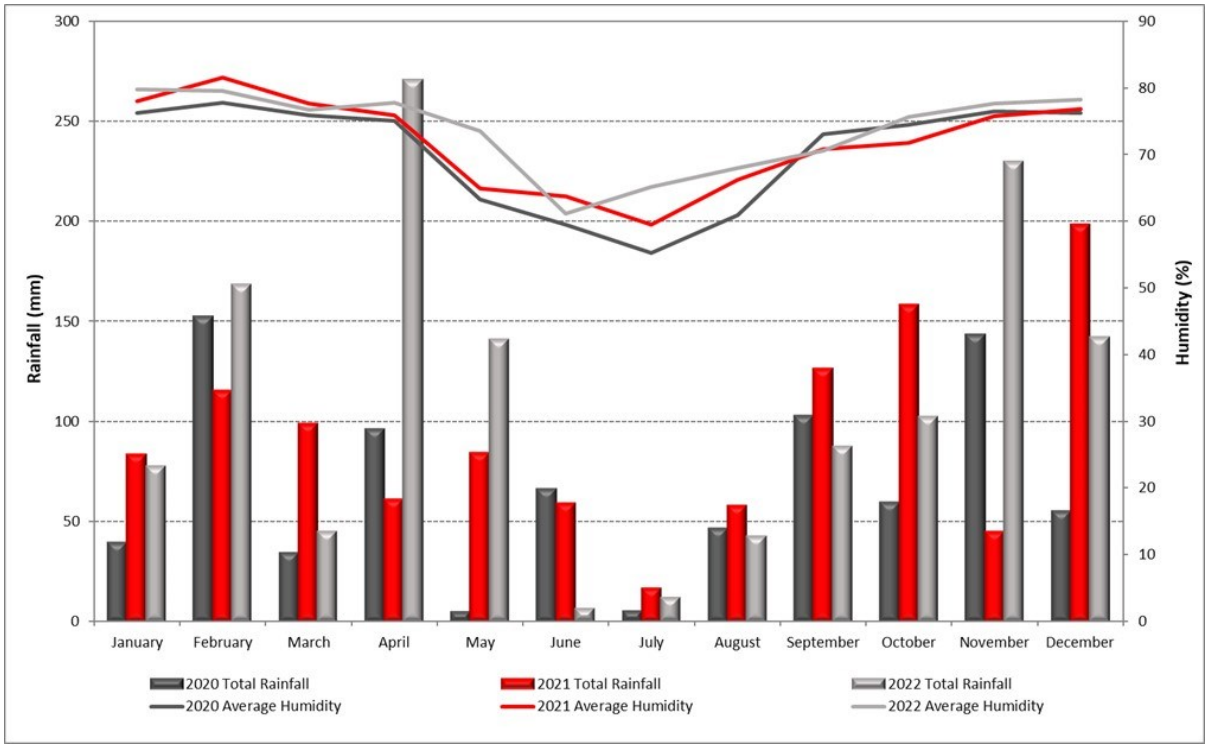


Figure 8-4 - Total monthly rainfall and average humidity for the period January 2020 to December 2022 using modelled WRF data

8.2.2 WIND

Wind roses summarise wind speed and directional frequency at a location. Calm conditions are defined as wind speeds less than 1.0 m/s. Each directional branch on a wind rose represents wind originating from that direction. Each directional branch is divided into segments of colour, each representative of different wind speeds.

Typical wind fields are analysed for the full period; diurnally for early morning (00h00–06h00), morning (06h00–12h00), afternoon (12h00–18h00) and evening (18h00–00h00); and seasonally for summer (December, January and February), autumn (March, April and May), winter (June, July and August) and spring (September, October and November), using the Mtunzini weather station data and WRF modelled data.

Wind roses from the Mtunzini weather station data are presented in Figure 8-5 and are further discussed below.

- North-easterly winds are dominant in the region for the entire period, with calm conditions occurring ~22% of the time and an average wind speed of 3 m/s recorded.
- West-south-westerly winds are dominant during the early morning hours (00h00-06h00).
- From the morning and into the night (06h00-00h00) north-easterly winds are dominant.
- North-easterly winds prevail during summer and spring, whilst west-south-westerly winds prevail during autumn and winter. A west-south-westerly wind is also evident throughout the year. Stronger wind speeds are observed during spring.

Wind roses from the WRF modelled data are presented in Figure 8-6 and are further discussed below.

- North-north-easterly winds prevail in the region for the entire period, with calm conditions occurring ~1% of the time and an average wind speed of 5 m/s recorded.
- North-north-easterly winds prevail during the early morning hours (00h00-06h00) into the late morning (06h00-12h00). Winds from the west-south-west are however stronger from 06h00-12h00.
- In the afternoon (12h00-18h00) east-north-easterly winds prevail, with speeds strengthening at this time. During the night (18h00-00h00) north easterly winds prevail.
- Seasonally, winds from the north-northeast prevail throughout the year with stronger wind speeds observed during spring.

When comparing both wind datasets, it was observed that winds from the north-northeast prevailed using the modelled WRF data, with the Mtunzini weather station indicated a slight shift in winds with prevailing winds from the northeast. As such, similar trends in wind directions were observed and hence gives confidence that the WRF modelled data is an accurate representation for the dispersion model. The slight changes in data can, however, be associated with the height of the datasets and the location of the datasets.

Furthermore, when comparing this data with the wind conditions in the Air Quality Impact Assessment for the Fairbreeze Mine, undertaken by SGS in 2011, which stated that the predominant winds at Mtunzini over the 2007 to 2009 period originated from the north to the east-northeast (28.5%), a slight difference in wind direction is noted. The average wind speed for the 2007 to 2009 period was 4.8 m/s with calms occurring ~ 0.04% of the time. Changes in data can be attributed to the changes in climatic conditions over time (i.e. over ten years).

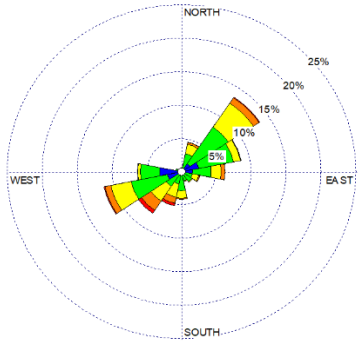
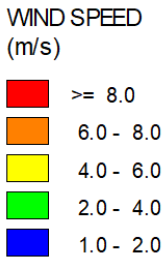
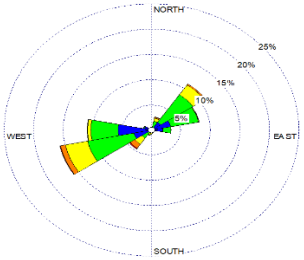
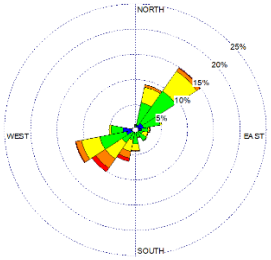
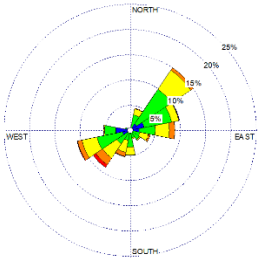
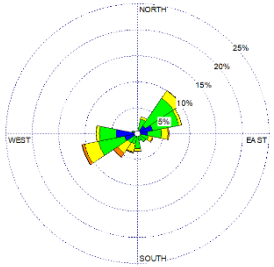
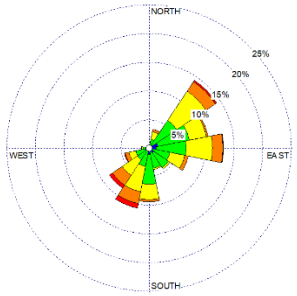
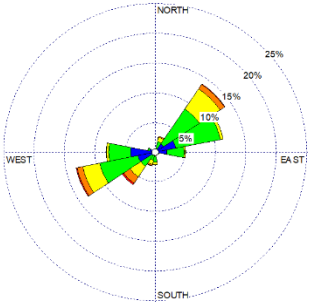
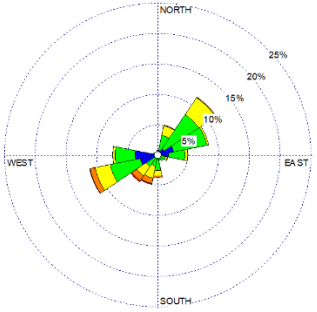
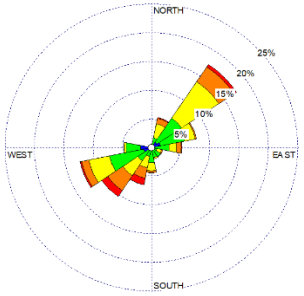
SAWS Mtunzini Weather Data	Early Morning	Late Morning	Summer	Autumn
January 2020 – December 2022	00h00 – 06h00	06h00 – 12h00	December, January & February	March, April & May
 **Calms = 22.42%** 	 Calms = 35.60%	 Calms = 19.34%	 Calms = 14.65%	 Calms = 28.31%
Afternoon / Evening	Night	Winter	Spring	
12H00 – 18H00	18h00 – 00h00	June, July & August	September, October & November	
 Calms = 6.96%	 Calms = 28.27%	 Calms = 30.13%	 Calms = 16.38%	

Figure 8-5 - Wind conditions for the Port Dunford region for the period January 2020 to December 2022 using SAWS Mtunzini weather data

WRF AERMET Data	Early Morning	Late Morning	Summer	Autumn

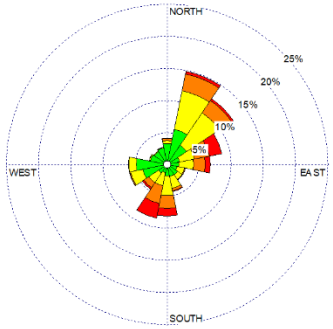
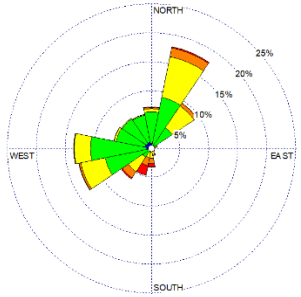
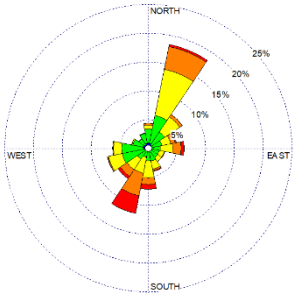
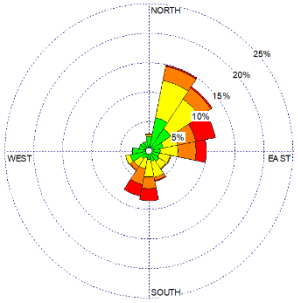
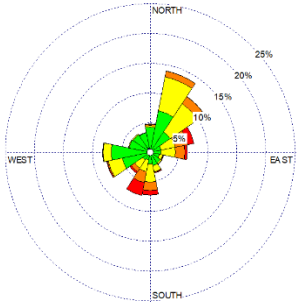
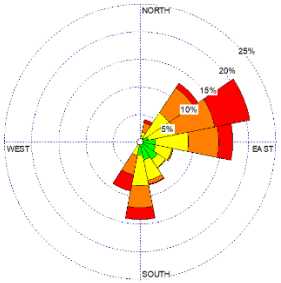
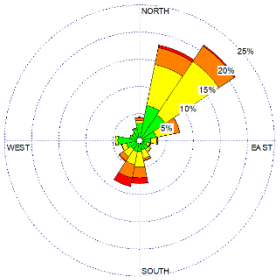
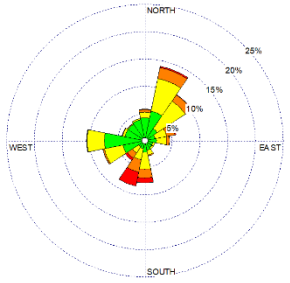
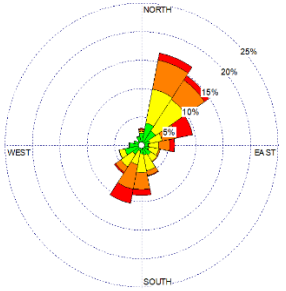
January 2020 – December 2022	00h00 – 06h00	06h00 – 12h00	December, January & February	March, April & May
 **Calms = 1.14%**	 Calms = 1.23%	 Calms = 2.03%	 Calms = 1.14%	 Calms = 1.12%
	Afternoon / Evening	Night	Winter	Spring
	12H00 – 18H00	18h00 – 00h00	June, July & August	September, October & November
WIND SPEED (m/s) >= 8.0 6.0 - 8.0 4.0 - 6.0 2.0 - 4.0 1.0 - 2.0	 Calms = 0.14%	 Calms = 0.99%	 Calms = 1.43%	 Calms = 0.87%

Figure 8-6 - Wind conditions for the Heleza Moya region for the period January 2020 to December 2022 using WRF modelled data

8.3 TOPOGRAPHY

The overall topography within the Fairbreeze area is undulating and comprises low hills and dunes lying parallel to the coastline (Figure 8-7). These have been significantly eroded and incised by water courses which form the low points in the topography. The altitude varies from virtually sea level to the highest point of approximately 108 metres above sea level. Slope angle varies considerably, with parts of the site to the north-west of the N2 being virtually level, while on the south-eastern side, much of the area containing the ore-bearing sands have a significantly steeper topography. Slopes of up to approximately 60% (27°) were recorded in places (Agricultural Resource Council (ARC), 2011).

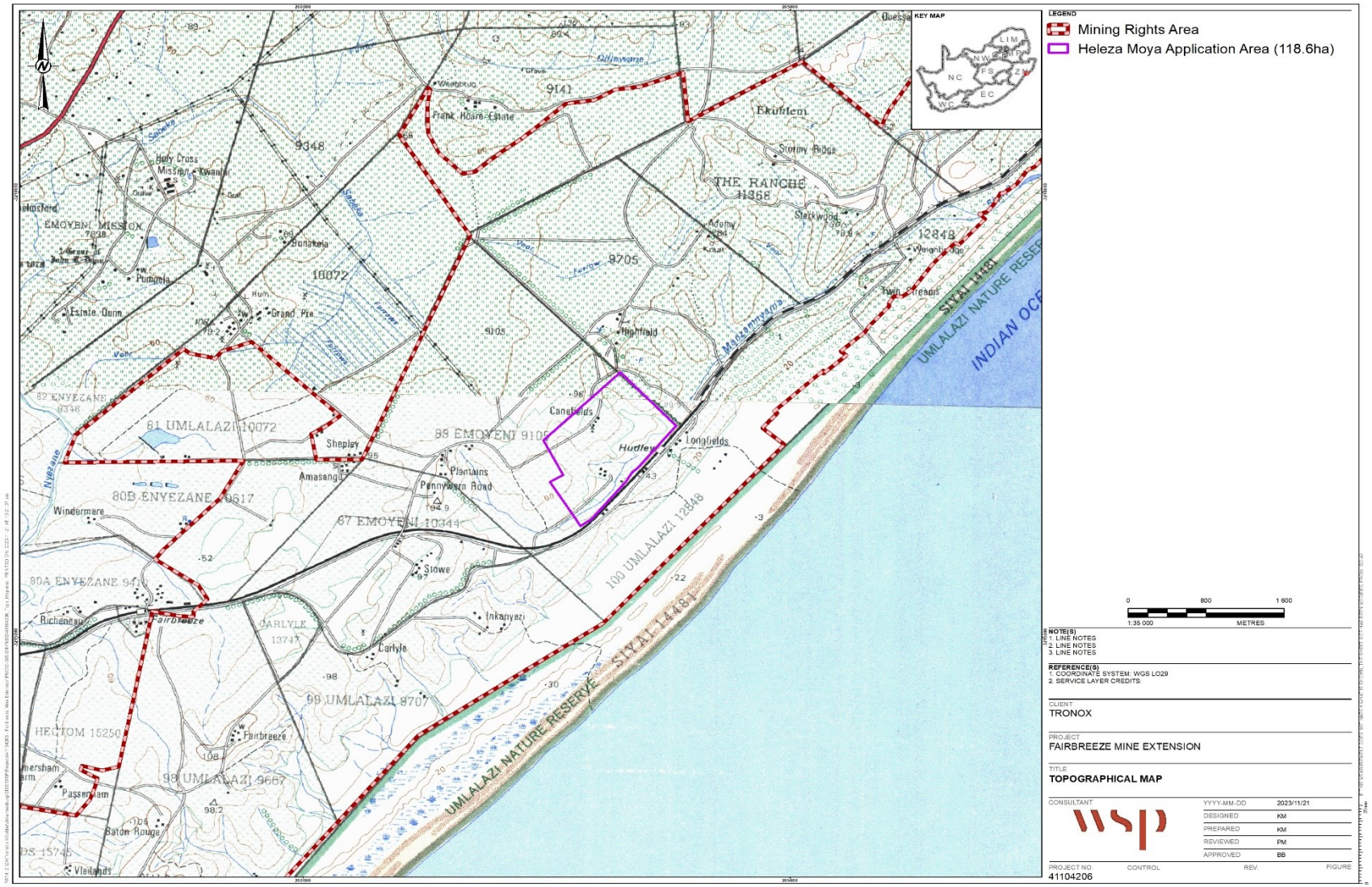


Figure 8-7 - Topography map of the Project area

8.4 GEOLOGY

8.4.1 REGIONAL GEOLOGY

The KZN coastline developed during the second phase of Gondwanaland break-up (150 - 130 million years ago [Mya]) as sediments were deposited seaward on the Early Cretaceous shoreline of the Mozambique coastal plain, which extends from northern Mozambique to south of Durban. The Mozambique coastal plain reaches a width of approximately 8 km in the vicinity of Hillendale but broadens considerably to almost 80 km in southern Mozambique (Botha, 1997a). It narrows quite suddenly to less than 3 km immediately south of Mtunzini and continues as a narrow coastal strip towards the south. Marine sedimentation occurred along the coastal zone during the major marine transgression of the Cretaceous period and continued into the Early Tertiary period, but all previously deposited material higher than the present-day ±100 m contour was eroded during the slow regression which followed during Tertiary times (McCarthy, 1988a). On the Mozambique coastal plain, the unconformity below the Tertiary shoreline strata is tilted and it truncates the underlying continental slope sediments of the Cretaceous period.

During the Miocene epoch of the Tertiary period (26 – 7 Mya), a more rapid drop in sea level left stranded beach sediments inland of the shore. As the coastal plain developed, ancient dune sediments then overlay these. Concomitant with this regression was the lowering of river base levels, which promoted the incision of deep gorges along the coastal river valleys and increased sedimentary influx into the sea. The drop in sea level occurred in a number of pulses and resulted in the formation of several stranded wave-cut platforms, beach deposits and associated back-dune aeolianites during each period of standstill (McCarthy, 1988a). Transgression, regression and progradation during each of these pulses occurred repeatedly at similar relative elevations above sea level, resulting in the formation of a number of stacked heavy minerals bearing lenses within these coastal sediments.

At the beginning of the Pleistocene epoch, about 2 Mya, changes in sea level were also rapid and coincided with periods of glaciation and deglaciation. These changes in sea level allowed for continued sediment reworking in the coastal zone and the overall regression, which occurred from Early Cretaceous through to Late Quaternary times, led to the widening of the coastal plain upon which later beach and other sediments accumulated.

In recent times, the Maputoland coastal region has received a lot of attention in terms of scientific research (Botha, 1997). It is evident from the type-section of the newly proposed Maputoland Group that there are two stratigraphic horizons which have produced “Berea-type red sands”; both deeply weathered coastal sediments (Figure 8-8). The first is the weathered remnants of the Tertiary-aged Umkwelane Formation and the second, the remnants of the Quaternary-aged Kosi Bay Formation.

The reddish brown, red, yellowish reddish and brown sand deposits forming the inland sand ridge have been correlated with similar sediments that form the Berea coastal ridge extending north of Durban. The homogeneous appearance of the surficial sands is misleading and the internal architecture of this geomorphic feature could be lithostratigraphically complex, comprising a stacked sequence of aeolian sand units (Umkwelane Formation) overlying beach facies sands and gravels (Uloa Formation) deposited on the irregularly stepped bedrock unconformity surface. It is likely that these raised strandlines incised and coastal barrier dunes accumulated during the Mio-Pliocene regression. During a series of glacio-eustatic sea-level fluctuations in the Pleistocene the dunes were weathered and eroded to form the “whaleback” ridge.

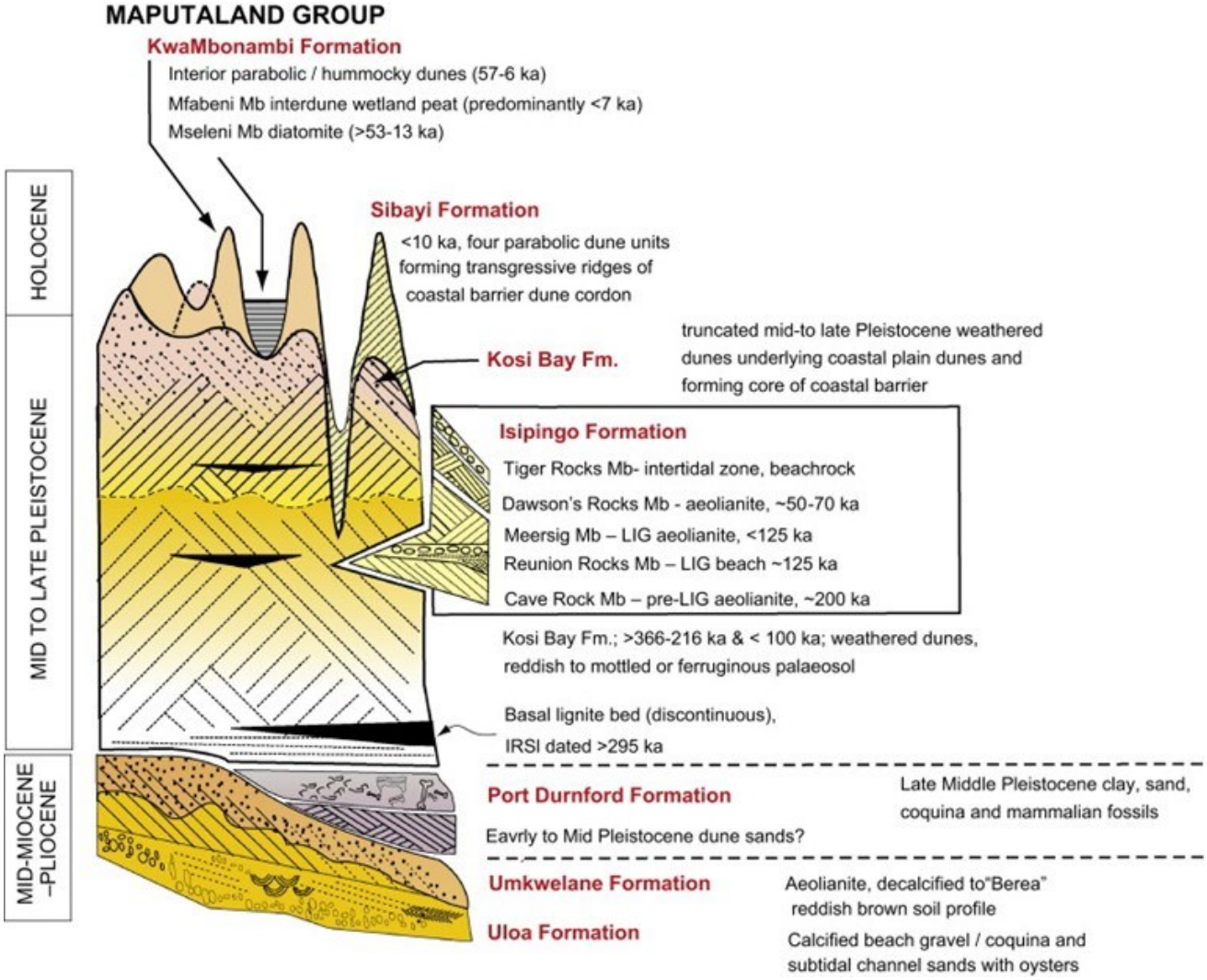


Figure 8-8 - Schematic lithostratigraphic section of composite Maputoland Group (source Council for Geoscience)

8.4.2 LOCAL GEOLOGY

The Fairbreeze deposits are thought to consist almost entirely of older (Pliocene parent) Berea-type red sands, which have been exposed to a long period of weathering resulting in the disintegration of the original components to form silt-sized particles and clay. These sands are generally well sorted and sub-rounded to rounded. Progressive enrichment in the swash zones of several beaches, which developed along the large coastal beach / dune system, resulted in the concentration of heavy minerals. The Natal Metamorphic and Structural Province and the Karoo Igneous Province are the primary source rocks (amphibolites, gneisses, schists, granitoids etc.) for heavy minerals.

Heavy minerals, derived from inland rocks and sediments, were deposited into the ocean by the Tugela River, concentrated because of progressive enrichment in the swash zones of several beaches, which developed along the large coastal beach / dunal system. Ilmenite, zircon, rutile and leucoxene form the valuable heavy minerals (VHM) of this deposit.

The five deposits are arranged in an en echelon pattern parallel to the coast and it is thought that the oldest (and topographically highest) dunes are those furthest from the coast.

Where bedrock is indicated in the Fairbreeze region, whether on surface or at depth, it represents rocks of the Natal Group and Karoo Supergroup. The Natal Group rocks comprise immature fluviatile sandstones. The Karoo Supergroup sediments conformably overlie Natal Group rocks, represented by sandstones, shales and mudstones in the project area.

In the western reaches of the FBB and FBC deposits and central portion of the FBCX deposit, black to dark grey clayey material is intersected just before bedrock. Blue-greenish, gritty-whitish and medium-brown clay horizons (<0,5 m thick) are sporadically developed just above bedrock, especially in the northern areas of both the FBA, FBB and FBC deposits. This mottled clay is thought to have developed under hydromorphic soil conditions. The dunes have a general consistent NNE-SSW strike.

8.5 SOILS AND LAND USE CAPABILITY

8.5.1 SOILS

According to the ARC (2011), the key factors determining the agricultural potential of soil include its effective depth, clay content, and rainfall. Table 8-2 provides a summary of the land and agricultural potential of the predominant soils found in the area. These soils exhibit various restrictions and limitations, primarily due to their texture, fertility, subsurface drainage, and effective depth.

Most of the soils in the study area are sandy or loamy, ensuring good drainage and rapid water infiltration. However, there is a concern when a clayey subsoil underlies a sandy topsoil layer (referred to as "duplex" soil). If the topsoil erodes and exposes the subsoil clay, it can form a crust, sealing the soil and reducing infiltration. This situation is challenging to rehabilitate, especially when the subsoil has a structured composition and high sodium content (known as sodic soils). Certain areas at Fairbreeze, including the Kd, Fw/Kd, and possibly TuA map units, are susceptible to this issue. Despite this vulnerability, the risk of severe water erosion is mitigated because the subsoils are neither sodic nor severely structured, and the surface slopes are generally not steep.

The main soil types within specific areas for proposed activities are outlined as follows:

- MSRSF Area: Ka, Kd, TuA, Pn, Fw
- Valley Residue Storage Facility (VRSF) Area: Kd, TuB, Pn, Hu, Se
- Alternate Right-of-Way Designation and Railway Pipeline Corridor: Hu, TuB
- Preferred Right-of-Way Designation: Hu
- Areas including Ore bodies, PWP, N2 off-ramp, N2 pipeline route: Hu.

Table 8-2 - Diagnostic characteristics of soils at Fairbreeze Mine (Exigent, 2012)

Map Unit	Dominant Soil Form(s)	Soil characteristics and limitations	Land Capability	Agricultural Potential	Water Erosion Potential
Hu	Hutton	Deep, friable, freely-drained soil – no significant limitation	Arable	High	Low
Pn	Pinedene	Moderately deep, well-drained soil – minimal limitation	Arable	Moderate to high	Low
Fw	Fernwood	Deep, friable, freely-drained soil – fertility limitation	Arable (low)	Low to moderate	Low
Kd	Kroonstad	Moderately deep to deep, moderately well-drained – fertility limitation	Arable (low)	Low to moderate	Low to moderate
Fw/Kd	Fernwood/ Kroonstad	Moderately deep to deep, moderately well-drained soil – fertility limitation	Arable (low)	Low to moderate	Low to moderate
TuA	Tukulu	Moderately deep, moderately well-drained soil – slight wetness limitation in places	Arable	Moderate	Low to moderate
TuB	Tukulu	Moderately deep, poorly drained soil with wetness limitation, especially close to streams	Wetland	Low	Low
We	Westleigh	Shallow, poorly drained soil with wetness limitation	Grazing	Low	Low
Se	Sepane	Moderately deep, poorly-drained soil – minimal limitation	Arable (low)	Low to moderate	Low
Ka	Katspruit	Shallow, poorly drained soil of low-lying areas - wetness	Wetland	Low	Low

8.5.2 LAND USE

The proposed Project lies within the uMlalazi Local Municipality, one of five local municipalities in the King Cetshwayo District Municipality. Over 80% of this municipal region falls under the Ingonyama Trust, and the primary urban centres and economic hubs within this municipality are Eshowe, Mtunzini, and Gingindlovu (uMlalazi Local Municipality IDP, 2019/20).

Mtunzini, the proposed Project site, is located on the northern coast of KwaZulu-Natal. The town primarily consists of residential properties with a small commercial sector. To the south lies the Fairbreeze Mine, and to the northeast, between the town and the uMlalazi Estuary, is the Zini Fish Farm. This fish farm draws water from the uMlalazi Estuary and releases it back into the estuary through an outlet. The surrounding area is mainly characterised by commercial agricultural activities, predominantly sugarcane and forestry, along with community areas managed by the Ingonyama Trust Board.

The uMlalazi Nature Reserve acts as a buffer between the town and the Indian Ocean, with the uMalalazi Estuary marking its northern boundary. Managed by Ezemvelo KZN Wildlife, the reserve was declared a protected area in 1948, covering an expanse of 1,028 hectares. It boasts diverse birdlife and is home to one of the most extensive mangrove stands on the KwaZulu-Natal coastline (EKZNW, 2009/13). The reserve plays a crucial role in attracting tourism to the town and contributes significantly to the town's unique identity, characterised by its natural environment and eco-cultural activities.

8.6 BIODIVERSITY

8.6.1 HABITAT UNITS

Three units are regarded as modified habitats and three units are regarded as natural (or semi-natural) habitats in the area.

8.6.1.1 Modified Habitats

- Sugarcane Fields and Melaleuca Oil Plantations;
- Eucalyptus Timber Plantations; and
- Developed Sites.

8.6.1.2 Natural and Semi-Natural Habitats

- Swamp Forest;
- Secondary Bush-clumps and Thickets; and
- Secondary Grassland.

A habitat unit map of the study area is shown Figure 8-9.

Figure 8-9 - Habitat unit map of the study area

8.6.2 TERRESTRIAL FAUNA

The study area is situated in the KwaZulu-Cape Coastal Forest Mosaic ecoregion (WWF and IUCN, 1994). This ecoregion stretches along the eastern coastline of South Africa and is characterised by a combination of forests and thornveld. It marks the southernmost extent of tropical plant and animal species in Africa and houses unique plant species and narrowly distributed animals. Despite around nine percent of this ecoregion being protected in conservation areas, these reserves are fragmented and isolated. Consequently, they are highly susceptible to significant human-induced threats due to their vulnerable nature.

8.6.2.1 Mammals

Mammal Species Richness and Habitat Availability

Three mammal species were recorded in the study area during the field survey, namely the Thick-tailed Bushbaby (*Otolemur crassicaudatus*), Common Molerat (*Cryptomys natalensis*) and Vervet Monkey (*Chlorocebus pygerythrus*).

Vervet Monkey were observed in Secondary Bush-clumps and Thicket habitat occurring along the railway embankment, while earthen mounds indicating the presence of Common Molerat were noted along a path in Secondary Grassland adjacent to the railway line. A Thick-tailed Bushbaby was heard calling during the night-time amphibian survey. No mammals were recorded on the camera traps placed in the study area.

During previous surveys of the larger Fairbreeze mining rights area, a total of 18 mammal species were recorded (Golder, 2011). These are listed in Table 8-3 and mostly comprised small taxa, such as rodents, although a few larger species were also noted, including the Southern Bushbuck (Tragelaphus scriptus), Natal Red Duiker (*Cephalophus natalensis*) and Common Duiker (Sylvicapra grimmia). Golder (2011) noted the presence of Meller's Mongoose (*Rhynchogale melleri*). The mapped range of this species, however, does not overlap with the region in which the study area is located and therefore Meller's Mongoose has been omitted from Table 8-3.

The study area is small and highly modified, and suitable habitat for mammals is very limited. Some of the smaller mammals (e.g., rodents) listed in Table 8-3 may be present in the study area, however, is considered unlikely that any of the larger taxa are present, except potentially on a transient basis while moving between larger patches of natural habitat in the landscape.

Table 8-3 - List of mammal species previously recorded in the Fairbreeze Mining Rights Area, as per Golder (2011)

Family	Scientific Name	Common Name
Bathyergidae	***Cryptomys natalensis***	**Common Molerat**
Bovidae	*Tragelaphus sylvaticus*	Southern Bushbuck
Bovidae	*Cephalophus natalensis*	Natal Red Duiker
Bovidae	*Sylvicapra grimmia*	Common Duiker
Cercopithecidae	***Chlorocebus pygerythrus***	**Vervet Monkey**
Galagidae	***Otolemur crassicaudatus***	**Thick-tailed Bushbaby**
Herpestidae	*Mungos mungo*	Banded Mongoose
Leporidae	*Lepus saxatilis*	Scrub Hare

Family	Scientific Name	Common Name
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Mouse
Muridae	*Aethomys chrysophilus*	Red Veld Rat
Muridae	*Lemniscomys rosalia*	Single-striped Mouse
Muridae	*Mus minutoides*	Pygmy Mouse
Muridae	*Mastomys natalensis*	Natal Multimammate Mouse
Muridae	*Otomys angoniensis*	Angoni Vlei Rat
Muridae	*Otomys auratus*	Vlei Rat
Mustelidae	*Aonyx capensis*	Cape Clawless Otter
Soricidae	*Crocidura hirta*	Lesser Red Musk Shrew
Thryonomyidae	*Thryonomys swinderianus*	Greater Cane Rat

Source: (Golder 2011).
Species in **bold** text were recorded in the study area during the 2023 field survey.

Mammal Species of Conservation Concern

Six mammal species previously recorded in the Fairbreeze mining right area (MRA), as per Golder (2011), are of conservation concern. Natal Red Duiker, Cape Clawless Otter (*Aonyx capensis*) and Veli Rat (*Otomys auratus*) are listed as Near Threatened, while the Samango Monkey (*Cercopithecus albogularis labiatus*), Sclater's Forest Shrew (*Mysorex sclateri*) and Sensitive Species 8 are listed as Vulnerable on the regional mammal Red List (Childs et. al., 2016). These six Species of Conservation Concern (SCC) are discussed in more detail below:

- Natal Red Duiker (Near Threatened) favour indigenous forest and thicket, including both coastal- and swamp forests (Childs *et al*., 2016). This species has a widespread but disjunct distribution as a result of habitat loss, with an area of occupancy estimated at 1 800 km^2. In small forest patches, Natal Red Duiker attain densities of 0.5-0.4 animals per hectare. Childs et al., (2016) indicates that Natal Red Duiker is threatened by poaching. Limited suitable habitat remains available in the study area, but it is possible that this species is present.
- Cape Clawless Otter (Near Threatened) is an aquatic species, that is seldom found far from permanent water and riparian habitats (Child et al., 2016). Density estimates of this species vary, from 1 otter per 3-4 km of river to 1.5 otter per 1 km of river. This species is targeted by hunters for traditional medicine, bushmeat and for their pelt for clothes (Child et al., 2016). Little - to no suitable habitat is present in the study area, and therefore it is unlikely that the Cape Clawless Otter is present;
- Sclater's Forest Shrews (Vulnerable) occur near water in coastal and swamp forest. They are also known to occur in grassland and wetland habitats but cannot exist in degraded or transformed habitat. The EOO of Sclater's Forest Shrew is 15 972km^2, but its estimated AOO is only 697 km^2 (Child et al., 2016). Habitat loss is the primary threat to this species (Child *et al*., 2016). Suitable habitat is available in the study area and it is possible that Sclater's Forest Shrews is present;
- Sensitive Species 8 (Vulnerable) is a medium-sized, rare and secretive mammal taxon. It is territorial and lives in small family groups in forests, thickets and dense bush along the coast, but is also known to occupy modified habitats (Childs et al., 2016). Densities of this species along the KwaZulu-Natal coast range from 11 to 24 individuals per km^2. This species is subject to extensive

bush-meat hunting throughout its range, which is causing local extinctions (Childs et al., 2016). Limited suitable remains available in the study area, but it is possible that this species is present;

- Samango Monkey (Vulnerable) is a small primate, that is restricted to forest habitats. It is an arboreal species, favouring the canopy of evergreen forests. The AOO of the Samango Monkey is 46.19 km^2. Estimated population densities range from low (< 30 individuals/ km^2) in swamp forest to high (200 individuals/ km^2) in coastal forest (Childs et al., 2016). Limited suitable habitat is present in the study area for Samango Monkey, but it is possible that this species is present; and
- Vlei Rat (Near Threatened) is a mesic grassland species, favouring dense vegetation in close proximity to water (Childs et al., 2016). This species occurs widely in suitable habitat in the interior of South Africa, but there are limited records of its presence along the KwaZulu-Natal coast (Childs et al., 2016). Considering this, and the secondary nature of grassland habitat in the study area, it is considered unlikely that the Vlei Rat is present.

An additional 14 mammal species that have historic distribution ranges that overlap with the study area are considered SCC. These are listed in Table 8-4, along with their conservation statuses, habitat preferences, and a 'probability of occurrence' based on habitat suitability assessments and records.

The SCC listed in Table 8-4 include 17 taxa that are considered threatened or near threatened on the regional Red List (Childs et al., 2016), and nine species that are listed on the NEMBA ToPS List (2007). Six species that are listed at a regional/national level are also listed as either protected or specially protected at a provincial level, according to Nature Conservation Ordinance (No. 15 of 1974).

Table 8-4 - Mammals of conservation concern recorded or potentially occurring in the study area (Child *et al.*, 2016)

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS Status (2007)	KZN Provincial Status	Habitat Preferences	Probability of Occurrence in study area
Bovidae	*Cephalophus natalensis*	Natal Red Duiker	Near Threatened	-	Protected	Favours indigenous forest and thicket, including both coastal- and swamp forest (Childs *et al.*, 2016).	Possible – limited suitable habitat present. Previously recorded in Fairbreeze MRA (Golder, 2011).
Bovidae	*Nesotragus moschatus zuluensis*	Suni	Endangered	Vulnerable	Protected	Found in closed-canopy woodland, dune forests and thickets. The AOO of the Suni is 29.91km^2 (SANBI, 2020).	Possible – limited suitable habitat present.
Bovidae	*Redunca arundinum*	Southern Reedbuck	Least Concern	Protected	Protected	Favours open grassland areas in savanna, close to water.	Unlikely – no suitable habitat present.
Cercopithecidae	*Cercopithecus albogularis labiatus*	Samango Monkey	Vulnerable	-	Protected	Arboreal species, favouring the canopy of evergreen forests (Childs *et al.*, 2016).	Possible – suitable habitat present.
Chrysochloridae	*Calcochloris obtusirostris*	Yellow Golden Mole	Near Threatened	-	-	Fossorial species, favouring alluvium and	Unlikely – species is

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS Status (2007)	KZN Provincial Status	Habitat Preferences	Probability of Occurrence in study area
						coastal sands in forest and woodland habitats.	largely restricted to far northern KZN and Mozambique.
Felidae	*Leptailurus serval*	Serval	Near Threatened	Protected	-	Favours grassland and savanna habitats but can penetrate forest areas along rivers. Also found in agricultural landscapes (Childs *et al.*, 2016).	Probable – suitable habitat present.
Felidae	*Panthera pardus*	Leopard	Vulnerable	Vulnerable	Specially Protected	Range of habitats, but generally prefers woodland and grassed savanna. Also known to occur in coastal scrub.	Unlikely – limited suitable habitat present and a large predator, that is sensitive to anthropogenic disturbance and persecution.
Macroscelididae	*Petrodromus tetradactylus*	Four-toed Sengi	Near Threatened	Endangered	-	Favours a range of habitats, including forest, dense woodland and thickets (Child *et al.,* 2016).	Possible – suitable habitat present, but this species has not been recorded in the region (see distribution

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS Status (2007)	KZN Provincial Status	Habitat Preferences	Probability of Occurrence in study area
							map in Child *et al.,* 2016).
Muridae	*Dasymys incomtus*	African Marsh Rat	Near Threatened	-	-	Known from a variety of habitats, including forest, swampland and grassland but favour wetland habitats (Child *et al.,* 2016).	Unlikely – limited suitable habitat present.
Muridae	*Otomys auratus*	Vlei Rat	Near Threatened	-	-	Known from mesic grasslands and wetlands (Child *et al.,* 2016).	Unlikely – limited suitable habitat present.
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened	Protected	-	Aquatic species, that is seldom found far from permanent water and riparian habitats (Child *et al.,* 2016).	Unlikely – limited suitable habitat present. Previously recorded in Fairbreeze MRA (Golder, 2011).
Mustelidae	*Mellivora capensis*	Honey Badger	Least Concern	Protected	-	Favour a range of habitats including savanna and forests.	Possible – suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS Status (2007)	KZN Provincial Status	Habitat Preferences	Probability of Occurrence in study area
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened	-	-	Documented in savanna and grassland habitats but is expected to have a wide habitat tolerance including forests and pine plantations (Child *et al.*, 2016).	Possible – suitable habitat present.
Sciuridae	*Paraxerus palliates subsp. ornatus*	Red Squirrel (Ngoye)	Vulnerable	Endangered	-	Found in moist evergreen forest, riverine forest and thicket (Child *et al.*, 2016).	Unlikely – suitable habitat present, but closest known subpopulation is restricted to Ngoye Forest.
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened	-	-	Habitats specialist with an estimated AOO of 0.72 km^2 (SANBI, 2020). Favours riverine and aquatic vegetation along riverbanks and in wetlands.	Probable – suitable habitat present.
Soricidae	*Myosorex sclateri*	Sclater's Forest Shrew	Vulnerable	-	-	Occurs near water in coastal and swamp forest. Also noted to occur in grassland and wetland habitats. Has an estimated AOO of	Possible – suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS Status (2007)	KZN Provincial Status	Habitat Preferences	Probability of Occurrence in study area
						0.75 km^2 (SANBI, 2020).	
Vespertilionidae	*Kerivoula argentata*	Damara Woolly Bat	Near Threatened	-	-	Known from evergreen and riverine forests, as well as mesic and dry woodland. Though to favour riparian corridors.	Possible – suitable habitat present.
Vespertilionidae	*Scotoecus albofuscus*	Thomas' House Bat	Near Threatened	-	-	Low-lying humid savanna and dune forest along the coast.	Probable – suitable habitat present.
-	Sensitive Species 8	-	Vulnerable	Vulnerable	Protected	Occurs in range of forests, thickets and dense bush along the coast. They are also known to occupy modified habitats (Childs *et al*., 2016), with a total AOO estimated at 41.74 km^2 (SANBI, 2020).	Possible – limited suitable habitat present.

8.6.2.2 Birds

Birds Species Richness and Habitat Availability

The region in which the study area is located has a rich bird assemblage, with the Umlalazi Nature Reserve Important Biodiversity Area (IBA) situated adjacent to the Fairbreeze MRA and Ngoye Forest Reserve (also an IBA) located approximately 14 km to the north of the study area. According to data presented by the SABAP 2, 394 bird species have previously been recorded in the relevant pentads.

Golder (2011) documented the presence of 133 bird species in the Fairbreeze MRA and during the 2023 field survey, 18 common species were recorded as incidental/opportunistic observations in the study area.

Birds Species of Conservation Concern

Four bird species previously documented by Golder (2011) for the Fairbreeze MRA are SCC, namely the Crowned Eagle (*Stephanoaetus coronatus*), European Roller (*Coracias garrulus*), Grey Crowned Crane (*Balearica regulorum*) and Swamp Nightjar (*Caprimulgus natalensis*). These are discussed in more detail with respects to the study area below:

- Crowned Eagle (Vulnerable) – A widespread species that favours forest habitats but has also been known to occur in woodland and in exotic tree plantations (speciesstatus.sanbi.org). The regional population size of Crowned Eagle is estimated at < 1000 mature individuals (speciesstatus.sanbi.org). Potential habitat for this species is present in the study area, and it is therefore possible that it is present;
- European Roller (Near Threatened) – A non-breeding migrant bird species, that favours savanna habitats in the region. The EOO of the European Roller is 1 500 000 km2 and has remained stable for several years, but its AOO has reduced to only 242 120 km2 (speciesstatus.sanbi.org). Limited savanna-type habitat is available in the study area, but it is possible that the European Roller is present;
- Grey Crowned Crane (Endangered) – A widespread species that favours a mosaic of wetland and grassland habitats (speciesstatus.sanbi.org). They typically nest on the edges of pans and wetlands, and forage in the adjacent grasslands and croplands. Both the EOO and the AOO of the Grey Crowned Crane have reduced as a consequence of habitat loss, with the latter estimated at only 132 310 km2 (speciesstatus.sanbi.org). Little- to no suitable habitat is available in the study area, and it is therefore unlikely that the Grey Crowned Crane is present; and
- Swamp Nightjar (Vulnerable) – This species has a large but highly fragmented distribution, with an AOO of less than 2 000 km2 (speciesstatus.sanbi.org). It occurs in moist coastal grasslands that border wetlands, lagoons or rivers, and is suspected to have a particular affinity for niche habitat of Lala palm (*Hyphaene coriaceae*) stands (speciesstatus.sanbi.org). Considering this potential affinity, it is unlikely that the Swamp Nightjar is present in the study area.

An additional 33 bird species that have historic distribution ranges that overlap with the study area are considered SCC. These are listed in Table 8-5. Table 8-5, along with their conservation statuses, habitat preferences, and a 'probability of occurrence' in the study area based on habitat suitability assessments.

The SCC listed in Table 8-5 include 30 taxa that are considered threatened or near threatened on the regional bird Red List (Taylor *et al*., 2015). Twelve taxa are listed on the NEMBA ToPS List (2007) and six species (mostly waterfowl) are listed as protected at a provincial level according to Nature Conservation Ordinance (No. 15 of 1974).

Table 8-5 - Bird species of conservation occur that potentially occur in the study area

Family	Scientific Name	Common Name	Regional Red List Status (2015)	NEMBA ToPS List (2007)	KZN Provincial Status	Habitat Preferences*	Probability of Occurrence
Anatidae	*Anas sparsa*	African Black Duck	Least Concern	-	Protected	Riparian and wetland habitats.	Possible – limited suitable habitat present.
Calyptomenidae	*Smithornis capensis*	African Broadbill	Vulnerable	-	-	Favours woodland habitat types including coastal forest, riparian forest, savanna and thickets	Unlikely-Possible – limited suitable habitat present
Heliornithidae	*Podica senegalensis*	African Finfoot	Vulnerable	-	-	Forest and savanna habitats, with rivers and streams.	Possible – limited suitable habitat present.
Accipitridae	*Circus ranivorus*	African Marsh Harrier	Endangered	Protected	-	Wetlands and reedbeds.	Possible – limited suitable habitat present
Anatidae	*Nettapus auritus*	African Pygmy Goose	Vulnerable	-	Protected	Riparian and wetland habitats.	Possible – limited suitable habitat present
Accipitridae	*Terathopius ecaudatus*	Bateleur	Endangered	Vulnerable	-	Savanna habitats.	Unlikely – no suitable habitat present
Ciconiidae	*Ciconia nigra*	Black Stork	Vulnerable	Vulnerable	-	Riparian and wetland habitats.	Possible – limited suitable habitat present.
Turnicidae	*Turnix nanus*	Black-rumped Buttonquail	Endangered	-	-	Open grassland habitats.	Unlikely – no suitable habitat present

Family	Scientific Name	Common Name	Regional Red List Status (2015)	NEMBA ToPS List (2007)	KZN Provincial Status	Habitat Preferences*	Probability of Occurrence
Phalacrocoracidae	*Phalacrocorax capensis*	Cape Cormorant	Endangered	-	-	Coastal habitats.	Unlikely – no suitable habitat present
Sulidae	*Morus capensis*	Cape Gannet	Vulnerable	-	-	Coastal habitats.	Unlikely – no suitable habitat present
Anatidae	*Spatula smithii*	Cape Shoveler	Least Concern	-	Protected	Riparian and wetland habitats.	Possible – limited suitable habitat present.
Laridae	*Hydroprogne caspia*	Caspian Tern	Vulnerable	-	-	Marine and estuarine habitats.	Unlikely – no suitable habitat present
Numididae	*Guttera pucherani*	Crested Guineafowl	Least Concern	-	Protected	Dune forest, riparian forest and sand forest.	Possible – limited suitable habitat present
Accipitridae	*Stephanoaetus coronatus*	Crowned Eagle	Vulnerable	-		Tall, closed canopy forest, including riparian woodland.	Recorded in MRA (Golder 2011). Possible in study area.
Coraciidae	*Coracias garrulus*	European Roller	Near Threatened	-	-	Savanna habitats.	Recorded in MRA (Golder 2011). Possible in study area.
Anatidae	*Dendrocygna bicolor*	Fulvous Whistling Duck	Least Concern	-	Protected	Inland water bodies, with aquatic vegetation.	Possible – limited suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List Status (2015)	NEMBA ToPS List (2007)	KZN Provincial Status	Habitat Preferences*	Probability of Occurrence
Phoenicopteriformes	*Phoenicopterus roseus*	Greater Flamingo	Near Threatened	-	-	Shallow wetland habitats and saltpans.	Unlikely – no suitable habitat present
Rostrtulidae	*Rostratula benghalensis*	Greater Painted-snipe	Near Threatened	-	-	Wetland habitats, with exposed mudflats.	Unlikely – no suitable habitat present
Lybiidae	*Stactolaema olivacea*	Green Barbet	Endangered	-	-	Coastal evergreen forest.	Unlikely – limited suitable habitat present.
Gruidae	*Balearica regulorum*	Grey Crowned Crane	Endangered	Endangered	-	Open grassland wetland habitats, as well as agricultural lands.	Recorded in MRA (Golder 2011). Unlikely in study area.
Alcedinidae	*Alcedo semitorquata*	Half-collared Kingfisher	Near Threatened	-	-	Riparian woodland and forest, along flowing streams.	Possible – limited suitable habitat present.
Anatidae	*Sarkidiornis melanotos*	Knob-billed Duck	Least Concern	-	Protected	Marshes, floodplains and pans in savanna.	Possible – limited suitable habitat present.
Falconidae	*Falco biarmicus*	Lanner Falcon	Vulnerable	-	-	Range of habitats, including savanna	Unlikely – no suitable habitat present
Phoenicopteriformes	*Phoeniconaias minor*	Lesser Flamingo	Near Threatened	-	-	Shallow wetland habitats and saltpans.	Unlikely – no suitable habitat present

Family	Scientific Name	Common Name	Regional Red List Status (2015)	NEMBA ToPS List (2007)	KZN Provincial Status	Habitat Preferences*	Probability of Occurrence
Alcedinidae	*Halcyon senegaloides*	Mangrove Kingfisher	Endangered	-	-	Coastal riverine forest and mangrove forests.	Possible – limited suitable habitat present.
Accipitridae	*Polemaetus bellicosus*	Martial Eagle	Endangered	Vulnerable	-	Range of habitats, including savanna.	Unlikely – no suitable habitat present
Falconidae	*Falco peregrinus*	Peregrine Falcon	Least Concern	Vulnerable	-	Restricted to areas near high cliffs.	Unlikely – no suitable habitat present
Pelecanidae	*Pelecanus rufescens*	Pink-backed Pelican	Vulnerable	Endangered	-	Wetland and estuarine habitats.	Unlikely – no suitable habitat present
Threskiornithidae	*Geronticus calvus*	Southern Bald Ibis	Vulnerable	Vulnerable	-	Mostly high-altitude grassland, but also coastal grasslands, and artificial grasslands and meadows.	Unlikely – no suitable habitat present
Accipitridae	*Circaetus fasciolatus*	Southern Banded Snake Eagle	Critically Endangered	Vulnerable	-	Lowland coastal forest margins with clearings and coastal grassland.	Possible – limited suitable habitat present
Bucorvidae	*Bucorvus leadbeateri*	Southern Ground Hornbill	Endangered	Protected	-	Open grassland and woodland.	Unlikely – no suitable habitat present
Turdidae	*Geokichla guttata*	Spotted Ground Thrush	Endangered	-	-	Open areas in forest understorey.	Possible – limited suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List Status (2015)	NEMBA ToPS List (2007)	KZN Provincial Status	Habitat Preferences*	Probability of Occurrence
Caprimulgidae	*Caprimulgus natalensis*	Swamp Nightjar	Vulnerable	-	-	Coastal grasslands bordering pans, rivers and wetlands.	Recorded in MRA (Golder 2011). Unlikely in study area.
Accipitridae	*Aquila rapax*	Tawny Eagle	Endangered	Vulnerable	-	Range of habitats, including savanna.	Unlikely – no suitable habitat present
Anatidae	*Thalassornis leuconotus*	White-backed Duck	Least Concern	-	Protected	Open, well vegetated waterbodies.	Possible – limited suitable habitat present
Accipitridae	*Gyps africanus*	White-backed Vulture	Critically Endangered	Endangered	-	Savanna habitats.	Unlikely – no suitable habitat present
Ciconiidae	*Mycteria ibis*	Yellow-billed Stork	Endangered	-	-	Permanent and seasonal wetlands.	Possible – limited suitable habitat present.
*Source: Habitat preferences as per Roberts VII Multimedia App.							

.

8.6.2.3 Herpetofauna

Herpetofauna Richness and Habitat Availability

According to the historic distribution maps presented in Bates *et al*, (2014) and Du Preez and Carruthers (2009), and Virtual Museum records for the 2831DC and 2931BA QDS, up to 94 reptile and 51 amphibian species have previously been recorded in the region in which the study area is located and are therefore potentially present in the study area itself.

Golder (2011) reported 18 reptile and 15 amphibian species in the Fairbreeze MRA. These are listed in Table 8-6 and

Table 8-7, respectively and comprise common and relatively widespread species.

During the 2023 field survey, no reptiles were recorded, but four amphibians were documented, including the Raucous Toad (*Sclerophrys capensis*), Red-legged Kassina (*Kassina maculata*), Brown-backed Tree Frog (*Leptopelis mossambicus*) and the Painted Reed Frog (*Hyperolius marmoratus*). These are common and widespread species.

Table 8-6 - Reptiles species previously recorded in the Fairbreeze MRA (Golder, 2011)

Family	Scientific Name	Common Name
Agamidae	*Acanthocercus atricollis*	Southern Tree Agama
Atractaspididae	*Amblyodipsas polylepis*	Common Purple-Glossed Snake
Atractaspididae	*Aparallactus capensis*	Cape Centipede Eater
Colubridae	*Crotaphopeltis hotamboeia*	White-Lipped Herald Snake
Colubridae	*Dasypeltis scabra*	Common Egg Eater
Colubridae	*Dispholidus typus*	Boomslang
Colubridae	*Philothamnus hoplogaster*	Green Water Snake
Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake
Colubridae	*Thelotornis capensis*	Vine Snake
Gekkonidae	*Hemidactylus mabouia*	Tropical House Gecko
Gekkonidae	*Lygodactylus capensis*	Cape Dwarf Gecko
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-Throated Plated Lizard
Lamprophiidae	*Lycophidion capense*	Cape Wolf Snake
Psammophiidae	*Psammophis mossambicus*	Olive Grass Snake
Pseudoxyrhophiidae	*Duberria lutrix*	Common Slug Eater
Scincidae	*Trachylepis striata*	African Striped Skink

Family	Scientific Name	Common Name
Scincidae	*Trachylepis varia*	Variable Skink
Viperidae	*Causus rhombeatus*	Common Night Adder
Source: (Golder 2011).		

Table 8-7 - Amphibian species previously recorded in the Fairbreeze MRA (Golder, 2011)

Family	Scientific Name	Common Name
Arthroleptidae	*Arthroleptis wahlbergi*	Bush Squeaker
Arthroleptidae	*Leptopelis natalensis*	Raucous Tree frog
Brevicipitidae	*Breviceps mossambicus*	Mozambique Rain Frog
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad
Hyperoliidae	*Afrixalus delicatus*	Delicate Leaf-folding Frog
Hyperoliidae	*Hyperolius argus*	Argus reed Frog
Hyperoliidae	*Hyperolius marmoratus*	Marbled Reed Frog
Hyperoliidae	*Hyperolius tuberilinguis*	Tinker Reed Frog
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina
Phrynobatrachidae	*Phrynobatrachus natalensis*	Natal Dwarf Puddle Frog
Pipidae	*Xenopus laevis*	Common Platanna
Ptychadenidae	*Ptychadena oxyrhynchus*	Sharp-nosed Ridged Frog
Pyxicephalidae	*Afrana angolensis*	Common River Frog
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream frog
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand frog
Source: (Golder 2011).		

Herpetofauna Species of Conservation Concern

Of herpetofauna taxa potentially occurring in the study area, 11 reptile and three amphibian species are of conservation concern. These are listed in Table 8-8 and Table 8-9 along with their conservation statuses, habitat preferences, and a ‘probability of occurrence’ based on habitat suitability assessments and records.

The environmental screening report for the proposed Project highlighted the potential presence of Eastern Green Mamba (*Dendroaspis angusticeps*) as a sensitive feature. The Eastern Green Mamba is listed as Vulnerable on the regional Red List. It is an arboreal species that occurs in coastal forests from sea level to 200 m, along the east- and southern African coastlines (Alexander, 2017). The AOO of the Eastern Green Mamba is < 2 000 km^2, and ongoing developed is causing the loss and fragmentation of vital forest habitat for this species (Alexander, 2017). It is probable that this species is present in the study area.

Table 8-8 - Reptile species of conservation concern potentially occurring in the study area

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA ToPS List (2007)	KZN Provincial Status	Habitat Preferences*	Probability of Occurrence
Chamaeleonidae	*Bradypodion caeruleogula*	uMlalazi Dwarf Chameleon	Endangered	-	-	Forest habitats, where it is known from only three forests (Ntumeni, Dlinza and Ngoya).	Unlikely – outside of the known forest patches.
Chamaeleonidae	*Bradypodion melanocephalum*	KwaZulu Dwarf Chameleon	Near Threatened	-	-	Range of habitat types, including grassland, savanna, thickets. EOO is estimated at 17 400 km^2.	Possible – suitable habitat present
Crocodylidae	*Crocodylus niloticus*	Nile Crocodile	Vulnerable	Protected	Protected	Aquatic species inhabiting swamps, lakes and rivers.	Unlikely – no suitable habitat available.
Elapidae	*Dendroaspis angusticeps*	Eastern Green Mamba	Vulnerable	-	-	Arboreal favouring forest from the sea level to 200 m. AOO estimated at 1692 km^2.	Probable – suitable habitat present
Pelomedusidae	*Pelusios rhodesianus*	Variable Hinged Terrapin	Vulnerable	-	-	Occurs in temporary pans and well vegetated water bodies in coastal regions. EOO is estimated at > 5000 km^2.	Unlikely – no suitable habitat available.

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA ToPS List (2007)	KZN Provincial Status	Habitat Preferences*	Probability of Occurrence
Pythonidae	*Python natalensis*	South African Python	Least Concern	Protected	Protected	Range of habitats but favouring riverine rocky areas.	Possible – suitable habitat present
Testudinidae	*Kinixys natalensis*	KwaZulu-Natal Hinged-back Tortoise	Vulnerable	-	Protected	Dry rocky savanna and thornveld, at elevations between 50 - 1 200 m.	Unlikely – no suitable habitat available.
Testudinidae	*Kinixys zombensis*	Eastern Hinged-back Tortoise	Least Concern	-	Protected	Favours dense bushveld and coastal forest to scrub savanna. EOO is estimated at 18 359 km^2.	Possible – suitable habitat present
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern	-	Protected	Range of habitats including savanna and thicket, but not forest.	Unlikely – no habitat present
Varanidae	*Varanus niloticus*	Water Monitor	Least Concern	-	Protected	Range of habitats, but always near permanent water.	Possible – limited suitable habitat present
Viperidae	*Bitis gabonica*	Gaboon Adder	Least Concern	Protected	Protected	Moist coastal forest and adjacent grassland and thickets.	Possible – limited suitable habitat present.

*Source: Habitat preferences as per Bates *et al.*, (2014) and/or speciesstatus.sanbi.org.

Table 8-9 - Amphibian species of conservation concern potentially occurring in the study area

Family	Scientific Name	Common Name	National Red List Status (2014)	NEMBA ToPS List (2007)	KZN Status	Habitat Preferences*	Probability of Occurrence
Hemisotidae	*Hemisus guttatus*	Spotted Shovel-nosed Frog	Near Threatened	-	-	Grasslands and savannas, where it breeds in pans and rivers.	Possible – suitable habitat present
Hyperoliidae	*Hyperolius pickersgilli*	Pickersgill's Reed Frog	Endangered	-	-	Occurs in Indian Ocean Coastal Belt vegetation where it favours perennial wetlands with dense reed beds and an understorey of thick vegetation. EOO is estimated at 4768 km^2, while the AOO is calculated at only 12 km^2.	Possible – suitable habitat present
Pyxicephalidae	*Pyxicephalus edulis*	African Bullfrog	Least Concern	Protected	-	Open grassed woodland and wetland habitats.	Possible – suitable habitat present.

*Source: Habitat preferences as per Du Preez and Carruthers (2009)

8.6.2.4 Invertebrates of conservation concern

Invertebrate SCC that were highlighted by the environmental screening report for the proposed Project as potentially sensitive features are discussed below:

- Flat-necked Shieldback (Arytropteris basalis) is listed as Vulnerable. This species is known from only nine locations and has an EOO estimated at 13 000 km^2 and a AOO of only 32 km^2 (Bazelet & Naskrecki, 2013a). It favours coastal forest and thicket mosaics along the KwaZulu-Natal coast, which are under threat from various anthropogenic activities. This species was last collected in 1982 (Bazelet & Naskrecki, 2013a). Limited forest habitat is present in the study area and it is therefore unlikely that the Flat-necked Shieldback is present;
- East Coast Katydid (*Pomatonota dregi*) is listed as Vulnerable. It occurs in Indian Ocean Coastal Belt forests, where it feeds on indigenous Acacia trees (Bazelet & Naskrecki, 2013b). The EOO of the East Coast Katydid is small at only approximately 8000 km2 and its population is very fragmented (Bazelet & Naskrecki, 2013b). Acacia trees are not common in the study area, and it is therefore unlikely that the East Coast Katydid is present; and
- Bladder Grasshopper (Physophorina livingstonii) is listed as Endangered. This forest dwelling species occurs along the southern and east coast of Africa (Couldridge & Bazelet, 2018). It has an extensive EOO of approximately 3.4 million km^2, and an AOO estimated at between 72 – 3 500 km2 (Couldridge & Bazelet, 2018). The host plant of Bladder Grasshopper is unknown, and this species has not been collected in the field for over 60 years (Couldridge & Bazelet, 2018). Considering the limited amount of forest habitat in the study area and the rarity of this species, it is unlikely that the Bladder Grasshopper is present.

8.6.3 TERRESTRIAL FLORA

The study area is located in the Indian Ocean Coastal Belt Biome, with embedded elements of the Forest Biome. According to the 2018 SANBI mapping of South Africa's regional vegetation types, the study area comprises two vegetation types, namely Maputaland Coastal Belt (CBA 1) and Swamp Forest (FOa2) (Figure 8-10). Similarly, the finer-scale provincial vegetation mapping for KwaZulu-Natal (Ezemvelo, 2011) also identifies Maputaland Coastal Belt and Swamp Forest: *Ficus Trichopoda* Swamp Forest in the study area Figure 8-11). The broader region in which the study area is located is referred to as the Maputaland-Pondoland-Albany Hotspot on account its rich biodiversity attributes.

Biome characteristics, as well as descriptions of the regional vegetation types, as per Mucina and Rutherford (2011) and the Maputaland-Pondoland-Albany Hotspot are presented in Sections below.

Figure 8-10 - Study area in relation to SANBI's (2018) mapping of South Africa regional vegetation types

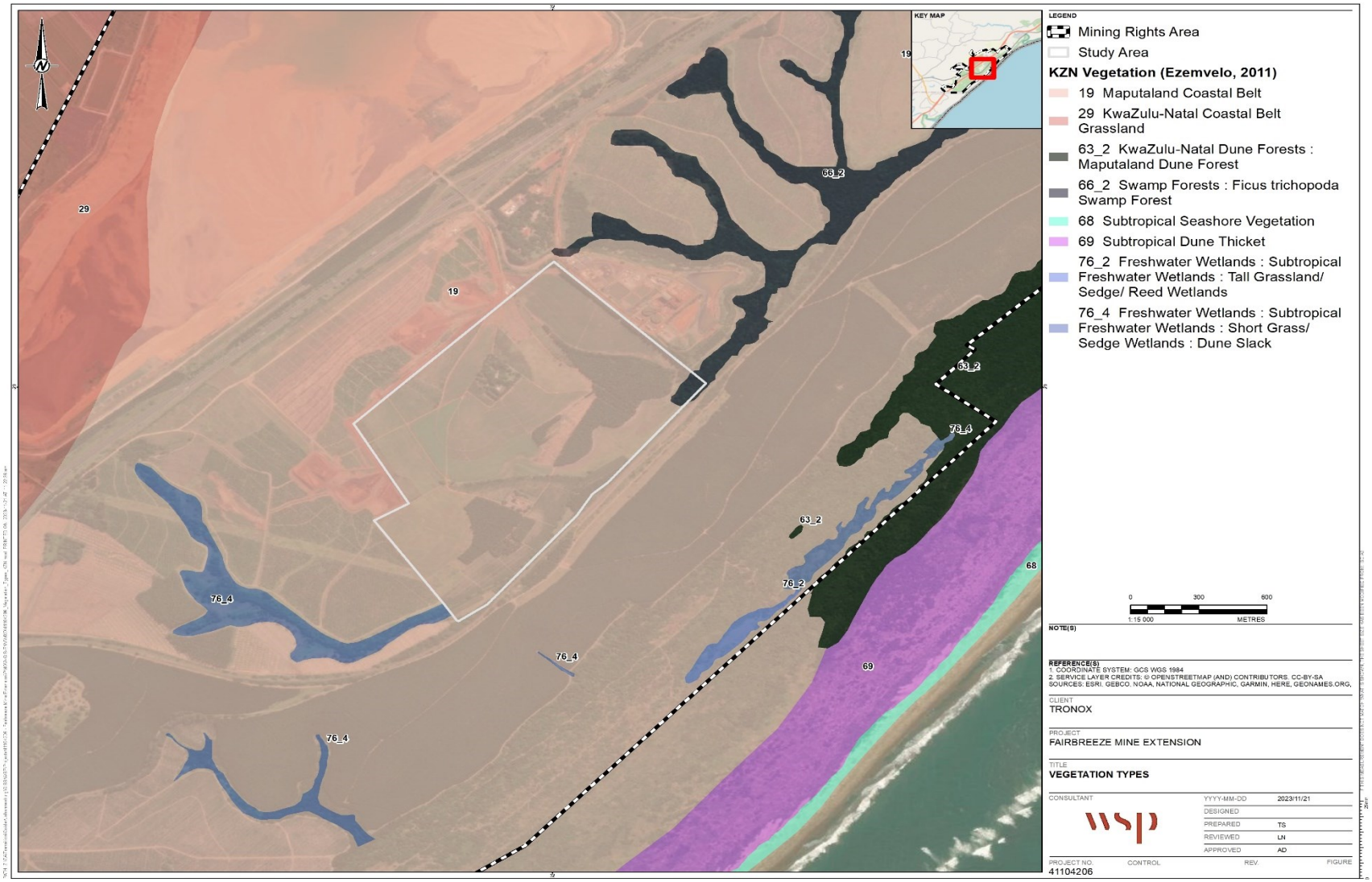


Figure 8-11 - Study area in relation to the delineations of the KwaZulu-Natal provincial vegetation map

8.6.3.1 Biomes

Indian Ocean Coastal Biome

The Indian Ocean Coastal Belt biome extends along the South African coast from the Mozambique border southward to the Great Kei River in the south. Landscapes are flat to alternating rolling hills, bisected by deeply incised river valleys.

Vegetation is dominated by forests, with edaphically or hydrologically controlled areas of grassland, as well as savanna habitat also present (Mucina and Rutherford, 2011). Owing to agriculture, agroforestry and various coastal developments, large portions of this biome have been transformed. Areas comprising the Indian Ocean Coastal Belt biome are densely populated, with almost continuous residential settlements along the coastline (Mucina and Rutherford, 2011).

Forest Biome

Forests are defined by their distinctive vegetation structure, which is multi-layered and dominated by trees up to 30 m in height (Mucina and Rutherford, 2011). The combined strata form an overlapping or closed canopy and graminoids in the herbaceous layer are generally rare (Mucina and Rutherford, 2011).

In South Africa, all forests are evergreen. They occur in small (<100 ha) to very small (<10ha) scattered patches along the eastern and southern margins of the country (Mucina and Rutherford, 2011). Predicated on the modelling of favourable combinations of climate (rainfall) and substrate conditions, up to 7% of South Africa's land surface forms potential habitat for forests (Mucina and Rutherford, 2011). However, only 0.1% of the country is covered by extant forest. Apart from climate and substrate, local fire pattern is also a key determinant of the distribution of forests, particularly in hilly and mountainous landscapes (Mucina and Rutherford, 2011).

8.6.3.2 Regional vegetation types

Maputaland Coastal Belt

Maputaland Coastal Belt vegetation extends in a 35 km broad strip along the flat coastal plain of the Indian Ocean from KwaZulu-Natal and into Mozambique (Mucina and Rutherford, 2011). Vegetation comprises pockets of various forest-types and thickets, embedded within primary and secondary grasslands, timber plantations and sugar cane fields.

Important or characteristic taxa in Maputaland Coastal Belt vegetation according to Mucina and Rutherford (2011) include:

Trees and Tall Shrubs: *Syzygium cordatum, Vachellia natalitia, Annona senegalensis, Apodytes dimidiata, Bridelia micrantha, Canthium inerme, Chrysanthemoides monilifera, Euclea natalensis, Ficus burtt-davyi, Kraussia floribunda, Phoenix reclinata, Searsia natalensis, Sclerocroton integerrimum* and *Strychnos spinosa*.

Low Shrubs*: Agathisanthemum bojeri, Helichrysum kraussii* and *Tephrosia longipes.*

Climbers: *Abrus precatorius* and *Smilax anceps.*

Graminoides: *Diheteropogon amplectens, Eragrostis Sclerantha, Ischaemum fasciculatum, Themeda triandra, Urelytrum agropyroides, Aristida stipitata, Cymbopogon pospischilii, Elionurus muticus, Eragrostis inamoena, Eragrostis lappula, Trachypogon spicatus* and *Tristachya leucothrix.*

Herbs: *Achyranthes aspera, Centella asiatica, Chamaecrista plumosa, Hermbstaedtia odorata, Vernonia centaureoides* and *Vernonia oligocephala*).

Swamp Forest

Swamp Forests occur in small pockets along a narrow coastal belt from Maputaland in the north to Port Grosvenor in the south (Mucina and Rutherford, 2011). Vegetation is characterised by tall forests with two main strata. The upper canopy is dominated by *Ficus trichopoda, Barringtonia racemosa, Syzygium cordatum* and *Cassipourea gummiflua*, while the understorey is typically dominated by ferns such as *Microsorum punctatum* and *Nephrolepis biserrata* (Mucina and Rutherford, 2011).

Important or characteristic taxa in Swamp Forest according to Mucina and Rutherford (2011) include:

Tall Trees: *Macaranga capensis*, *Ficus trichopoda, Rauvolfia caffra, Schefflera umbellifera, Barringtonia racemosa, Shirakiopsis elliptica* and *Syzygium cordatum.*

Small Trees. *Allophylus dregeanus, Bridelia micrantha, Cassipourea gummiflua, Morella serrata, Phoenix reclinata* and *Sclerocroton integerrimum.*

Climbers: *Stenochlaena tenuifolia* and *Ipomoea indica.*

Tall Shrubs: *Burchellia bubalina, Psychotria capensis, Tarenna pavettoides* and *Hibiscus tiliaceus.*

Herbs: *Microsorum punctatum, Eulophia horsfallii* and *Nephrolepis biserrata*

Graminoides: *Scleria angusta*.

8.6.3.3 Maputaland-Pondoland-Albany Hotspot

The Maputaland-Pondoland-Albany (MPA) Hotspot is recognised by its high degree of floristic endemism and diversity. The MPA Hotspot extends below the escarpment from the Eastern Cape through KwaZulu-Natal and into Mpumalanga Province, Swaziland and Mozambique (Conservation International, 2008).

The floristic richness of the MPA Hotspot is second only to the Cape Floristic Region in Africa. Approximately 8 100 plant species are present, of which, 1 900 are strict endemics (Conservation International, 2008). The region also has remarkable fauna diversity, with 540 birds, 200 mammals, over 200 reptiles and 72 amphibians recorded (Conservation International, 2008).

According to Conservation International (2008) an estimated 20% of the original extent of the MPA Hotspot has been transformed. Commercial and subsistence agriculture are major agents of habitat transformation, along with commercial forestry, urbanisation and mining.

Large areas of the hotspot are also under communal land ownership, and as a result, portions that are not directly transformed, are nonetheless severely overgrazed and overharvested (Conservation International, 2008).

8.6.3.4 Regional ecological sensitivity and conservation setting

National and Provincial Red List Ecosystems

At a national level, the Maputaland Coastal Belt is listed as an Endangered ecosystem. The KwaZulu-Natal provincial status of Maputaland Coastal Belt is also listed as Endangered, while that of Swamp Forest: Ficus Trichopoda Swamp Forest is listed as Critically Endangered.

Figure 8-12 shows the historic and remaining extent of Red List/Threatened ecosystems, as per the SANBI's 2018 and 2021 datasets.

It is noted that historically, the entire study area and surrounding landscape would have been classified as Endangered. However, the study area and most of the surrounding land is transformed, and the only remaining extent of Endangered habitat in the immediate landscape, is the band of natural habitat located to the south of the study area (Figure 8-12).

Kwazulu-Natal Biodiversity Sector Plan

The KwaZulu-Natal Biodiversity Sector Plan (KZN BSP) provides a spatial framework to identify areas of high biodiversity importance or irreplaceability in the province. Features such as vegetation types, habitats, and fauna and flora assemblages, are used to determine the biodiversity importance or irreplaceability of particular land parcels.

The majority of the study area is not delineated under the KZN BSP (Figure 8-13). A small patch of natural habitat (Swamp Forest) in the eastern corner of the study area is however, delineated as Critical Biodiversity Area (CBA) Irreplaceable, which is the highest conservation for land outside formal protected areas. This is part of a larger network of CBA Irreplaceable habitat (Swamp Forest) associated with the Manzamnyama stream that extends in narrow bands to the east and west of the study area (Figure 8-13). It is also noted that the strip of land between Umlalazi Nature Reserve and the timber plantation to the south of the study area is also delineated as CBA Irreplaceable area - shown in Figure 8-13.

Water Management

The broader region in which the study area is located is mapped as a Strategic Water Source Area (SWSA) (refer to Figure 8-14). It is noted however, that the study area is not located within a Freshwater Ecosystem Priority Area (NFEPA).

Indigenous Forests

According to the national Forest Inventory mapping of South Africa's indigenous forests, no indigenous forests are located in the study area or in the immediate surrounding landscape. The closest mapped forest patches according to this database include small patches located adjacent to the coast to the south-west and north-east of the study area (shown in Figure 8-15). This notwithstanding, based on work conducted during the field survey and according to the KwaZulu-Natal provincial vegetation mapping delineations, a small patch of forest habitat (Swamp Forest) is located in the eastern corner of the study area.

Protected Areas and Priority Areas for Protected Area Expansion

Three land-based protected areas are located in close proximity to the study area (SAPAD, 2022), namely Umlalazi Nature Reserve, Ngoye Forest Reserve and Amatikulu Nature Reserve. These are discussed in more detail below:

- The closest protected area is Umlalazi Nature Reserve (Umlalazi), which is located less than one kilometre to the south-east of the study area (shown in Figure 8-16). Umlalazi is a long, narrow coastal reserve of approximately 1451.32 ha. It is known for its swamp- and mangrove forests, lagoon, Palm-nut Vultures (Gypohierrax angolensis) and Kosi Palms (Raphia australis). Umlalazi is a recognised Important Bird Area (IBA) on account of the presence of several globally, regionally and biome-restricted species (Marnewick, et al., 2015);

- Ngoye Forest Reserve (Ngoye) is located approximately 14 km to the north of the study area. This reserve is approximately 3894.07 ha in extent and is surrounded by rural communities. It is characterised by well-developed primary forest and large patches of grassland. Ngoye is also a recognised IBA on account of several IBA trigger species, including the Green Barbet (Stacolaena olivacea), which in South Africa is restricted to Ngoye Forest (Marnewick, et al., 2015); and
- Amatikulu Nature Reserve (Amatikulu) is a long, narrow reserve of about 1 572 ha in extent, comprising coastal forest and grassland habitats. The reserve is located approximately 12 km to the south-west of the study area. Both the Amatikulu and Nyoni river estuaries are located in the reserve.

It is noted that according to the National Protected Areas Expansion Strategy (2018), a small portion of land in the south-west corner of the study area has been identified as a Priority Focus Area. This Priority Focus Area extends eastward from the study area, encompassing a narrow network of forest habitat, before merging with Umlalazi Nature Reserve.

Figure 8-12 - Study area and the NEMBA Threatened Ecosystems – showing both historic and remaining extends of vegetation types

Figure 8-13 - Spatial planning of the KwaZulu-Natal Biodiversity Sector Plan

Figure 8-14 - Study area in relation to Strategic Water Source Areas (SWSA)

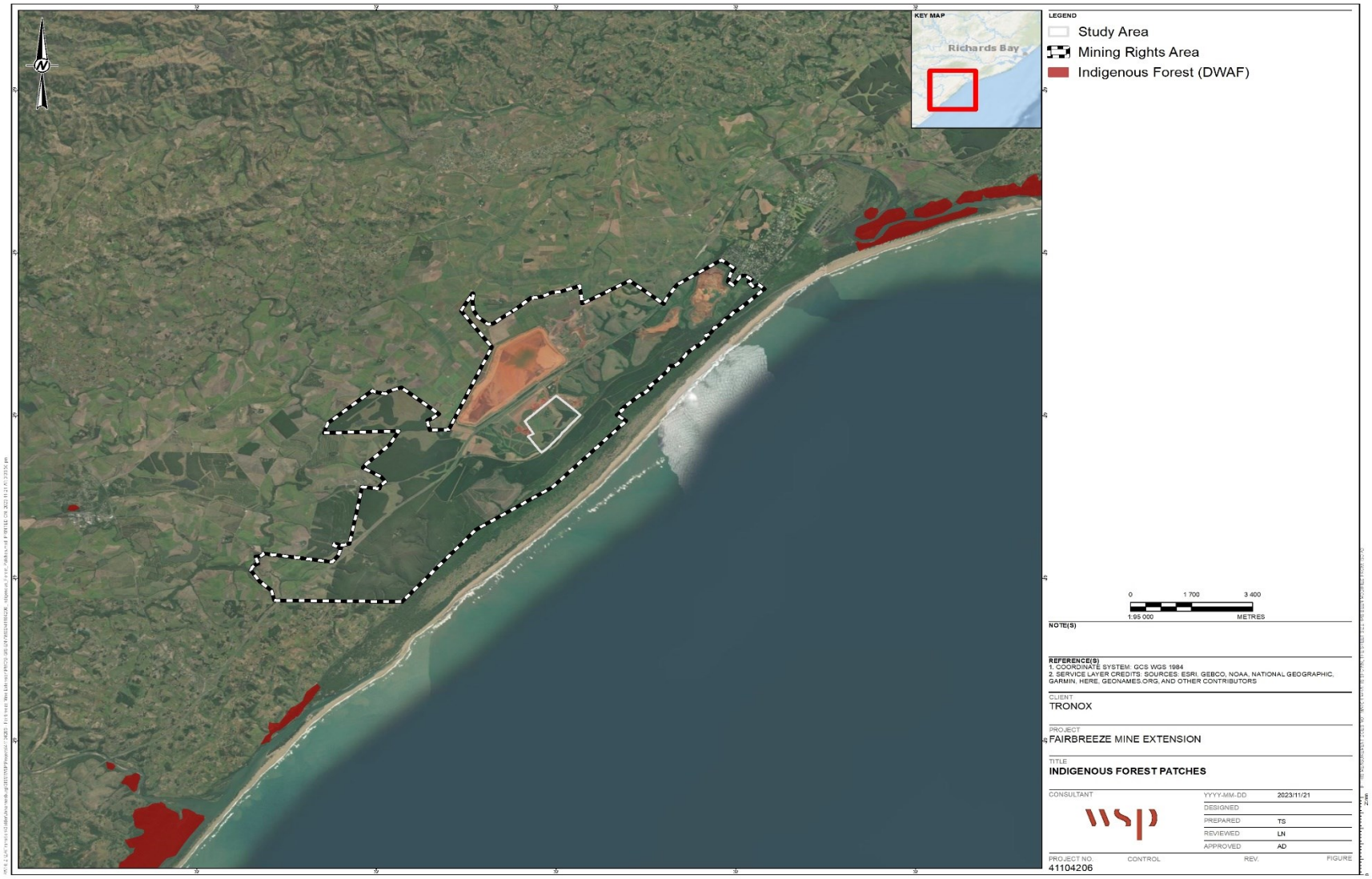


Figure 8-15 - Study area in relation to mapped indigenous forests patches, as per National Forest Inventory

Figure 8-16 - Study area in relation to the nearby Umlalazi Nature Reserve

8.6.3.5 Landscape in context and existing impacts on biodiversity

The study area is located in a highly transformed and fragmented landscape matrix. The following section provides a summary of the characteristics of the surrounding landscape and the nature of existing anthropogenic impacts:

- Most of the land surrounding the study area is completely modified (transformed) and comprises sugarcane fields, timber plantations or mining areas;
- Remaining areas of natural habitat in the immediate surrounding landscape include narrow belts of Swamp Forest that are associated with local streams and drainage lines, such as the Manzamnyama.
- The Manzamnyama flows parallel to the railway line along the southern border of the study area. To the east of the study area, it is joined by several tributaries that coalesce to form the headwaters of the Siyaya River, which flows in a north-easterly direction before entering Umlalazi Nature Reserve where it forms an estuary and discharges into the Indian Ocean. The mouth of the Siyaya River estuary is located about 7.3 km to the north-east of the study area;
- The nearest large and significant patch of natural habitat is the band of forest in Umlalazi Nature Reserve, which is located along the coastline to the south-east of the study area;
- Prominent linear infrastructure includes the N2 Highway, which is located to the north of the study area, and a railway line, which marks the south-eastern boundary of the site; and
- No residential or developed areas are present in the landscape surrounding the study area.

8.7 CONCEPTUAL GROUNDWATER AND SURFACE WATER MODEL

Surface water and groundwater sources mix to form observed stream flow. The groundwater mound, in the vicinity of the catchment divide, yields baseflow towards the coastal streams as well as towards streams flowing inland (Figure 8-17). Where the groundwater intersects the land surface in topographical depressions between the coastal dunes, wetlands are likely to occur as shown in the sections through the Siyaya catchment in Figure 8-17. Significant interflow is likely to contribute to stream flow from sloped land surfaces. Overland flow is likely to contribute to surface runoff during extreme rainfall events. Access to surface water, and in some places to groundwater, by vegetation is likely to result in high evapotranspiration fluxes.

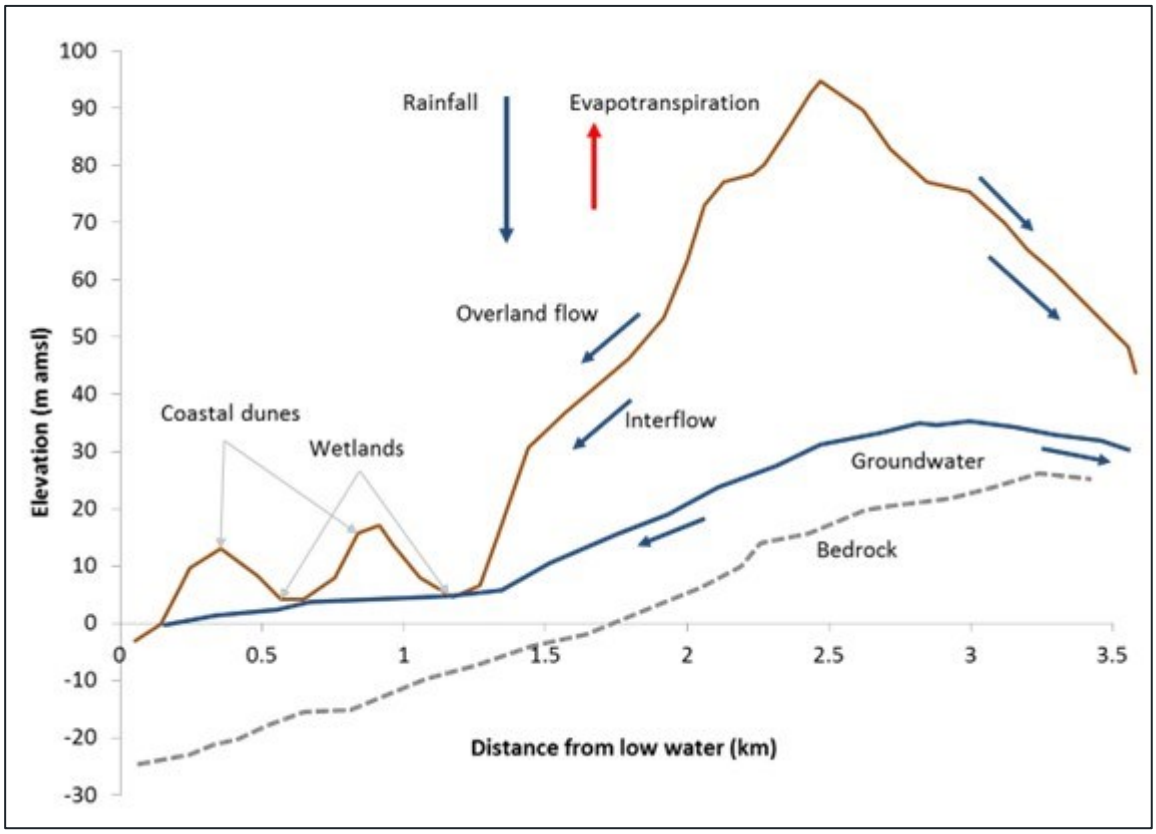


Figure 8-17 - Section through the Siyaya catchment (after Kelbe and Germishuyse, 2010), showing the dominant hydrological process

8.8 SURFACE WATER

8.8.1 REGIONAL CATCHMENT AND DRAINAGE

The Fairbreeze Mine area straddles the boundary between quaternary catchments W11C and W13B along a strip approximately 1km inland of the north coast of KwaZulu-Natal south of Mtunzini (**Figure** 8-18). Key rivers which drain the mine area include the following:

- Draining inland in a north westerly direction;
    - The Sabeka River which drains the site inland in a westerly direction, then turning southwest to become a tributary of the Nyezane River.
- Draining to the coast in a south easterly direction;
    - The northern 1/4 of the site drains to the Siyaya River and estuary.
    - The central section of the mine area drains to the Amanzimnyama River, which becomes a tributary of the Siyaya River and estuary.
    - At the furthest south extent of the mine area, various smaller systems drain south easterly into the coastal dunes).

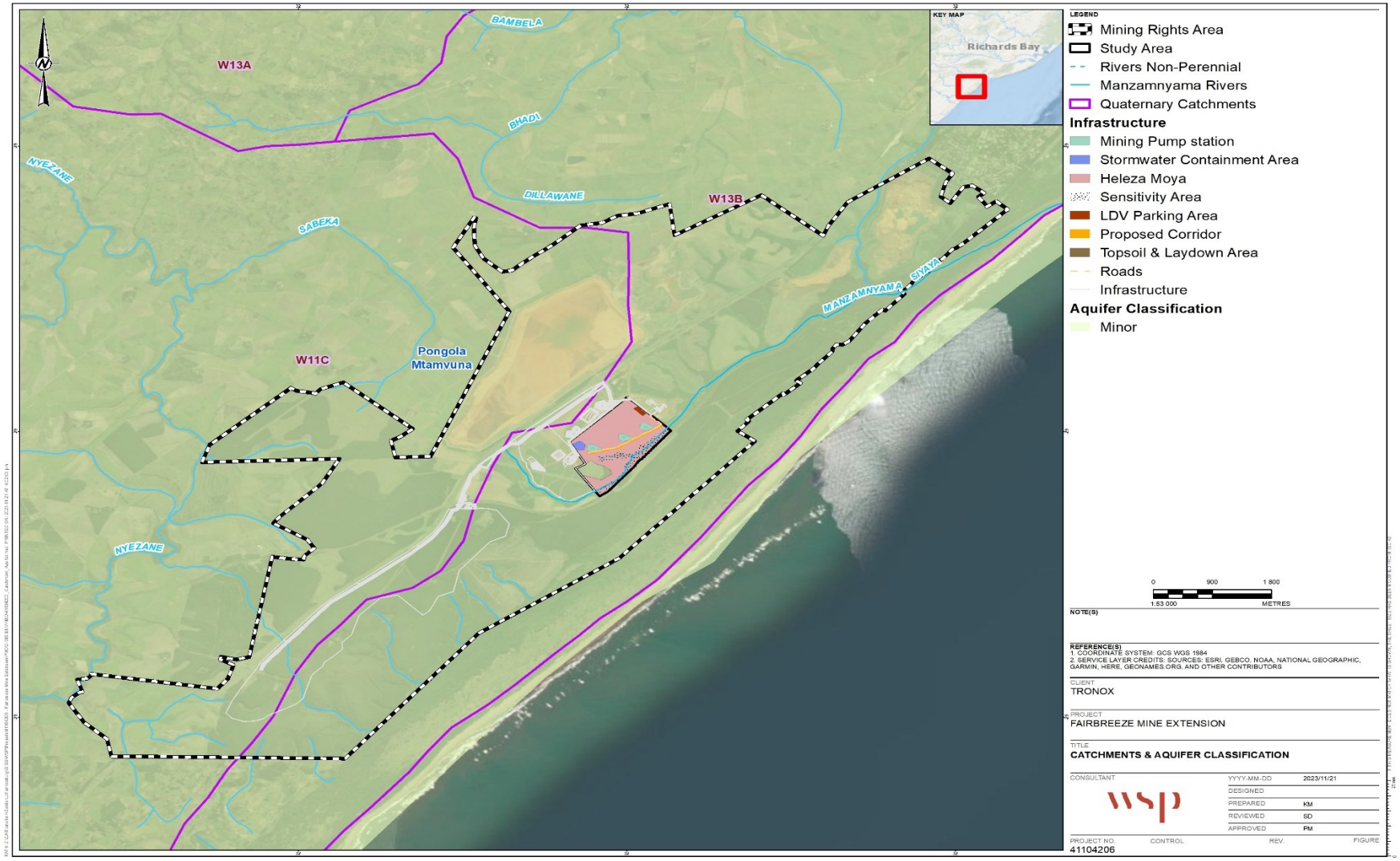


Figure 8-18 - Catchment management area of the proposed Project

8.8.2 SURFACE WATER QUALITY

Surface water quality at the Fairbreeze mine is monitored monthly through a number of sampling points (FB1 to FB35) (Figure 8-19). The water quality is generally good compared to background sample values, with few elevated species' concentrations in comparison to previous years. Na and Cl are constantly elevated, as indicated in the time series (2011-2019) in Figure 8-20 and Figure 8-21. There are two instances of Na exceeding the DWS recommended concentration for domestic use (200 mg/l) and frequent instances of Cl exceeding the recommended 200 mg/l.

Plotting the Cl concentrations against the associated Na values, for each sampling event, reveals a significant correlation, Figure 8-22, with a Na/Cl ratio of 0.547. This is typical of ocean water and is deemed to be the reason for these ions being prevalent in surface waters due to rainfall concentrations adjacent to the coast. Nevertheless, some form of treatment would likely be required to use these water sources for domestic use or for irrigation purposes (du Plessis et al., 2017).

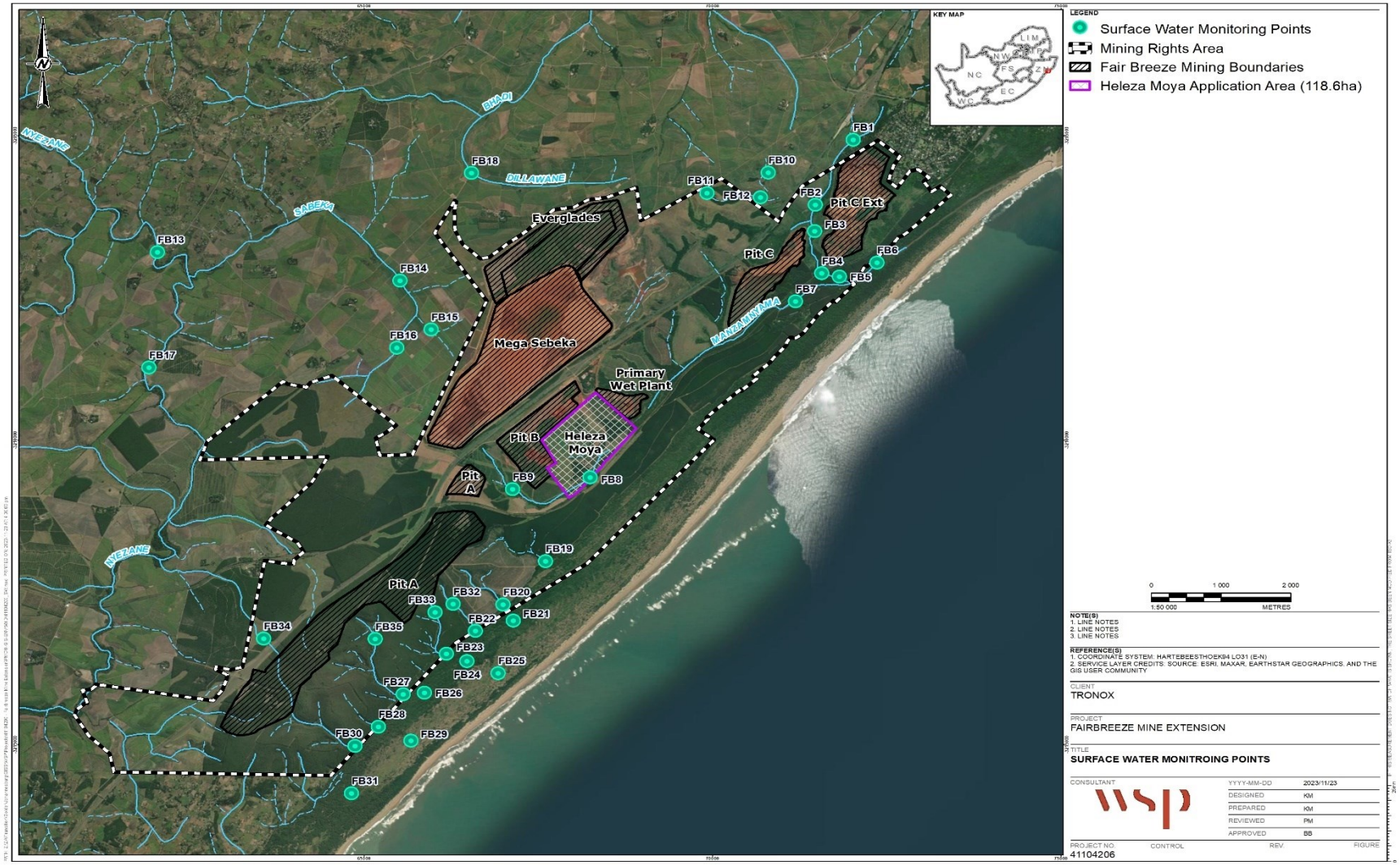


Figure 8-19 - Surface water monitoring points at Fairbreeze Mine

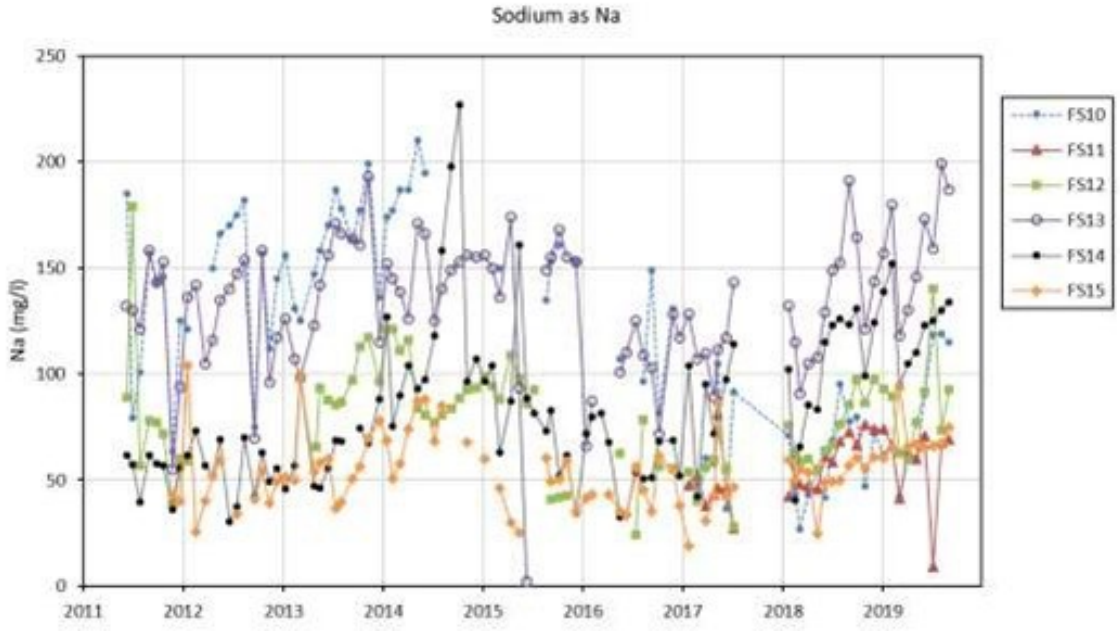


Figure 8-20 - Sodium levels between 2011-2019

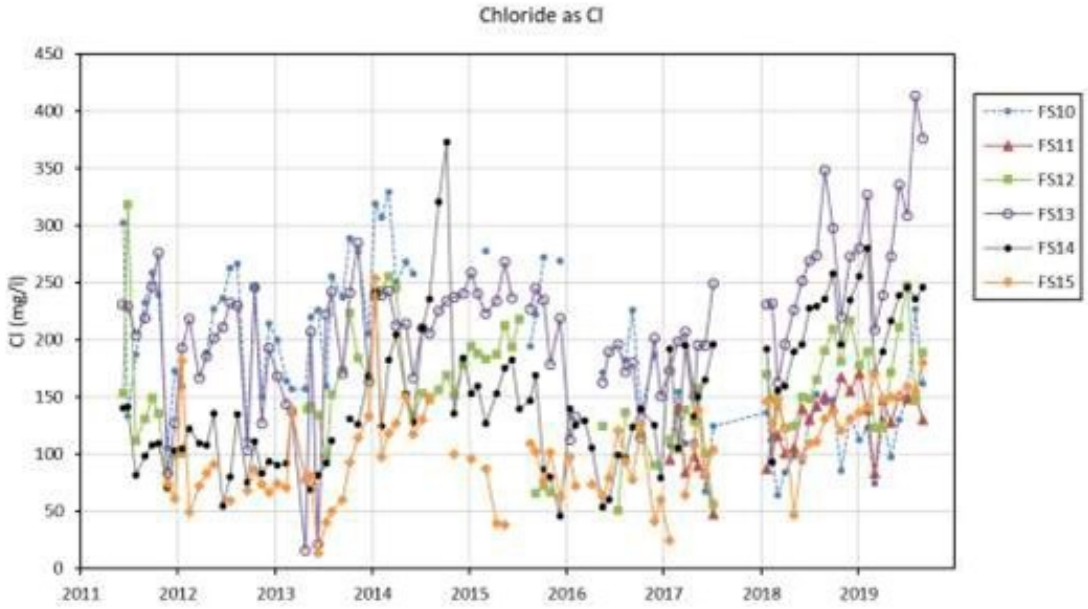


Figure 8-21 - Chloride levels between 2011-2019

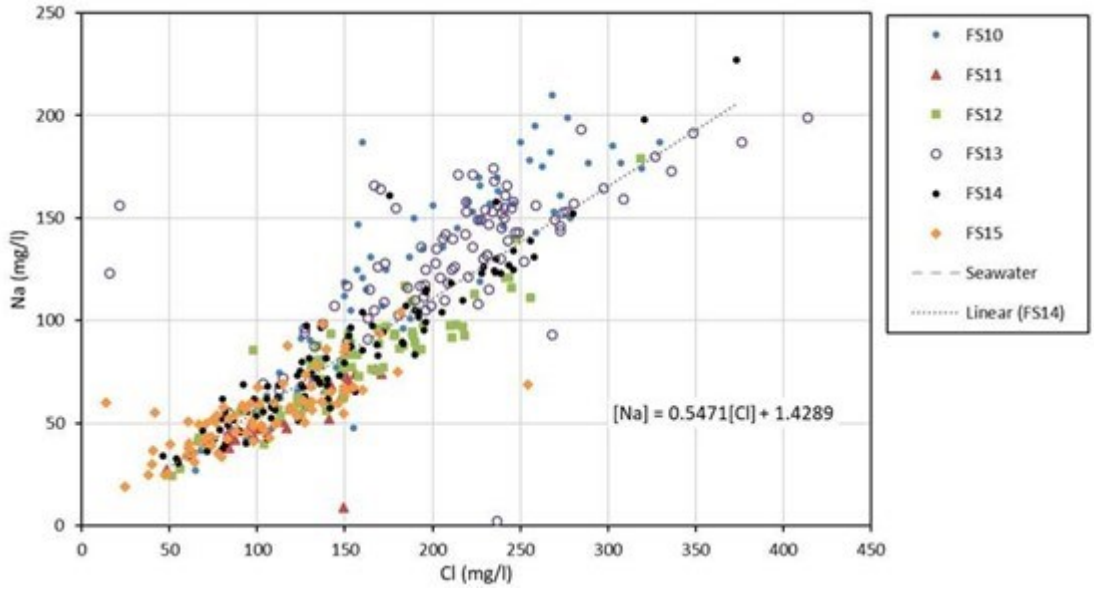


Figure 8-22 - Relationship between Na and Cl between 2011-2019

Sulphate concentrations include one high value, Figure 8-24, in sample location FS10 (353 mg/l) that exceeds the DWS recommended concentration for domestic use (200 mg/l). The sulphate peak in 2014 is not associated with an increase in EC or variation in pH, but is associated with increases in Fe and Mn, so could originate from a release. Nevertheless, the sampling location, FS10, is upslope of the current and proposed TSF sites and is therefore considered to be a localised release. In addition, the median sulphate concentration at FS10 (10.5 mg/l) and indeed, the 98% percentile concentration (123 mg/l) are well below the drinking water standard. Further sulphate peaks in the second half of 2016 at FS10 and FS13 (210 mg/l at FS13 and 207 mg/l at F13), only marginally exceed the drinking water standard. All sulphate concentrations fall below the SANS 241:2005 standard of 400 mg/l.

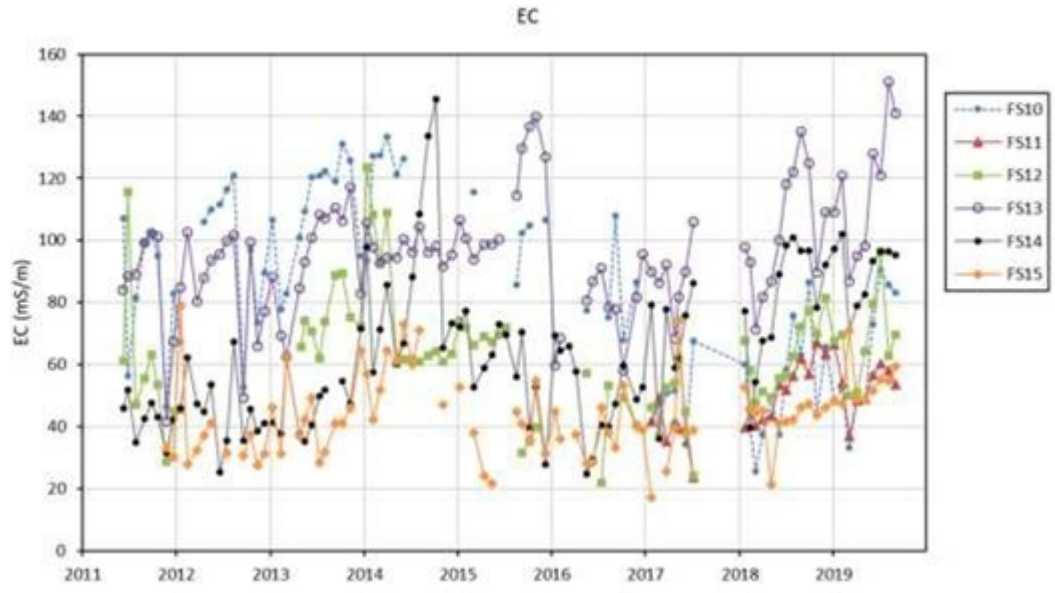


Figure 8-23 – EC levels between 2011-2019

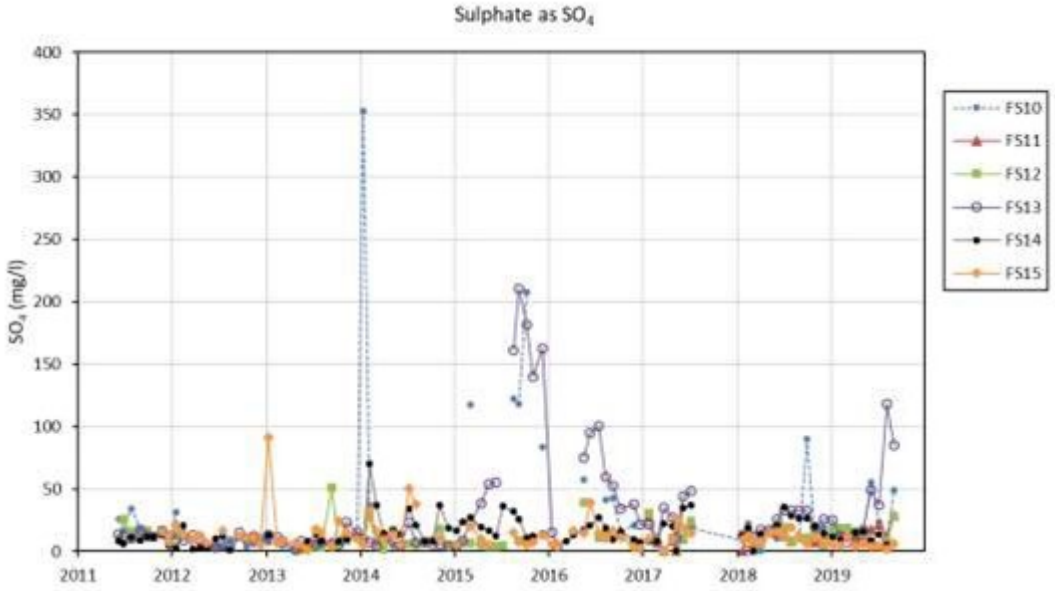


Figure 8-24 - Sulphate levels of EC between 2011-2019

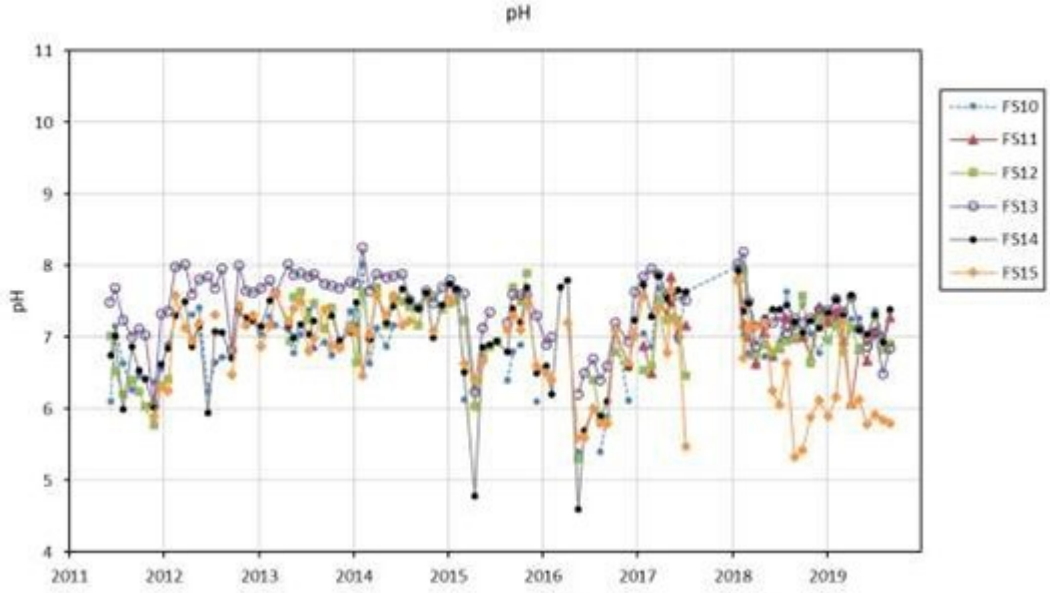


Figure 8-25 - pH levels between 2011-2019

For the proposed Project, the surface water quality has been examined in relation to the simulated and observed flow regimes, with a focus on the Amanzimnyama river, leading into the Siyaya estuary, and addressing sediment and salinity aspects of water quality.

8.8.2.1 Sediments

Sediments in the estuary have been noted as a concern through visual observation from local residents. An analysis of the suspended solids (SS) is thus warranted. In the Amanzimnyama catchment, only FS08 and FS09 are sampled regularly. The SS at these stations have been correlated against prevailing observed (DWS) flows (at the Amanzimnyama weir), as illustrated in Figure 8-26. Similar plots have been developed for all Amanazimnyama and Siyaya sampling

stations
(Figure 8-27 shows a data for a typical Siyaya station) and all show similar trends.

Typically, this data reveals that the high SS concentrations are associated with low flows, (perhaps even stagnant water) while high flows have low SS concentrations. This is true for both the Amanimnyama and Siyaya catchments. This demonstrates that high rainfall-runoff events do not result in excessive sediment loads, but rather serve to dilute the SS concentrations.

While stripping ahead of the mining void may generate some additional sediments, the data demonstrates that this has been carefully controlled in the past and sediment loss from the Heleza Moya development is likely to be controlled within the mining area.

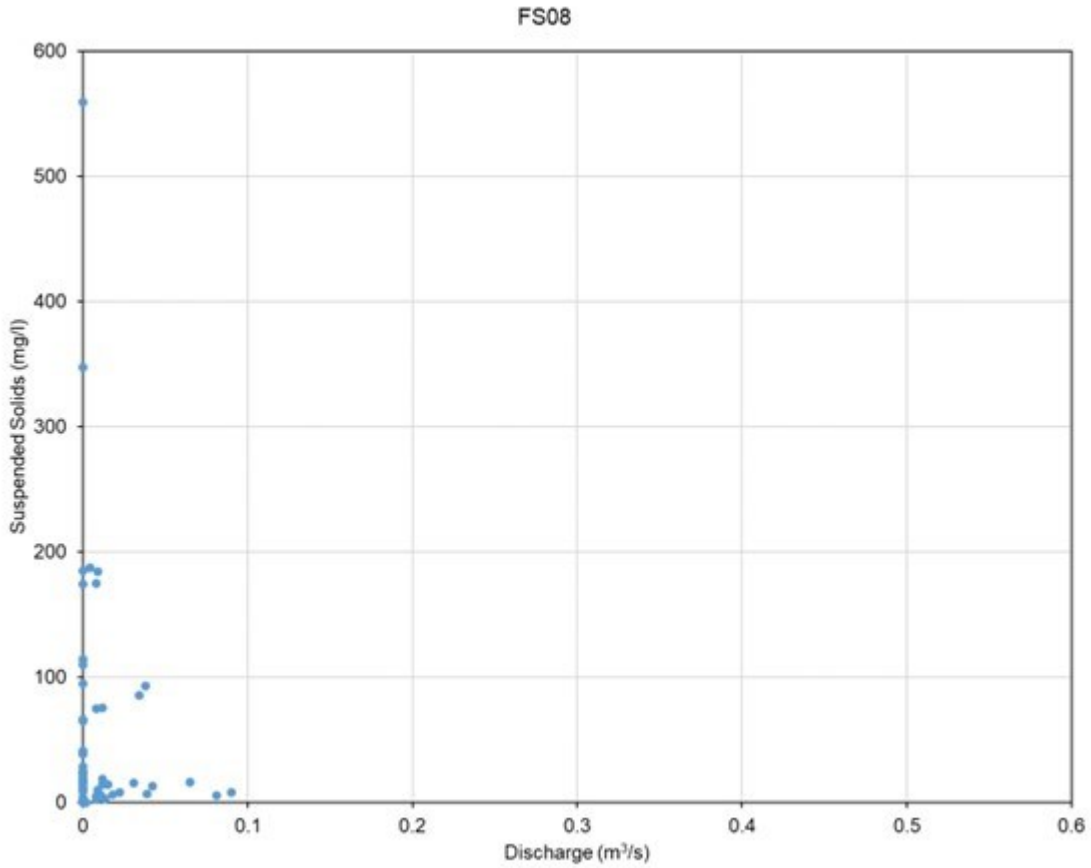


Figure 8-26 - Discharge versus Suspended Solids concentrations on the Amanzimnyama river

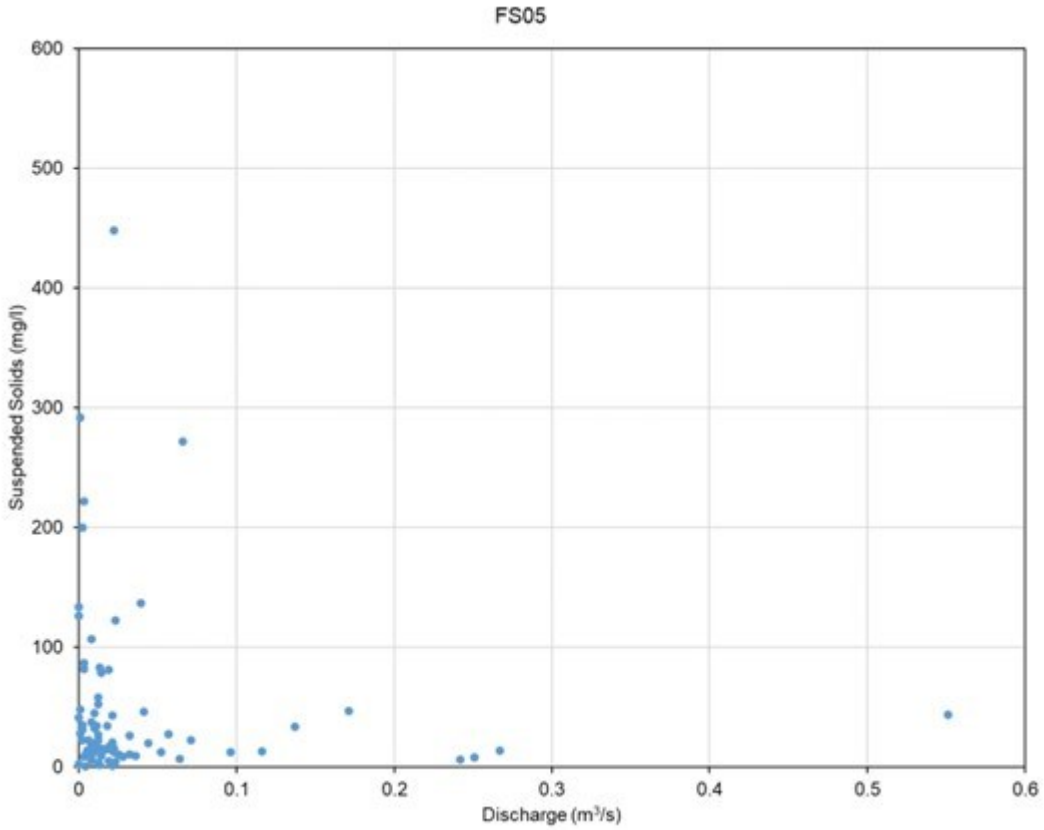


Figure 8-27 - Discharge versus Suspended Solids concentrations on the Siyaya river

An orange floc has been noted in the Amanzimnyama during the assessment of backfill seepage in the C and C-ext blocks. This may be what has been observed in the estuary. While analysis of this almost jelly-like substance has revealed it comprises predominantly Iron 55.24% g/g and Silica 7.06% g/g. Other constituents comprised:

- Strontium <0.003 %g/g;
- Barium 0.04 %g/g;
- Vanadium <0.02 %g/g;
- Zirconium <0.005 g/g;
- Titanium 0.08 g/g;
- Aluminium 0.50 g/g;
- Manganese 0.24 %g/g; Manganese
- Oxide 0.26 %;
- Magnesium 0.40 g%/g;
- Calcium 0.31 %g/g;
- Potassium <0.02 %g/g;
- Phosphorus 0.42 %g/g;
- Chromium <0.02 %g/g; and
- Loss on Ignition (1000 °C) 34.96 %g/g.

This same suspension has been noted on the west side of the N2 highway and is considered a natural suspension of subsurface seepage of in-situ soils in the area.

8.8.2.2 Salinity

Surface water quality sample results were assessed from sites FB1 to FB18. None of the water quality variables pose a health risk (DWAF, 1996) except for high iron concentrations at FB7 and FB18.

Elevated salinity values (as observed in Figure 8-28 of the surface water impact report) are assumed to be sodium (Na) and chloride (Cl) associated with deposition from coastal rainfall. This phenomenon is illustrated in the relationship between Na and Cl in, Figure 8-29, which shows a regression slope similar to that found in sea water.

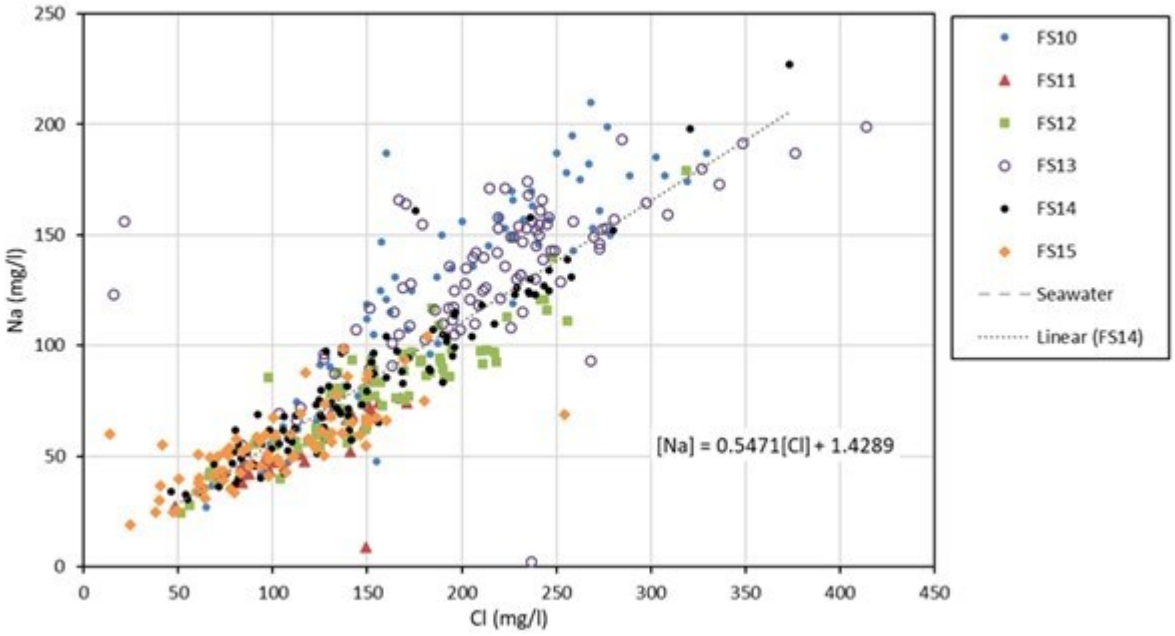


Figure 8-28 - EC of surface water observation sites for 2011 and 2019.

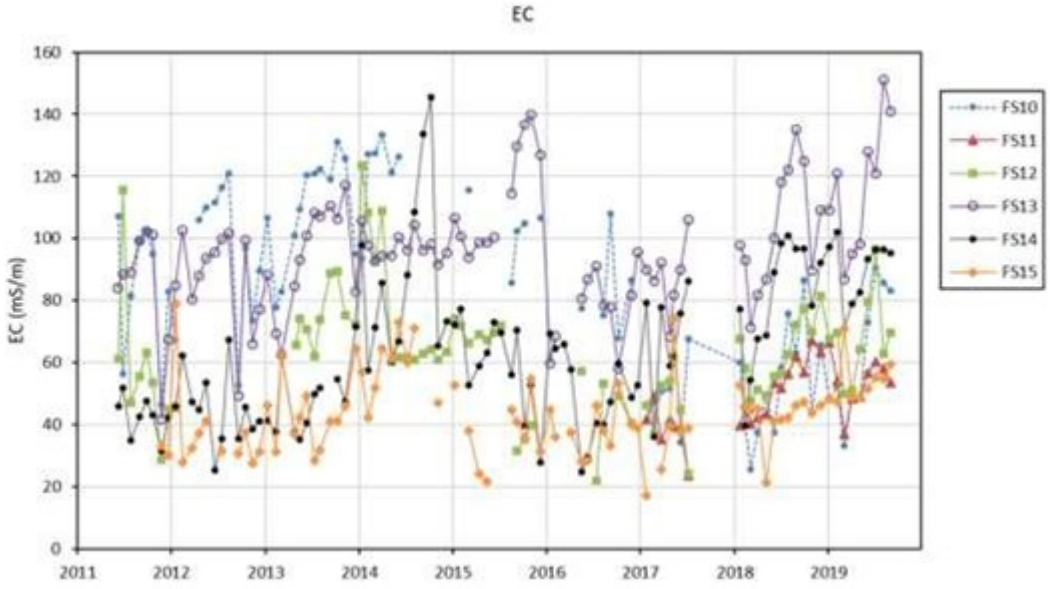


Figure 8-29 - Sodium-Chloride relationship of surface water samples

8.8.3 RUNOFF

A runoff divide runs parallel with the coast some 2.5 km offshore (Figure 8-30). Form here drainage occurs towards the coast in an easterly direction, but in the proximity of the coastal dunes, rivers are diverted northwards by the marine sediments, where they emerge in estuaries (e.g., Siyaya estuary). West of the divide, drainage occurs in a north westerly direction. Similar drainage patterns occur in the groundwater, where the groundwater mound is highest at the catchment divide.

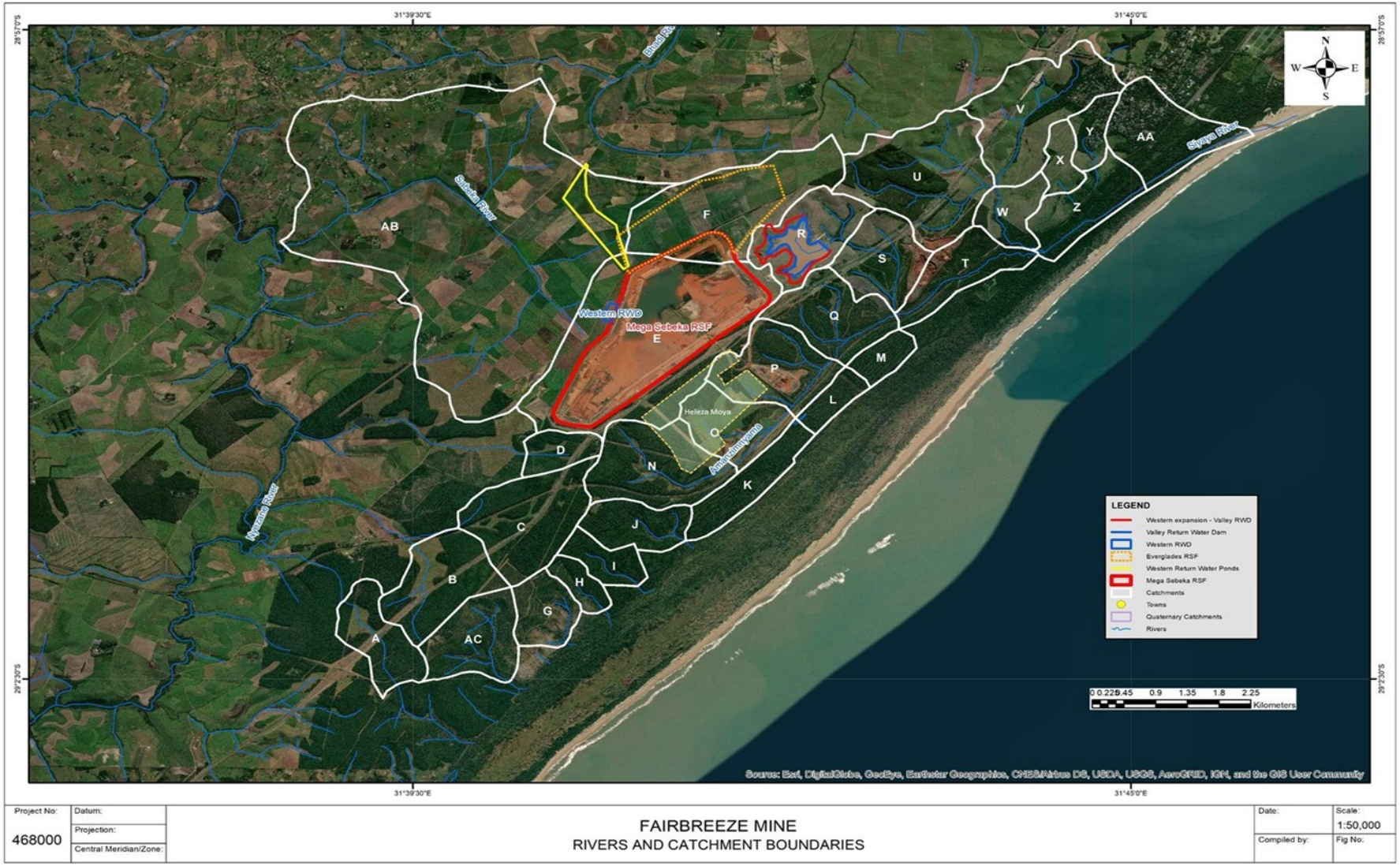


Figure 8-30 - : Drainage sub-catchment delineation (A-AB), showing the outline of the Heleza Moya mining area (yellow dashed line)

8.8.3.1 Gauging weirs

Two gauging stations occur below the mining site, the Amanzimnyama weir (W1H018) and the Siyaya weir (W1H019) as shown in Figure 8-31. Records are available for an early period, from 1983 to 1989 for the Siyaya and 1983 to 1987 for the Amanzimnyama weirs. However, the weirs were entirely silted up during 1990 and abandoned. Recent records for the Siyaya weir (2005 to 2013) appear usable, but the Amanzimnyama weir record shows mostly levels below the lowest sharp crested weir invert due to zero flows in the catchment. However, on occasions of flow onset, the weir basin first fills, after which discharge over the weir may reflect flows. This means that many low flow events are not recorded. Since August 2013, the Siyaya weir is deemed to be faulty. Indeed, a visit to the weir on 15 December 2015 revealed an overflow of 50 mm, but the recorded depth of flow on that date was negative.

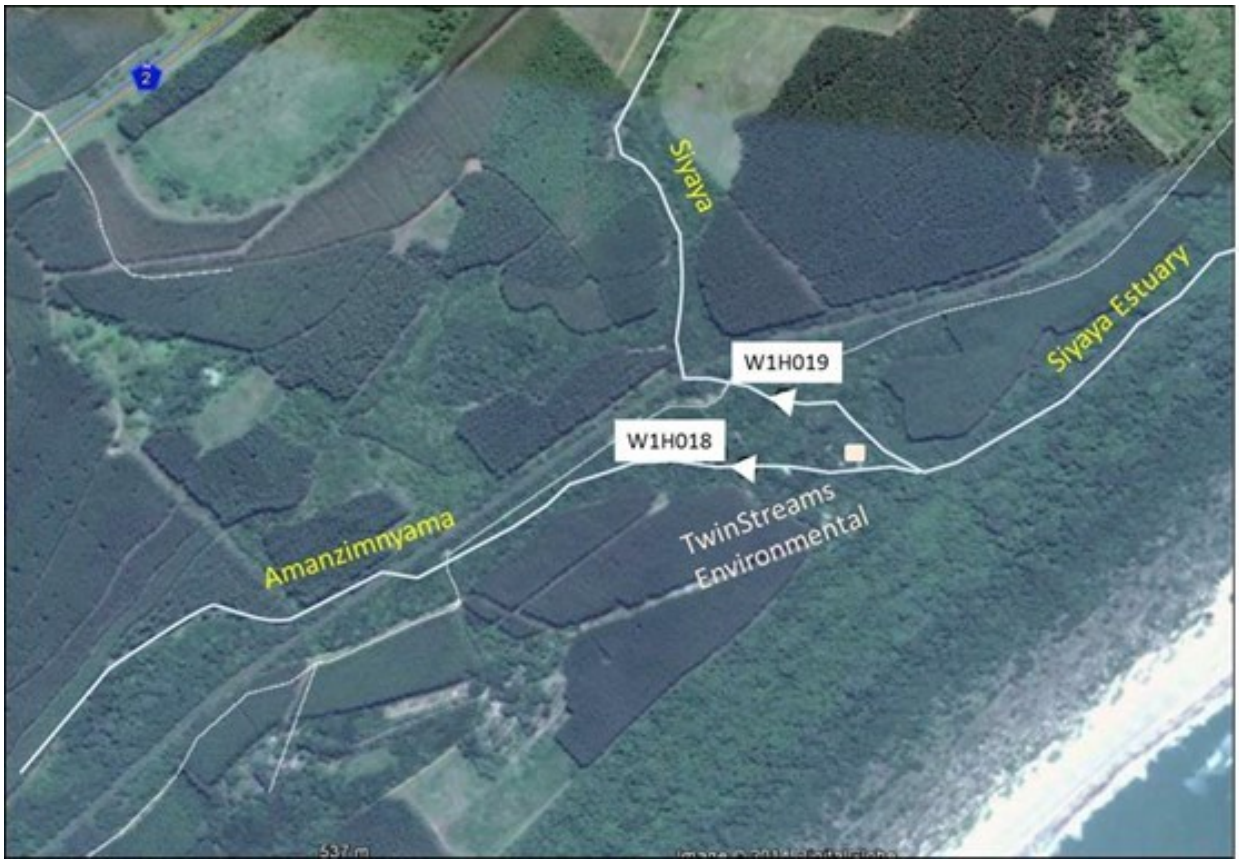


Figure 8-31 - Location of gauging weirs Amanzimnyama (W1H018) and Siyaya (W1H019)

8.8.4 Wetlands

According to Golder (2011), seven wetland units were identified, based on connectivity and the influence that each wetland system has on the other. Barnes (2000) adds that there are important birding areas in the vicinity of the project area including some situated just north of Mtunzini. Although these areas are situated outside of the study area, the wetlands within the study area will play an important role in terms of linkages between these important birding areas. The wetlands within the project area may also have an important role to play with regards to foraging for birds from nearby Important Birding Areas.

Five different wetland types were classified within the study area, including a seasonal wetland that traverses the Project area, namely (Figure 8-32):

- Channelled valley bottom wetlands;
- Unchannelled valley bottom wetlands;
- Valley head seeps;
- Hill slope seep with channelled outflow; and
- Hill slope seep without channelled outflow.

The vegetation health in the wetland ecosystems ranged from a Class A (largely natural) to Class E/F (critically modified). The Ecological Importance and Sensitivity (EIS) of the wetlands in the study area ranged from low/marginal to very high.

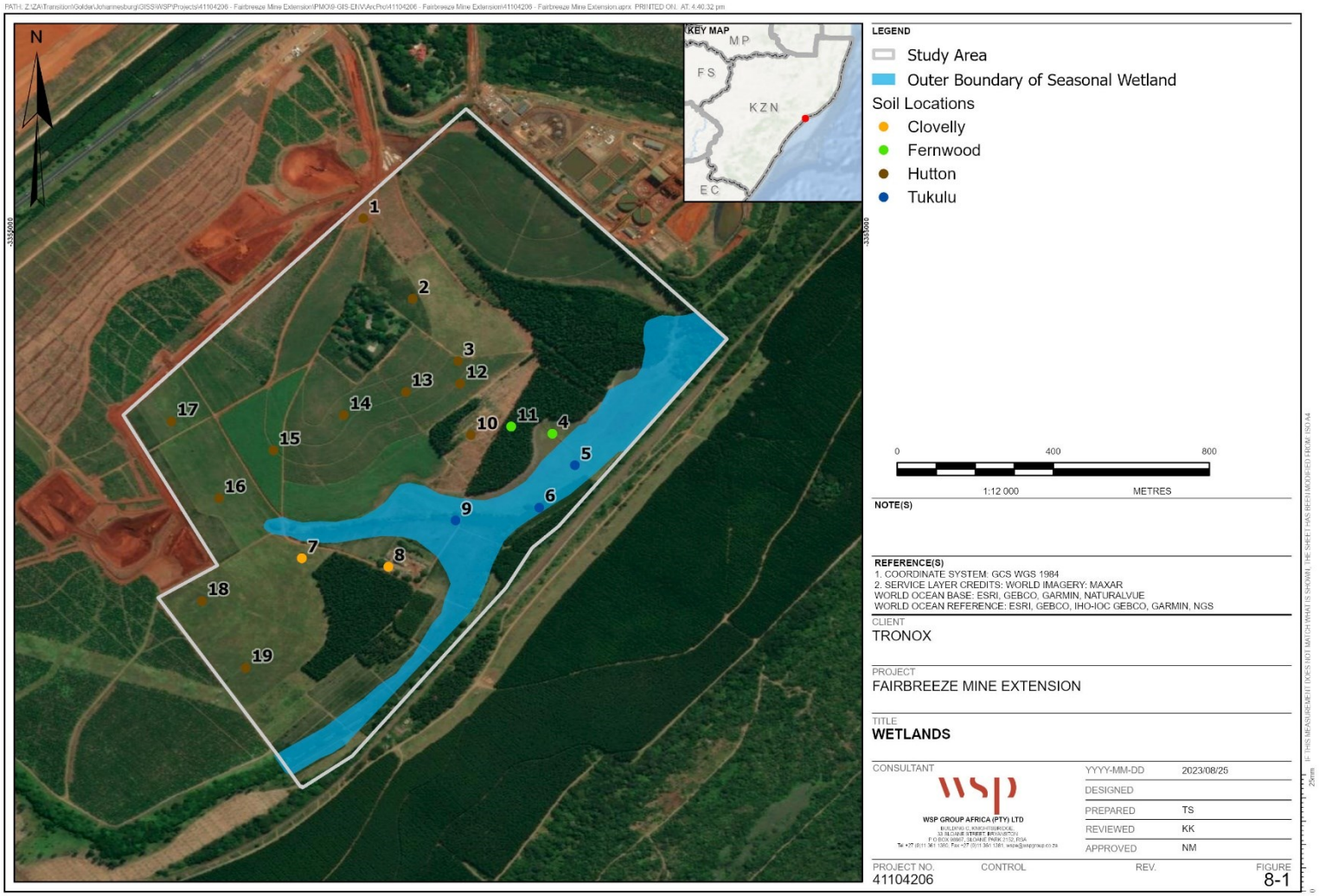


Figure 8-32 - Wetlands around the Project area

8.8.5 SURFACE WATER HYDROLOGY

8.8.5.1 Catchment Delineation

Twenty-five (25) sub catchments have been delineated within the Amanzimnyama and Siyaya basins to simulate the Siyaya estuary outflows. The catchment delineation was based on flow directions and catchment divides as well as the twenty-four land use zones (Table 8-10). Current and proposed rehabilitated land uses are used for current and closure scenarios (Scenario 5 in Table 8-10) simulations.

Table 8-10 - Summary of the percentage land use in each catchment of the Siyaya and Amanzimnyama rivers and Siyaya Estuary

Land Use	Siyaya 83-89	Siyaya Current	Siyaya Scenario 5	Amanzimnyama 83-89	Amanzimnyama Current	Amanzimnyama Scenario 5	Estuary 83-89	Estuary Current	Estuary Scenario 5
Indigenous Forest	11	10.4	10.4	15.7	15.9	19.3	38.2	28.9	38.9
Plantation Forest	0	29.3	3.2	0	65.6	16.6	0	17.9	6.2
Built Up	3.8	1	7.7	1	1.9	2.1	12.3	24.7	24.7
Maintained	0.6	0.6	0	0.8	0.9	0.7	0.8	0.8	0
Grassland	37.2	3.2	43.6	68.3	1.5	47.2	31.9	1.7	21.4
Sugar Cane	46	47.3	29.3	9.6	9.7	10.3	10	9.4	0
Wetland	1	1	5.8	4.6	4.6	0	3.1	3.3	5.7
Water Bodies	0	0	0	0	0	3.7	3.3	3.3	3.3
Dense Alien	0.4	0.4	0	0	0	0	0	0	0

8.8.5.2 Model Parameterisation

The Agrohydrological Model (ACRU), agrohydrological model was parameterised with soil, topographical and vegetation characteristics based on land uses as listed in SRK (2015). Runoff (including quickflow and baseflow), evapotranspiration and recharge fluxes and soil water and groundwater storage states are simulated for each land use in each sub catchment on a daily basis for the record, 1970 to 2023.

8.8.5.3 Fairbreeze Mine Runoff Simulation

Runoff simulations were initially tested against observed data from the Amanzimnyama and Siyaya weirs. Daily runoff simulations of all the catchments in the Fairbreeze boundary are driven by daily rainfall and atmospheric evapotranspiration demand inputs. Controlling these are the soil water, groundwater and vegetation characteristics. The soil water and groundwater storage states are updated daily, defining the volume of runoff response, infiltration to groundwater and baseflow releases. When the soil profile is dry, evapotranspiration is reduced below the potential atmospheric demand and water distribution to groundwater is low. Again, the model has been set up to allow for the accumulation of surface and subsurface water in the riparian and wetland zones, resulting in enhanced evapotranspiration responses in vegetation adjacent to streams and in wetlands.

The recharge to groundwater is simulated as the daily fluxes leaving the soil profile. These have been simulated for the different land uses in the study area and used in the groundwater model to estimate baseflow, while concurrently matching observed groundwater levels (Section 8.9).

Flow exceedance plots for the observed flow records and the simulated runoff for the pre- and post-commercial forestry periods are shown for the model setup of the Siyaya River in Figure 8-33. The calibration focused on the Siyaya River weir (W1H019), having the best flow records with the fewest data gaps and errors. The data are plotted on an exceedance diagram, which shows the percent of the time that any discharge is equalled or exceeded. The flow regimes for the post-commercial afforestation period, (2005–2014) are illustrated with the modelled and observed daily runoff. The simulated flows closely reflect the observed flows and can thus be used to predict flow regimes for periods during mining and closure.

The simulated flow regime in the Amanzimnyama catchment, based on calibration against the 2005 to 2014 record, yields flows higher than those observed (Figure 8-34). However, the gauging record in the Amanzimnyama catchment during this period is deemed unreliable and has many interrupted periods which may have produced high flows. Also, discharges are predominantly lower than 0.1 m^3/s and measurements here are considered inaccurate. Nevertheless, the simulations reflect the hydrological response to the changed land use and the model is deemed adequate for continued predictions.

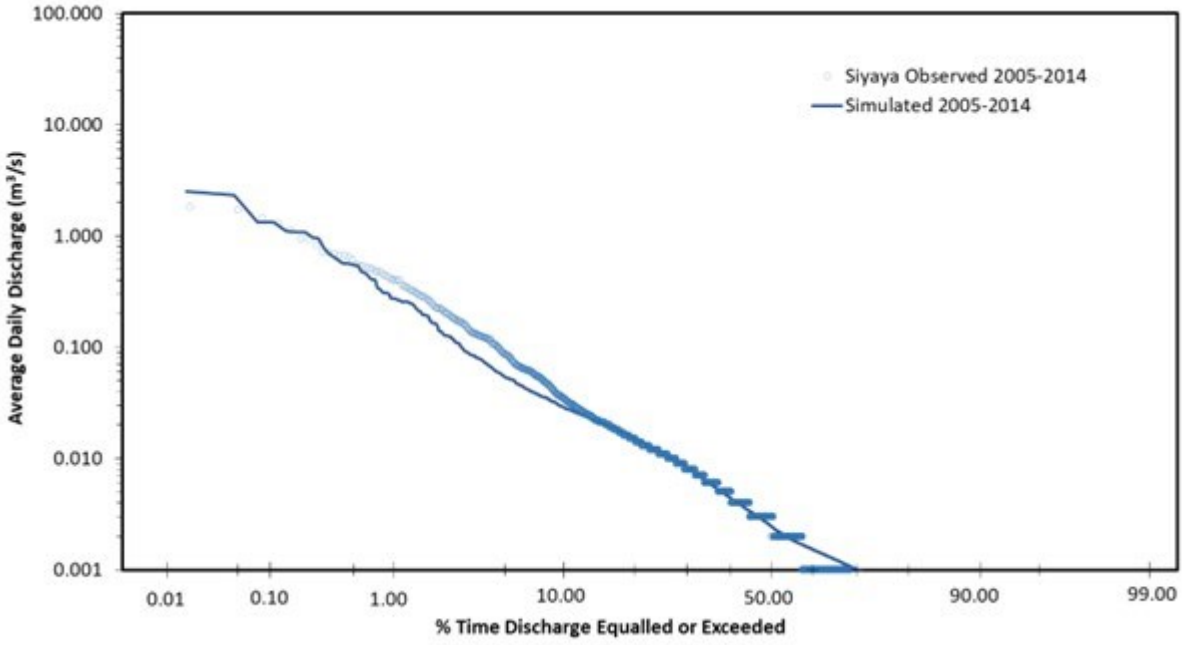


Figure 8-33 - Flow exceedance of observed and simulated daily flows for the Siyaya weir for 2005-2014.

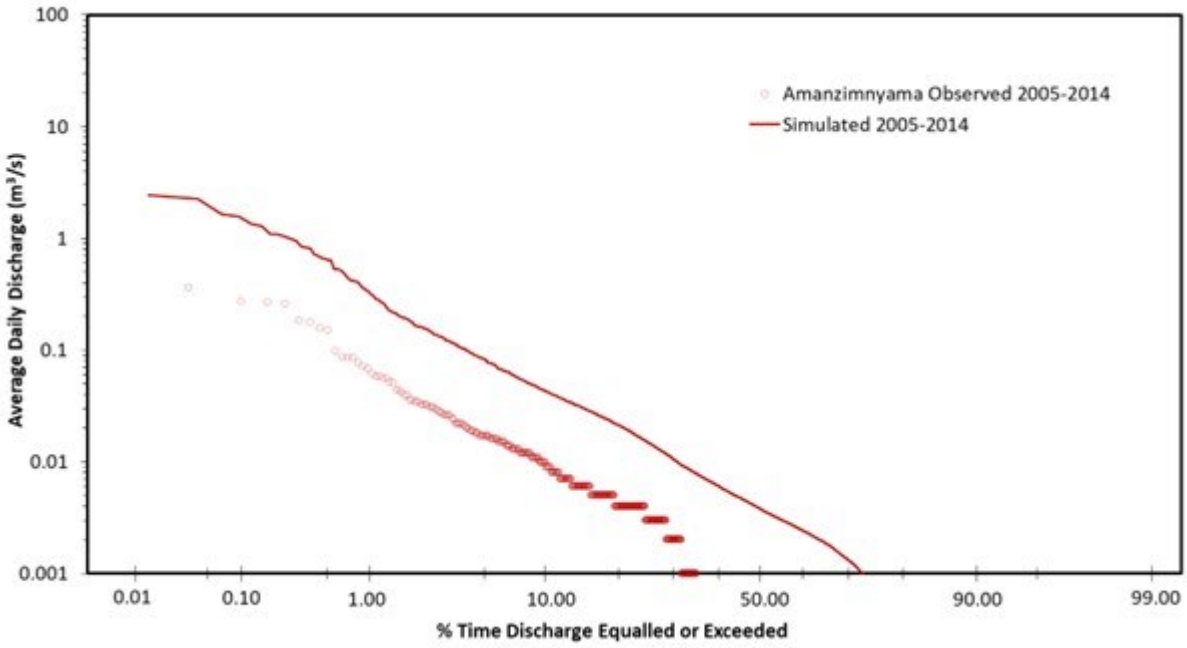


Figure 8-34 - Flow exceedance of observed and simulated daily flows for the Amanzimnyama weir for 2005-2014

The time series of simulated and observed flows for the Amanzimnyama and Siyaya are illustrated in Figure 8-35 and Figure 8-36, respectively. The erratic observed flow record is easily discerned, while the simulations reveal extended baseflow reduction beyond the capacity of the weirs to measure (below 0.001 m3/s). Periodic manual flow measurements have been performed using velocity cross-section analysis (ENVASS, 2022). These are shown together with DWS observed flow for the Amanzimnyama (Figure 8-37) and Siyaya (Figure 8-38) weirs, from 2016 to August 2023.

The simulations of the Amanzimnyama River have been extended to 2023, for the purposes of evaluating the impact of the Heleza Moya mining on the discharge in this catchment (next section).

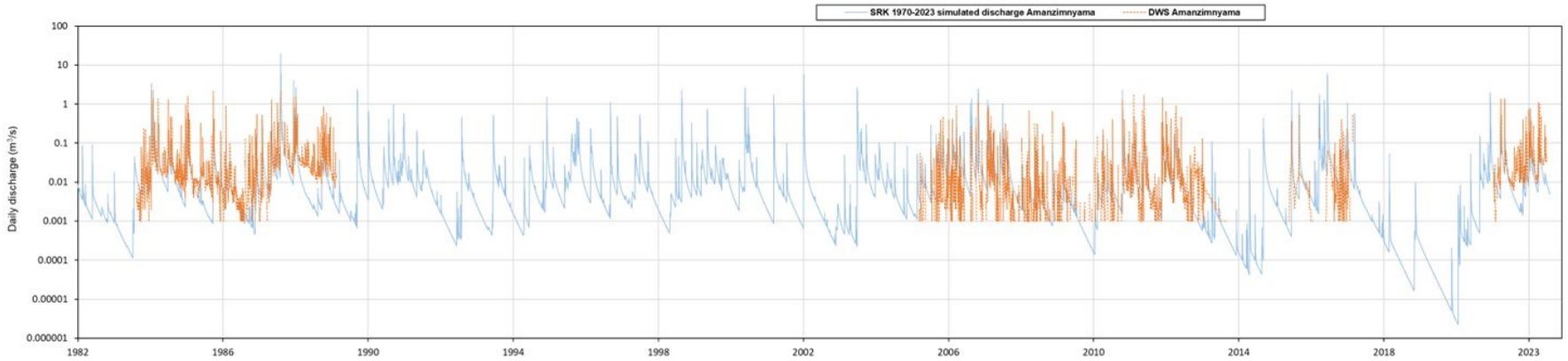


Figure 8-35 - Log scale time series of daily simulated and observed (DWS) flows at the Amanzimnyama weir (1982 – 2023)

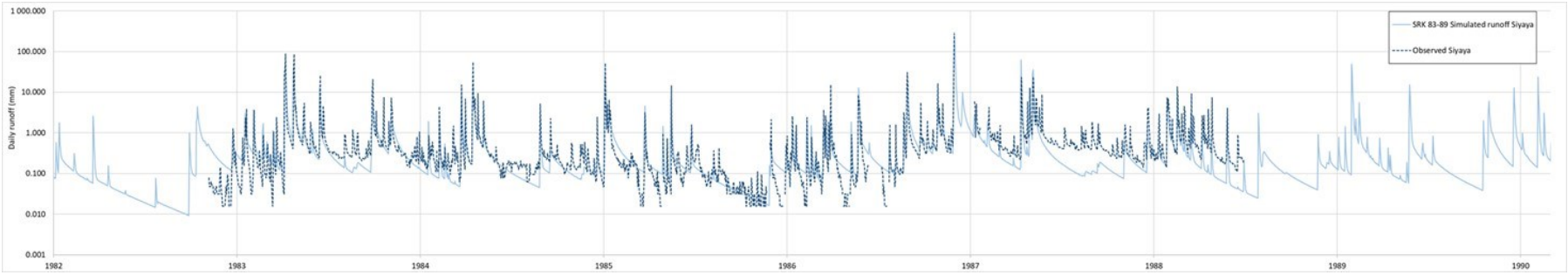


Figure 8-36 - Log scale time series of daily simulated and observed (DWS) flows at the Siyaya weir (1982 – 1990)

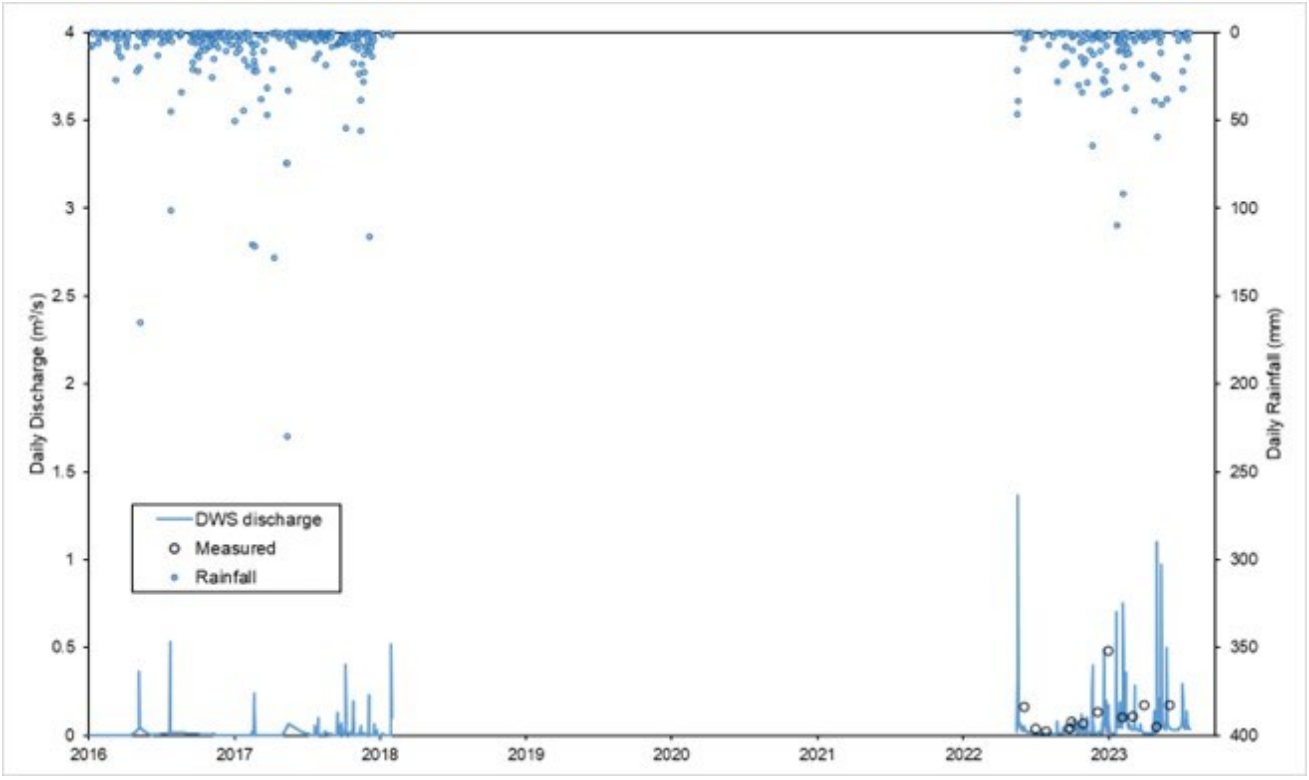


Figure 8-37 - Amanzimnyama observed flows (DWS) and manual measurements (open circles)

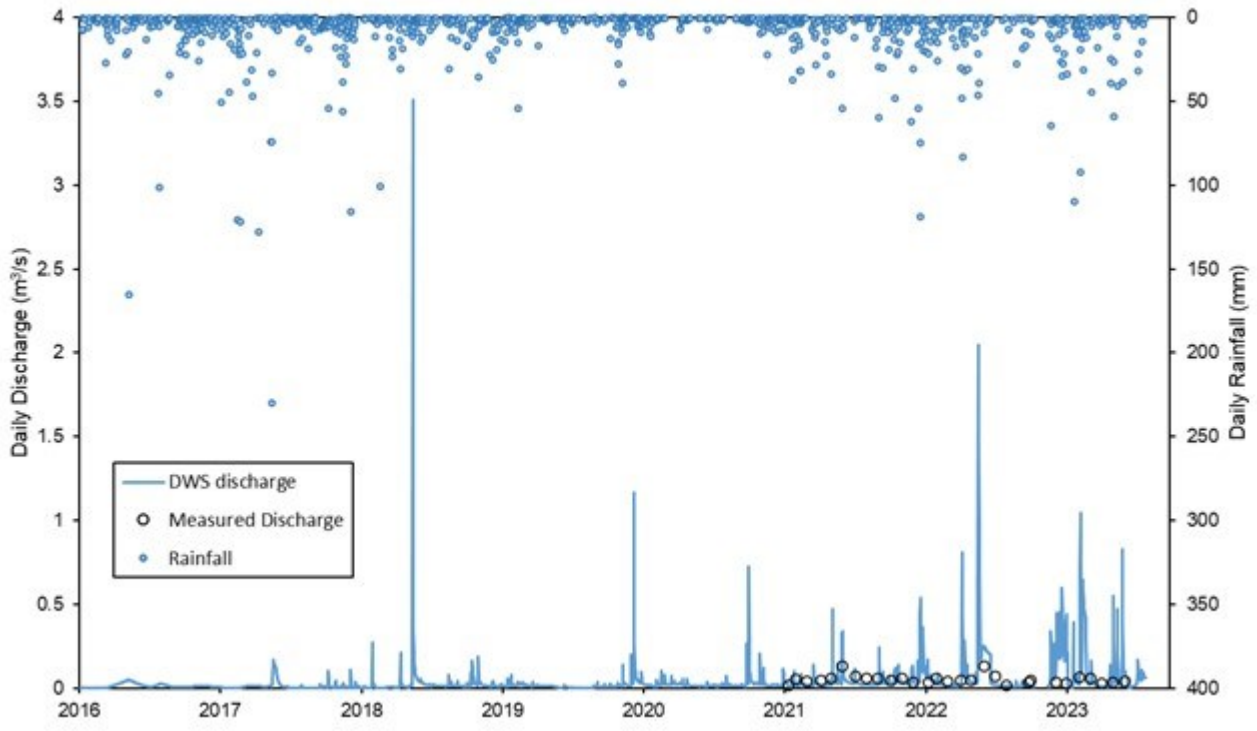


Figure 8-38 - Siyaya observed flows (DWS) and manual measurements (open circles)

8.8.5.4 Heleza Moya Surface Water Simulation

Four scenarios were simulated to represent the Heleza Moya mining development. The first comprised current land use, the second Year 2025, the third Year 2027 and the final scenario comprised closure land use. The progression of mining development is illustrated in Figure 4-8, while the land uses in catchments O and P (Figure 8-39) are summarised in a snapshot table in Figure 8-40. Where mining void, stripping ahead of the void and backfilled void occur in a catchment, the current land use area is reduced accordingly.

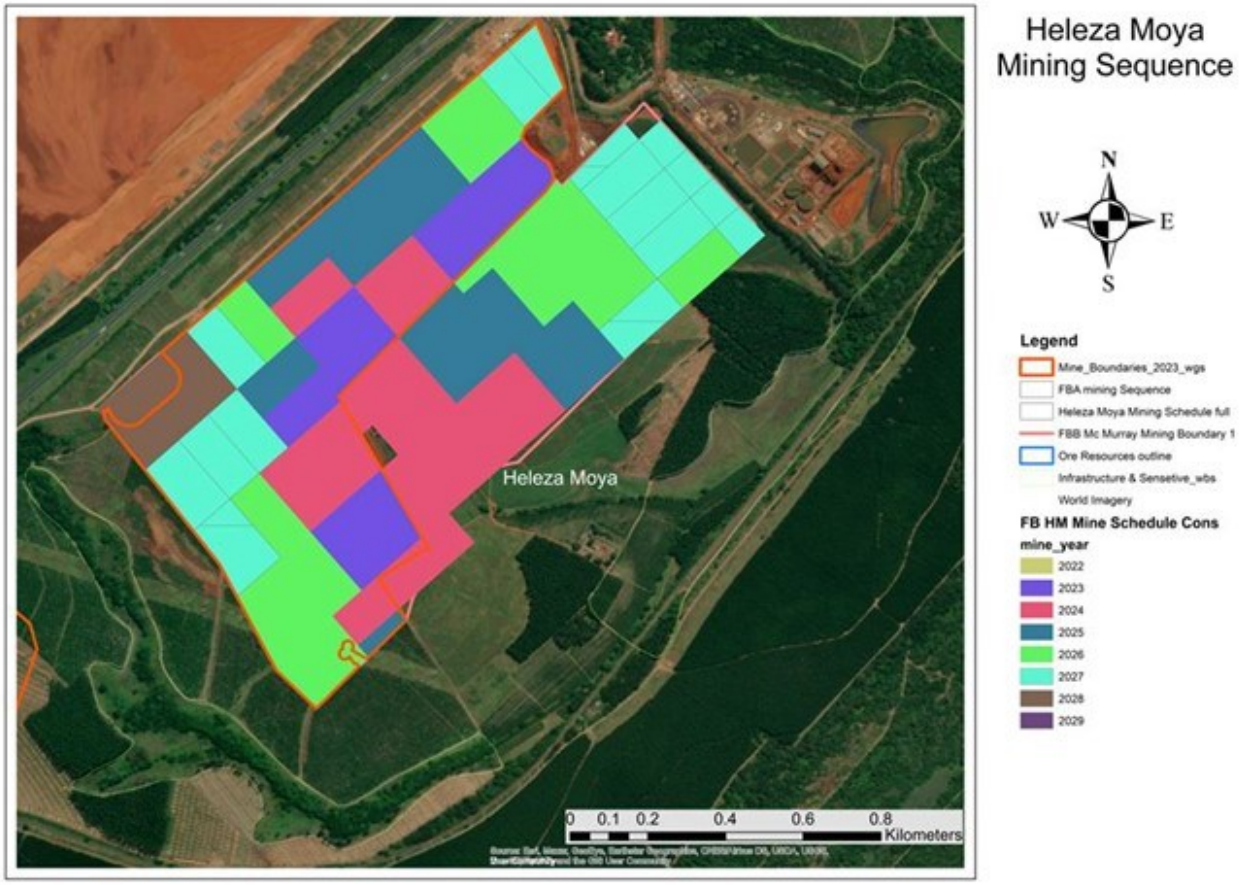


Figure 8-39 - Sequencing of mining at Heleza Moya and FBB

Land use	AREA (Km^2)					
	Amanzimnyama current	Amanzimnyama 2025-Scenario		Amanzimnyama 2027-Scenario		Amanzimnyama Closure
	Catchment P+O	Catchment O	Catchment P	Catchment O	Catchment P	Catchment P+O
Total catchment area	2.595	1.111	1.484	1.111	1.484	2.595
Grasslands	0.062	0.001	0.060	0.001	0.049	0.030
Plantations	1.406	0.429	0.937	0.469	0.922	1.916
Forestry	0.045	-	0.045	-	0.045	0.045
Surgarcane	0.625	0.356	0.199	0.426	0.105	0.146
Infrastructure	0.036	0.021	0.014	0.021	0.014	0.036
Wetland	0.422	0.193	0.229	0.193	0.229	0.422
Stripped (10%) (mining)	-	0.011	-	-	0.012	-
Open Void (60%) (mining)	-	0.066	-	-	0.072	-
Backfilled (30%) (mining)	-	0.033	-	-	0.036	-

Figure 8-40 - Summary of Land-use Areas in Heleza Moya simulation (SRK, 2023)

Where a mining void exists during the 2025 or 2027 scenario, the model has been set up to neglect any runoff generated from the open void. The rain falling directly into the void is assumed to either report to the groundwater or be returned to the Valley Return Water Dam (VRWD). The open void is assumed to comprise 60% of the area designated for mining at the particular time. Further, an area of stripped vegetation, ahead of the mine void is assumed to comprise 10% of the designated mine area and an area of backfill assumed to comprise 30% of the mining limit for the year under simulation. The current land uses of either catchment O or P are reduced by the amount taken up by the mining area. The runoff results for each scenario are reported at the Amanzimnyama weir and for the Siyaya estuary to estimate the perturbations to the flow regimes effected by the Heleza Moya development. These results are presented in the form of flow exceedance plots, as shown in Figure 8-41 (Amanzimnyama weir) and Figure 8-42 (Siyaya Estuary).

The Amanzimnyama weir flow exceedance demonstrates a very slight reduction in the high and low flows during the 2025 scenario (mostly O catchment). The 2027 scenario flows are slightly increased compared to the 2025 scenario, while the closure flows are very close to the current runoff in the Amanzimnyama catchment over the entire flow regime. Over the range of flows, the 2025 discharges vary from 0.6% to 1.3% lower than current flows, while the 2027 scenario flows are similarly lower than current. The DWS observed flows lie below the 2025 simulated flow regime. However, the observed record is far shorter than the simulated and much of the high and very low flows are not observed. Nevertheless, the data are reassuring, since an improvement in flow regime is predicted for closure.

These flow regime reductions are repeated at the Siyaya weir, (Figure 8-42), but, due to the unimpacted Siyaya flows, the reductions are lower. Over the range of flows, the 2025 discharges vary from 0.6% to 0.7% lower than current flows, while the 2027 scenario flows are similarly lower than current, except at low flows, where the 2027 flows are some 6% lower than current.

The simulated closure flow regime is practically identical to the current flows, as assessed at the Amaminzimnyama weir and at the Siyaya estuary. The closure flows are marginally (1.6%) lower than current for flows for flows lower than the 80% exceedance flow, probably due to the deep infiltration assumed in the backfill. These low flows are deemed to improve with time.

Impact of these minor perturbations to the flow regime at the Siyaya estuary can only be assessed against recent estuary studies and regional DWS classifications. DWS is currently undertaking the

classification of significant water resources and determination of the resource quality objectives for water resources in the Usuthu and Mhlathuze catchments and these are due for completion in May 2024. The Basic Human Needs Reserve in the W13B quaternary (which includes the uMlalazi and Siyaya systems) is currently estimated at 0.099 Mm3/annum and projected at 0.115 Mm^3/annum in 2030. However, no water in the Manazimnyama and Siyaya rivers are used for drinking purposes.

Using previously developed flow and water quality criteria for current and closure scenarios, the impact on the estuary ecology have been assessed to be inconsequential (CRUZ Environmental, 2020; Anchor Environmental, 2023) and the minor perturbations to the flow regimes due to the Heleza Moya mining are unlikely to affect this assessment.

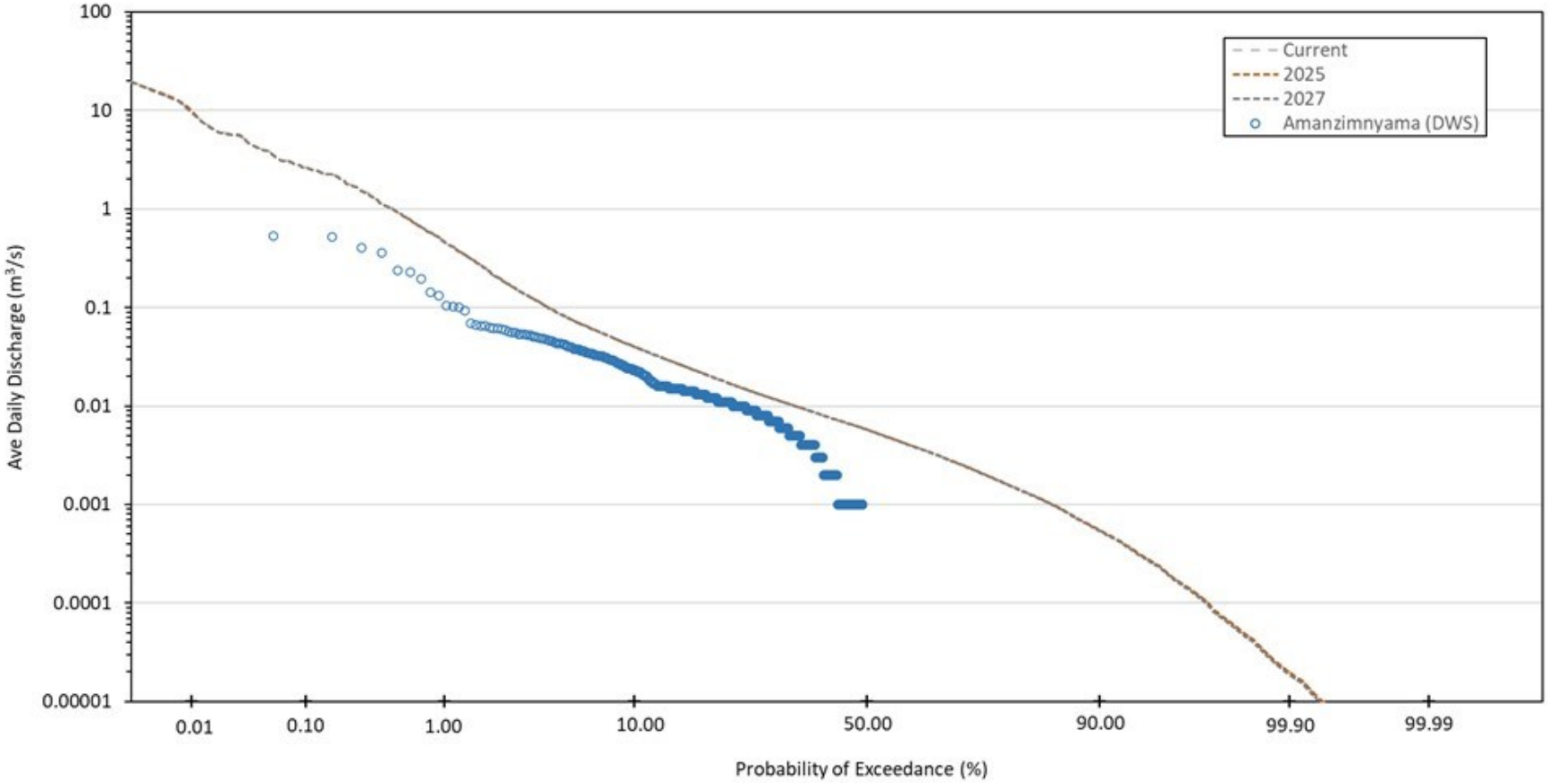


Figure 8-41 - Flow exceedance at the Amanzamnyama weir for selected simulated scenarios and the DWS observed flows

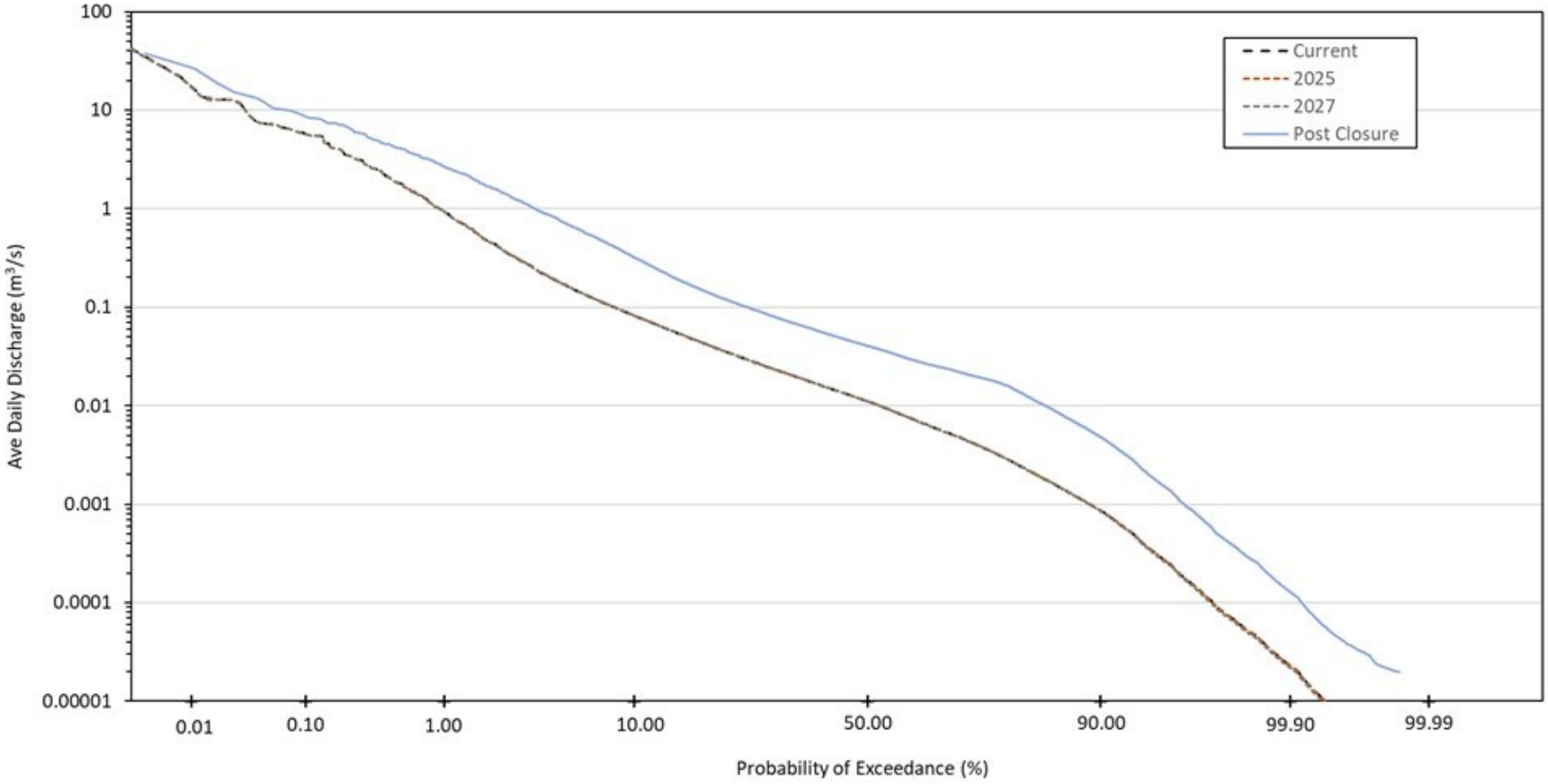


Figure 8-42 - Flow exceedance at the Siyaya Estuary for selected simulated scenarios and closure (closure flows from SRK 2021, Scenario 5)

8.8.6 SURFACE WATER MONITORING

The gauging structures at the Amanzimnyama and Siyaya rivers have provided reasonable data, when properly maintained in the past (SRK discussions with DWS). To refine the understanding of surface water and groundwater interactions in the catchment, it is recommended that observations at these gauges be continued. It is advised that:

- The Siyaya and Amanzimnyama weirs have been surveyed in order to establish discharges during over-topping of the rectangular weirs. The resultant overtopping estimates have been concluded and added value to the record. However, since August 2013, the water level observations at the Siyaya weir have been deemed faulty.
- An independent pressure transducer logger could be established upstream of the weirs to provide an automated depth of flow measurement to estimate low flows which do not result in discharge through the weir (to be included with further discussion with DWS).
- Samples of rainfall, stream flow at the gauges as well as near-surface water and groundwater in the catchment be collected and analysed for stable isotopes of water (2H and 18O) and selected cations and anions in the UKZN Soil and Water laboratory. A time series of isotope samples will allow for distinction of groundwater (baseflow), interflow and event water contributions to the streamflow. This will enable an accurate representation of the surface water and groundwater interactions to be derived and simulated. This understanding will improve the prediction of the water balance and identification of ecologically sensitive areas during mining.

8.8.7 CONCLUSION

A comprehensive upgrade of the flow record has been achieved to include observed (DWS) and manually measured flows in the Amanzimnyama and Siyaya catchments.

During this focus on the Heleza Moya mining development, the ACRU model has been updated to include a system of cascading hillslope responses to allow build-up of subsurface water in riparian and wetland zones, and thus increase evapotranspiration in these areas. Simulations of runoff for recent periods in the Siyaya and Amanzimnyama catchments are accurate, compared to the revised observed runoff at the gauge stations (W1H019 and W1H018). Using the model settings and the land use distribution for proposed mining at Heleza Moya and post mining scenarios, a long- term record of daily average flows was generated for the Amanzimnyama weir and the Siyaya Estuary.

Surface runoff is insignificant reduced at the Amanzimnyama weir and at the estuary during mining at Heleza Moya, and closure scenario simulations reflect a return to an improved flow regime at the Siyaya estuary.

No human drinking water occurs in the Amanzimnyama or Siyaya systems and any perturbations to the reserve (anticipated to be established in April/May 2024), caused by the Heleza Moya mining, are considered inconsequential in either of these systems.

The surface water model development will continue in future years, particularly with respect to compatibility with the groundwater simulations and anticipated rehabilitation of soils and land use conditions.

8.9 GROUNDWATER

8.9.1 HYDROCENSUS

In 2010 a hydrocensus was undertaken for Fairbreeze Mine, together with test pumping (SRK, 423506), and this was then supplemented with an expansion of the hydrocensus in 2017. The hydrocensus carried out identified groundwater users within and surround the mining activities. A summary of the hydrocensus results given in Table 8-11 includes historical census data. Groundwater in the area is abstracted from boreholes for domestic and irrigation purposes from the deeper aquifer, though details of their yields are limited. However, no large-scale abstraction is taking place. The locations of the boreholes visited during the hydrocensus are shown in Figure 8-43. .

Table 8-11 - Summary of Hydrocensus results (2010 and 2017)

No	Owners Name	Date	Site Name	Rest Water Level	Borehole Depth	Latitude Longitude	Latitude Longitude	Notes/Comments
PIEZOMETERS								
1	Exxaro	29/09/2010	FP0029		8	28.98903	31.73093	May be blocked
2	Exxaro	29/09/2010	FP0034		8.9	28.99324	31.72639	May be blocked
3	Exxaro	29/09/2010	FP0031		15.3	28.98811	31.72886	No water
4	Exxaro	29/09/2010	FP0023		0.64	28.98276	31.7334	Blocked
5	Exxaro	29/09/2010	FP0015		25.55	28.98622	31.7285	No water
6	Exxaro	29/09/2010	FP0005	14.9	23.2	28.98365	31.71688	Only able to check one
7	Exxaro	29/09/2010	FP0017			28.97704	31.7345	Could not Find
8	Exxaro	29/09/2010	FP0018			28.98007	31.729	Could not Find
9	Exxaro	29/09/2010	FP0012			28.98503	31.72419	Blocked
10	Exxaro	29/09/2010	FP0020			28.98047	31.73191	Blocked
11	Exxaro	29/09/2010	FP0021			28.98231	31.73361	Could not Find
SRK BOREHOLES (Drilled in 2005)								

No	Owners Name	Date	Site Name	Rest Water Level	Borehole Depth	Latitude Longitude	Latitude Longitude	Notes/Comments
1	Exxaro	29/09/2010	FRBD 1			28.99524	31.67993	Could not find
2	Exxaro	29/09/2010	FRBD 2	4.65	51	28.99026	31.68002	
3	Exxaro	29/09/2010	FBRD 3	4.5	50.24	28.99416	31.68751	
4	Exxaro	29/09/2010	FBRD 4			28.99955	31.69287	Could not find
5	Exxaro	29/09/2010	FBRD 5	11.9	23	28.98769	31.69435	
6	Exxaro	29/09/2010	FBRD 6	Dry	22	28.98707	31.70679	
7	Exxaro	29/09/2010	FBRD 7	7.35	51.4	28.9791	31.69484	
8	Exxaro	29/09/2010	FRBD 8	4.7	48.9	28.98577	31.6812	
9	Exxaro	29/09/2010	FBRD 9	5.8	53.4	28.98213	31.71495	
10	Exxaro	29/09/2010	FBRD 10			28.97633	31.70421	Could not find
11	Exxaro	29/09/2010	FBRD 11	15.9	52.6	28.9829	31.71386	
12	Exxaro	29/09/2010	FBRD 12			28.97479	31.7167	Could not find
13	Exxaro	29/09/2010	FBRD 13	16.9	51.1	28.97185	31.70887	
2010 CENSUS BOREHOLES								

No	Owners Name	Date	Site Name	Rest Water Level	Borehole Depth	Latitude Longitude	Latitude Longitude	Notes/Comments
1	Mondi	29/09/2010	Fairbreeze	12.35	35.3	28.98216	31.70848	Use- drinking, bathing and for watering school garden.
2	Exxaro	29/09/2010	Siyayi	25.37	82.6	28.96307	31.74237	Casing only, not in used
3	Jonathan	29/09/2010	Twinstreams 1	15	23	28.98475	31.73341	Irrigation. 15kW pump
4	Jonathan	29/09/2010	Twinstreams 2	19.3	>100	28.9859	31.73268	Use - drinking, bathing and cleaning
5	Steve Untiedit	29/09/2010	Twinstreams 3	8.01	57	28.98121	31.73711	Use- drinking, bathing and cleaning
6	Exxaro	29/09/2010	Siyayi 2	21.25	76	28.97013	31.74092	Use - drinking, bathing and cleaning
7	Gabey Maitre	29/09/2010	Grand Pre 10072 (2831DC00335)	30	61.6	28.99372	31.65858	Use - drinking, bathing, cleaning and irrigation
8	Gabey Maitre	29/09/2010	Grand Pre 10072			28.99372	31.65858	Use- irrigation, approx. 15 meters away from 2831DC00335

No	Owners Name	Date	Site Name	Rest Water Level	Borehole Depth	Latitude Longitude	Latitude Longitude	Notes/Comments
9	Exxaro	29/09/2010	Emoyeni 87 10344 GED Pennywern			29.0086	31.68305	This borehole is not in use anymore, borehole sealed
10	Mike Cramer	30/09/2010	Belkom Farm	26.9	53.2	28.9409	31.75815	Could not get a sample owner was not available
11	Mondi	30/09/2010	Emoyeni	26.85	50.4	29.01639	31.67751	Mondi Borehole not working
12	Mondi	30/09/2010	Umlalazi Fairbreeze	30.85	60.4	29.03272	31.65861	Mondi Borehole used for drinking, bathing and cleaning
2017 CENSUS BOREHOLES								
	Phumula Farm	01/10/2017	PHML1			28.97161	31.68653	Borehole pump not working
	Phumula Farm	01/10/2017	PHML2			28.96967	31.68042	No longer in use
	Phumula Farm	01/10/2017	PHML3			28.96978	31.68042	Use - for domestic purposes
	Phumula Farm	01/10/2017	PHML4			28.97272	31.6806	Use - watering Peanut farm
	Everbird Farn	01/10/2017	EVRD5			28.97092	31.67963	Use - for domestic purposes

No	Owners Name	Date	Site Name	Rest Water Level	Borehole Depth	Latitude Longitude	Latitude Longitude	Notes/Comments
	Amasundu Farm	01/10/2017	AMSD6			28.95878	31.67409	Use - for domestic purposes
	Ngoye View	01/10/2017	NGYVW7			28.93698	31.70911	Use - for domestic purposes
	Ngoye View	01/10/2017	NGYVW8			28.95555	31.71103	Use - for domestic purposes
	Ouessant Farm	01/10/2017	OUSNT9			28.96067	31.72866	Use - for domestic purposes
	Ouessant Farm	01/10/2017	OUSNT10			28.95614	31.73038	Use - for domestic purposes
	Ouessant Farm	01/10/2017	OUSNT11			28.95491	31.72788	Use - for domestic purposes
	Goodman Farm	01/10/2017	GDMNF12			28.93083	31.67935	Use - for domestic purposes
	Goodman Farm	01/10/2017	GDMNF13			28.94799	31.6792	Use - for domestic purposes
	Destimed Haven Farm	01/10/2017	DTHVN14			28.95372	31.69445	Use - for domestic purposes
	Destimed Haven Farm	01/10/2017	DTHVN15			28.94971	31.69424	Use - for domestic purposes

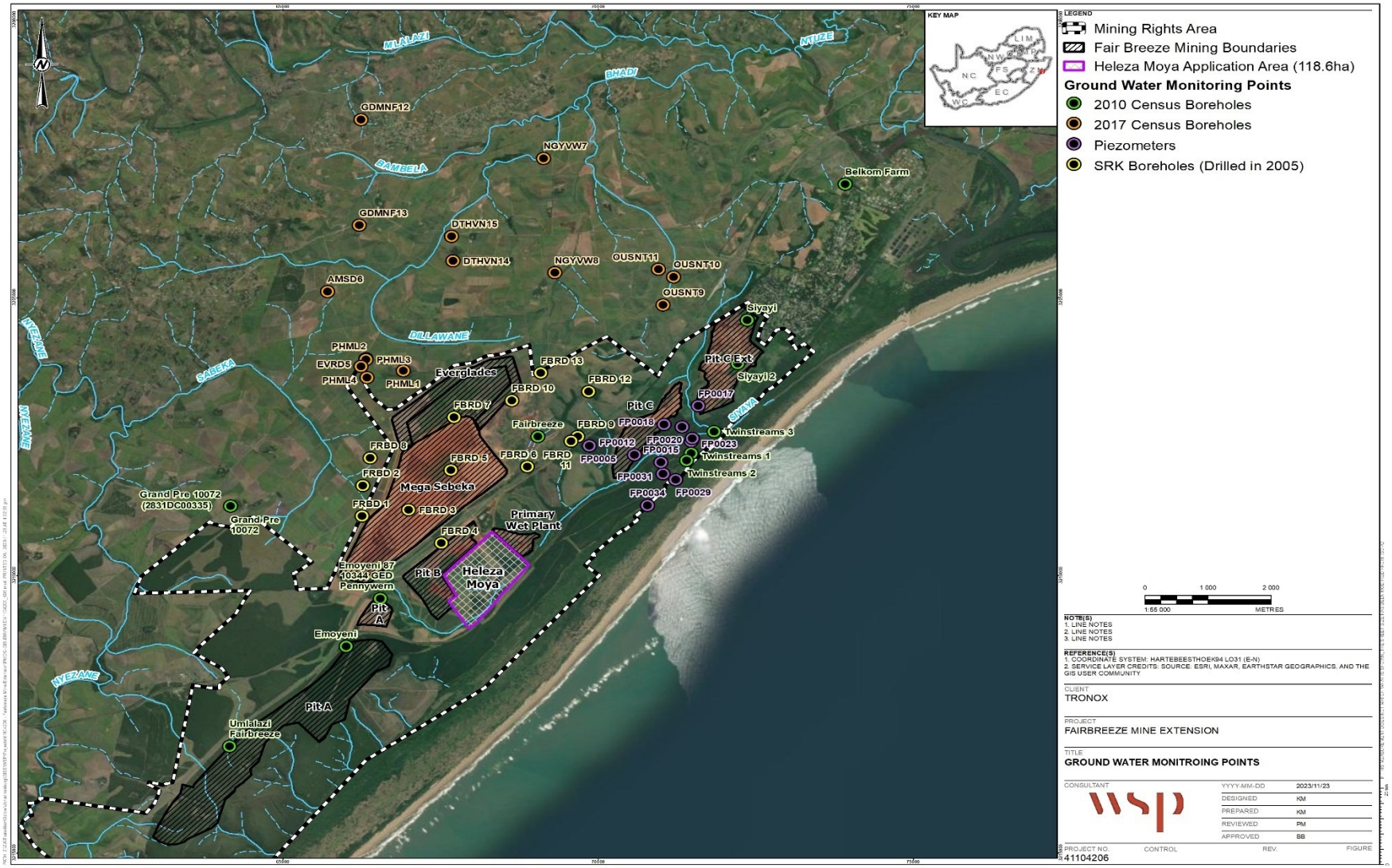


Figure 8-43 - Hydrocensus and monitoring boreholes at Fairbreeze Mine

8.9.2 GROUNDWATER QUALITY

Regular, quarterly, monitoring of surface and groundwater has taken place since 2013, when mining began. The groundwater monitoring results provide a general overview of water quality. The average concentrations of a groundwater sample point for the various monitored parameters were calculated and compared to the domestic water quality guideline values. The average groundwater quality is generally within the guideline values as illustrated by selected ions in Figure 8-44 to Figure 8-48.

The following exceptions are noted:

- Boreholes - Bonakala 1 and TEC have elevated concentrations of chloride and sodium. All other sample points have less than 200 mg/l chloride and sodium. The Na and Cl levels at Bonakala 2 has remained fairly constant since 2020.
- The borehole TEC continues to have elevated concentrations of sulphate in comparison to the other monitoring boreholes.
- The average Electrical Conductivity (EC) has remained below the SANS 241:2015 guideline limits. The Bonokala and TEC boreholes historically have elevated levels relative to the other sampling points and at the guideline limit for drinking water. The elevate levels are natural and unlikely to be related to mining.
- Average pH is generally between 6 and 9 in all monitoring boreholes.

The seepage observed from the VRWD has no significant impact on the water quality at monitoring boreholes FBRD9 and 13 and similarly there is no significant impact on water quality at FBMW6.

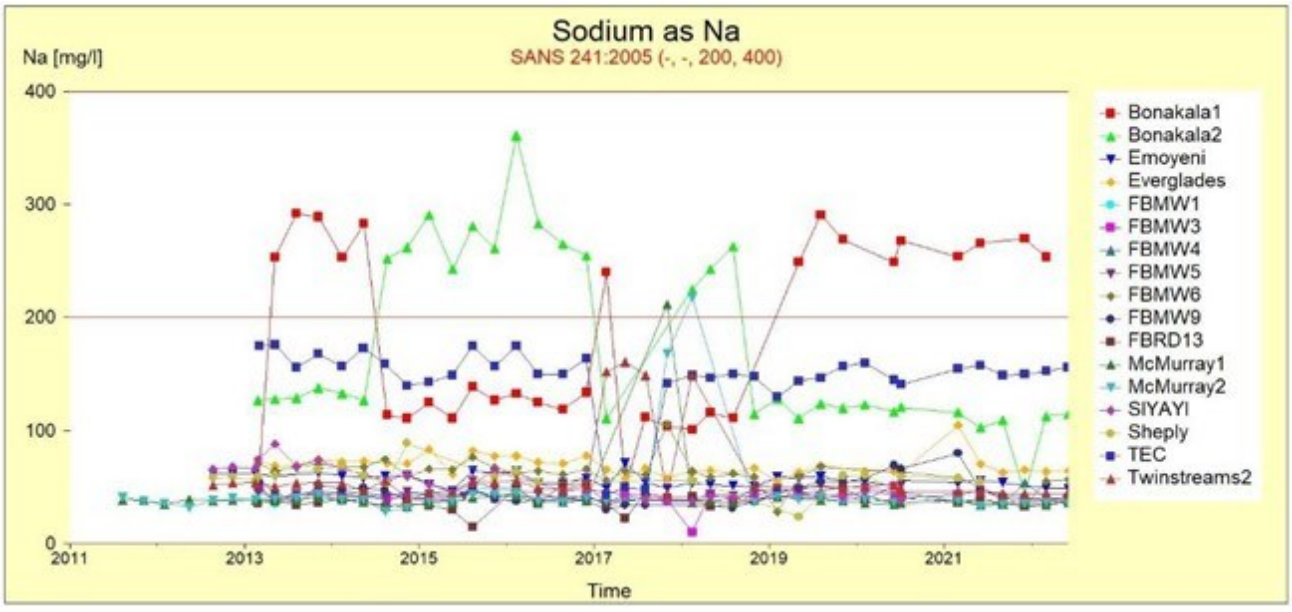


Figure 8-44 - Sodium Concentrations at Monitoring Boreholes

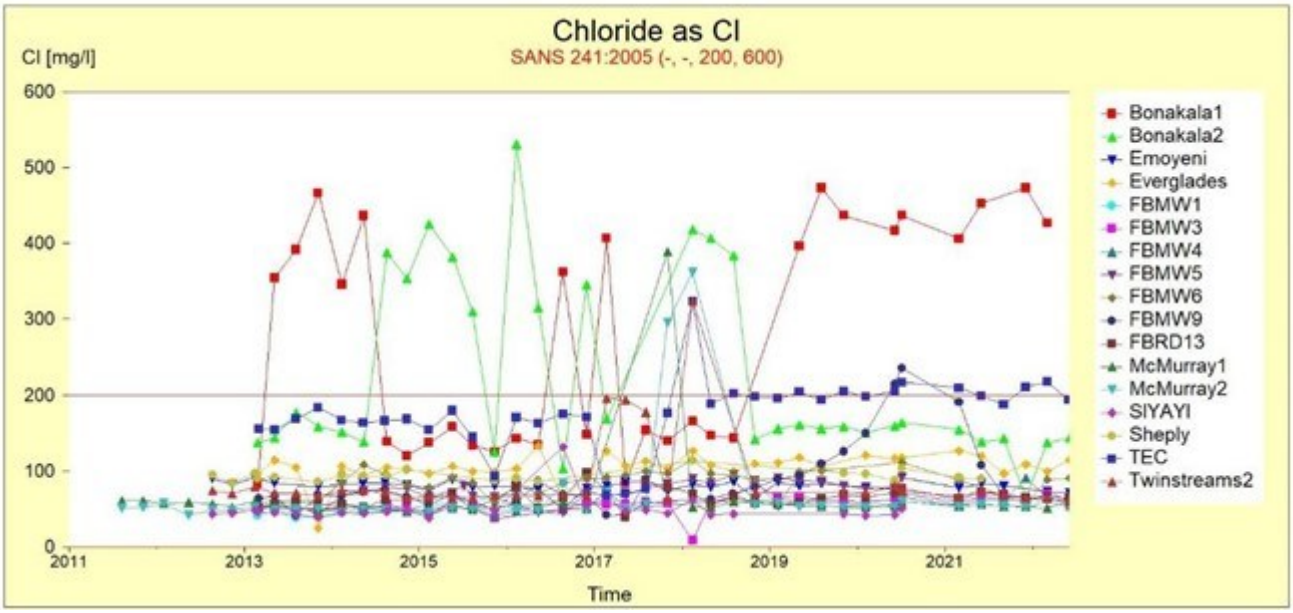


Figure 8-45 - Chloride Concentrations at Monitoring Boreholes

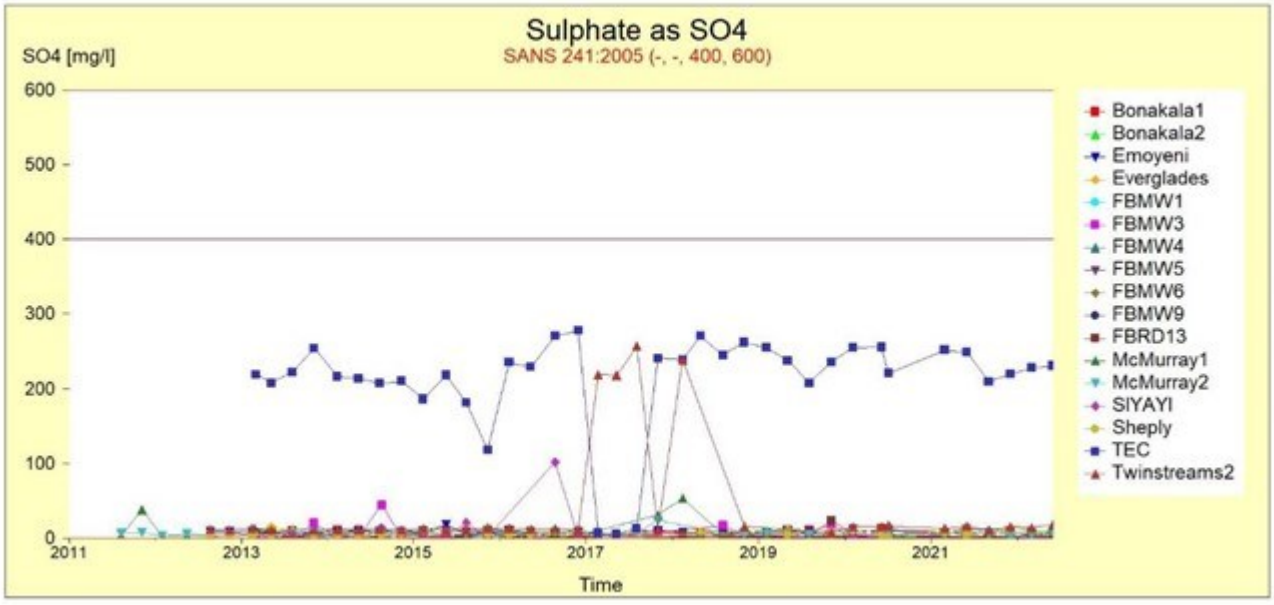


Figure 8-46 - Sulphate Concentrations at Monitoring Boreholes

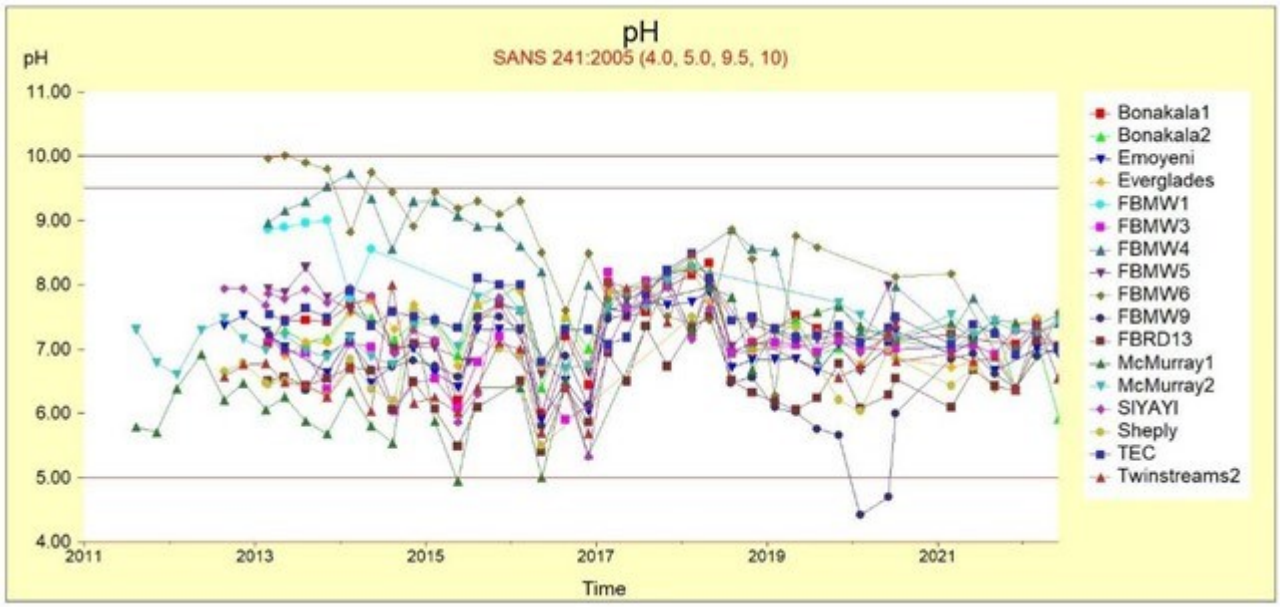


Figure 8-47 - pH at Monitoring Boreholes

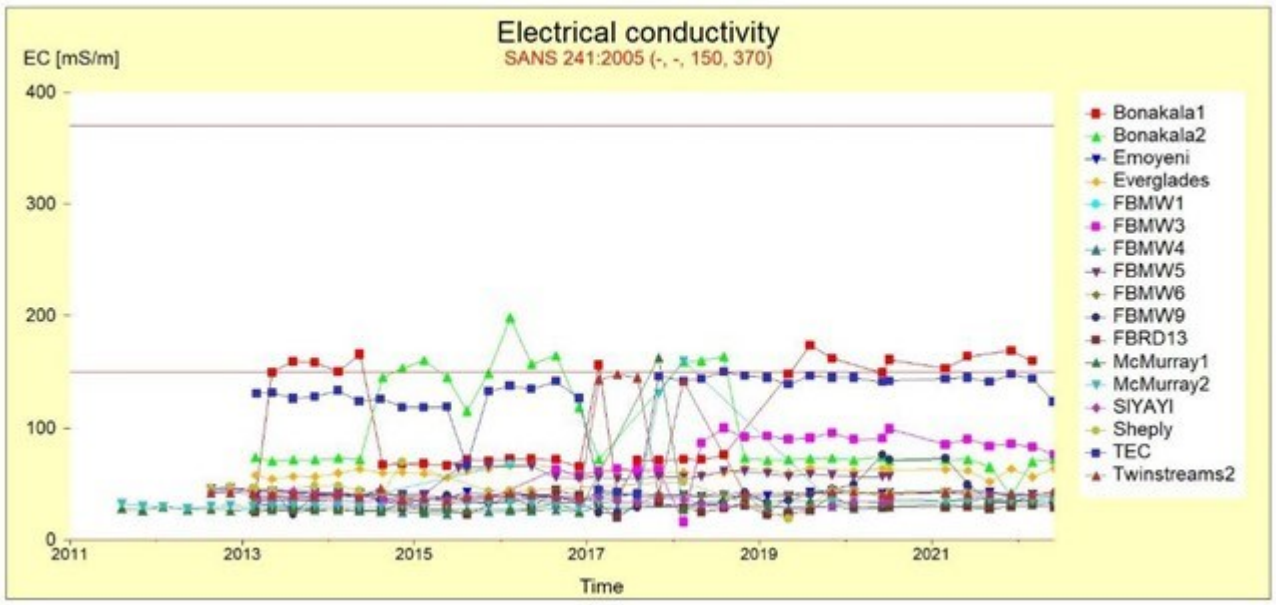


Figure 8-48 - Electrical Conductivity at Monitoring Boreholes

8.9.3 GROUNDWATER HYDROLOGY

8.9.3.1 Numerical Groundwater Model

A three-dimensional, numerical groundwater flow model was constructed during 2011 using the finite element code MINEDW (Azrag et al., 1998) to simulate the effects on groundwater during mining.

The reports completed for the construction of the model as well as subsequent updates are as follows:

- A detail description of the numerical model setup - SRK hydrogeological report for the 2011 EIA (SRK, 423506);

- Re-calibration of numerical model using most recent water level monitoring data in 2014 (SRK, February 2015); and
- The numerical groundwater model calibration was checked and updated annually since 2016 using the most recent groundwater level monitoring data and estimates of measured baseflows in the Siyaya and Amanzimnyama Streams.

During the annual update the model was refined and principally the boundary conditions that define the streams within the catchment and land-use based recharge rates were refined using the latest topographical survey, rainfall data and ACRU model results. Faults, as mapped by geophysical survey and regional mapping, were included as preferential flow pathways.

The latest FBB and Heleza Moya (HM) annual mine plans and a backfill strategy was included in the predictive simulation, which covered the period from 2023 to 2030. The Hydrus model RSFs seepage rates were applied to the MINEDW model. The numerical model domain boundary conditions and hydraulic parameters were left unchanged from the original model.

8.9.3.2 Hydrologic Study Area and Boundary Conditions

The Fairbreeze mining area is drained by a number of streams both ephemeral and non-perennial that flow into the Mlalazi River to the north, the Matigulu River to the south or directly to the ocean. To the west the land surface rises to form a ridge which is assumed to correspond to the groundwater divide. These physical boundaries were used to define the Hydrological Study Area.

All selected rivers including the Siyaya and Amanzinyama River within the Hydrological Study Area were simulated as drainnode boundaries within the first model layer, with the specified heads varying along the river course. Gaining streams are thus simulated when the groundwater heads are higher than the stream stage.

For predictive simulation, a variable-flux boundary condition which allows flow across the model boundary was applied. The variable-flux boundary condition that is incorporated into MINEDW uses a linked analytical solution to simulate infinite continuity of the hydrogeologic units at the boundary. The same hydraulic properties of the units at the boundary are assigned to the analytical “extension” of the units. The variable-flux boundary condition calculates the flows across the boundaries as a function of the calculated changes in groundwater levels (heads) at the boundaries.

The ocean was assigned a fixed head of zero. The upper boundary of the model is the phreatic surface, which is calculated by the model during both steady-state and transient simulations.

8.9.3.3 Mesh

The finite-element grid of the Hydrological Study Area used for the Fairbreeze model is shown in map view in Figure 8-49. The mesh is more finely discretised in the vicinity of the pits, where the horizontal dimensions of the elements are about 30 to 60 m. The finer discretisation enables better numerical resolution where the hydraulic gradients are the greatest and also allows the geometry of the pits and surrounding hydrogeologic units to be represented at a reasonable level of detail. Heleza Moya is a new orebody and lies within a zone of coarser discretisation region and will be refined in future updates. The elements forming the mesh depict the top (or bottom) of triangular prisms, with the points at the corners of the prisms constituting the finite-element “nodes.” The model comprises 486 100 elements and has 270 380 nodes.

The mesh was divided into eleven layers vertically, each with an average thickness of 10 m. These layers represented the Quaternary sands, Maputuland Group, and bedrock. The Quaternary sands

were present only in the topmost layer of the model. It is assumed that the hydraulic conductivity decreases with depth, which is why the bedrock was divided into an upper and lower zone. The bottom of the model was set arbitrarily at -80m below sea level. The most recent FFB and HM pits exceed the assumed depth of the Maputuland Group in the model. Therefore, future updates will need to incorporate the revised geology.

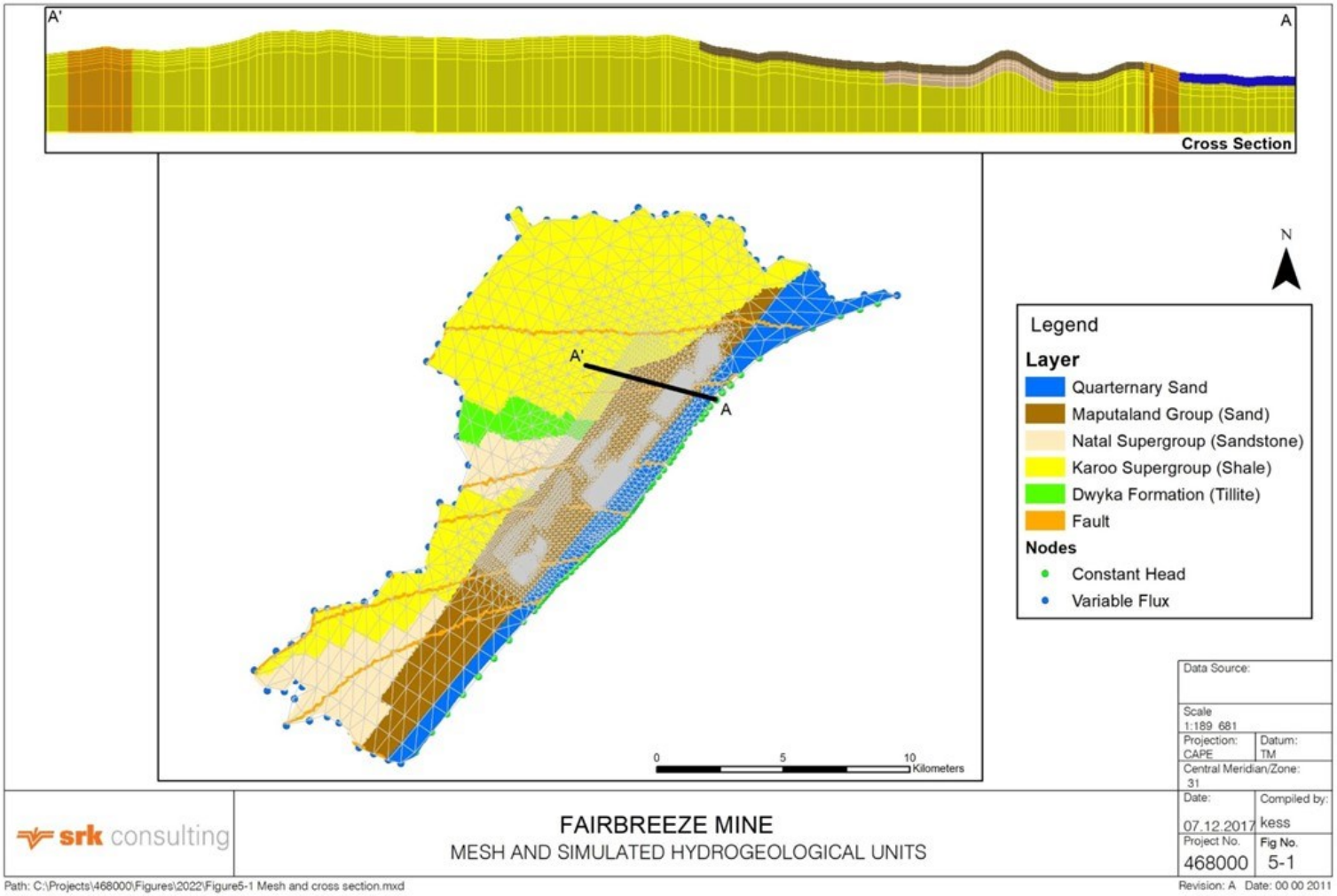


Figure 8-49 - Mesh and simulated hydrogeological units

Source: SRK (2023)

8.9.3.4 Model Parameterisation

Hydraulic Parameters

The geological units incorporated in the model are represented by individual layers and zones within the model mesh. The hydraulic parameters of importance in investigation groundwater flow are hydraulic conductivity, specific storage and specific yield. These parameters control the ease with which groundwater can move through the subsurface and how much water can be released from the system. This is important to estimate inflow if any into the mine voids, drawdown and pore pressure distribution. The hydraulic properties used in the model are summarised in Table 8-12.

Table 8-12 - Hydraulic Properties of Units Used in the Numerical Model

Unit	Hydraulic Conductivity K [m/day]		Storage Parameters	
	K_{xy}	K_z	Specific Storage Ss [m^{-1}]	Specific Yield S_y [-]
Sandstone (Upper Layer)	0.5	0.5	5×10^{-06}	0.005
Sandstone (Lower Layer)	0.4	0.4	5×10^{-06}	0.005
Tillite (Upper Layer)	0.3	0.3	5×10^{-06}	0.05
Tillite (Lower Layer)	0.25	0.25	5×10^{-06}	0.005
Shale (Upper Layer)	0.2	0.2	5×10^{-06}	0.05
Shale (Lower Layer)	0.17	0.17	5×10^{-06}	0.005
Maputaland Group Sands	10	10	5×10^{-06}	0.05
Quarternary Sands	20	20	5×10^{-06}	0.05
Faults	1	1	5×10^{-06}	0.005

Recharge

Rainfall recharge varies over the area due to varying rates of evapotranspiration from the natural vegetation, commercial forest and sugar cane plantations. Previous estimates put recharge at between 5% and 8% of rainfall (Rison, 2004) and a recharge model (Kelbe et. al., 2001) suggests that the maximum recharge from individual rainfall events is 50 mm with a threshold of 10 mm before recharge occurs. Recharge for the current model was varied according to land use shown in Figure 8-50 and assigned values as in Table 8-13.

These recharge factors were applied to the actual monthly precipitation for the period 2003 to 2022 and the average monthly precipitation values for predictive simulation. The recharge rates used allowed for the best calibration of the numerically simulated water levels to the observed water levels.

Table 8-13 - Recharge Percentage

Land Use	Percentage Recharge
Sugarcane	6%
Farmlands	6%
Forest	5%
Natural	7%
Urban	10%

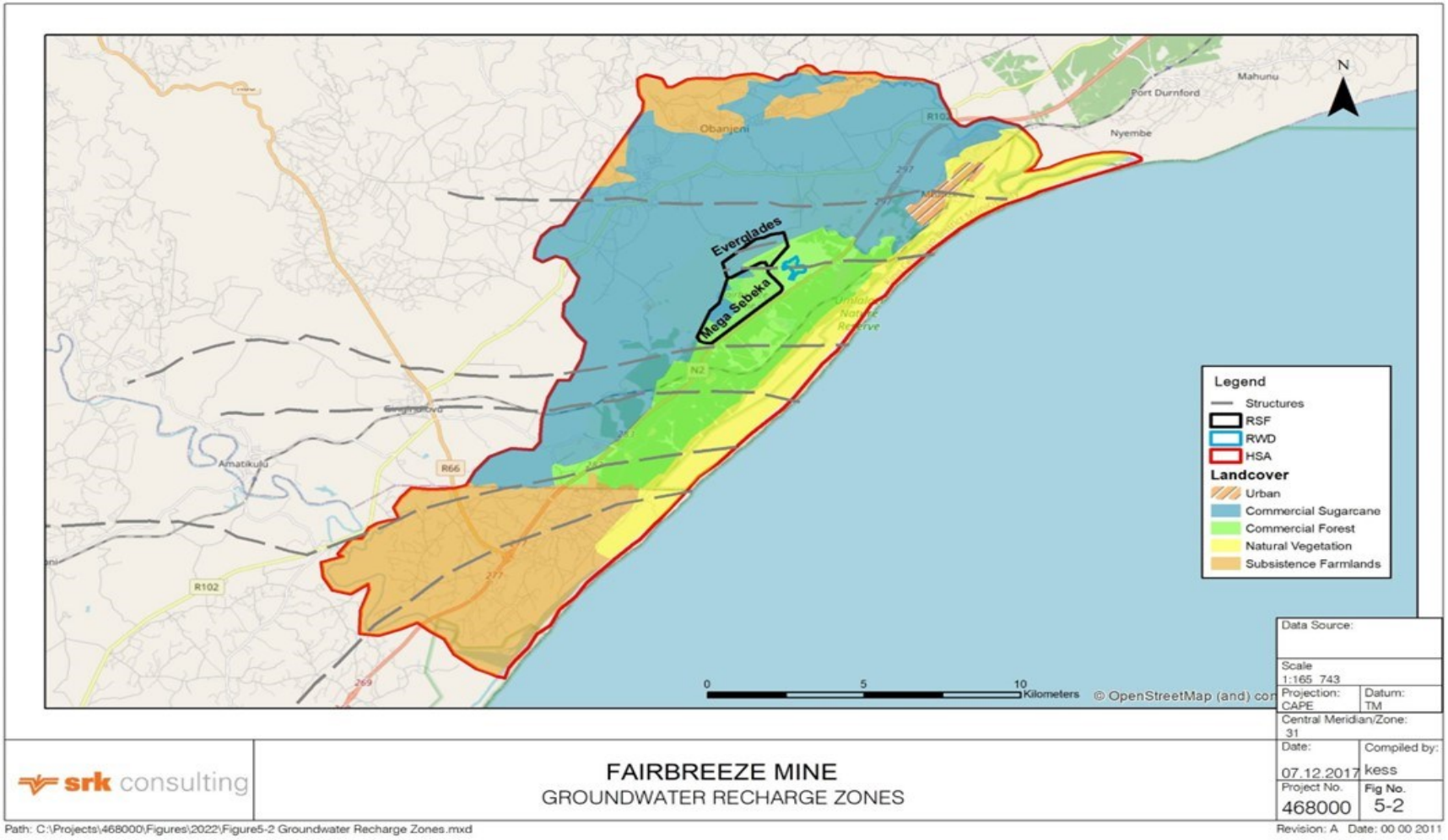


Figure 8-50 - Groundwater recharge zones

Source: SRK (2023)

8.9.3.5 Simulation of Residue Storage Facility

Based on the recent HYDRUS 2D model the percolation flux through the foundation RSF materials to the groundwater phreatic surface was calculated to be 0.36 mm/d. This seepage rate was applied over the entire footprint of the MSRSF.

8.9.3.6 Simulation of Mining and Rehabilitation

The annual, 2023 to 2030, configurations for the FBB and Heleza Moya mining voids were included in the model. The mine plans and actual mine voids as per the 2021 annual model update were left unchanged for FBC and FBC Ext.

The recharge applied to the mining voids, during the period of mining and the subsequent year, is 12% of the mean monthly precipitation. Backfilling of mining voids at FBC ext has begun. Backfilled areas will be grassed and as such, the recharge applied for the rehabilitated areas was assumed to be the same as that assigned to grasslands, that is 7% of the mean monthly precipitation.

8.9.4 PREDICTIVE SIMULATION OF MINING AND REHABILITATION

8.9.4.1 Groundwater at Mining Voids

Mining started in 2016 at FBC and both the FBC and FBC ext orebodies are mined out. Mining operations have recently commenced at FBB and HM pits, and they are expected to continue until 2030. The FBB and HM pits are predicted to extend to below the current water table, which ranges from 30 to 40 mamsl at present. Based on the model outcomes:

- Inflows into FBB will range from approximately 3 000 (35 L/s) to 2 500 m3/d (30 L/s) (Figure 8-51) at the end of mining in 2026. Steady increase in inflows at the HM pit will begin as FBB is backfilled, peaking at approximately 1 644 m3/d (19 L/s) in 2029.
- The inflow is due to the pit extending well below the water table. The amount of seepage into the pit will be dependent on actual rainfall. Inflow into HM may also be due to seepage from the backfilled FBB.
- Cross-sections through the FBB and HM orebodies showing the water table position relative to the void (Figure 8-52), illustrated that as the pits develop seepage is likely to occur along the up-gradient pitwalls and from the base of the pit. Seepage is predicted to begin seven months into mining.
- The drawdown associated with the mining will expand as the mine fully develops (Figure 8-53). The Shepley Farm borehole is outside the significant zone of drawdown of 3m, however monitoring of this borehole should continue.
- Just two years after rehabilitation (Figure 8-54), the water levels would be largely recovered to close to pre mining.

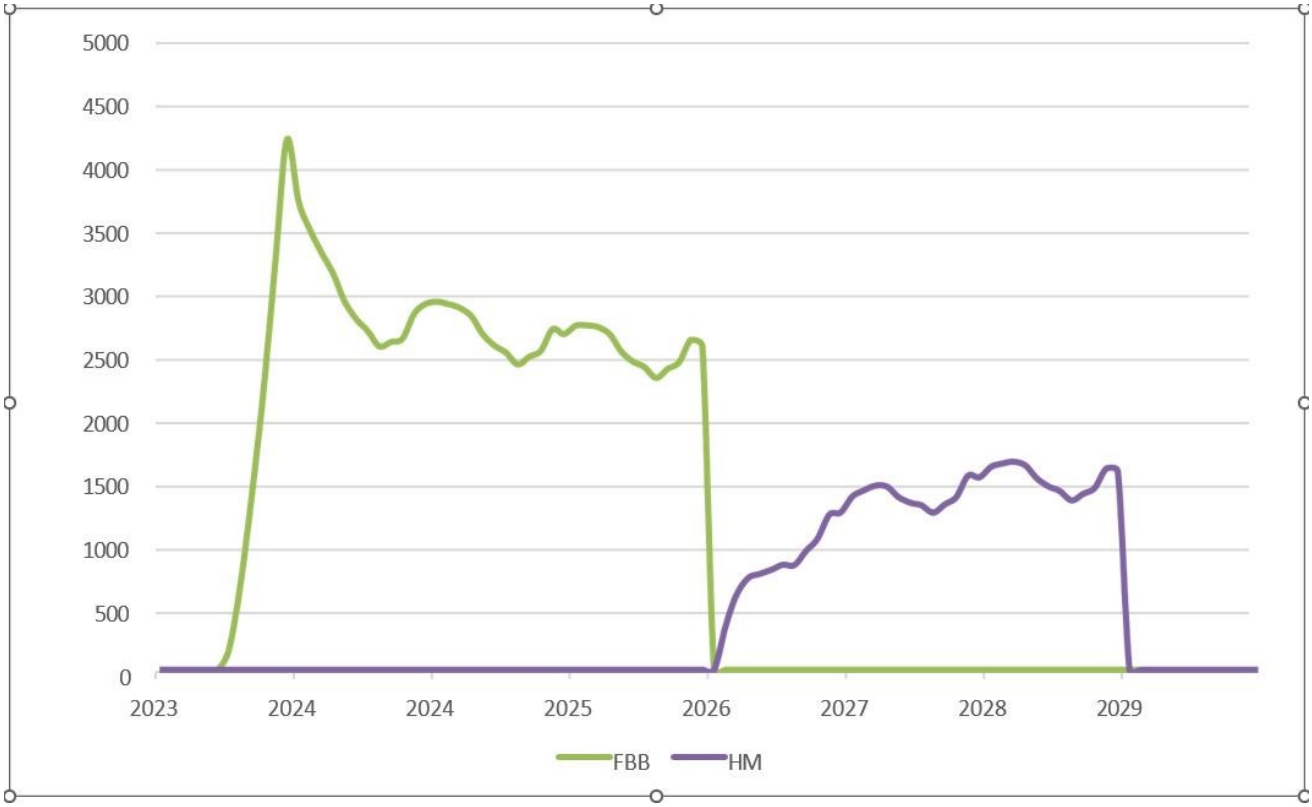


Figure 8-51 - Predicted Inflows into FBB and Heleza Moya (HM)

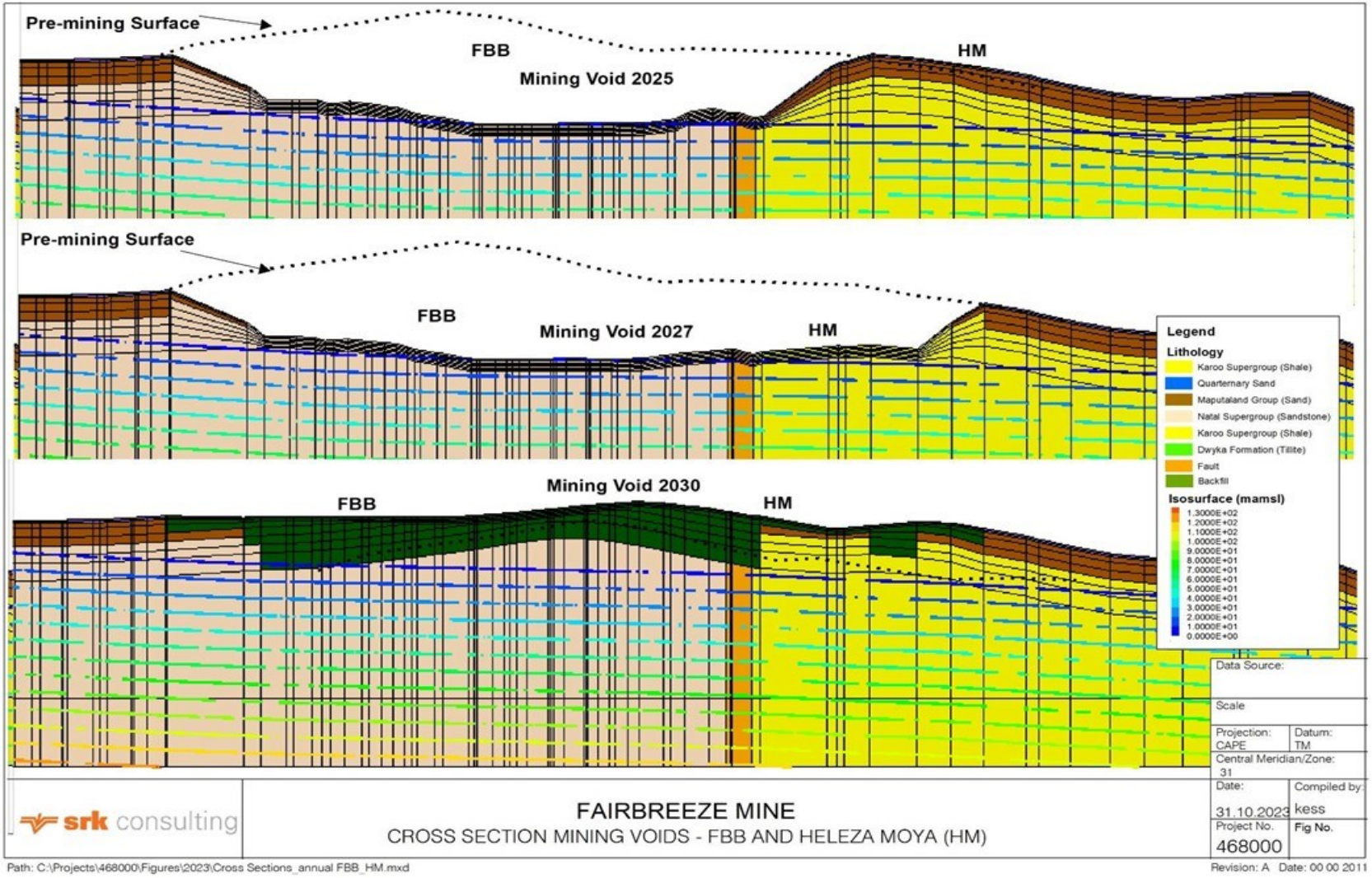


Figure 8-52 - Cross section mining voids - FBB and Heleza Moya (HM)

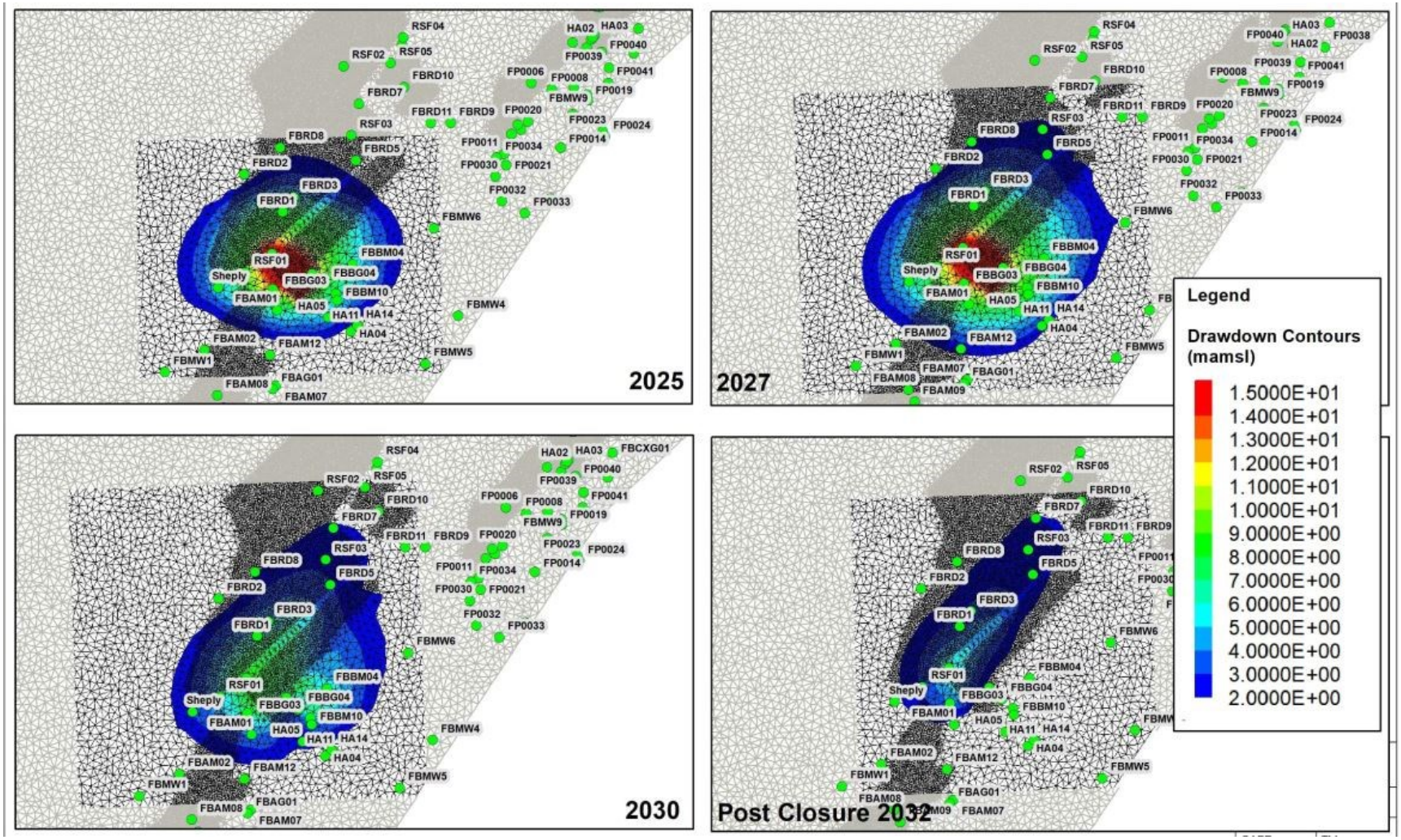


Figure 8-53 - Drawdown over LoM - FBB & Heleza Moya (HM)

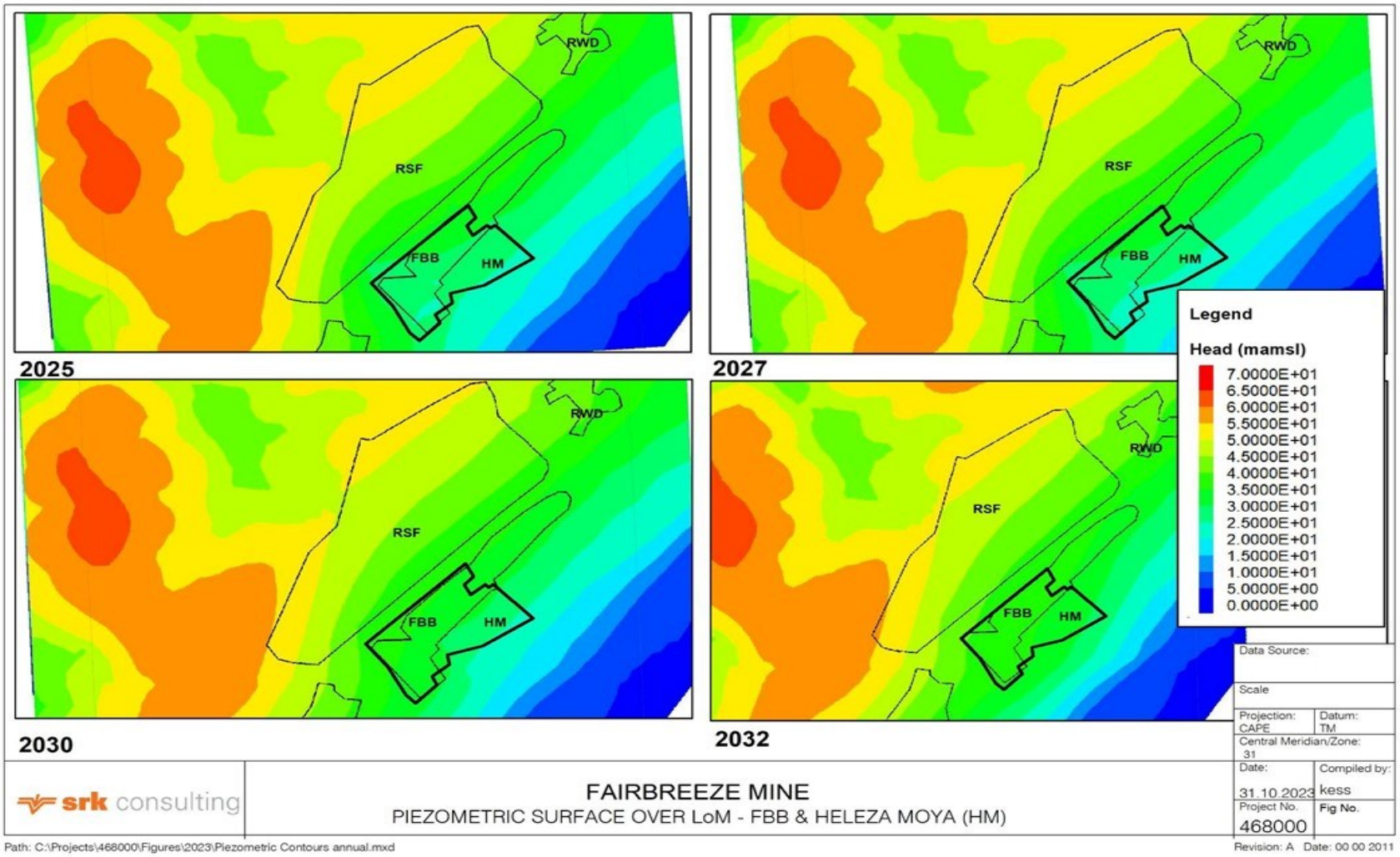


Figure 8-54 - Piezometric surface over LoM -FBB & Heleza Moya (HM).

8.9.4.2 *Groundwater at Mining Voids*

Recharge was assumed to be 12% of the mean monthly precipitation during mining and one subsequent year thereafter. During the rehabilitation phase and once grasslands are established the recharge is assumed to decrease to 7% of the mean monthly precipitation. Baseflow which will vary with seasonal rainfall (Figure 8-55) is predicted to change during mining as follows:

- Siyaya will remain low at less than 100 m^3/d, however not drying up totally. This is mainly due to higher recharged associated with the rehabilitated FBC and FBCext.
- Amanzimnyama will experience about a 25 m3/d decrease in baseflow during the mining of the FBB and HM orebodies. This is a relatively small decrease compared to the overall streamflow. It is noteworthy that the stream does not go dry i.e., there is always some baseflow under average rainfall conditions.
- Post mining baseflows will increase to approximately 120 m^3/d. The baseflow contributions will be proportionally to the recharge. Recharge over the rehabilitated area is assumed to be 7% of MAP, a 5% decrease from the mining period, hence the baseflow will re-establish as lower levels than during the mining period. The baseflow post rehabilitation is similar to the pre-mining simulated levels and corresponds with the hydrology analysis.

These estimates are based on best approximations of recharge and thus could change with improved recharge estimates. Low rainfall season will exacerbate the baseflow decreases and the converse will occur under higher rainfall seasons. Monitoring of the weir along these streams will be important to confirm decreases and if required initiate mitigation.

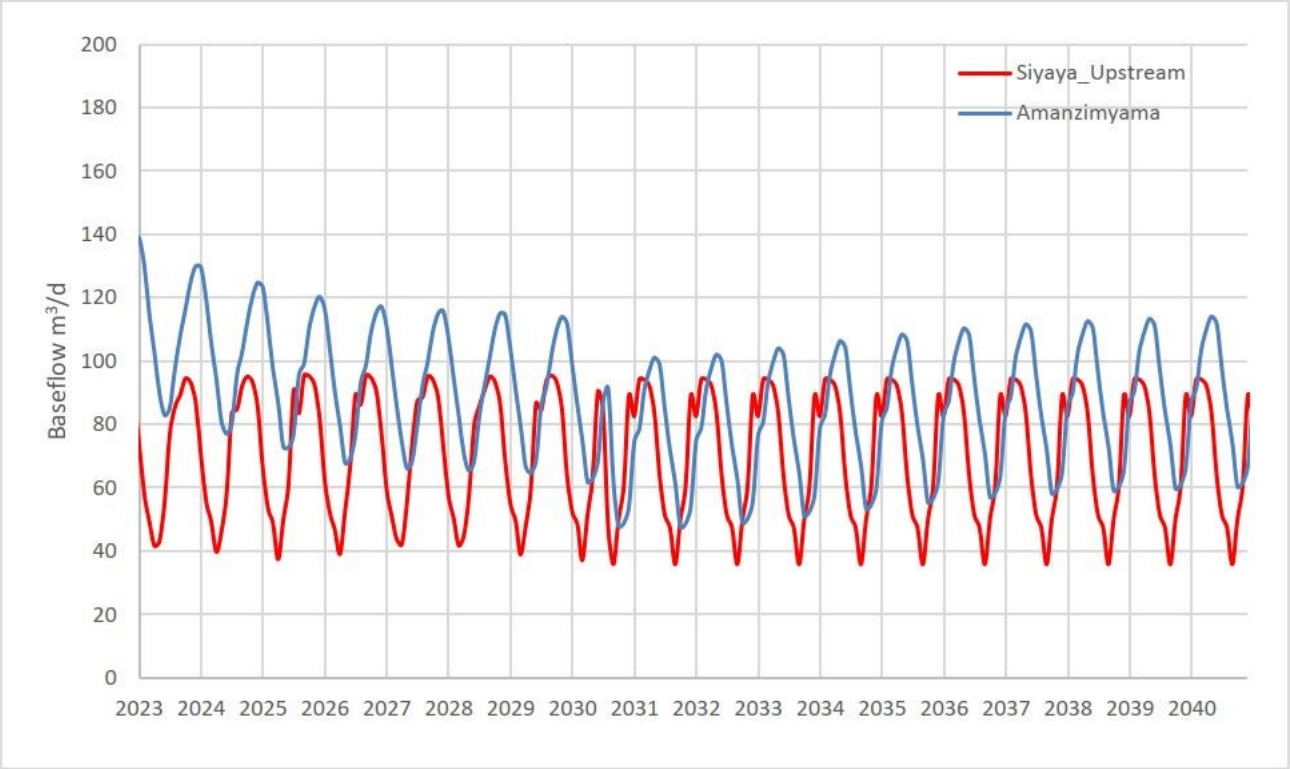


Figure 8-55 - Baseflow predictions into the Siyaya and Amanzimnyama River

8.9.5 GROUNDWATER MONITORING

8.9.5.1 Groundwater Level Monitoring

It is crucial to monitor water levels monthly, especially around the RSF and future mining area, ensuring good spatial and temporal coverage. Some piezometers located near the mining area are damaged, so it is necessary to protect the remaining ones that are situated outside of the mine. As several newer boreholes have been installed in recent years, a review and update of the monitoring program is required.

8.9.5.2 Groundwater Quality Monitoring

The program should continue on a quarterly basis so that any impacts form the mining can be detected and quantified. Given the Everglades RSF is in construction, seepage has occurred from various control dams and changes to mine plans were made, we recommend that a thorough review is done of the monitoring network and historical data. Dashboards to display and interpret data may also be useful.

8.9.6 CONCLUSION

- FBB and HM will extend to below the water table resulting in seepage and inflows into both pits. As FBB is backfilled seepage from there will report to HM. The inflows should be considered preliminary as the discretisation at HM is course and the model needs to be update with the latest lithological model. Inflows at FBB is anticipated to be 30 to 35 L/s and at HM at most 19 L/s.
- The inflows could be directed to the in-pit sump for use in mining operation or more active dewatering considered using in-pit trenches or ex-pit dewatering boreholes. However at this stage further investigation and confirmation of model simulations is required before selecting an appropriate approach.
- Dewatering at the pits will result is drawdown around the pits but, is unlikely to impact significantly on neighbouring water supply boreholes. The Shepley Farm borehole is outside the significant zone of drawdown of 3 m, however monitoring of this borehole should continue as it is located close to the simulated zone of drawdown.
- Baseflow to the Amanzimnyama could decline by approximately 25 m3/d during the period when FBB and HM will be mined. The reduction in the groundwater baseflow, is relatively small in comparison to stormflow.
- Post rehabilitation the baseflow and the water levels will recover. Baseflow contributions are expected to be c. 120 m^3/d post closure and will be a function of recharge rates dictated in part by the final land use.
- Seepage from the PCD at the PWP seems to be leaking and contributing to an increased in water level at FBMW6. No visible impact on the groundwater quality is noted and this is probably because the water quality within the PCD is of good quality and similar to the groundwater.

8.10 SURFACE AND GROUNDWATER INTERACTION

While the surface water and groundwater models are independent simulations, each includes processes used in the other. The surface water model includes a detailed water balance of the runoff, vegetation and soil water dynamics but also includes a crude estimate of the release of accumulated water from a groundwater storage volume, in the form of baseflow to a stream. The groundwater model, on the other hand, includes an estimate of recharge fluxes from the surface, but simulates the groundwater flows below the phreatic surface in detailed response to geological materials and

hydraulic gradients. The groundwater model also reports fluxes reaching a stream and these fluxes are also referred to as baseflow. Both models are corrected against observed data. In the case of the surface water model, simulated flows are compared to observed weir discharges, and in the case of the groundwater model, simulations are compared to observed groundwater levels in boreholes.

The lateral flow and groundwater processes in the Zululand coast have been the subject of much research (Kelbe and Germihuyse, 2010; Gundling *et al.*, 2014). These processes have been considered in the set-up of each model (Chapter 3). It is therefore worth comparing the baseflows simulated by each of the models, to provide further confidence in the accuracy and robustness of the simulations.

The results of this comparison are shown in Figure 8-56. The groundwater generated baseflow, for the most part, reflects the low flows of the surface water simulation. The correlation of these low flows is considered adequate, considering the significant differences in the two models.

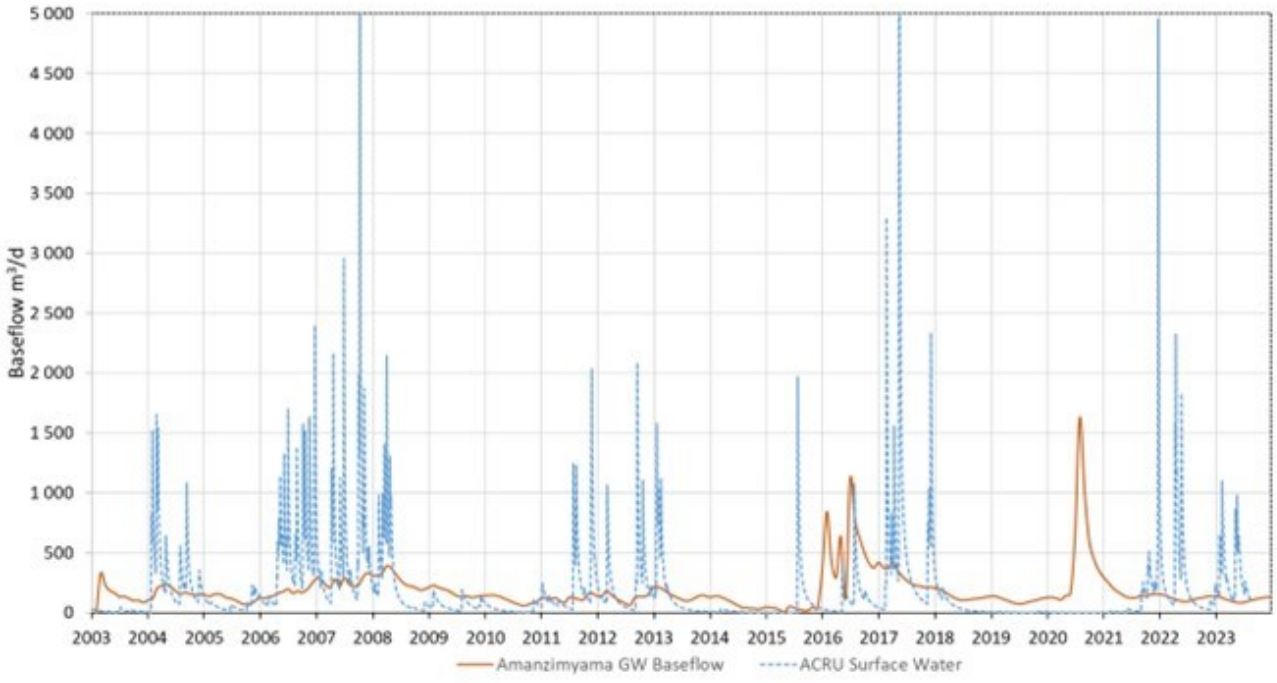


Figure 8-56 - Groundwater baseflows compared to surface water simulation (2003-2023)

8.11 ESTUARINE HEALTH

Anchor Environmental were appointed to express an opinion on the potential impact to the Siyaya Estuary as a result of the inclusion of Heleza Moya to the Fairbreeze mine. Refer to Appendix C12 for the Estuarine Compliance Statement.

The Siyaya Estuary (also known as Siaya, Siyani, Siyaní, Siyai) is a Small Temporarily Closed Estuary situated on the subtropical KwaZulu-Natal east coast within the provincially protected uMlalazi Nature Reserve. It is the northern-most estuary of this type along the KZN coastline and has in the past provided an important nursery function for estuary dependent marine species. The estuary is situated within the Natal Inshore Ecoregion, inshore of the uThukela Marine Protected Area (MPA), which provides protection to the important oceanographic area known as the Natal

Bight that is characterised by a gently sloping and relatively shallow sea floor that extends a considerable distance offshore.

The position of the proposed additional Heleza Moya mining area in relation to the Siyaya Estuary and the associated Siyaya estuarine functional zone as indicated in Figure 8-57. The head of the estuary is approximately 3 km downstream of the proposed additional mining area, which is located immediately north of a portion of the Amanzimnyama stream.

The Siyaya estuary has a relatively small catchment made up of the sub-catchments of the Siyaya and Amanzimnyama streams. These catchments have been extensively transformed through past land uses comprising predominantly sugar production and Eucalyptus plantations (1930s onwards) and more recently mining (last 10 years). In this small temporarily closed system, highly dependent upon rainfall within the catchment area and associated wetland releases, these changes have negatively affected estuarine health. This has been documented over the years from the first descriptions contained in Begg's (1978) survey on the state of the estuaries in KwaZulu-Natal which already raised concern that although a number of estuarine and benthic macro invertebrate and fish species were still utilising the system, the use of the system by many estuarine species had ceased. This was attributable to reduction in the frequency at which the mouth was connected to the ocean and shadowing of the estuary with increasing growth of Phragmities reeds.

Despite its inclusion in the uMlalazi Nature Reserve Protected Area (PA), the estuary has declined in ecological health from the 1970s through to now and is currently ranked as an "E" or "severely degraded" system. It is emphasised that smaller, sensitive estuaries tend to degrade to the lower health Categories (C to F) more rapidly than the larger, permanently open estuaries, which have a greater level of resilience and can generally maintain a boundary category if pressures are not increased.

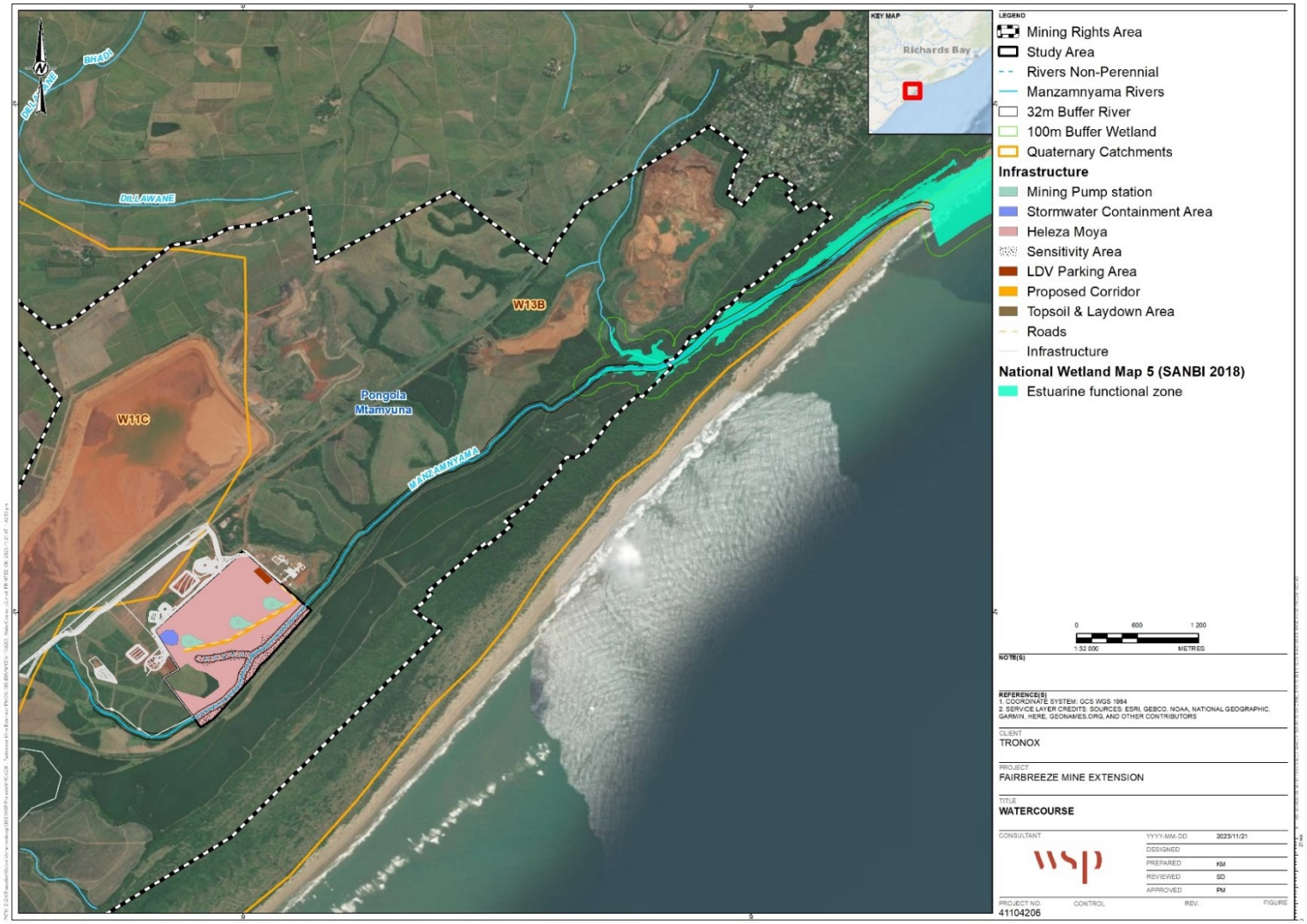


Figure 8-57 - Overview of the proposed Heleza Moya Expansion in relation to the Siyaya Estuarine Functional Zone (EFZ)

8.12 SOCIO-ECONOMIC

The Fairbreeze Mine extension project is within the King Cetshwayo District Municipality and uMlalazi Local Municipality.

8.12.1 KING CETSHWAYO DISTRICT MUNICIPALITY

The King Cetshwayo District Municipality (KCDM) had a population of 982 726 in 2019, this accounted for 8.6% of the province's total population. The number of households decreased from 225 798 in 2016 to 222 000 in 2019. The percentage of people living in poverty reduced from 73.76% in 2009 to 72.11% in 2019.

There were 87 4000 unemployed people in 2019, the district experiences an average annual increase of 3.91% in unemployed people. The district contributes 6.5% of the total estimated Gross Domestic Product (GDP) (2016). For basic services such as sanitation, KCDM has 33% of households with flushing toilets, 27% use chemical toilets, and 39% use pit latrines. The rest use ecological and bucket toilets (King Cetshwayo District, 2020).

8.12.2 UMLALAZI LOCAL MUNICIPALITY

uMlalazi Local Municipality (2217 km^2) has three main towns Eshowe, Mtunzini and Gingindlovu. A large proportion of the municipality is under traditional land use.

8.12.2.1 Population

The population in uMlalazi Local Municipality was 221 078 in 2001, which decreased to 213 601 in 2011 and later increased to 223 140 in 2016 (uMlalazi Local Municipality, 2023-2024). In 2019, the population was 222 000 and is estimated to grow to 304 280 by 2035. Table 1-1 provides demographic information from KCDM and uMlalazi Local Municipality in 2018. The average household size is the same in KCDM and uMlalazi Local Municipality whereas population density is 88% less in uMlalazi Local Municipality compared to KCDM. The house per square kilometre is less in uMlalazi Local Municipality by 5 units, KCDM has 27 households per square kilometre and uMlalazi Local Municipality has 22 (Isingo Projects, 2018-2023).

Table 8-14 - Population Trends (Isingo Projects, 2018-2023)

Geography	KCDM	uMlalazi Local Municipality
Average household size	5	5
Square Kilometre area	8213	2214
Population per square kilometre (density)	121	107
Household per square kilometre	27	22

8.12.2.2 Gender, age and ethnic groups

Females account for 54.5% of the uMlalazi Local Municipality population. The municipality has a predominately young population with 64.8% of people being under 30 years of age. Because of this, the youth of uMlalazi Local Municipality constitute an important factor to consider in long-term planning needs. Black people account for 97% of the population, followed by coloured people at

0.5%, indian or asian people at 0.6% and white people at 1.2%. Figure 8-58 shows the gender distribution graph for uMlalazi Local Municipality.

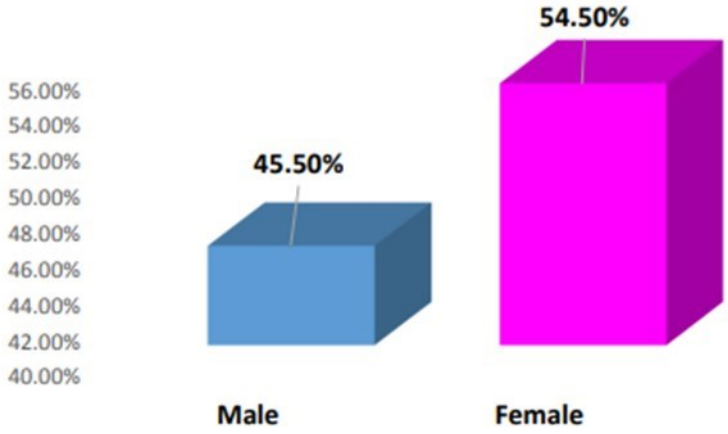


Figure 8-58 - Gender distribution in uMlalazi Local Municipality

8.12.2.3 Employment

Approximately 40% of the population is unemployed. The primary employment sectors are agriculture, forestry and fishing, which employ 25% of the labour force. Figure 8-59 shows the sectoral contribution to employment in uMlalazi Local Municipality. Wholesale/retail trade as well as in community and social services provided 24.9%, 18.4% and 18.1% of the jobs respectively in 2017. In 2016, 45% of the households in uMlalazi Local Municipality earned less than R1 600.00 per month uMlalazi Local Municipality, 2023-

2024).

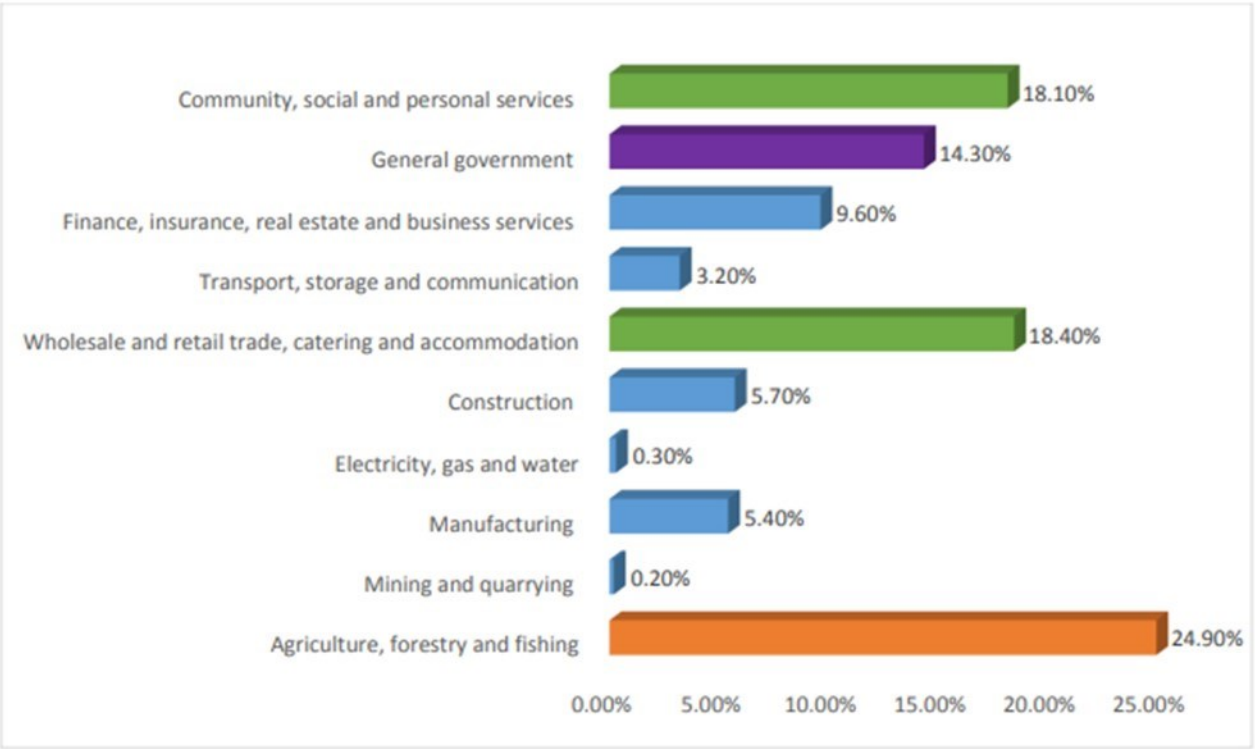


Figure 8-59 - Sectoral Contribution to Employment (uMlalazi Local Municipality, 2023-2024)

8.12.2.4 Economy

uMlalazi Local Municipality contributes 21.3% of the district's GDP. The primary economic activities in the district are manufacturing, transport, and agriculture, at 51.4%, 15.1% and 9.5% of GDP, respectively. Tourism was included in the remaining generators of GDP, and it is noted that this sector was relatively underdeveloped and represented a significant growth potential economic sector. The sectors that generate the most employment are agriculture, 12% of total employment, social services (9%) and manufacturing (5%) (uMlalazi Local Municipality, 2023-2024).

The King Cetshwayo District Municipality's Spatial Development Framework (SDF) (King Cetshwayo District Municipality, 2021) indicates that mining is an important sector within the municipality as it largely contributes to the municipality's economic growth. Furthermore, Tronox is named as one of the districts 'mining giants' and as a flagship mining company due to its scale of operation.

Fairbreeze Mine expansion is aligned to the vision of the municipality's IDP and the district's SDF. The expansion will also secure continued feed to the Central Processing Plant (CPC) in Empangeni for the next two years and allow for the continued supply of customers (Tronox KZN Sands, 2023-2027).

8.12.2.5 Basic services

For essential services such as sanitation, uMlalazi Local Municipality has 20% of households with flushing toilets, 23.8% use chemical toilets, and 53.8% pit latrines. The rest use Ecological and bucket toilets. About 13.2% of the population gets solid waste collected by the local authority or privately at least once a week, and 5.3% less than once a week. About 68.6% have their own refuse dump, and the rest use the communal refuse dump or have no rubbish disposal (uMlalazi Local Municipality, 2023-2024).

8.12.2.6 Health

The highest mortality in the district is caused by HIV/AIDS (34.70%), followed by tuberculosis (22.70%) and lower respiratory Infections (6.60%) (King Cetshwayo District, 2020). Figure 8-60 shows the district disease profile. The uMlalazi Local Municipality recorded 38.61% of deaths related to HIV/AIDS from 2007 to 2017. (uMlalazi Local Municipality, 2023-2024). The uMlalazi Local Municipality Local Municipality has 14 clinics, three district hospitals and six mobile clinics.

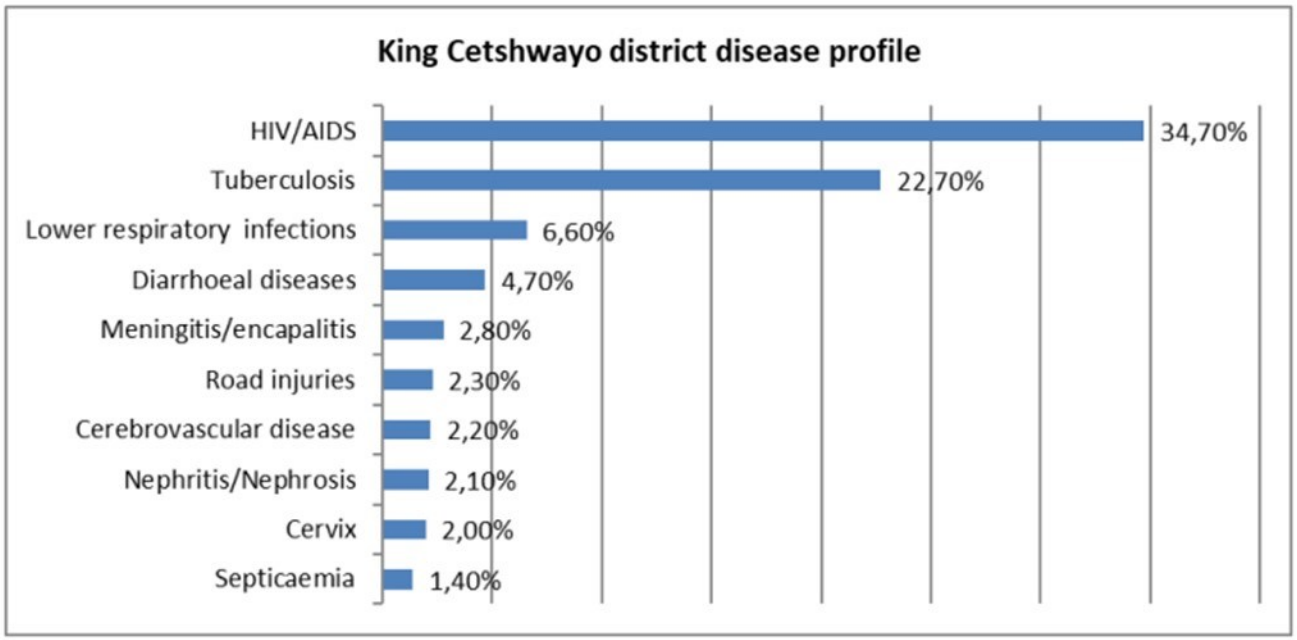


Figure 8-60 - King Cetshwayo District disease profile (King Cetshwayo District, 2020)

8.12.2.7 Education

The district municipality has 452 primary schools and 204 secondary schools. The number of people without schooling in KCDM accounts for 12.37% the province (King Cetshwayo District, 2020). The number of people with matric was 178 000 in 2019, and the number of matric and postgraduate degree constitutes 8.54% of the province. Within the uMlalazi Local Municipality Local Municipality, 2.9% have a tertiary qualification. People with matric as the highest qualification contribute 14.3% of the population, 23.0% of people have some secondary education, 35.4% have primary education, and 24.4% have no schooling (uMlalazi Local Municipality, 2023-2024).

8.13 HERITAGE AND PALAEONTOLOGY

8.14 HERITAGE RESOURCES

The area on which the Fairbreeze Mine is located has been extensively assessed for heritage resources by Anderson (2004, 2010, 2020, 2021) (Figure 8-61). Some of the heritage resources found in the area in recent years can be seen in Figure 8-62.The extensive and detailed work completed by Anderson (2004, 2010, 2020, 2021) is referred to below to determine the likely impacts of the proposed mine expansion on heritage resources. No additional specialist fieldwork was conducted. Anderson (2010) notes that “This area has been occupied by colonial people since the mid-late 19th century, in the form of John Dunn (1853), forts for the Anglo-Zulu War (1879), and magisterial buildings (1895), Ongoye Forest (1904) to the north, and later afforestation and sugar cane farming (van Jaarsveld, 1998). Several farm buildings, and/or their ruins, exist in the study area, and these may date to the early days of Mtunzini.

Whelan (2010) notes that “As with most of the rest of Zululand, this district was opened up for white settlement as a result of the Zululand Delimitation of Lands Commission in 1905. This is reinforced by the survey dates of the affected farms evident on the survey diagrams (see individual assessments). The Zululand Coastal Lands, of which the affected lots form part, were some of the earliest surveys and allotments. Grouped, as described by Minaar (1992: 3) lots 89 to 99 form the

Umlalazi lots. Minaar notes that ‘Originally the farms in this area were surveyed in larger areas than normal at the time because the area was considered more suitable for cattle and cotton than for cane. The farms on the coastal side of the main road were largely third grade farms with large areas of marsh and swampland’ (Minaar;1992: 14)” This application is for Lot 88.

8.14.1 PALAEONTOLOGY

According to the SAHRIS Palaeosensitivity Map (Figure 8-63), the development area is located on sediments with high palaeontological sensitivity. However, the PIA desktop reports completed for this area note that the area is of low significance (Smith, 2020). Dr Smith states: “The Umkwelane (Berea Red Sand) Formation is not fossiliferous. Theoretically it could contain fossils but nothing significant has been recorded. The Vryheid Formation can be fossiliferous. Trace fossils, not significant, are common. Vertebrate fossils have been recorded but are extremely rare. The Pietermaritzburg Formations and the Dwyka Group can show trace fossils (not significant) but are not known for any significant Palaeontological Material.” As such, it is unlikely that the proposed development will impact on significant palaeontological heritage resources, however, any slight risk of impact can be mitigated through the implementation of the attached Chance Finds Procedure.

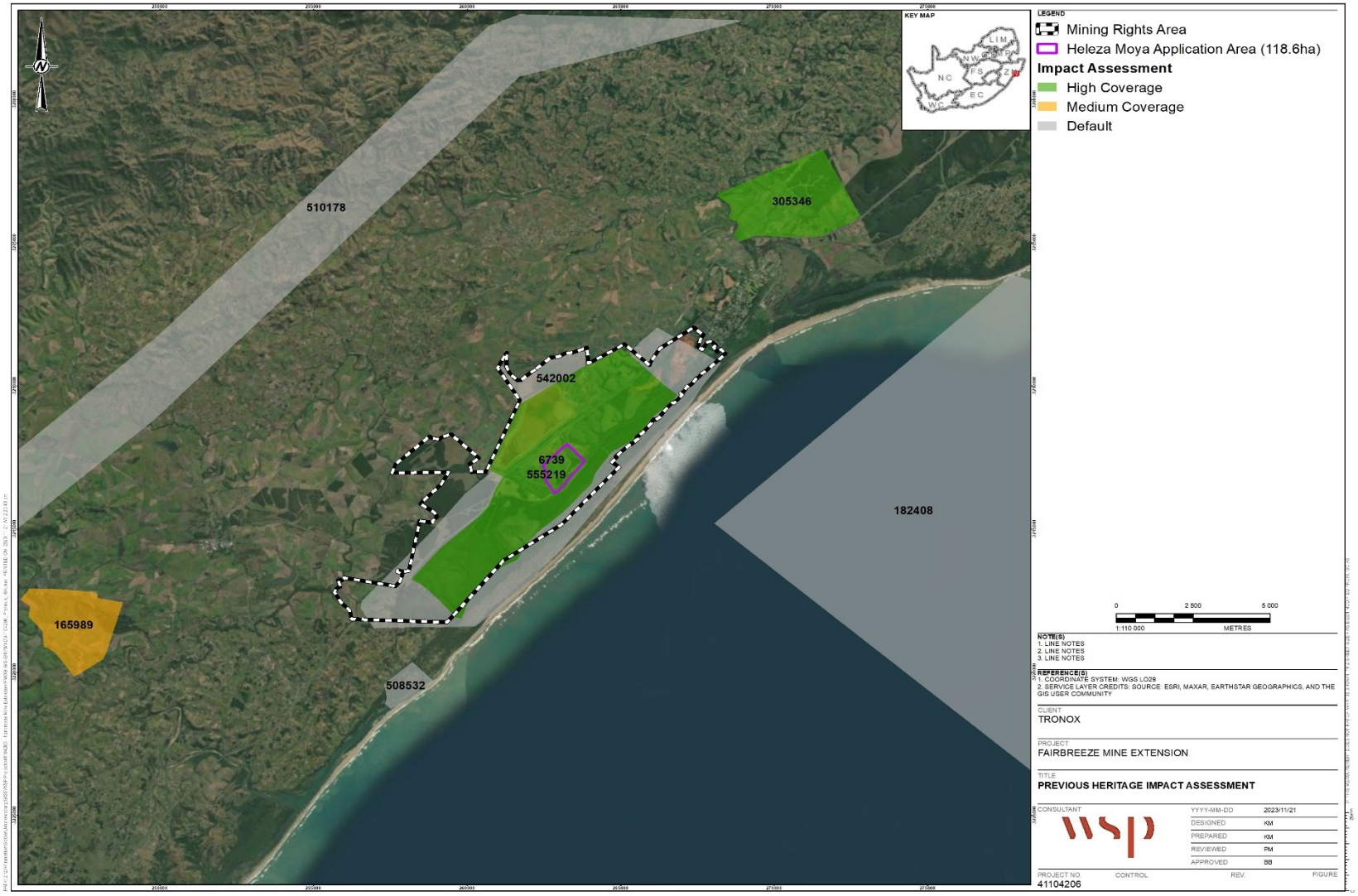


Figure 8-61 - Previous Heritage Impact Assessments surrounding the proposed development area, with SAHRIS NIDS indicated

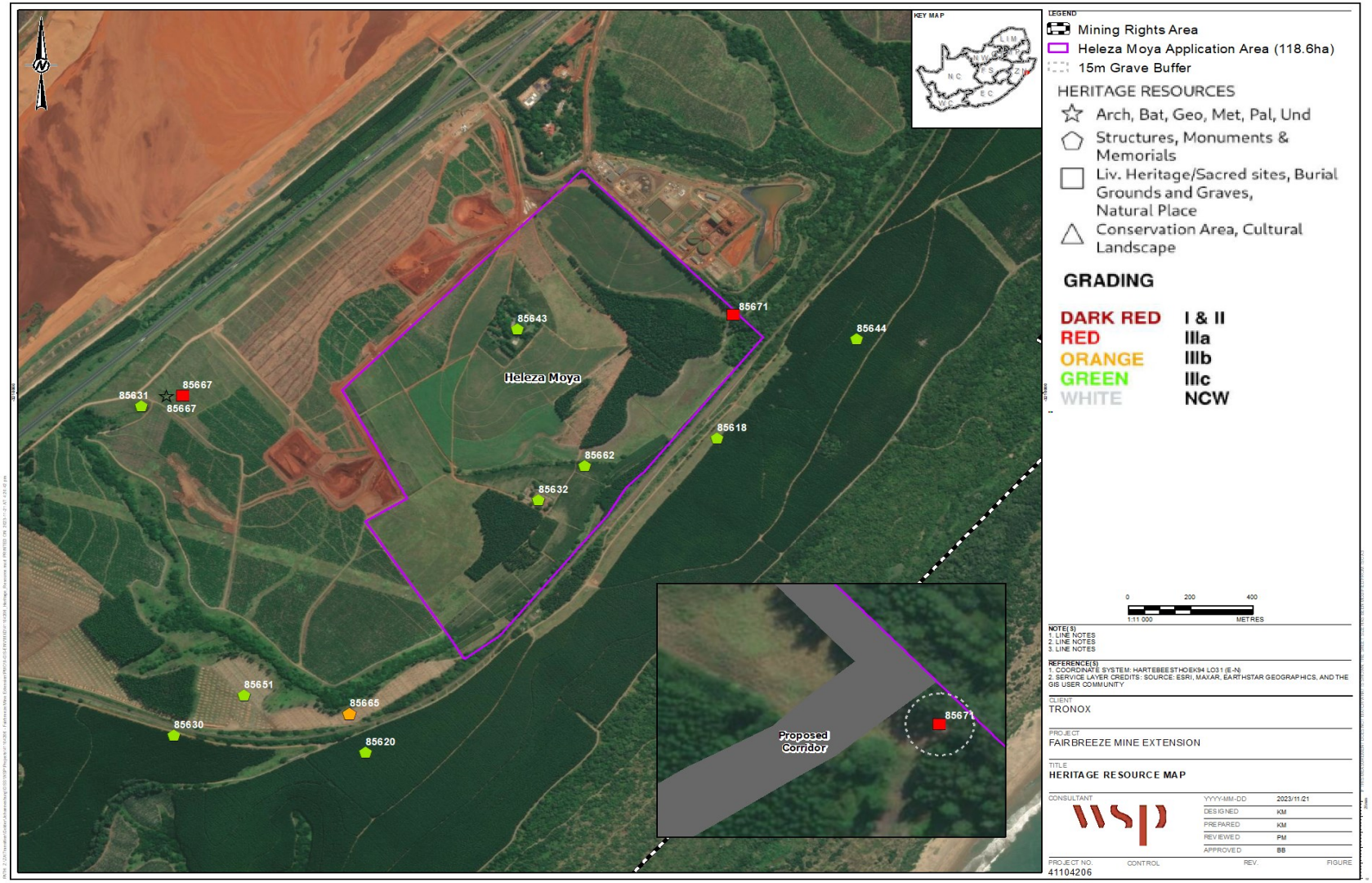


Figure 8-62 - Heritage resources in the project area

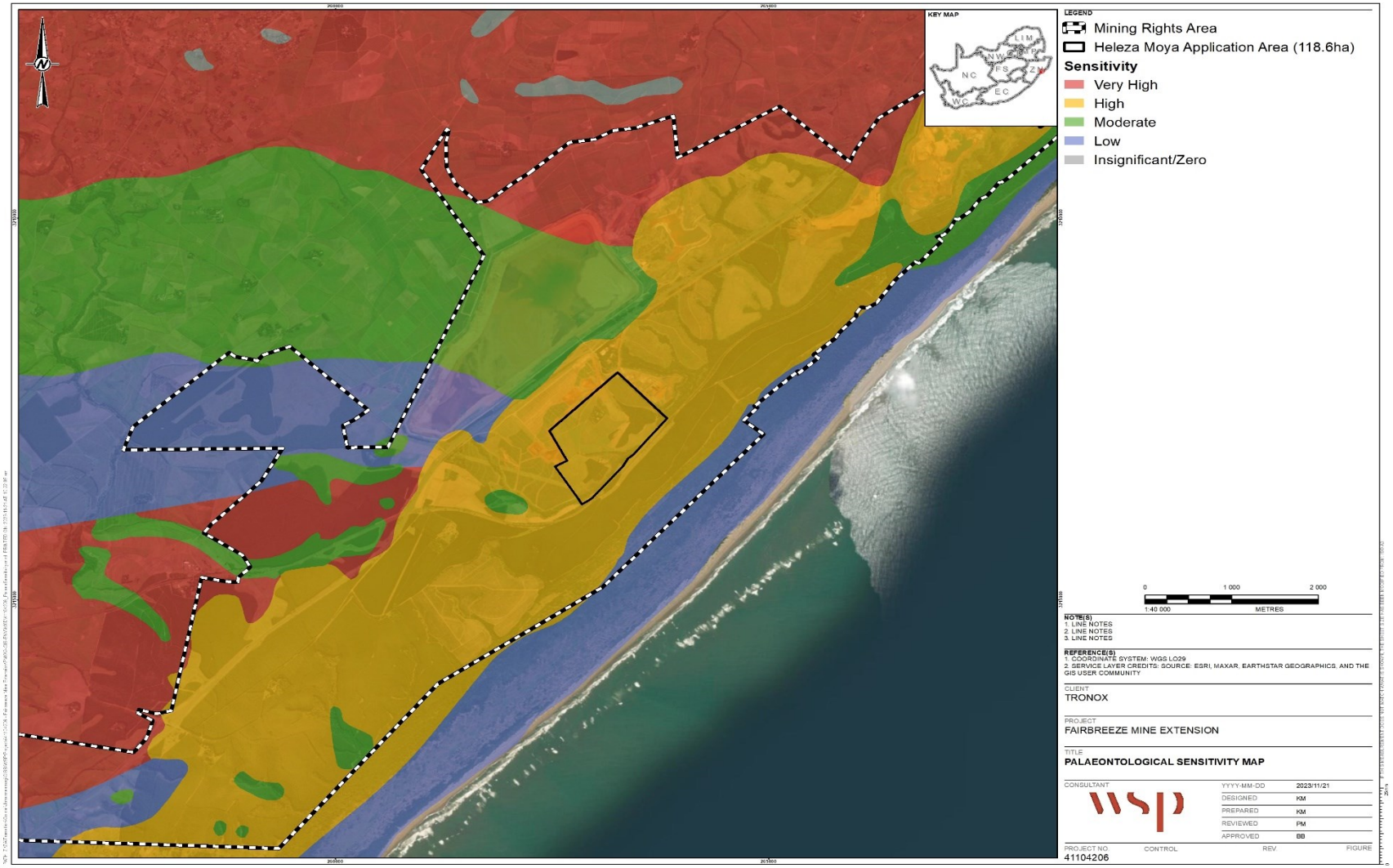


Figure 8-63 - Indicating moderate fossil sensitivity underlying the study area

8.15 NOISE

Tronox currently operates the heavy mineral sands Fairbreeze Mine, located immediately southwest of the town of Mtunzini, ~33.5 km southwest of Richards Bay in KwaZulu-Natal. Fairbreeze is surrounded by agricultural land, plantations and natural open land. Nearby towns include Mtunzini (immediately northeast of Fairbreeze), Mbizimbelwe (immediately southwest of Fairbreeze), KwaGingindlovu (~3.7 km west-northwest of Fairbreeze), Mabhokweni (~3.9 km northwest of Fairbreeze), Mabangwa (~2.5 km northwest of Fairbreeze), Nguqu (~3.4 km northwest of Fairbreeze), Obanjeni (~5.2 km northwest of Fairbreeze) and Izingeni (~4.2 km north-northwest of Fairbreeze). Scattered farmhouses / free-standing receptors are also evident at varying distances from Fairbreeze and are indicated in Figure 8-64. The proposed Heleza Moya site is located within the approved Fairbreeze mining right area.

The Fairbreeze mine, which has been in operation for nearly ten years, comprises four approved mining areas, an onsite primary wet plant (PWP) and a fines residue storage facility (RSF). Heavy mineral concentrate from the PWP containing ilmenite, zircon, rutile and other mining co-products, is transported by road to the Tronox Central Processing Complex (CPC) in Empangeni which includes a Mineral separation plant and smelter where titanium dioxide and pig iron are produced.

At Fairbreeze there are currently four ore bodies present, namely Fairbreeze A (FBA), Fairbreeze B (FBB), Fairbreeze C (FBC) and Fairbreeze C extension (FBCX). The current proposal is to expand the FBB ore body to include economically viable mineralised areas within the Heleza Moya property, as an extension to the FBB ore body which is currently being mined.

Mining at Heleza Moya will follow the same mining methods currently employed at the Fairbreeze Mine (hydraulic mining) and the required mineral beneficiation and infrastructure to support the mining activity and fleet is already in place, with no increase in plant processing capacity required. Sources of noise associated with Heleza Moya will include excavators and front-end-loaders (topsoil stripping and backfilling), hydraulic mining equipment, various pumps and pump stations, screens and trucks. When the mining at Heleza Moya commences, the abovementioned equipment will need to be transferred into the Heleza Moya area (from the current FBB area), with no new noise sources introduced for the Project. With the introduction of no new noise sources, the existing noise climate surrounding the site is anticipated to remain mostly unchanged.

Mining at FBB commenced in 2023 and will continue until 2026. The proposed Heleza Moya reserve will be mined as a direct extension of this orebody with mining commencing in Heleza Moya in 2025 and continuing until 2029, a period of four years. The combined FBB and Heleza Moya Pit will consequently be active for seven years, excluding final rehabilitation activities. There is no defined construction stage. The topsoil pre-strip activities are considered part of the mining process.

The Heleza Moya site is surrounded on three sides by the existing Fairbreeze Mine, with the land use on the coastal side (southeast) over the railway track, being a mix of natural land (conservation) and plantations (forestry). The nearest sensitive receptors to the Heleza Moya site are farmhouses / free-standing receptors, located 2.6 km northeast of the site, within the Fairbreeze boundary (Figure 8-64).

The current noise climate in and around Fairbreeze is predominantly influenced by mining sources, vehicles on the nearby N2 road, natural sources such as insects and birds, and the ocean (NOSA, 2019a; NOSA, 2019b; NOSA, 2020; NOSA, 2021a, NOSA, 2021b; NOSA, 2022b). An initial noise impact assessment (which included monitoring) was conducted in 2010 (Safetech, 2010) to assess

the impacts of the Fairbreeze mine before it became operational. Subsequently, annual noise monitoring campaigns have been undertaken since 2019 at various receptor locations and most recently at a permanent noise monitoring station located close to the boundary with Mtunzini (NOSA, 2019a; NOSA, 2019b; NOSA, 2020; NOSA, 2021a, NOSA, 2021b; NOSA, 2022a, NOSA, 2022b; NOSA, 2022c). The location of the noise monitoring points are presented in Figure 8-65.

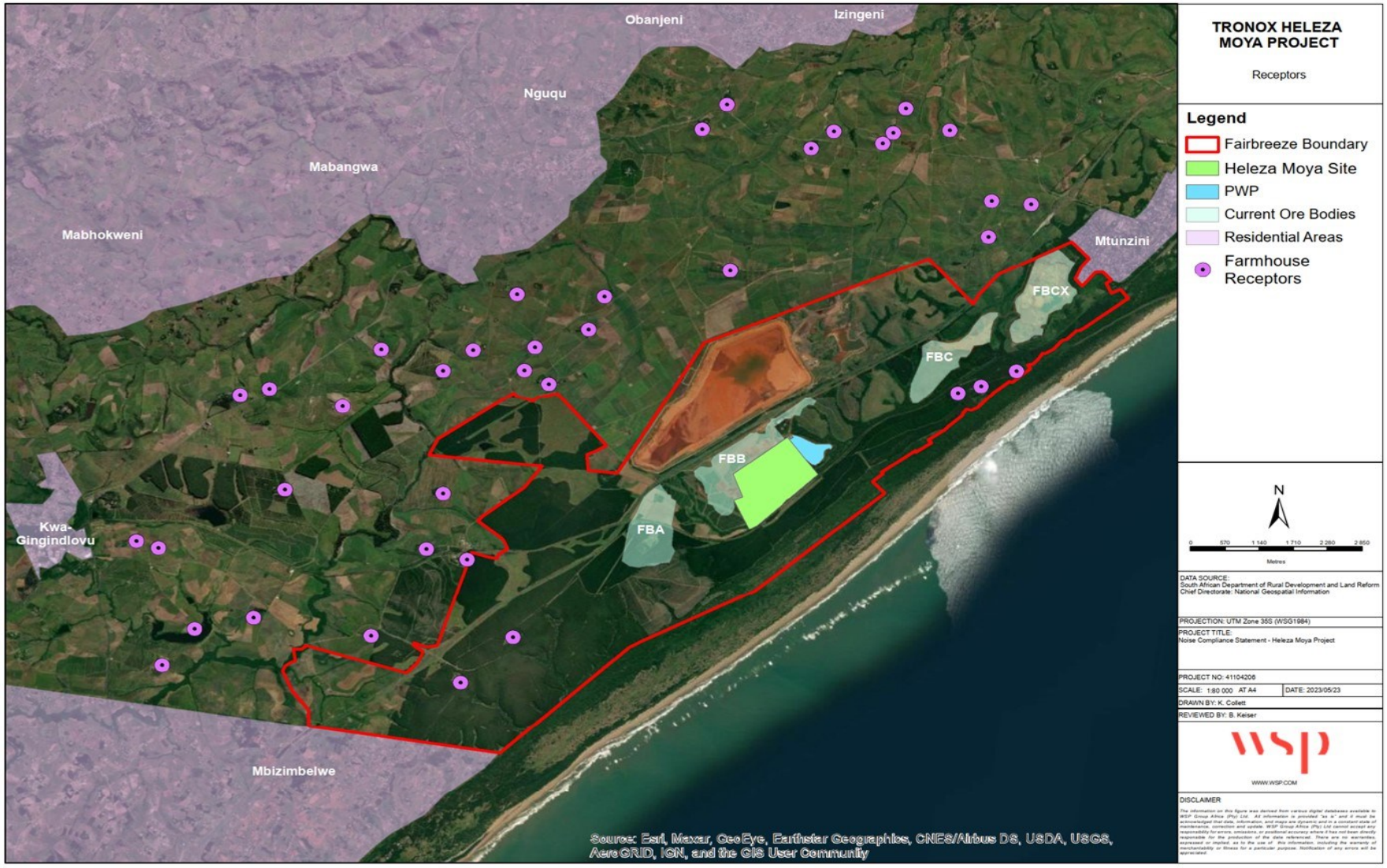


Figure 8-64 - Basic site layout and receptor locations

Figure 8-65 - Noise monitoring locations

Model predictions from the 2010 study at the relevant current-day sensitive receptors are presented in Table 8-15. The sites at which noise was predicted in the 2010 noise study have subsequently been refined into the specific noise monitoring locations which form part of the mine's ongoing noise monitoring programme. A summary of noise levels that have been recorded at the relevant monitoring points during monitoring campaigns over time are presented in Table 8-16, while a summary of results from the permanent monitoring station are presented in Table 8-17. It is noted, a short raw data set from the permanent monitoring station was made available to the noise assessment team. The period reviewed was April to May 2022. During this time. It must be noted that mining was actively taking place at the Fairbreeze Pit C extension immediately adjacent to Mtunzini.

Mining is currently occurring at the FBB orebody and mining at the Heleza Moya site will be an extension to this FBB orebody. The 2010 model predictions confirm that noise levels at all nearby receptors were predicted to be compliant with the relevant South African National Standards (SANS) 10103:2008 guideline rating levels during mining at FBB.

From the 2022 monitoring data, all receptors with the exception of McMurray's farm (which is now owned by Tronox and is the subject of the current mining application) indicate daytime results that are below the guideline level. McMurray's Farm (the farmhouse location itself) now forms part of the Heleza Moya site and is no longer considered a receptor as this area falls within the proposed future mining area. During 2022, mining was only occurring at the FBCX ore body, which is in close proximity to Mtunzini, while the PWP and associated access roads are adjacent to the McMurray's site.

Table 8-15 - Noise level predictions from the initial Noise Impact Assessment (Safetech, 2010)

Location	Noise levels associated with different sources (dB(A))					
	PWP + FBA	PWP + FBB	PWP + FBC West	PWP + FBC East	PWP + FBCX South	PWP + FBCX North
McMurray's Farm	25.4	25.7	25.3	25.3	25.3	25.3
Mtunzini	0.0	0.0	12.0	10.8	22.2	42.1
Twin Streams Educational Centre	3.4	3.8	21.5	27.6	17.4	14.3
Twin Streams Nursery	8.1	8.4	19.9	25.6	12.8	11.0

Notes:
- Only receptors applicable to the current-day situation are presented here
- PWP = Primary Wet Plant
- Values highlighted in red exceed the SANS Rural Guideline Rating Level (45 dB(A) – day and 35 dB(A) – night)

Table 8-16 - Historical noise monitoring data (NOSA, 2019a; NOSA, 2019b; NOSA, 2020; NOSA, 2021a; NOSA, 2021b; NOSA, 2022)

Location	June 2019		October 2019		June 2020		Dec 2020/Jan 2021		December 2021		June 2022	
	Day (dB(A))	Night (dB(A))	Day (dB(A))	Night (dB(A))	Day (dB(A))	Night (dB(A))	Day (dB(A))	Night (dB(A))	Day (dB(A))	Night (dB(A))	Day (dB(A))	Night (dB(A))
MP A (McMurray's Farm)	46.5 36.2	47.2 43.2	45.4	39.6	45.3	40.9	47.7	45.9	47.4	44.7	45.3	39.7
MP B (Twin Streams Nursery)	44.3 40.8	44.1 44.1	42.1	41.5	53.9	40.5	42.5	50.7	50.4	46.4	39.0	49.0
MP C (Twin Streams Educational Centre)	40.2 37.4	44.6 42.6	39.7	44.4	50.5	39.7	46.8	46.2	53.4	44.2	39.3	42.0
MP D (XaXaZa Caravan Park)	38.2 37.4	38.0 41.2	39.3	36.3	41.7	38.6	38.2	44.3	54.4	51.6	37.9	43.0

Notes:
- Values highlighted in red exceed the SANS Rural Guideline Rating Level (45 dB(A) – day and 35 dB(A) – night)
- June 2019 has results for two consecutive days of monitoring

Table 8-17 - Results from the permanent noise monitoring station for April and May 2022 (NOSA, 2022a; NOSA 2022b)

April 2022		May 2022	
Time	Average Noise Level (dB(A))	Time	Average Noise Level (dB(A))
06:00	47.4	06:00	49.4
07:00	49.4	07:00	50.1
08:00	48.1	08:00	49.1
09:00	48.5	09:00	48.7
10:00	48.8	10:00	49.3
11:00	48.0	11:00	61.0
12:00	63.6	12:00	48.8
13:00	48.6	13:00	48.5
14:00	48.7	14:00	48.7
15:00	48.6	15:00	47.9
16:00	47.9	16:00	48.0
17:00	48.3	17:00	48.9
18:00	50.6	18:00	49.8
19:00	50.3	19:00	49.3
20:00	50.2	20:00	52.1
21:00	48.2	21:00	50.3
22:00	47.7	22:00	48.4
23:00	49.0	23:00	48.3
00:00	49.5	00:00	49.3
01:00	49.1	01:00	48.9
02:00	49.4	02:00	48.6
03:00	49.7	03:00	48.4
04:00	48.4	04:00	48.3
05:00	47.7	05:00	49.3

Note:
- Values highlighted in red exceed the SANS Suburban Guideline Rating Level (50 dB(A) – day and 40 dB(A) – night)

For context, and notwithstanding that mining at FBCX is nearing completion, the approximate distances between key noise receptors and existing infrastructure, as well as the proposed Heleza Moya mining area are summarised in Table 8-18.

Table 8-18 - Proximity of receptors to activities at the Fairbreeze Mine

Fairbreeze Mine Activity	Distance to Receptors (m)		
	Mtunzini	Twin Streams Nursery	Twin Streams Educational Centre
Fairbreeze C Ext.	150	1,200	400
PWP	5,100	2,500	3,700
Fairbreeze B	5,700	3,100	4,300
Heleza Moya	5,700	2,600	4,000

While the FBCX pit, where active mining is currently taking place at Fairbreeze, extends to ~150 m of the edge of Mtunzini town, ~400 m from the Twin Streams Educational Centre and 1.2 km from the Twin Streams Nursery, the subsequent mining areas are considerably further from these receptors. The PWP is ~2.5 km from the Twin Streams Nursery and 5.1 km from Mtunzini town itself. Similarly, FBB where mining has commenced in 2023, lies 3 km from Twin Streams Nursery and 5.7 km from Mtunzini at its closest point. The proposed Heleza Moya mining extension to FBB will be approximately 5.4 km from Mtunzini and 2.6 km from the Twin Streams Nursery at its closest point.

Thus, should monitored noise levels be compliant at receptors in close proximity to existing mining activities, then it is reasonable that noise levels at these receptors will reduce as mining moves to more distant localities. Noise levels at sensitive receptors are not expected to fall out of compliance when mining progresses to FBB (as previously predicted and authorised) and Heleza Moya (subject of the current application).

It is understood that mining at FBCX is nearing completion, whereafter mining will move to FBB (and subsequently Heleza Moya), with the progression of mining moving even further south after that to the approved FBA orebody. During that time, noise levels at the Twin Streams receptors and Mtunzini will decrease further.

Additionally, noise levels recorded at the permanent monitoring station are mostly compliant during the day except for peaks above the guideline level around midday and late evening. Night-time monitoring results throughout all monitoring campaigns exceed the SANS rural guideline level consistently. It is noted that these results are assessed against the most stringent guideline level (rural) even though the station is located within the mining rights boundary. These elevated levels at night are predominantly influenced by existing background sources that are constantly present (traffic on the N2, ocean noise and wind), with some influences from the mining operations (NOSA, 2022a; NOSA, 2022b).

The above provides further support that when mining at Heleza Moya occurs, no additional impact over that already inherent in the area and associated with the approved mining operation are likely to be experienced because Heleza Moya will be mined as an extension of the FBB orebody and will be more than 2.6 km from the closest receptor.

From the preceding discussions, additional noise impacts attributable to the Heleza Moya Project are not anticipated for the following reasons:

- There are no new noise sources associated with the Heleza Moya site, which will be mined as an extension of the approved FBB orebody.
- Historical model predictions and monitoring results indicate that when mining occurs at the FBB orebody, no impacts at nearby receptors (Twin Streams receptors and Mtunzini) will be perceived, hence no impact is anticipated to result from the extension of mining into the proposed mineable area at Heleza Moya.
- Receptors are located at considerable distances from the Heleza Moya site (closest receptor is over 2.6 km away) and from previous experience with other mining sites, noise impacts are usually perceived within 1 to 2 km from the source.

8.16 AIR QUALITY

8.16.1 EXISTING SOURCES OF EMISSIONS

The predominant land use in the Project development area is mining and agriculture. Other land uses in the area include vehicle tailpipe emissions and domestic fuel burning at neighbouring residential areas and settlements.

8.16.1.1 Agricultural activities

Emissions from agricultural activities are difficult to control due to the seasonality of emissions and the large surface area producing emissions (USEPA, 1995). Expected emissions resulting from agricultural activities include particulates associated with wind erosion, ploughing and burning of crop residue, chemicals associated with crop spraying and odiferous emissions resulting from manure, fertilizer and crop residue.

Dust associated with agricultural practices may contain seeds, pollen and plant tissue, as well as agrochemicals, such as pesticides. The application of pesticides during temperature inversions increases the drift of the spray and the area of impact. Dust entrainment from vehicles travelling on gravel roads may also cause increased particulates in an area. Dust from traffic on gravel roads increases with higher vehicle speeds, more vehicles and lower moisture conditions.

The proposed Project is surrounded by commercial timber plantations and forestry as well as commercial sugarcane farming. These are most likely the contributors of fugitive emissions from agricultural activities. However, it is noted that fugitive emissions from agricultural activities generally have confined impacts near to the source, limiting the regional impacts.

8.16.1.2 Industrial activities

Several industrial sources are located within the regional Project area which result in a significant amount of particulate emissions. These include the existing Fairbreeze Mine just north of the proposed site, Antioxidants Aromas and Fine Chemicals (AAFC), BHP Billiton Bayside and Hillside Smelters, Foskor Fertiliser Plant, Tongaat Hulett Sugar Mill, Mondi Felixton and Richards Bay Pulp Mills, The Port of Richards Bay, Richards Bay Coal Terminal and Richards Bay Minerals.

8.16.1.3 Vehicle tailpipe emissions

Atmospheric pollutants emitted from vehicles include hydrocarbons, CO, carbon dioxide (CO_2), nitrogen oxides (NOx), SO_2 and particulates. These pollutants are emitted from the tailpipe, from the engine and fuel supply system, and from brake linings, clutch plates and tyres. Hydrocarbon emissions, such as C_6H_6, result from the incomplete combustion of fuel molecules in the engine. CO is a product of incomplete combustion and occurs when carbon in the fuel is only partially oxidized to CO_2. NOx are formed by the reaction of nitrogen and oxygen under high pressure and temperature conditions in the engine. Sulphur dioxide is emitted due to the high sulphur content of the fuel. Particulates, such as lead, originate from the combustion process as well as from brake and clutch linings wear (Samaras and Sorensen, 1999).

Possible contributors to mobile combustion emissions include vehicle activity on the R102, R66, the N2 as well as other access roads surrounding the site. Neighbouring communities are likely to use these routes on a daily basis for work. Furthermore, the railway line running from Richards Bay to Durban is likely a significant source of dust emissions within the area.

8.16.1.4 Domestic fuel burning

Pollutants released from these fuels include CO, NO_2, SO_2, inhalable particulates and polycyclic aromatic hydrocarbons. Particulates are the dominant pollutant emitted from the burning of wood. Smoke from wood burning contains respirable particles that are small enough in diameter to enter and deposit in the lungs. These particles comprise a mixture of inorganic and organic substances including aromatic hydrocarbon compounds, trace metals, nitrates and sulphates. Polycyclic aromatic hydrocarbons are produced as a result of incomplete combustion and are potentially carcinogenic in wood smoke (Maroni *et al.,* 1995). The main pollutants emitted from the combustion of paraffin are NO_2, particulates, CO and polycyclic aromatic hydrocarbons.

Domestic fuel burning usually shows a characteristic diurnal and seasonal signature. Periods of elevated domestic fuel burning, and hence emissions, occurs in the early morning and evening for space heating and cooking purposes. During the winter months, an increase in domestic fuel burning is recorded as the demand for space heating increases with the declining temperature.

While electricity is predominantly used within the urban settlements area, a portion of households are likely to make use of gas, paraffin and wood as a fuel source, more specifically within the rural settlements area.

8.16.2 LOCAL AMBIENT AIR QUALITY

8.16.2.1 Dust fallout monitoring

Dust fallout monitoring data for the Fairbreeze Mine for the most recent six-year period from January 2018 to August 2022 was obtained and has been assessed below. The description and coordinates of the monitoring locations are shown in Table 8-19 and illustrated in Figure 8-66, whilst the dust fallout results are illustrated from Figure 8-67 to Figure 8-72.

Missing dust fallout results are representative of months where no data was recorded, samples were contaminated, dust buckets were either removed, missing, or stolen from the location, no site access, road to site was damaged or worms were found in the sample.

In 2018, one exceedance was recorded at Site 5 in July, two non-sequential exceedances at N2S1 in June and November and two non-sequential exceedances at FBC100 in January and March. No exceedances were recorded at the other sites. As such, all monitoring locations were compliant with the National Dust Control Regulations (600 mg/m^2/day for residential sites and 1 200 mg/m^2/day for non-residential sites) which allow for two non-sequential exceedances within one year (Figure 8-67).

In 2019 one exceedance was recorded at Site 5 in November, one in exceedance in March and one exceedance at N2S1 in February. No exceedances were recorded at the other sites. As such, all monitoring locations were compliant with the National Dust Control Regulations which allow for two non-sequential exceedances within one year (Figure 8-68).

In 2020 one exceedance was recorded at Site 5 in January, two sequential exceedances at Pump Station 02 in October and November and two non-sequential exceedances at Pump Station 03 in August and October. No exceedances were recorded at the other sites. As such, most monitoring locations were compliant with the National Dust Control Regulations which allow for two non-sequential exceedances within one year, with the exception of Pump Station 02 (Figure 8-69).

In 2021 three sequential exceedances each were recorded at Site 2, Tree Barrier and FBC200 from October to December, one exceedance each at Site 5 and Site 10 in February and seven sequential

exceedances at Pump Station 03 from April to October. No exceedances were recorded at the other sites. As such, most monitoring locations were compliant with the National Dust Control Regulations which allow for two non-sequential exceedances within one year, with the exception of Site 2, Tree Barrier, FBC200 and Pump Station 03 (Figure 8-70).

In 2022 no exceedances were recorded. All monitoring locations were thus compliant with the National Dust Control Regulations which allow for two non-sequential exceedances within one year (Figure 8-71).

In 2023 two sequential exceedances were recorded at the Wetlands, Twinstreams Educational Centre, and Site 10 from January 2023 to August 2023, which resulted in a non-compliance with the GNR 827: Non-residential guideline for the past annual monitoring (Figure 6 14).

An average dust fallout rate of 223 mg/m2/day, 213 mg/m2/day, 247 mg/m2/day, 429 mg/m^2/day, 106 mg/m^2/day and 676.75 mg/m^2/day was recorded for 2018, 2019, 2020, 2021, 2022 and 2023 respectively. The average dust fallout rate over the six-year period was 315.62 mg/m^2/day.

Importantly, the dust fallout results in the Air Quality Impact Assessment for the Fairbreeze Mine, undertaken by SGS in 2011, cannot be directly compared to the current dust fallout results presented here as the current locations are different to the historic locations.

Table 8-19 - Dust fallout monitoring locations at the Fairbreeze Mine

Sampling Point	Classification	Latitude (°S)	Longitude (°E)
Site 2	Residential	28° 58' 02.2"	31° 44' 42.2"
Site 3	Industrial	28° 57' 56.1"	31° 43' 10.6"
Site 4	Industrial	28° 59' 05.2"	31° 43' 40.5"
Site 5	Industrial	28° 59' 56.1"	31° 42' 09.2"
Site 6	Industrial	29° 01' 22.9"	31° 41' 35.4"
Site 7	Industrial	29° 01' 46.4"	31° 39' 59.5"
Site 8	Industrial	29° 02' 24.6"	31° 39' 11.2"
Site 9	Industrial	29° 00' 09.9"	31° 41' 58.1"
Site 10	Residential	28° 57' 52.1"	31° 44' 41.8"
Medical Centre	Residential	28° 57' 23.0"	31° 45' 18.1"
Sports field	Residential	28° 57' 19.7"	31° 44' 51.9"
Town Park	Residential	28° 57' 36.5"	31° 44' 56.9"
Tree Barrier	Residential	28° 57' 40.7"	31° 44' 36.9"

Sampling Point	Classification	Latitude (°S)	Longitude (°E)
Topsoil	Industrial	28° 58' 04.4"	31° 44' 24.2"
Wetlands	Industrial	28° 58' 13.5"	31° 44' 39.9"
N2S1	Industrial	28° 58' 24.0"	31° 44' 1.50"
Farmhouse	Residential	28° 58' 50.2"	31° 43' 36.2"
N2B2	Industrial	28° 58' 36.3"	31° 43' 19.6"
Twin streams Educational Centre	Industrial	28° 58' 51.9"	31° 44' 09.6"
Twinstreams Nursery	Industrial	28° 59' 12.7"	31° 43' 39.4"
Shepley Farm	Industrial	29° 00' 16.6"	31° 40' 27.5"
Pump Station 02	Industrial	No coordinates provided	
Pump Station 03	Industrial	No coordinates provided	
FBC100	Internal monitoring	28° 58' 44.8"	31° 43' 41.6"
FBC200	Internal monitoring	28° 58' 40.8"	31° 43' 45.3"

Figure 8-66 - Dust fallout monitoring locations at the Fairbreeze Mine

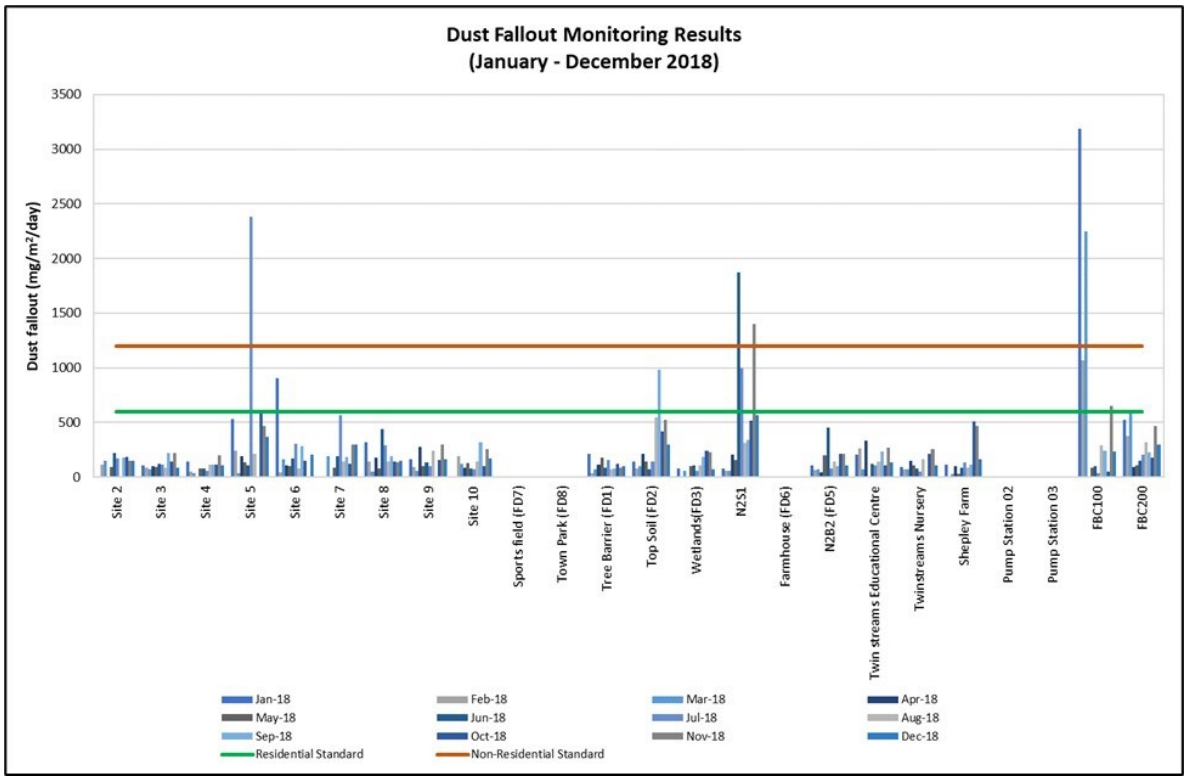


Figure 8-67 - Dust fallout results from January to December 2018 at the Fairbreeze Mine

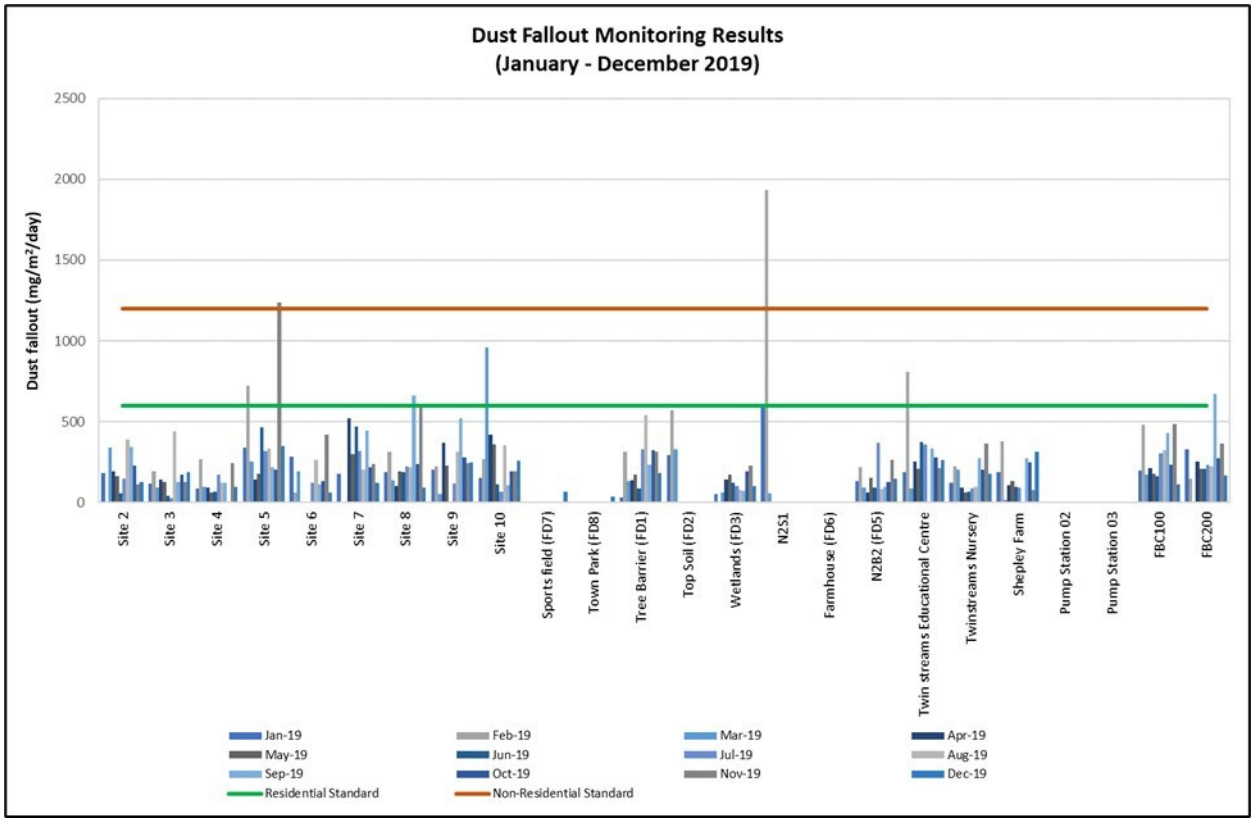


Figure 8-68 - Dust fallout results from January to December 2019 at the Fairbreeze Mine

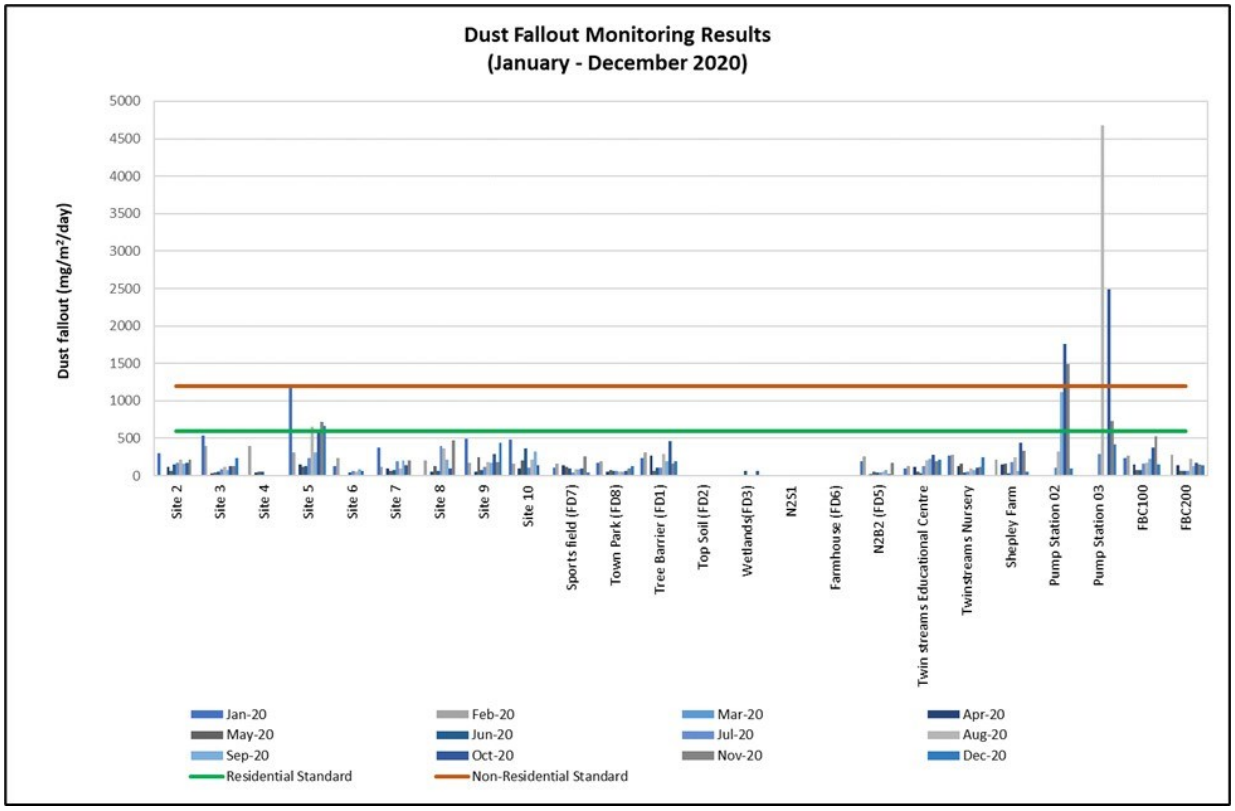


Figure 8-69 - Dust fallout results from January to December 2020 at the Fairbreeze Mine

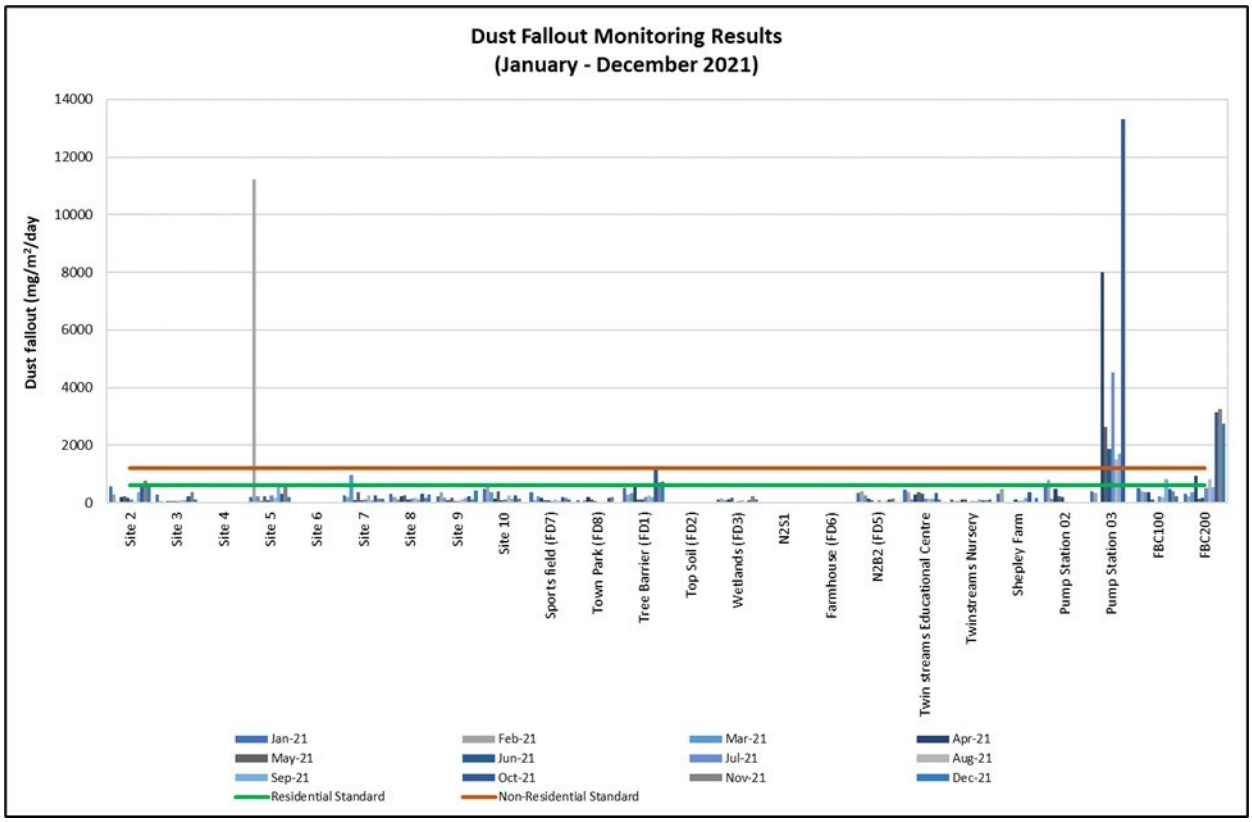


Figure 8-70 - Dust fallout results for January to December 2021 at the Fairbreeze Mine

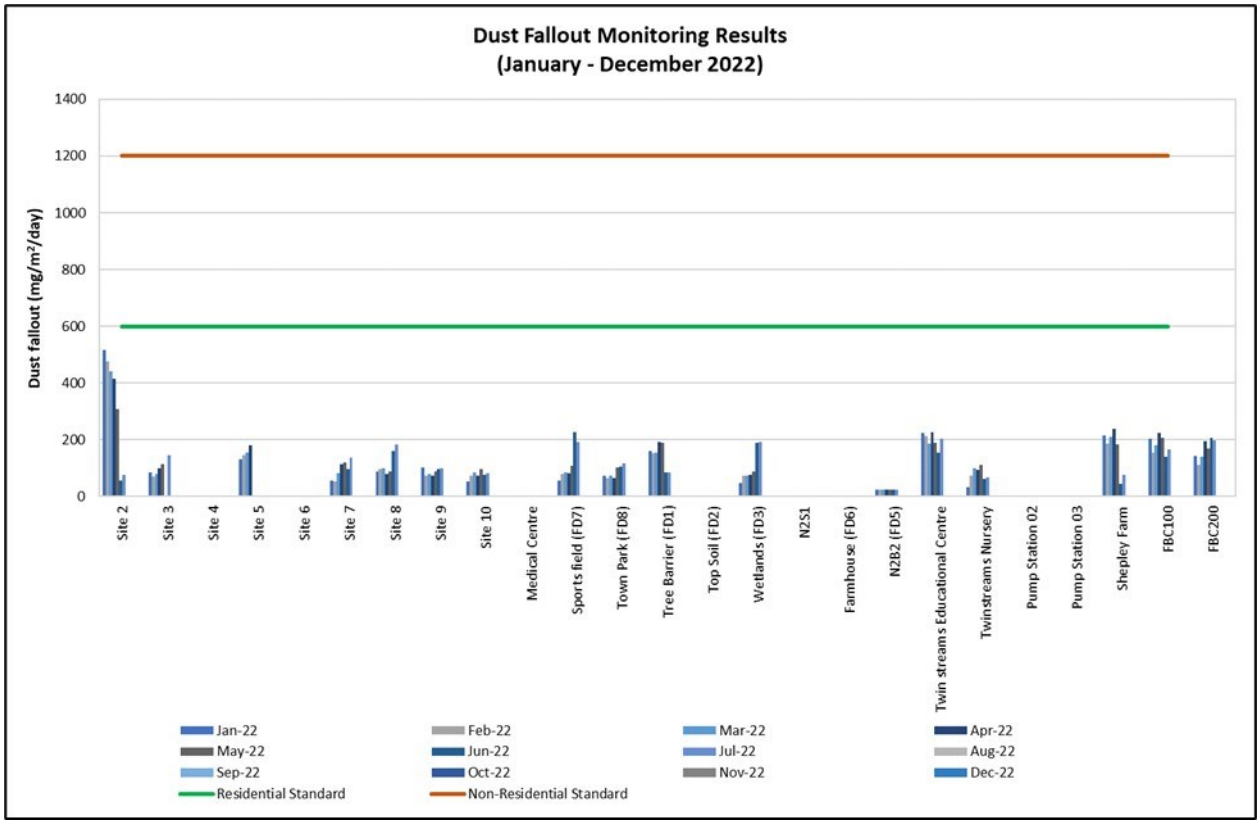


Figure 8-71 - Dust fallout results from January to December 2022 at the Fairbreeze Mine

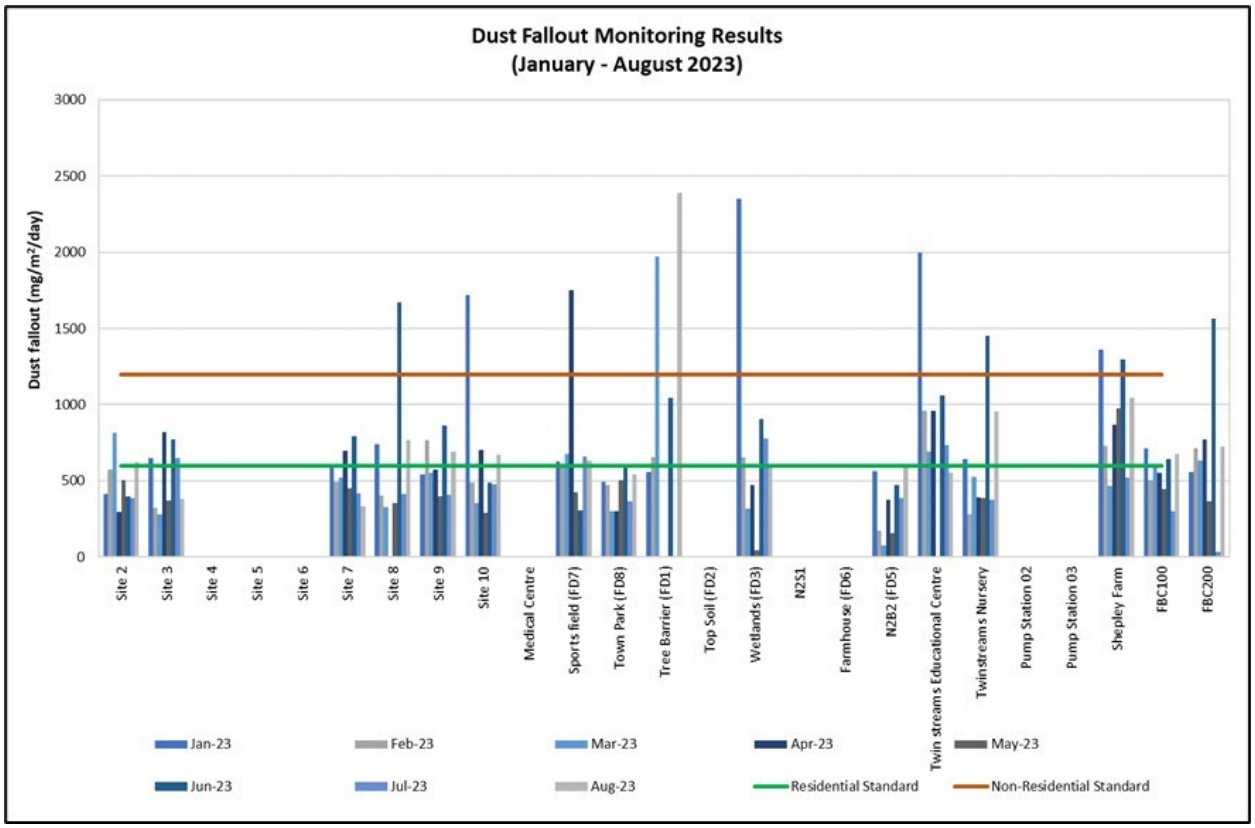


Figure 8-72 - Dust fallout results from January to August 2023 at the Fairbreeze mine

Particulate matter monitoring

Ambient measured PM_{10} concentrations were sourced from the eSikhaleni Richards Bay Clean Air Association (RBCAA) station and from the South African Air Quality Information System (SAAQIS) eSikhawini monitoring station, which are the closest stations to the site (~20 km and ~25 km away from the site). Although these stations are the closest stations to the site, both stations are considered far and not completely representative of the site. Furthermore, additional PM_{10} concentrations data was collected from on-site monitoring stations namely Shepley Farm, Mtunzini, McMurray Farm, and CPC.

It is noted that the McMurray Farm ambient air quality station would have been representative of the site given the distance from the site to the station (~1 km away from the site) but the station along with the other on-site stations (Shepley Farm, Mtunzini and CPC) were limited in terms of data for the 2020 and 2021 reporting periods. As such, data was obtained for the most recent period from January 2020 to December 2022 from the eSikhaleni and eSikhawini monitoring stations. Table 8-20 shows the coordinates and data recovery for the two monitoring stations. The data recovery was adequate, with percentages above 70% over each year at each station.

Table 8-20 - Coordinates and data recovery of the off-site and on-site monitoring stations

Station	Latitude (°S)	Longitude (°E)	Distance from Site (km)	Data Recovery (%)		
				2020	2021	2022
Off-site monitoring stations						
eSikhaleni	26.3295	28.1429	~20	79.00	92.80	75.50
eSikhawini	26.3295	28.1429	~25	85.60	96.40	71.10
On-site monitoring stations						
Shepley Farm	29.0065	31.6742	~3	Data not available	Data not available	100
Mtunzini	28.9604	31.7490	~5	Data not available	Data not available	83
McMurray Farm	29.0031	31.6980	~1	Data not available	Data not available	75
CPC	28.7188	31.8712	~36	Data not available	Data not available	67

Table 8-21 presents the 24-hour (99th percentile (P99)), annual average PM_{10} concentrations and the number of 24-hour exceedances recorded over the monitoring period, whilst Figure 8-73 shows the 24-hour PM10 concentrations over the monitoring period for the eSikhaleni monitoring station.

No exceedances of the 24-hour PM10 standard (75 µg/m3) were recorded, except for 2021 which recorded two exceedances (Table 8-21). Annual averages over all three years were below the annual (40 µg/m3) average PM10 standard.

Table 8-21 - Ambient PM10 concentrations recorded at the eSikhaleni monitoring station from January 2020 to December 2022

	Daily P99 Concentration (µg/m^3)			Annual Average Concentration (µg/m^3)			Number of 24-Hour NAAQS Exceedances		
	2020	2021	2022	2020	2021	2022	2020	2021	2022
eSikhaleni	50.32	65.61	34.41	25.30	23.29	12.90	0	2	0

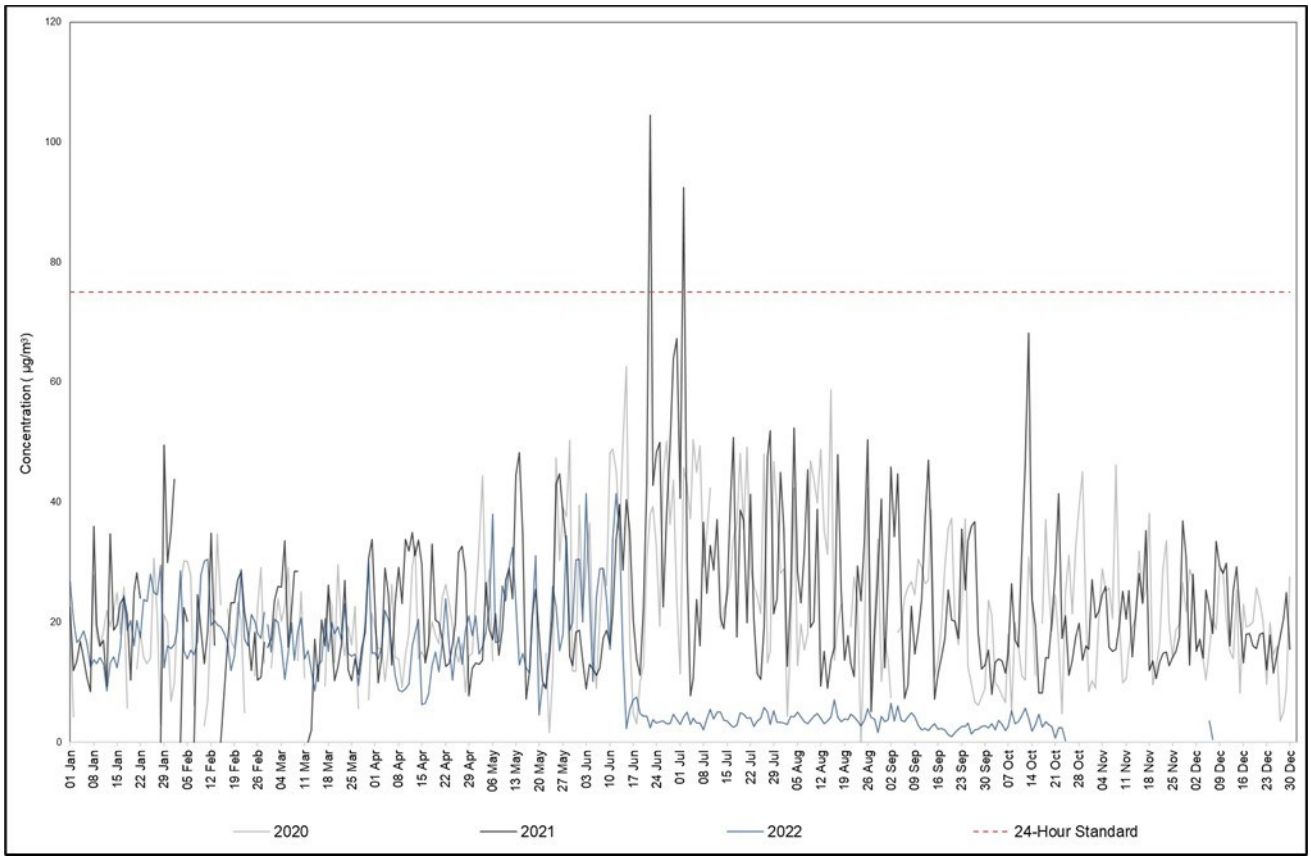


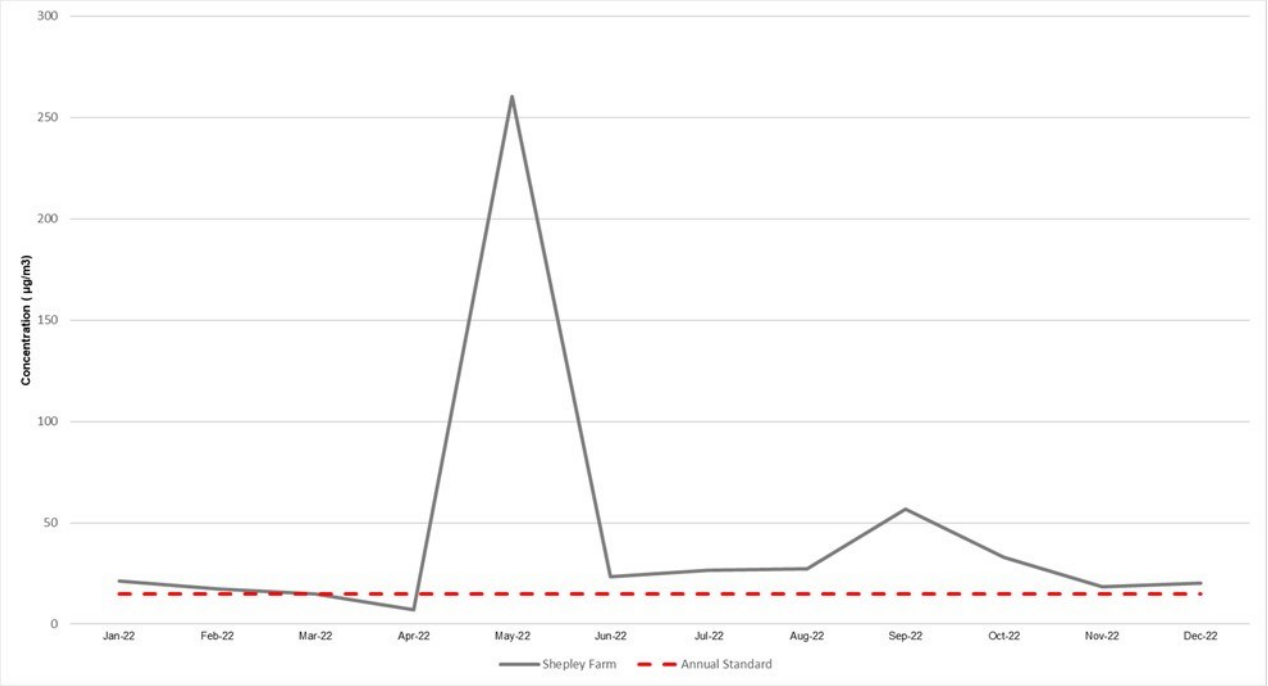
Figure 8-73 - Daily average PM10 concentrations at the eSikhawini monitoring station from January 2020 to December 2022

Table 8-22 presents the 24-hour (P99) and annual average PM_{10} concentrations as well as the number of exceedances recorded over the monitoring period, whilst shows the 24-hour PM_{10} concentrations over the monitoring period for the eSikhawini monitoring station.

No exceedances of the 24-hour PM_{10} standard (75 µg/m^3) were recorded except for 2021 which recorded two exceedances (Table 8-22). Annual averages were below the annual (40 µg/m^3) average PM_{10} standards.

Table 8-22 - Ambient PM10 concentrations at the Shepley Farm monitoring station from January 2020 to December 2022

Station	Annual Average Concentration (µg/m^3)			Number of annual NAAQS Exceedances		
	2020	2021	2022	2020	2021	2022
Shepley Farm	Data not available	Data not available	Data not available	Data not available	Data not available	10



Important to note is that the Air Quality Impact Assessment for the Fairbreeze Mine, undertaken by SGS in 2011, reported an annual average PM_{10} concentration of 26 µg/m^3 for the period April to December 2010 from the ambient air quality monitoring station in Mtunzini (the nearest ambient air quality station to the site). The station was operational from April 2010 to 2014, whereafter it was decommissioned. As such, no recent data was available to incorporate into the report.

8.17 VISUAL

8.17.1 CURRENT VIEWS OF HELEZA MOYA

Heleza Moya farm is bordered by Pit B to the northwest and the Primary Wet Plant (PWP) on the northeast border. Pit A is located further southwest along the coast provides a screen for viewers located west of Heleza Moya towards Gingindlovu.

Views from Mtunzini towards Heleza Moya, facing southwest, are dominated by the Pit C operations and existing tree screens. When considering the southernmost boundary of Mtunzini and views from the Umlalazi Nature Reserve towards the coast, it is expected to be of a reducing horizon line due to the mining direction (i.e., south to north) (Young, 2011). Figure 8-74 illustrates a simulated view towards the PWP, categorically Heleza Moya located beyond the PWP. This viewpoint provides an indication of the expected visual exposure expected of Heleza Moya from Mtunzini.

Viewers commuting on the underpass parallel to the N2 beyond the MRA toward the coast would experience temporary and localized visual exposure due to the valley-bottom topographic feature that exists between the underpass and Heleza Moya (i.e., the elevation of the underpass is almost the same elevation as the Heleza Moya Proposed corridor locality topography with a valley in between).

The temporary and localized visual exposure will result from viewers engaging in activities such as cycling, walking, jogging, etc., along the underpass adjacent to Helza Moya.

Figure 8-74 - Simulation of the Fairbreeze operation – viewpoint near the central boardwalk entrance to the beach approximately from 28°57'49.04"S; 31°46'1.19"E (Young, 2011).

9 DESCRIPTION OF ALTERNATIVES TO BE CONSIDERED INCLUDING THE OPTION OF NOT GOING AHEAD WITH THE ACTIVITY

The EIA Regulations of 2014 (as amended) stipulate in Regulation 3 of Appendix 3 (referred to as the 'EIA Assessment Report') that the evaluation of alternatives is required as part of the EIA process for a proposed development. The EIA Regulations of 2014 (as amended) outline, in Chapter 1, the definition of 'alternatives' concerning a proposed activity or project, indicating them as "different means of achieving the overarching purpose and requisites of the activity." Consequently, these alternatives encompass a range of possibilities, which may include:

- The property or location where the activity is proposed to take place.
- The nature of the intended activity.
- The layout or design of the activity.
- The technological approach to be adopted in the activity.
- Operational aspects tied to the activity.
- The option of abstaining from implementing the activity itself.

The subsequent sections offer comprehensive insight into the alternatives explored in connection with the proposed Project.

9.1 LOCATION ALTERNATIVES

Over the past couple of years Tronox acquired adjoining properties which now form the Fairbreeze Mine. Heleza Moya Farm was also a property of interest for Tronox; however, a sale agreement was not reached with Mr McMurray (former owner of Heleza Moya Farm). Therefore, as the Fairbreeze Mine was developed into the surrounding properties the Heleza Moya Farm was now landlocked, i.e., surrounded by Fairbreeze Mine. Tronox has now reached a sale agreement with Mr McMurray and has now newly acquired this farm portion. The Heleza Moya Farm is positioned adjacent to orebody FBB to the south, therefore, expanding FBB orebody into Heleza Moya Farm was an impending strategy.

Fairbreeze already owns the mining right to the land surrounding the Heleza Moya Farm and currently mining in the area. Equipment from the FBB ore body will be relocated and used at Heleza Moya, therefore the mining activities will be a continuation of the mining taking place on the FBB area.

Therefore, this is the preferred location for the proposed Project and there are no alternatives.

9.2 TECHNOLOGY ALTERNATIVES

9.2.1 MINING METHOD

9.2.1.1 Mechanical Dredging

Mechanical mining methods may be employed to strip the barren areas in the ore body. Other mining methods that were evaluated in detail but rejected for environmental, financial or safety reasons, were:

- Bowl scraper;
- Wheel loader / truck;

- Hydraulic excavator / truck and conveyor; and
- Bucket wheel excavator.

The bowl scraper, wheel loader and hydraulic excavator options would require large mobile equipment fleets, generating high levels of noise and dust. The high rainfall would disrupt the operation of such equipment. The bucket wheel excavator was discounted due to its inflexibility. The monitoring and dredging options are preferable in terms of reduced environmental impact. A dredging operation was not considered due to the undulating floor topography and high silt content, which could cause the dredge pond to "freeze".

9.2.1.2 Hydraulic Mining (Preferred)

The mining method employed at Fairbreeze mine, and considered the preferred mining method at Fairbreeze, is Hydraulic Monitoring. A jet of high-pressure water is aimed at a mining face, thereby cutting into and loosening the in-situ sand so that it collapses on the floor. The water acts as a carrier medium for the sand (ROM), due to the high clay fines content contained in the ROM. The slurry generated by the monitors, flows to a collection sump where Oversize is removed, and the slurry is then pumped towards the PWP through a system of booster pumps. The varying grade and slimes content requires the mining of different faces concurrently to reduce large variations. Up to six monitors will operate to produce rates up to 2160 tonnes per hour.

At the Primary Wet Plant (PWP) the heavy minerals will be separated from the sand, silt and clay fraction. The heavy mineral concentrate will then be trucked by road to Tronox CPC at Empangeni for refinement. The fine discard or slimes material from the PWP will be pumped to an existing Residue Storage Facility (RSF) while the coarse discard or tailings will be pumped back to the mining area to backfill the mining void. The mined-out areas will be rehabilitated to achieve a pre-mining land capability.

9.2.2 RECYCLING, WATER AND ELECTRICITY

The mining activities, in its operational phase, is expected to implement recycling policies and measures for optimal utilisation of resources and minimisation of waste generation. The high-pressure water lines would also need to be extended from the current FBB area onto Heleza Moya to power the hydraulic monitors. The Fairbreeze area is supplied with electrical power from the Eskom electricity grid.

9.2.3 DESIGN AND LAYOUT

The positioning of the infrastructure was considered based on the access to the reserves, environmental sensitives and existing haul roads. The location also considered the PWP location regarding ease of access and efficiency. The position of 88 kV powerline was also considered in the decision to place the infrastructure.

With the above considered the preferred infrastructure position was selected. The preferred infrastructure position also allows the opportunity to realise economies of scale as the infrastructure will be oved from FBB, thus increasing output with the same infrastructure.

The proposed infrastructure location is also accessible through existing routes that ultimately transport product to the CPC.

9.3 ‘NO-GO’ ALTERNATIVE

The option of the project not proceeding would mean that the environmental and social status would remain the same as it is currently. This implies that both negative and positive impacts would not take place. As such, the short-term negative impacts on the environment would not transpire; equally so, the long-term positive impacts such as environmental air pollution source reduction, as well as economic and skills development would not occur.

10 ENVIRONMENTAL IMPACTS ASSESSMENT

This Chapter identifies the perceived environmental and social effects associated with the proposed Project. The assessment methodology is outlined in **Section 5.5**. The issues identified stem from those aspects presented in **Section 8.** of this document as well as the Project description provided in **Section 0**.

Furthermore, a decommissioning assessment will be considered as part of the decommissioning process that will be subject to a separate authorisation and impact assessment process. The impact assessment in this section encompasses the geographical, physical, biological, social, economic, heritage and cultural aspects in accordance with Appendix 1 of GN R. 982.

NOTE: The sub-sections set out in the section below should be read in conjunction with the specialist report enclosed herewith as Appendix E.

10.1 HERITAGE AND PALAEONTOLOGICAL IMPACT ASSESSMENT

A number of known heritage resources (structures, burial grounds/graves and archaeological) sites exist in the larger geographical location of the MRA. The sites that fall within the boundary of the Heleza Moya property are indicated in Table 10-1 and Figure 8-62.

Table 10-1 – Heritage resources within the Heleza Moya property

Site ID	Site Co-ordinates	Site Name	Site Category	Grade*
85632	29° 0'29.63"S; 31°41'59.20"E	Umlando-CM9	Structures – Compounds	IIIC
85643	29° 0'10.01"S; 31°41'56.52"E	Umlando-CFS 1	Building	IIIC
85662	29° 0'25.70"S; 31°42'4.70"E	Umlando-LH3	Building – Labourers houses	IIIC
85671	29° 0'8.20"S; 31°42'22.20"E	Umlando-CFS 2	Burial Grounds and Graves	IIIA
*Grade:	IIIA - These are heritage resources which are significant in the context of an area. Administered by local municipal authorities that have successfully applied for devolution of powers to the local level. IIIC - These are heritage resources which are significant in the context of a streetscape or direct neighbourhood. Administered by local municipal authorities that have successfully applied for devolution of powers to the local level			

The heritage resources found on the site include old compounds, labourers houses and burial ground/graves.

10.1.1 CONSTRUCTION PHASE

Based on the heritage assessment on what is known of the area, it is unlikely that the archaeological resources located within the development area will have high levels of cultural value. Graves always carry a High Significance Rating in terms of Cultural Heritage; however, with the implementation of the recommended mitigation measures, the probability of impact is likely to be “low”, resulting in an overall impact of “low” significance. The following additional mitigation measures are recommended:

- It is recommended that the site be fenced-in properly and that a Buffer Zone of at least 15 m be placed around the outer perimeter of the burial ground/graves in which no development and mine

related activities should be allowed. The site should also be b signposted indicating it as a burial area. Access to the burial ground/graves for potential descendants/family should be provided unhindered.

10.1.2 OPERATIONAL PHASE

The mitigation measures proposed for the construction phase are applicable.

10.1.3 DECOMMISSIONING PHASE

The mitigation measures proposed for the construction phase are applicable.

10.2 AIR QUALITY IMPACT ASSESSMENT

The predicted concentrations for dust, PM_{10} and $PM_{2.5}$ were below the relevant ambient air quality standards at all identified sensitive receptors (i.e., within the National Ambient Air Quality Standards (NAAQS)).

10.2.1 CONSTRUCTION PHASE

The unmitigated construction activities were predicted to have a “moderate” environmental significance regarding impacts of air quality (dust, PM_{10} and $PM_{2.5}$) on sensitive receptors. The activities giving rise to these air quality impacts include bulk earthworks, development, relocation of required service infrastructure on the site, development of access roads, site establishment, topsoil stripping and construction of project components, etc. With the implementation of suitable dust mitigation measures, the residual impacts are anticipated to be “low”.

Although impacts associated with the construction phase of the project are considered to be short-lived and transient, the following mitigation measures would serve to further reduce such impacts to the receiving environment:

- Planning construction activities in consultation with nearby residences. Information regarding construction activities should be provided to all nearby residences of the proposed site. Such information includes:
  - Contact details of a responsible person on site should complaints arise to reduce emissions in a timely manner.
- Avoid dust generating works during the windiest conditions.
- When working near a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible.
- Ensure construction fleet vehicles are kept at speed limits within 20-40 km/h at the construction site.
- Wet suppression and wind speed reduction are common methods used to control open dust sources at construction sites as a source of water and material for wind barriers tend to be readily available.
- Additionally, the following general control methods for open dust sources, as recommended by the USEPA can be applied (Table 10-2):

Table 10-2 - Mitigation measures for general construction (US EPA, 1995)

Emission Source	Recommended Control Method
Truck transport (1)	Wet suppression
	Paving e.g., asphalt concrete
	Chemical stabilisation (2)
Bulldozers	Wet suppression (3)
Cut/fill material handling	Wind speed reduction
	Wet suppression
	Wet suppression
Cut/fill haulage	Paving
	Chemical stabilisation
General construction	Wind speed reduction
	Wet suppression
	Early paving of permanent roads
Notes:	(1) Loads could be covered to avoid loss of material in transport, especially if material is transported offsite. (2) Chemical stabilisation usually cost-effective for relatively long-term or semi-permanent unpaved roads (3) Excavated materials may already be moist and may not require additional wetting.

10.2.2 OPERATIONAL PHASE

Impacts associated with the operational phase of the project are largely associated with fugitive emissions from the proposed Project which have the potential to arise from the following main sources:

- Unpaved roads – as the vehicle's tyres move across the road surface the frictional forces result in the soil and rock particles breaking down into smaller sized particles.
- Materials handling activities – tipping, removal, loading and offloading activities.
- Wind erosion from stockpiles – can occur during the loading of the piles, when wind disturbs the stockpile surface, and during reclamation.

The operational phase impacts of air quality (dust, PM_{10} and $PM_{2.5}$) on sensitive receptors is anticipated to be "low". With the implementation of suitable mitigation measures, the residual impacts are anticipated to remain with a "low".

However, the following mitigation measures would serve to further reduce such impacts to the receiving environment:

- Unpaved Roads:
  - Water is to be applied as a dust suppressant to the unpaved roads at the site.
  - Implement vehicle speed and access restrictions within the site (approximately 20 - 40 km/h).
  - Vehicles carrying loose aggregate should be covered with tarpaulins or sheets at all times.

- Prevention of material deposition onto haul roads through avoiding the overloading of truck loads resulting in spillages on the roads; preventing wind erosion from adjacent open areas; and ensure adequate storm water drainage to prevent water erosion of the roads.
- Prioritising source reduction measures through the use of the most direct travel routes on site; undertaking backhauling; using conveyors instead of haul roads where possible; and using larger capacity trucks to minimise the number of trips.
- Water bowser routes should align with the daily/weekly mine plan schedule and a maintenance programme should be in place to ensure continuous availability of the water bowsers.

- Material Handling Activities:
  - Modifying or ceasing loading activities during dry and windy conditions.
  - Avoid double handling of material where possible.
  - ▪ Minimising the drop height of the material from truck loads.
  - Using water carts with boom sprayers or wet suppression systems when loading and unloading activities occur.
- Stockpiles:
  - The height of existing berms at stockpiles be increased, reducing the impact of winds on the stockpile.
  - Temporary stockpiles be enclosed by porous walls.
  - Small, temporary stockpiles can be covered with a porous sheet (preferably hessian).

10.2.3 DECOMMISSIONING PHASE

A detailed assessment was not undertaken for the decommissioning and post closure phase impacts.

10.2.4 CUMULATIVE IMPACT

The predicted concentrations are well below the relevant ambient air quality standards at all sensitive receptors. Further, predicted concentrations are likely to be absorbed into the existing ambient air quality environment.

10.3 NOISE IMPACT ASSESSMENT

10.3.1 CONSTRUCTION PHASE

During the daytime, current noise levels at FBB from the mining activities are slightly above the SANS Rural Guideline Rating Level of 45 A-weighted decibel (dB(A)), however exceedances are below the 7 dB(A) threshold for annoyance as per the South African Noise Control Regulations (GN R.154 of 1992). The predicted noise levels at Heleza Moya are not anticipated to exceed current levels at FBB as mining activities as Heleza Moya will be a continuation of the mining taking place on the FBB.

Therefore, an increase in noise impacts due to the Fairbreeze extension into Heleza Moya is not anticipated due to the following:

- No new noise sources will be associated with the Heleza Moya site, equipment from the FBB ore body will be relocated and used at Heleza Moya.

- Historical model predictions and monitoring results indicate that when mining occurs at the FBB orebody, no impacts at nearby receptors are perceived, hence no impacts as a result of mining at Heleza Moya are expected.
- Receptors are located at inordinate distances from the Heleza Moya site (closest receptor is 2.6 km away) and from previous experience with other mining sites, noise impacts are usually perceived within 1 to 2 km from the source.

Impacts associated with the construction phase of the project are considered to be short-lived and transient in nature with a “low” significance, however the following mitigation options are recommended (IFC, 2007) to avoid further increase to the current noise levels:

- Selecting equipment with lower sound power levels.
- Ensuring equipment is well-maintained to avoid additional noise generation.
- Ensure that heavy mobile equipment operations, especially those near sensitive receptors, are scheduled for daytime hours.
- Installing suitable mufflers on engine exhausts.
- Installing acoustic enclosures for equipment that causes radiating noise.
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas.
- Re-locating noise sources to less-sensitive areas to take advantage of distance and shielding.
- Continuous monitoring station is maintained as well as the annual monitoring campaigns at the most relevant receptors continue.

With the implementation of suitable mitigation measures, the residual impacts are anticipated to remain with a “very low”.

10.3.2 OPERATIONAL PHASE

Impacts associated with the operational phase of the project are minimal, no new special conditions/mitigations measures above the current Fairbreeze EMPr (2021) are applicable.

10.3.3 DECOMMISSIONING PHASE

A detailed assessment was not undertaken for the decommissioning and post closure phase impacts.

10.3.4 CUMULATIVE IMPACT

The predicted noise levels are below the threshold for annoyance as per the South African Noise Control Regulations (GN R.154 of 1992). at all sensitive receptors.

10.4 TERRESTRIAL FAUNA IMPACT ASSESSMENT

10.4.1 CONSTRUCTION PHASE

10.4.1.1 Loss and disturbance of fauna habitat

Habitat loss refers to the physical removal of natural habitat. Habitat disturbance refers to the modification of habitat to the extent that it loses important functionality. These impacts can negatively impact the viability of all fauna populations occurring in the study area, including SCC.

Construction activities will include vegetation clearing and bulk earth works, which will take place in the footprints of proposed project infrastructure. Based on the available infrastructure layout plans for

the proposed project, no infrastructure is planned within the natural/semi natural habitats as a result only about 21.60 ha of the modified habitat will be lost to the proposed project (Table 10-3).

Table 10-3 - Extent of habitat loss associated with proposed Project activities

Habitat Type	Habitat Units	Sum of area (ha)	Approx. Extent (ha) of Loss
Modified Habitats	Developed Site	3.18	0.00
	Eucalyptus Timber	30.41	6.00
	Sugarcane Fields and Melaleuca Oil Plantations	70.28	15.59
	Sub Total	**103.88**	**21.60**
Natural Habitats	Scattered Trees and Bush-clumps	1.36	0.00
	Secondary Grassland	12.42	0.00
	Swamp Forest	0.97	0.00
	Sub Total	**14.75**	**0.00**

Due to the highly transformed habitat of the study area and the extent of loss of modified habitat, the impact is considered to be of “moderate” significance prior to mitigation. With mitigation, this magnitude of the impact can be lowered to a “low” significance.

The following mitigation measures are recommended:

- Vegetation clearing should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas;
- The footprints to be cleared should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; and
- No heavy vehicles should travel beyond the marked works zone.

The following rehabilitation measures are recommended:

- A rehabilitation/landscaping protocol should be developed and implemented on-site. The protocol should include, *inter alia*, the following provisions:
    - Stockpiling of topsoil from development footprints during site preparation;
    - Post-construction, the landform should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment;
    - Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and
    - Locally occurring indigenous grasses species should be used to revegetate all areas disturbed during construction.

10.4.1.2 Injury, mortality and disturbance of fauna

Large and mobile fauna will move off to avoid disturbances caused by construction activities. However, smaller and less mobile species may be trapped, injured and killed during vegetation clearing and earth works. Susceptible fauna includes *inter alia*, burrowing mammals (e.g., rodents), reptiles and amphibians. Other common potential causes of fauna death, injury and disturbance during the construction phase may include:

- Vehicle collisions along construction and access roads;
- Hunting and snaring by construction workers;
- Trapping of fauna in excavations and trenches; and
- Excessive dust and noise from construction machinery may cause sensory disturbances.

The impact prior to mitigation is considered to be of "moderate" significance, with a long-term impact duration (project life). With mitigation, which includes *inter alia*, the active and correct management of all human-animal interactions, significance is reduced to "low", and the probability of the impact can be reduced to low as well, within scale to the site only.

The following mitigation measures are recommended to minimise and avoid thi impacrt:

  - An Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions. The ECO should be trained in *inter alia*, snake handling and basic fauna identification;
- Any fauna species trapped in construction areas, should be safely and correctly relocated to an adjacent area of natural habitat;
- As appropriate, barriers should be erected around construction trenches and excavations to prevent fauna being trapped in these features;
- A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions;
- The handling, poisoning and killing of on-site fauna by workers and contractors must be strictly prohibited; and

The rules and regulations concerning all wildlife should be communicated to workers and contractors through on-site signage and awareness training (induction).

10.4.1.3 Establishment and Spread of Alien Invasive Species Resulting in Degradation of Fauna Habitat

Disturbances caused by vegetation clearing and earth works during the construction phase will facilitate the establishment and spread of alien invasive vegetation. Alien plant infestations can spread exponentially, suppressing or replacing indigenous vegetation. This may result in a loss of functional fauna habitat and an attendant reduction in fauna diversity.

Before mitigation, impact significance is "moderate", while duration is long-term, and it has a high probability of occurrence. With the implementation of active control during the construction phase, this impact can be reduced to a "low" significance, with a short-term duration.

The following mitigation measures are recommended:

- An Alien Invasive Species (AIS) Control and Eradication Plan must be developed for the Project. It is recommended that the plan include:
  - A combined approach using both chemical and mechanical control methods;

- Periodic follow-up treatments, informed by regular monitoring;
- A specific focus on:
  - All sites disturbed by construction; and
- Areas of wetland/stream vegetation.

10.4.2 OPERATIONAL PHASE

10.4.2.1 Injury, Mortality and Disturbance of Fauna Species

Key potential causes of terrestrial fauna death and injury during the operational phase include:

- Vehicle collisions along access roads during day-to-day maintenance activities; and
- Increased hunting and snaring as a result of improved accessibility associated with the proposed access road network.

The impact prior to mitigation is considered to be of very high magnitude and will permanently impact affected fauna. The spatial scale is local. It is also considered to have a moderate probability, resulting in an impact of “moderate” significance. With mitigation, the impact of “low” significance.

The following mitigation measures are proposed:

- No off-road driving is permitted for vehicles and mobile machinery used during operations and for maintenance purposes.
- A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions;
- The handling, poisoning and killing of on-site fauna by maintenance personnel must be strictly prohibited; and
- The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.

10.4.2.2 Establishment and spread of alien invasive species resulting in degradation of fauna habitat

The spread of alien invasive species from disturbed sites into areas of natural habitat will continue to be an impact of concern during the operational phase.

Before mitigation, the significance is rated “moderate” due to the considerable scale of the impact, however with the implementation of the mitigation measures the impact can be reduced to a “low” significance.

The following mitigation measure will help minimise adverse impacts:

- Active alien invasive species control should continue throughout the operational phase, as per the Project’s AIS Control and Eradication Plan.

10.4.3 DECOMMISSIONING PHASE

10.4.3.1 Establishment and Spread of Alien Invasive Species Resulting in Degradation of fauna habitat

Decommissioning activities, such as the dismantling and clearing away of infrastructure are likely to disturb vegetation and soils, which may facilitate the establishment and spread of alien invasive flora species.

Before mitigation, impact magnitude is high, while duration is long-term, and it has a high probability – this results in a "moderate" impact significance. However, with the implementation of mitigation measures, the impact significance can be reduced to "low".

The following mitigation measure would serve to further reduce this impact to the receiving environment:

- Active alien invasive species control should continue during the decommissioning phase and follow up control should be carried out for a five- year period following decommissioning.

10.5 TERRESTRIAL FLORA IMPACT ASSESSMENT

10.5.1 CONSTRUCTION PHASE

10.5.1.1 Loss and Disturbance of Flora Habitat

Habitat loss and disturbance refers to the direct removal or disturbance of natural habitat that results from vegetation clearing and earth works. The development of proposed Project infrastructure will require vegetation clearing and earth works within the planned development footprints. This will directly impact individual flora species, as well as flora habitat integrity.

Based on the available infrastructure layout plans for the proposed Project, a breakdown of the approximate extent of direct habitat loss and disturbance associated with the proposed Project is presented in Table 10-4. Approximately 21.60 ha of modified habitat loss is likely to occur as a result of the proposed project development ().

Table 10-4 - Approximate extent of direct habitat loss associated with the proposed Project

Habitat Type	Habitat Units	Sum of area (ha)	Approx. Extent (ha) of Loss
Modified Habitats	Developed Site	3.18	0.00
	Eucalyptus Timber	30.41	6.00
	Sugarcane Fields and Melaleuca Oil Plantations	70.28	15.59
	Sub Total	**103.88**	**21.60**
Natural Habitats	Scattered Trees and Bush-clumps	1.36	0.00
	Secondary Grassland	12.42	0.00
	Swamp Forest	0.97	0.00
	Sub Total	**14.75**	**0.00**

The impact prior to mitigation could permanently affect vegetation within and potentially adjacent to the development footprints (local). It is also considered to have a definite probability, resulting in an impact of "moderate" significance. With mitigation, the impact significance remains "moderate" with a slightly lower magnitude as the impact can be confined to the site scale.

Considering the development nature of the proposed Project, this impact is difficult to avoid, however measures can be taken to minimise the significance; therefore the following mitigation measures are recommended:

- Areas of undisturbed natural habitat should be avoided:
- All temporary construction footprints, including, but not limited to, laydown areas, portable toilets, cement batching plants, etc., should only be located in areas of modified habitat; and
- Proposed Project access roads should be aligned with existing farm roads and tracks.
- Vegetation clearing should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas;
- The footprints to be cleared should be clearly demarcated according to the mine plan prior to construction to prevent unnecessary clearing outside of these areas; and
- No heavy vehicles should travel outside of dedicated / disturbed areas.

Rehabilitation

A rehabilitation/landscaping protocol should be developed and implemented on-site. The protocol should include, *inter alia*, the following provisions:

- Stockpiling of topsoil from development footprints during site preparation;
- Post-construction, the landform should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment;
- Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and
- Locally occurring indigenous grasses species should be used to revegetate all areas disturbed during construction.

Offsetting

- The current Fairbreeze Offset Plan must be adhered to.

10.5.1.2 Disruption of Ecosystem Processes due to Project Infrastructure

The proposed mining project may cause alterations in important ecosystem processes, such as wildfire patterns (through habitat fragmentation) and water flow/seepage patterns (through soil compaction). This may result in changes in flora composition driving a potential loss of species richness.

The impact prior to mitigation is considered to be of medium magnitude based on the transformed landscape matrix in which the proposed project is located, with a long-term duration. The post mitigation characteristic presents a lower magnitude resulting in a lower significance score. The significance rating for this impact is “low” before and after mitigation.

The following mitigation measure will help minimise adverse impacts:

- To prevent wetland desiccation, the wetland management and protection measures outlined in the wetland impact assessment for the proposed Project should be strictly implemented on-site.

10.5.1.3 Establishment and Spread of Alien Invasive Species

Disturbances caused by vegetation clearing and earth works during construction will facilitate the establishment and spread of alien invasive vegetation. Alien plant infestations can spread

exponentially, suppressing or replacing indigenous vegetation. This may result in the impairment of ecosystem functioning and a loss of biodiversity.

Several highly invasive alien species were recorded on-site during the field visit, including inter alia; Chromolaena odorata, Lantana camara, Nephrolepis cf. cordifolia, Rivina humilis and Syngonium podophyllum, Chromolaena odorata, Lantana camara, Melia azedarach, Schinus terebinthifolius and Solanum mauritianum. It is possible that additional disturbances caused by construction activities may result in the further spread of alien vegetation into grassland and wetland habitats.

Before mitigation, impact magnitude is very high, while duration is long term and it has a high probability. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of “moderate” significance. With the implementation of active control during the construction phase, this impact can be reduced to a “low” significance, with a reduced spatial extent.

The following mitigation measure will help minimise adverse impacts:

- An Alien Invasive Species (AIS) Control and Eradication Plan include this Project area. It is recommended that the plan include:
    - A combined approach using both chemical and mechanical control methods;
    - Periodic follow-up treatments, informed by regular monitoring; and
    - A specific focus on:
        - All sites disturbed by construction; and
        - Areas of wetland/stream vegetation

10.5.1.4 Loss of Flora Species of Conservation Concern

Several flora SCC were recorded or are likely to be present in the broader study area, based on known distribution ranges. It is thus likely that flora SCC are present in the Project site and may be impacted during construction.

The adverse impact on SCC is anticipated to be “moderate” before mitigation, and “low” after mitigation. The adverse impacts on SCC can be mitigated through the implementation of the following control measures:

- Prior to any vegetation clearing, the proposed construction footprints should be clearly marked in the field;
- A wet/growing season field survey for flora SCC should then be conducted within the planned development footprints to determine the identify and number of potentially impacted flora SCC;
- Informed by the findings of the survey:
    - Wherever possible, infrastructure footprints should be re-aligned/re-positioned to avoid SCC locations;
    - Where re-alignment/re-positioning is not possible, permits should be obtained from the relevant authority to rescue and relocate impacted plants; and
- A Flora SCC Rescue and Relocation as per the 2012 EMPr should be implemented for the proposed Project to provide guidance on all aspects of SCC rescue and relocation.

10.5.2 OPERATIONAL PHASE

10.5.2.1 Establishment and Spread of Alien Invasive Species

The potential establishment of alien invasive species will continue to be an impact of concern during the operational phase.

Before mitigation, the significance is rated “moderate” due to the considerable scale of the impact, however with the continued implementation of active control during the operational phase the impact can be reduced to a “low” significance. The spatial extent will be reduced to the site only and the probability of the impact occurring as predicted would be reduced to low.

The following mitigation measure is recommended:

- Active alien invasive species control should continue throughout the operational phase, as per the Project’s AIS Control and Eradication Plan.

10.5.3 DECOMMISSIONING PHASE

10.5.3.1 Establishment and Spread of Alien Invasive Species

Decommissioning activities, such as the dismantling and clearing away of infrastructure are likely to disturb vegetation and soils, which may facilitate the establishment and spread of alien invasive species.

Before mitigation, impact magnitude is high, while duration is long-term, and it has a high probability – this results in a “moderate” impact significance. However, with the implementation of mitigation measures, the impact significance can be reduced to “low”.

The following mitigation measure would serve to further reduce this impact to the receiving environment:

- Active alien invasive species control, as per the AIS Control and Eradication Plan, should continue during the decommissioning phase and follow up control should be carried out for a five- year period following decommissioning.

Rehabilitation:

- All project infrastructure should be dismantled and removed from site;
- All sites disturbed during the decommissioning phase should be stabilised and rehabilitated, as per the rehabilitation/landscaping protocol.

10.6 SOIL AND LAND CAPABILITY

10.6.1 CONSTRUCTION PHASE

The relevant impacts which were identified as part of the initial authorisation includes the following:

- Loss of a soil resource.
- Erosion of soils changing topography, resulting in a loss of soil resource and contribution of sediment to the river/estuary system.
- Loss of land with agricultural potential for mining.
- Change in land use.

The key management measures recommended in the Fairbreeze 2021 EMPr are still relevant. However, it is recommended that current soil stockpiling plan be reviewed to amend the soil depth

removed to be stockpiled or used immediately to 1 m (if not more broadly) and reconsider the current first 0.5 m in the ore body areas and 0.3 m in the waste facility areas. This will assist in retaining the Hutton soils as these soils are valuable agricultural soils that are mostly more than a meter deep.

10.6.2 OPERATIONAL PHASE

The mitigation measures proposed in the Fairbreeze 2021 EMPr are applicable.

In terms on rehabilitation, the existing rehabilitation plan for the broader site (the whole of Fairbreeze Mine) is appropriate for the study site. It identifies the loss of soil, especially topsoil, as the main potential impact of mining the site, followed by erosion and sedimentation. It also identifies the loss of arable land and long-term changes in land use as significant potential impacts. The plan recommends suitable mitigation measures, performance indicators and monitoring measures.

10.6.3 DECOMMISSIONING PHASE

A detailed assessment was not undertaken for the decommissioning and post closure phase impacts.

10.7 SOCIAL IMPACT ASSESSMENT

10.7.1 CONSTRUCTION PHASE

10.7.1.1 Continued Economic Revenue

The continuation of the Fairbreeze Mine will positively impact the GDP. The production of goods and services from the mine will continue due to the continuation of the mine, further contributing to the country's economic development. Although limited, any local economic spending and investment is rated positively. Continued economic development has a positive impact. The significance rating is “low” positive before mitigation and “moderate” positive after mitigation.

The EMPr (2012) contains adequate mitigation commitments that expand on implementing the SLP and prioritising local employment. These include:

- The policy is to employ at least 60% of the people from the Region
- Tronx will only hire people outside this area if the necessary skills are unavailable locally.
- Per the Social and Labour Plan, the company will introduce training programmes focused on raising the skill levels of the residents.
- The SLP further echoes this by stating that economic development projects will prioritise the local municipality, followed by the communities within the district municipality.

10.7.1.2 Extension of Training Programs

Tronox supports many skills development programmes for the local community. The business previously monitored learning and development programmes to upskill employees and the community. These programmes include bursary plans, internships, and mentorship plans.

10.7.1.3 Extension to the Employment of Staff at the Mine

Tronox supports many skills development programmes for the local community. The business previously monitored learning and development programmes to upskill employees and the community. These programmes include bursary plans, internships, and mentorship plans. As a

positive impact, the significance rating of the extension of training programmes increases from “moderate” and remains “moderate” post-mitigation but with a higher magnitude and scale.

The Fairbreeze EMP contains adequate mitigation that expands on how training programmes should prioritise local communities.

10.7.1.4 Extension of Employment for Contractors

According to the SLP (Tronox KZN Sands, 2023-2027), the workforce (Fairbreeze Mine plus support staff) is 456 permanent employees, consisting of 345 males and 11 females. It is estimated that each employee has an average of five dependants, which gives a total of 2 280 non-employees directly dependent on wages from the business (Tronox KZN Sands, 2023-2027). In addition to these, permanent employees Fairbreeze operations contractors employ 1 949 employees. These jobs will also be secured by extending the mine's life by two years.

The extension of the Fairbreeze Mine will allow some employees to continue with their contracts for two more years.

Extension of employment has a positive impact. The significance rating is “moderate” before mitigation and remains “moderate” after mitigation, post-mitigation but with a higher magnitude and scale.

The EMP suggests that labour should be sourced locally, and the SLP mentions that 100% of the employment is from the district municipality. No additional employment opportunities are associated with the proposed mine extension into the Heleza Moya land parcel. Consequently, no further mitigation needs to be added to the existing EMP.

10.7.2 OPERATIONAL PHASE

10.7.2.1 Skill Transfer and Development

The current skills development initiatives include the following:

- Apprenticeship Programme;
- Learnership Programmes (Internal and External);
- Experiential Development Programmes (Technicians and Professionals in Training);
- Bursars (Internal and External);
- Internships (Internal and External);
- Career Pathing and Mentorship Plan; and
- Portable Skills Development (Where applicable).

The operation extension to include Heleza Moya will extend skill development programmes by two more years. Therefore, this is a positive impact; skill transfer and development's impact rating increases from “low” to “moderate” after mitigation.

10.7.3 CUMULATIVE IMPACT

The extension of the mine is not expected to add any new cumulative impacts experienced from the existing mine.

10.8 GROUNDWATER IMPACT ASSESSMENT

Mining started in 2016 at FBC and both the FBC and FBC ext orebodies are mined out. Mining operations have recently commenced at FBB and will be followed by the Heleza Moya pit which is

expected to be continue until 2030. The FBB and Heleza Moya pits are predicted to extend to below the current water table, which ranges from 30 to 40 mamsl at present. The subsections below highlight the results of the mining and rehabilitation predictive simulation.

10.8.1 CONSTRUCTION AND OPERATIONAL PHASE

10.8.1.1 Groundwater at Mining Voids

- Inflows into FBB will range from approximately 3 000 (35 L/s) to 2 500 m^3/d (30 L/s) at the end of mining in 2026. Steady increase in inflows at the Heleza Moya pit will begin as FBB is backfilled, peaking at approximately 1 644 m^3/d (19 L/s) in 2029.
- The inflow is due to the pit extending well below the water table. The amount of seepage into the pit will be dependent on actual rainfall. Inflow into Heleza Moya may also be due to seepage from the backfilled FBB.
- Cross-sections through the FBB and Heleza Moya orebodies showing the water table position relative to the void (Figure 8-52), illustrated that as the pits develop seepage is likely to occur along the up-gradient pitwalls and from the base of the pit. Seepage is predicted to begin seven months into mining. During the first few months of mining at Heleza Moya, it is unlikely ingress will occur since mining will take place above the water table.
- The drawdown associated with the mining will expand as the mine fully develops The Shepley Farm borehole is just within the significant zone of drawdown of 3 m, and monitoring of this borehole should continue and if required any adverse impacts mitigated. This is unlikely to significantly affect neighbouring water supply boreholes.
- No impact on the groundwater quality is noted and this is probably because the water quality within the PCD is of good quality and similar to the groundwater.

10.8.1.2 Changes to Baseflow Conditions

- Siyaya will remain low at less than 100 m^3/d, however not drying up totally. This is mainly due to higher recharged associated with the rehabilitated FBC and FBCX.
- Amanzimnyama will experience about a 25 m^3/d decrease in baseflow during the mining of the FBB and Heleza Moya orebodies. This is a relatively small decrease compared to the overall streamflow. It is noteworthy that the stream does not go dry i.e., there is always some baseflow under average rainfall conditions.
- The mining of FBB and HM has a very minor effect on the streamflow of the Amanzimnyama and negligible effect at the Siyaya estuary.

10.8.2 DECOMMISSIONING AND POST CLOSURE PHASE

10.8.2.1 Groundwater at Mining Voids

Based on the model outcomes it is anticipated that just two years after rehabilitation (around 2032), the water levels would be largely recovered to close to pre mining.

Changes to Baseflow Conditions

The changes to the baseflow conditions are based on best approximations of recharge and could change with improved recharge estimates. The baseflow is predicted to change as follows:

- During the rehabilitation phase and once grasslands are established the recharge is assumed to decrease to 7% of the mean monthly precipitation.

- Post mining baseflows will increase to approximately 120 m^3/d. The baseflow contributions will be proportionally to the recharge. Recharge over the rehabilitated area is assumed to be 7% of MAP, a 5% decrease from the mining period, hence the baseflow will re-establish as lower levels than during the mining period.
- The baseflow post rehabilitation is similar to the pre-mining simulated levels and corresponds with the hydrology analysis. The post-closure baseflow contribution will be a function of recharge rates dictated in part by the final land use.

The following enhancements are recommended:

- Monitoring of the Shepley borehole should continue as it is located close to the simulated zone of drawdown.
- Monitoring of the Amanzimnyama and Siyaya upstream to confirm any baseflow decreases to inform mitigation if required.
- Review the monitoring program to considering changes in mining, infrastructure, and observed groundwater changes.

10.9 SURFACE WATER IMPACT ASSESSMENT

10.9.1 CONSTRUCTION PHASE

The vegetation will be cleared during the construction phase. The box cut will be established as well as access roads and stockpiles. The clearing of vegetation and vehicle activities will increase the erosion potential from the mining area. Fairbreeze has managed sediment using silt fences and keeping the cleared footprint to a minimum. The sediment analysis undertaken in the hydrology study (SRK, 2023) of the Amanzimnyama and Siyaya Rivers showed that the sediment concentrations are an inverse to the flow rate ie the concentrations reduce with increased flow due to the dilution of the higher concentrations in the river under low flow conditions with the lower concentration water under high flow conditions. The lower concentrations in the higher flow conditions was subscribed to the sediment management implemented on site.

10.9.2 OPERATIONAL PHASE

The key surface water impacts that were assessed in the hydrology specialist study (SRK, 2023) were:

- Estimate base flow changes in the Amanzimnyama River during operations and post closure.
- Compute loss of runoff yield as the mine block plan progresses.
- Evaluate and assess perturbations to the Amanzimnyama and Siyaya River flow regime due to the mining of Heleza Moya.
- Changes in water quality due to mining of Heleza Moya.

The application of the calibrated ACRU model to estimate flow conditions at the weir locations on the Amanzimnyama and Siyaya weirs showed that the flow regime is insignificantly impacted by the mining of Heleza Moya during operations for the three operational scenarios modelled.

The water quality is currently good and meets the water quality guidelines for the different uses in the Amazimnyama and Siyaya Rivers. The management of sediment in runoff using silt fences and limiting the stripped area will continue. The use of pollution control dams and stormwater management infrastructure designed to meet Regulation 704 of the National Water Act (1998) will be used to separate clean and potentially polluted runoff. The potentially polluted runoff will be managed in the mine water system and the clean runoff will be returned to the environment. The rainfall falling directly

onto the open pit will be collected in sumps and re-used in the mine process. With the implementation of these systems, the water quality is unlikely to be impacted.

Consequently, little material impact on either flow or quality in the Manzamnyama stream is expected to result from the proposed mining at Heleza Moya.

10.9.3 DECOMMISSIONING PHASE

During decommissioning the infrastructure will be removed and rehabilitation of the mine footprint will begin. The stormwater infrastructure and management system will be maintained and kept functional during this process to collect runoff from the areas being decommissioned. The runoff will be managed in the polluted water management system until the rehabilitation is complete and the vegetation re-established.

10.9.4 CUMULATIVE IMPACT

The simulation of the post-closure scenario showed that the impact on the flows in the Amnzimnyama and the Siyaya were insignificant. In fact, the modelled post closure scenario showed a return to an improved at the Siyaya Estuary.

10.10 ESTUARINE IMPACT ASSESSMENT

Typically, the impacts of the construction phase and the operational phase of a development differ however, because the proposed project is an operational expansion of the existing Fairbreeze B mining operation there is, in essence, no construction phase for. Therefore, only a Mining operation and the Decommissioning Phase have been assessed.

In assessing potential impacts of the proposed Fairbreeze Mine Extension, consideration was given to the fact that although the Heleza Moya site is located approximate 3 km upstream of the head of the Siyaya estuary, it does fall within a feeder river catchment (the Manzamnyama), which is presently experiencing a considerable amount of anthropogenic disturbance.

The Siyaya Estuary is considered a priority system from a biodiversity perspective and is already experiencing a ‘Very High’ Cumulative Pressure level (Van Niekerk et al. 2019). The delivery of ecosystem services by the system is dependent on the ecological wellbeing of the estuary, which is influenced by the quality and quantity of freshwater reaching the system from its catchment and the condition of the fauna and flora within the Estuarine Functional Zone (EFZ).

10.10.1 OPERATIONAL PHASE

Mining of the Heleza Moya pit extension effectively entails additional mining activities in, and access to, the area upstream of the estuary and the effects of earthworks and hydraulic mining operations. These have the potential for associated pollution events, changes in water quality and quantity, as well as the loss of vegetation (non-native).

The evaluation of the potential impacts of the proposed mining expansion on the estuary is strongly influenced by the low level of change in water quality and flow predicted to occur in the Manzamnyama stream.

The significance of these potential impacts during the operational phase of mining on the estuary before implementation of mitigation ranged from medium to very low and after mitigation had reduced before within a significance range of low to insignificant.

10.10.2 DECOMMISSIONING PHASE.

Decommissioning phase impacts on the estuary are not expected to differ significantly from those in the mining phase, given the small size of the extension area in relation to the catchment and the low level of change predicted to occur in the stream.

10.10.3 CUMULATIVE IMPACT

Sixty-nine percent (69%) of the Siyaya catchment is currently disturbed by anthropogenic activities. However, the Heleza Moya extension represents only a small proportion of this total anthropogenic disturbance within the catchment (6%), and a similarly small proportion of the total catchment area (only 4%). Therefore, before mitigation the cumulative impact of the Heleza Moya extension is considered of 'Low' negative significance and 'Very Low' following the implementation of the prescribed mitigation contained in the EMPr.

10.11 VISUAL IMPACT ASSESSMENT

10.11.1 CONSTRUCTION PHASE

Visibility and visual exposure

The viewshed analysis indicated that Heleza Moya would be visible to an extent which does not go beyond the current Fairbreeze Mine zone of influence, resulting in "very low" visibility before and after mitigation.

Visual Intrusion

The visual intrusion would be rated as "very low" before and after mitigation since Heleza Moya is compatible with the land use patterns within the study area, i.e., Fairbreeze Mine. Receptors from the coast may experience a temporary change in landscape, however this will be short-lived and transient.

10.11.2 OPERATIONAL PHASE

The mitigation measures proposed for the construction phase are applicable.

10.11.3 DECOMMISSIONING PHASE

Visual intrusion would reduce dramatically at decommissioning assuming that the recommended rehabilitation measures are effectively implemented. Once the mining area is backfilled it will be contoured mechanically to assure slopes blend into the current landscape. The topsoil stockpiled before the mining will be returned and the area will be vegetated as per the rehabilitation process implemented on the current Fairbreeze Mine areas.

10.11.4 CUMULATIVE IMPACT

The region was predominantly an agricultural landscape that has been substantially transformed by mining over the recent years. Most of the land within the MRA was, or remains, under commercial timber plantations or sugarcane fields. The cumulative impact associated with the existing visual impacts from existing mine infrastructure and facilities, coupled with the anticipated visual impacts from the proposed Project infrastructure and activities is "negligible".

10.12 REHABILITATION AND CLOSURE

10.12.1 FINANCIAL PROVISION

A closure report in accordance with the MPRDA Guideline to Financial Provision was compiled in 2005 for Fairbreeze Mine. For the purposes of the inclusion of Heleza Moya, a closure report was drafted to include the new infrastructure and mining development project (and not the entire mining right). The closure report is appended in Appendix 1. The subsection below highlight the financial provisions recommend for mining at Heleza Moya farm.

10.12.2 CLOSURE OBJECTIVES

The closure philosophy and objectives below have been developed to guide the closure measures to be implemented on site towards achieving the above closure vision. The key closure objectives are as follows:

Landform:

- Achievement of pre-mining land capability comparable to the current Fairbreeze Mine.
- Rehabilitated areas are free draining.
- Limited erosion gullies or features.
- No unplanned ponding.
- No unrehabilitated melon holes.

Soils and land capability:

- To achieve audited compliance with soil stripping and handling procedure.
- ≥85% correlation between available soil and stripped soil.
- Topsoils across rehabilitated pit area.
- Bulk density: < 1.55g/cm^3.
- Available rooting depth.
- Rock content: as low as possible in terms of the soul physical parameters.
- Compliance with the relevant soil chemistry parameters.

Water resources:

- Updated numerical groundwater model and water liability assessment.
- Updated mine water management plan (for residual and latent impacts).
- Compliance with GN R. 704.
- Updated and secured financial provision for residual and latent impacts.
- Comply with WUL requirements.

Biodiversity:

- Natural areas vegetation structure and species composition to align with local reference site.
- Alien invasive plants not dominating and presence to align with, and improve on, surrounding local reference sites.
- Natural areas vegetation structure and species composition to align with local reference site.
- Presence of alien invasive plants to align with and improve on surrounding local reference sites.

Infrastructure:

- No remnant infrastructure or waste materials remaining on surface, unless transferred in writing in the signed agreements.
- Social and economic:
  - Site is safe for human and animals.
  - Post closure land-use agreements (covering land use, rehabilitated land management and ongoing maintenance, including where relevant management of residual impacts).

Climate:

Apply latest climate change prediction to assessment of residual and latent impacts- provision of reasonable and adequate contingency funding.

10.12.3 CLOSURE ACTIONS

In order to align Heleza Moya to the current closure plan the following activities would need to be specifically address:

- Preparation and planning for closure- This includes all of the tasks leading up to the finalisation of the closure plan for implementation.
- Rehabilitation of access roads - the main haul road leading to the operations, as well as the access route to the soil stockpile areas. It is anticipated that certain of these access roads will be retained as smaller local access to the site to allow for controlled access during closure and post closure monitoring and maintenance.
- Rehabilitation of the pit areas. One of the key components of the rehabilitation of the pits is to ensure a suitable and sustainable final landform.
- Rehabilitation of the soil stockpile areas.
- General surface rehabilitation- including soil amelioration and planting of vegetative cover for the affected natural areas, and planting of crops on the defined arable land areas.
- Removal of fencing required during the mining operations. Fencing will need to be removed.
- at closure to avoid unnecessary post closure maintenance and management costs.
- Maintenance and aftercare- Maintenance and aftercare is typically applied during the closure period (i.e., once active rehabilitation and closure is completed and ending once a closure certificate is obtained). Typically, aftercare and maintenance include general maintenance activities including, soil amelioration (inclusion fertilization), ongoing monitoring, control of alien invasive, and surface stability and settlement actions. It should be noted that for the purposes of this report and the associated financial provisions, that the relevant monitoring and maintenance/ aftercare actions are included in the other closure components listed above.

10.12.4 ENVISAGED POST-MINING TOPOGRAPHY

The current land-use on the site is predominantly agriculture. It is also noted that the site is presently highly suitable and viable as a productive agricultural unit. It is on this basis that it is proposed that all reasonable efforts be taken to return the greater majority of the mine affected land, post closure, to viable and productive farmland.

10.12.5 ENVISAGED POST-MINING LAND USE

There are various alternative closure and post closure options available for the Fairbreeze mine extension project driven by various factors. Possible alternatives identified for post closure land-use on Heleza Moya surface right from all the data collected include the following options:

- Leasing of land on a permanent basis.
  - Leasing for plantation establishment.
  - Leasing the land to local farmers for grazing.
- Agricultural development (specialist farming/small farming projects like aquaponics, hydroponics etc.).
- Sell or transfer some property and/or infrastructure for industrial purposes.

The above alternatives assume the following:

- That disturbed mine land is fully rehabilitated, and rehabilitation has proved to be sustainable.
- The risks of rehabilitated land are low and the surface can be managed by suitable third party with suitable knowledge, training and experience.
- Tronox is able to attain site relinquishment, after application of closure certificate or transfer of liabilities to third party.

The preferred closure and post closure option is as follows:

The Heleza Moya Surface rights is fully rehabilitated in line with what is currently implemented at Fairbreeze Mine, and rehabilitation design meets specifications, and the surface is maintained with appropriate agricultural practices for use by Tronox or third parties where possibility exist.

10.12.6 CLOSURE COST SUMMARY

The scheduled closure costs, as at September 2023, are summarised in Table 10-5. The assumptions are outlined in section 12.12.

Table 10-5 - Scheduled closure costs as at September 2023

No.	Closure Component	Scheduled closure (ZAR)
1	Infrastructural Aspects	-
2	Mining Areas	18 924 750.00
3	General Surface Rehabilitation	2 287 938.02
4	Surface Runoff Measures	-
	Sub-Total 1	**21 212 688.02**
5	Post Closure Aspects	
5.1	Surface water quality monitoring	106 233.60
5.2	Groundwater quality monitoring	145 555.20
5.3	Rehabilitation monitoring	164 424.00
5.4	Care and maintenance - low intensity	931 775.00
5.5	Care and maintenance - high intensity	-
	Sub-Total 2	**1 347 987.80**
6	Additional Allowances	-
6.1	Preliminary and General	3 181 903.20
6.2	Contingencies	2 121 268.80

No.	Closure Component	Scheduled closure (ZAR)
6.3	Provisional amount for Closure Related Social Aspects	-
6.4	Additional studies	-
	Sub-Total 3	**5 303 172.00**
7	Residual and Latent Aspects	-
	Sub-Total 4	**-**
	Grand Total Excl. VAT. (Sub-total 1 + 2 + 3 + 4)	**27 863 847.82**

10.13 ASSESSMENT OF POTENTIAL IMPACTS

Please refer to the impact assessment summary tables enclosed herewith as **Appendix E**. The table summarises the impacts directly related to the construction phase, operational phase and decommissioning phase of the proposed project and provides a significance rating for each impact before and after mitigation.

11 ENVIRONMENTAL IMPACT STATEMENT

The essence of any impact assessment process is aimed at ensuring informed decision-making, environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that "development must be socially, environmentally and economically sustainable…. and requires the consideration of all relevant factors…". NEMA also imposes a duty of care, which places an obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act No. 108 of 1996) should be anticipated and prevented, and where they cannot be prevented altogether, they must be minimised and remedied in terms of "reasonable measures".

In assessing the environmental feasibility of the proposed construction of the proposed Project, the requirements of all relevant legislation have been considered. The identification and development of appropriate mitigation measures that should be implemented to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience, and the relevant legislation (where applicable).

Potential impacts associated with the proposed facility have been assessed and the significance of these evaluated with consideration of proposed mitigation measures. Due to the footprint and surround areas of the facility being greatly transformed, industrialised and containing hardstanding surfaces, a lack of suitable environmental features exist. Thus, impact assessments were not conducted, but the status of the environmental conditions of the facility and surroundings were confirmed by site visits. Potential overall negative impacts were considered to be of low significance, positive impacts to the social-economic environment were also identified. The low significance of potential impacts was substantiated on the premise that EMPr measures would be implemented. Mitigation measures have been developed where applicable for the above aspects and are presented within the EMPr (**Appendix A**). It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

The BAR will be subject to public review, which will be undertaken according to the requirements of NEMA with every effort made to include representatives of all stakeholders within the process. The BAR will be updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

11.1 SPECIALIST CONCLUSIONS

11.1.1 HERITAGE AND PALAEONTOLOGY

- The proposed development reflects an acceptable level of change within an existing mining context.
- There is no objection to the demolition of the existing structures on the property on condition that the mitigation measures identified in Appendix E are implemented.
- There is no objection to the proposed expansion of the mine from a heritage perspective.

11.1.2 AIR QUALITY

Key findings from the dispersion modelling simulations for the Project indicated that:

- The modelled predicted and cumulative dust fallout rates at all sensitive receptors and across the modelling domain are expected to be below the residential and non-residential dust fallout standards.
- Modelled predicted and cumulative 24-hour and annual average PM_{10} concentrations at each sensitive receptor and across the modelling domain were below their respective 24-hour and annual average NAAQS.
- Modelled predicted 24-hour and annual average $PM_{2.5}$ concentrations at each sensitive receptor and across the modelling domain were well below their respective 24-hour and annual average NAAQS. No $PM_{2.5}$ background concentrations were available for the project area and as such, cumulative impacts for $PM_{2.5}$ could not be assessed.

11.1.3 NOISE

Based on the findings of the noise compliance statement, no changes in the noise climate are anticipated as a result of Heleza Moya and impacts on the natural environment are envisaged to be negligible / unchanged.

11.1.4 TERRESTRIAL FAUNA

Most of the study area is transformed and classified as modified habitat. Natural habitat is limited to a small patch of Swamp Forest in the eastern corner of the study area, while small patches of semi-natural and regenerating Secondary Grassland and Secondary Bush-clumps and Thickets are also present.

The proposed Project is not deemed to present significant negative environmental issues or impacts.

11.1.5 TERRESTRIAL FLORA

The area where flora SCC were recorded in or immediately adjacent to the study area during the field survey, including *Raphia australis* and *Cassipourea gummiflua var. verticillata,* which are both listed as Vulnerable on South Africa's regional Red List should be protected to ensure that no further negative impact will be sustained on the extent and condition of habitats supporting this species as a result of mining at Heleza Moya.

Most of the study area is transformed and classified as modified habitat, with a limited patch of Swamp Forest in the eastern corner as well as small patches of semi-natural and regenerating Secondary Grassland and Secondary Bush-clumps and Thickets are also present.

11.1.6 SOIL AND LAND CAPABILITY

A seasonal wetland boundary was delineated as accurately as possible based on the limitations mentioned. It is recommended that mining remain outside of this area.

Regarding land capability, the impact on adjacent agriculture will be significant with respect to food security however this will be short-lived. The mining operation can generate significant monies and skills to ensure the betterment of the farm post-rehabilitation (Mottram and Associates cc, 2023).

Furthermore, the existing rehabilitation plan for the broader site (the whole of Fairbreeze Mine) is appropriate for the study site.

11.1.7 SOCIAL

The extension of the Fairbreeze Mine will have minimal impacts on the surrounding communities and environment because the proposed portion of land is already within an existing mining area, and the nearest sensitive receptor is 5.5 km away. The EMP currently in place for the Fairbreeze Mine has sufficient measures to mitigate all social impacts mentioned in section 10.7.

11.1.8 GROUNDWATER

The mining of FBB and HM has a very minor effect on the streamflow of the Amanzimnyama and negligible effect at the Siyaya estuary. However, the recommended key improvements should be carried out.

11.1.9 SURFACE WATER

The modelling of the flow regimes showed that the impact of the mining of Heleza Moya will not impact the flow regime in the Amanzimnyama or the Siyaya Rivers significantly. The post closure flow scenario was simulated to return to an improved flow regime at the estuary post closure.

The implementation of the planned stormwater management and pit water management during operations as well as the maintenance of the sediment management strategy will ensure that the water quality in the surface water will remain in current ranges.

The proposed Heleza Moya extension contributes only a small proportion of this cumulative disturbance on the Siyaya Estuary.

11.1.10 ESTUARINE ENVIRONMENT

Offsets, or the compensation of negative impacts on biodiversity, are only required if any of the impacts assessed by specialists are deemed residual impacts. Residual impacts are defined as those that have a ‘Medium’ or higher negative significance rating following the implementation of mitigation measures. If the essential mitigation measures listed above are appropriately followed, all impacts assessed here are rated as ‘Low’, ‘Very Low’ or ‘Insignificant’, suggesting that no offsets are required for the extension of the Fairbreeze B orebody into the Heleza Moya Property.

There are a number of legacy issues/ cumulative impacts acting on the catchment, which have subsequently resulted in the Estuary experiencing a high level of cumulative pressure. Cumulatively anthropogenic disturbance covers 66% of the catchment. The proposed Heleza Moya extension contributes only a small proportion of this cumulative disturbance (6%) and is of ‘Very Low’ negative significance when considering the direct impacts of the extension on the Siyaya Estuary after mitigation. The remaining Fairbreeze mining areas that fall within the catchment, contribute approximately 20% of the total disturbance. It is worth noting that 5% of this disturbed area has been rehabilitated in the form of FBC. Conversely, Eucalyptus and sugarcane plantations contributed 43 and 17% of the disturbed catchment area, respectively. The impacts of these have been discussed in more detail in a separate more comprehensive report (Jackson et al. 2024)

It is because of this high-pressure level that we recommended that the implementation of the Eco-pulse offsets proposed in the ‘Siyaya Plantations Offset Area’ be initiated in areas surrounding the four mine pits as soon as possible. Although the completion of rehabilitation on 62 ha of FBC (3% of the total catchment area) is a positive step towards improved catchment conditions, it will take

time for natural vegetation and hydrological conditions to recover in this area. Therefore, although the offsets are not directly related to the Heleza Moya operation, these offsets which form part of existing environmental authorisations will help to reduce overall cumulative impacts acting on the estuary and it has been shown that once all proposed offsets have been implemented Estuary health could increase to as high as a B/C category: Moderately modified to Near Natural.

If suitably undertaken, it is possible that mitigations which improve the quantity and quality of water entering the system could potentially have a slight positive effect on estuary health and connectivity. Therefore, it could be recommended that the proposed development be permitted to go ahead provided that the essential mitigations are strictly implemented and that environmentally responsible practices are adopted.

Fairbreeze Mine has an existing Environmental Management Programme (EMPr, dated February 2012) and an environmental team permanently operating across the mine. As part of the EMPr Fairbreeze will undertake monthly surface and groundwater monitoring as well as quarterly estuarine physico-chemical and macro benthic invertebrate surveys (WSP 2023). It is important that the conditions within the system continue to be monitored as such to enable adaptive management. If conditions become detrimental to the ecosystem the impacts of operation need to be reassessed and adjusted mitigation measures applied.

11.1.11 VISUAL

The proposed expansion of Fairbreeze Mine to Heleza Moya has no additional impacts compared to what was described in the original VIA for Fairbreeze Mine (2012). The existing topography and existing tree screens (evergreen eucalyptus, 15 m high and 8 m wide) creates an effective screen which will block views to Heleza Moya.

12 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

Knowledge gaps identified during the course of the study and the specialist studies conducted, these are summarised as follows.

12.1 HERITAGE AND PALAEONTOLOGY

No site alternatives or alternative proposals have been provided.

12.2 AIR QUALITY

The following assumptions were made for the air quality study:

- Construction Phase:
  - Construction is expected to last 6 months for 10 hours/day, 5 days/ week, as per Client data.
  - Area to be constructed is 13 ha, as per Client data.
  - Wet suppression will be used to mitigate dust during construction activities – a control efficiency of 50% will be used for wet suppression (National Pollutant Inventory, 2012).
- Operational Phase:
  - Wind erosion as a result of the topsoil (dozing) stockpile:
    - An area of 1 600 m^2 (40 m by 40 m) is assumed with a height of 10 m, as per Client data.
    - Wet suppression via water trucks is assumed, as per Client data. A control efficiency of 50% is assumed (CoA, 2012).
  - Material handling activities:
    - Assumed normal operation of 10 hours/day, as per Client data.
    - Assumed an average wind speed of 5 m/s, as per WRF modelled data.
    - Assumed a moisture content for mineral sands of 2.1% (as per USEPA AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles - Stone Quarrying and Processing).
    - The capacities were provided, as per Client data and the control efficiencies were assumed, as per the CoA, 2012.
  - Vehicle entrainment from unpaved roads for topsoil:
    - Assumed normal operation of 10 hours/day, 5 days a week, as per Client data.
    - Mean vehicle weight of 60 tonnes was assumed, as per Client data.
    - Three ADTs, with 5 trips per ADT for one week per month was assumed, as per Client data.
    - Average width road of 8 m and length of 1 400 m was assumed as per Client data.
    - Typical silt content of 4.8% has been assumed for industrial unpaved roads for sand and gravel processing plant haul roads (USEPA AP-42 Chapter 13.2.2: Unpaved Roads, 2006).
    - A control efficiency of 75% was assumed (CoA, 2012), for water tankers used, as per Client data.
- Background Concentrations:

- Cumulative impacts for dust fallout were assessed using the ambient background dust fallout rate. Background PM10 concentrations from the eSikhaleni and eSikhawini stations were not representative of the proposed Heleza Moya site due to the great distance from the proposed site to the stations, therefore the cumulative impacts from PM10 concentrations could not be assessed. Further, no PM2.5 background concentrations were available for the project area and as such, cumulative impacts for PM2.5 could also not be assessed.
- An average dust fallout background rate of 241.8 mg/m2/day (over the five-year period from 2018 to 2022) was utilized to assess the cumulative concentrations.

12.3 NOISE

The identification of sensitive receptors was based on a desktop assessment using the most recent satellite imagery available on Google Earth ProTM. Additionally, this was cross-correlated with receptors identified in previous monitoring campaigns. Some of those receptors are no longer in place and hence not included in this report. It is therefore assumed that all key receptors have been considered.

The scope of this report does not include the acoustic impacts on avifauna or any other animals. It is assumed that these impacts will be addressed in a separate biodiversity specialist study. Nonetheless, based on the fact that Fairbreeze has been a mining site for nearly 10 years, the immediate noise climate has been dominated by anthropogenic mining activities and animal receptors are likely used to this, so no additional impacts as a result of Heleza Moya are assumed.

12.4 TERRESTRIAL FAUNA

The following assumptions, uncertainties and gaps in knowledge are highlighted for this specialist study:

- Field work was conducted over a two-day period in February 2023. This period coincides with the late wet/growing season. With respects to possible seasonal influences and the short duration of field work:
  - It is possible that rare, cryptic, secretive and/or transient fauna species may not have been present and/or observed during the field survey. The absence or non-recording of a specific fauna species, at a particular time, does not necessarily indicate that 1) the species does not occur there; 2) the species does not utilise resources in that area; or 3) the area does not play an ecological support role in the ecology of that species; and
- Given the difficulty of fully sampling and characterising the abundance and distribution of fauna species in the study area during the short period of time allocated to field work, the baseline descriptions were qualitative; and
- With respect to the mapping of on-site habitat units, this process used a combination of field observations and existing aerial/spatial imagery datasets. Habitat mapping is therefore limited, in part, to the age of assessed aerial/spatial imagery.

12.5 TERRESTRIAL FLORA

The following assumptions, uncertainties and gaps in knowledge are highlighted for this specialist study:

- Field work was conducted over a two-day period in February 2022. This period coincides with the late wet/growing season. With respects to possible seasonal influences and the short duration of field work:
    - It is possible that certain flora taxa, including inter alia short-lived annuals, geophytes or cryptic species, that are most readily visible or distinguishable when in leaf or flower earlier in the wet/growing season, may have been overlooked during field visit;
- Given the difficulty of fully sampling and characterising the abundance and distribution of species in the study area during the short period of time allocated to field work, the baseline descriptions were qualitative; and
- With respect to the mapping of on-site habitat units, this process used a combination of field observations and existing aerial/spatial imagery datasets. Habitat mapping is therefore limited, in part, to the age of assessed aerial/spatial imagery.

12.6 SOIL AND LAND CAPABILITY

The site has been extensively cultivated so identifying the soil A horizons was seldom possible. The site conditions at the time of the site visit were very wet. The soils in the low-lying, very wet areas were very sandy, as a result soils slipped through the auger before they could be identified. It was thus not possible to clearly establish temporarily saturated areas through identification of mottling or permanently saturated areas through identification of gleying. Wetland areas were thus identified with some difficulty based on satellite imagery, topography, field observations of vegetation changes and auger points.

12.7 SOCIAL

No field work was undertaken as the project is a direct extension of the existing mine within its mining right. However, the public participation process, which will be undertaken as part of the basic assessment, will be used to augment this report.

12.8 GROUNDWATER

- The current numerical flow model has some limitations as the lithological thickness of the Maputaland Group was assumed, based on information at the time of constructing the original model. The Maputaland Group seems to be thicker, at least at the FBB and HM orebodies, than previously modelled. Improvements will need to be made to the current numerical model to simulate the extent of the Maputaland Group more accurately.
- The recharge applied to the mining pits and rehabilitated areas are assumed and based on judgement and as such incorporates some uncertainty. Improved estimates of recharge and seepage from mine water storage ponds can be made, based on the now available water level data, during future updates.

12.9 SURFACE WATER

The water quality monitoring program must be continued in the surface streams. The flow monitoring program at the weirs coupled with manual readings must be continued to support the ongoing annual ACRU model updates. The monitoring program and model updates must be updated and applied to assess impacts if the mine plan or water management infrastructure are changed.

12.10 ESTUARINE

The following list highlights the assumptions, limitations and knowledge gaps associated with this study which may influence the outcomes and the accuracy of the data collected.

- The following impact assessment is specific to the plans for the Heleza Moya pit extension at the Fairbreeze Mine submitted to Anchor at Inception, any subsequent changes to the project proposal area and dimensions, will need to be reevaluated for environmental impacts.
- This assessment is largely a desktop exercise, although some of the information is based on real field sampling from 2011 through to present, combined with other available data and it is assumed that these data and understanding of current conditions remains relevant.
- In their comment on the Draft BAR (DBAR) Ezemvelo KZN Wildlife (eKZNW) requested that "the Classification and Determination of Water Resources report (currently being undertaken by the Department of Water and Sanitation, due to be complete in May 2024)" be included in the Estuarine Impact Assessment. Due to the timeline and the deadlines that Anchor was required to meet on behalf of WSP (Mid-March 2024), this was not possible, as the Classification and Determination of Water
- Resources report had not yet been published. This Estuarine Specialist Report does, however, make reference to the most recent report conducted by the Department of Water and Sanitation in 2022: "Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to UMhlathuze Catchments: Estuary Survey Report", as well as other presently available literature.

12.11 VISUAL

The following limitations were applicable for the comparative viewshed:

- The digital map/model for the viewshed that was plotted by Young (2011) for Fairbreeze Mine was not available. The viewshed map developed by Young (2011) for Fairbreeze was superimposed on Heleza Moya to develop a comparative outcome.
- This Visual Impact Assessment and all associated mapping has been undertaken according to the worst-case scenario.
- The model used in this study (SRK, 2023) only took the topographic elevation into consideration in reaching the comparative outcome, this varies to the model used by Young (2011) which also simulates the projected height of the current tree screens.
- This report should be read in conjunction with the original VIA complied by Newtown Landscape Architects in March 2011.

12.12 CLOSURE AND REHABILITATION

The following assumptions have been developed for the Project:

- All mining pump stations and associated pipes will be removed from site for re-use to other mine sections, and were not included in the cost assessment
- Unit costs used in the cost estimates are based on the South African demolition and rehabilitation expert rates and were verified by WSP mine closure specialists.
- Any hydrocarbon-contaminated soil from spill incidents will be immediately dealt with during operations in line with project's operational procedures and the contaminated soil will be phyto-remediated. Therefore, it is assumed that there will be no oil-contaminated soil to deal with in the

event of unplanned closure, but any residual contaminated soil will be excavated and phyto-remediated if necessary

- All access roads not required for the ongoing environmental monitoring activities will be rehabilitated. Mine haul roads required for monitoring purposes will be narrowed for light vehicle access allowing the unused portions (at least half of the haul road) to be rehabilitated.
- Unit costs used in the cost estimates are based on the South African demolition and rehabilitation expert rates and were verified by WSP mine closure specialists.
- No allowances for severance packages (human resources costs) have been included in the closure costs
- In terms of generally accepted accounting practices, no cost off-sets due to possible salvage of infrastructure was considered and merely gross rehabilitation and closure costs are reported.

13 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

13.1 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

13.1.1 GENERAL CONDITIONS

Tronox must:

- Implement all aspects of the EMPr in sections Part B of this document;
- Comply with all relevant legislation at all times;
- Undertake annual internal auditing of environmental performance and annual reporting to the DMRE, in line with the EMP commitments; and
- Undertake biennial external auditing of environmental performance and provide the DMRE with a copy of the audit report, in line with the EMP commitments.

13.1.2 SITE SPECIFIC CONDITIONS

Over and above the conditions contained in the original EA/EMPr, the following must be complied with:

13.1.2.1 Heritage and Palaeontology

- On condition that the mitigation measures proposed by Anderson (2010), and listed in the table above, are implemented.
- The Chance Fossil Finds Procedure attached in the specialist study is implemented.
- Map compounds if no drawing available (Reference CM9 – refer to appended specialist report).
- More detailed investigation for some buildings, to be mapped and photographed Reference CFS1 – refer to appended specialist report.
- A permit in terms of section 37 of the KZN Amafa and Research Institute Act (Act No. 5 of 2018) for the demolition of the structures at CM9 and CFS1 must be obtained from the Amafa Institute.

13.1.2.2 Air Quality

The monitoring measures, as discussed in Section 10.2, ongoing, to effectively control fugitive emissions.

13.1.2.3 Noise

With reference to environmental acoustic impacts, based on the low sensitivity of the Heleza Moya site (due to limited surrounding receptors, the site being bordered on three sides by existing Fairbreeze operations, and no new noise sources being introduced with the operation of Heleza Moya), the proposed Project can be authorised with the existing noise management procedures in place.

13.1.2.4 Terrestrial Fauna

In accordance with the outcomes of the impact assessment and taking cognisance of the baseline, as well as the impact management measures prescribed in this report, the proposed Project, is not deemed to present significant negative environmental issues or impacts, and it should thus be authorised.

13.1.2.5 Terrestrial Flora

Based on the results of the impact assessment, there is no objection to the proposed project on condition that the mitigation measures are implemented.

13.1.2.6 Soil and Land Capability

- It is recommended that current soil stockpiling plan be reviewed to amend the soil depth removed to be stockpiled or used immediately to 1 m (if not more broadly) and reconsider the current first 0.5 m in the ore body areas and 0.3 m in the waste facility areas. This will assist in retaining the Hutton soils as these soils are valuable agricultural soils that are mostly more than a meter deep.
- Mining should remain outside of the delineated wetland boundary.

13.1.2.7 Social

Based on the positive impacts of economic growth and extension of employment contracts, it is recommended that the proposed project be authorised.

13.1.2.8 Groundwater

- Additional surface water and groundwater simulations should be carried out to better understand the hydrological process taking place in the FBB and Heleza Moya regions.
- Assessment of the impacts of the flow regime perturbations against the Reserve Determination when this becomes available.
- Adoption of stable isotopes analysis to enhance the simulation of surface water and groundwater interaction.
- Updating the current numerical groundwater model with the current geological model.
- The groundwater model should also be updated whenever there are changes to the mine plan.

13.1.2.9 Surface water

The water quality has largely been assessed against drinking water quality requirements. The water quality should also be compared to the Ecological Reserve requirements once the reserve has been set.

13.1.2.10 Estuarine

- Continue to implement the rehabilitation of Fairbreeze C extension area as per the 'Siyaya Plantations Offset Area' plan to reduce overall/cumulative mining impacts.
- Work to initiate the implementation of the 'Siyaya Plantations Offset Area' offsets and rehabilitation methods as soon as possible to reduce overall/cumulative mining impacts.
- Investigate the potential for rehabilitation of the South Eastern portion of the Heleza Moya property – the area which was excluded from the mining extension and which includes wetland habitat, the rehabilitation of which could help improve estuary health.

13.1.2.11 Visual

The mitigation measures recommended by Young (2011) should continue to be implemented.

14 PERIOD FOR WHICH ENVIRONMENTAL AUTHORISATION IS REQUIRED

The mining operation is expected to continue for about 15 years, followed by rehabilitation and aftercare of the revegetated areas. Therefore, it is requested that this authorisation remain in effect for at least 25 years.

15 EAP DECLARATION OF INTEREST AND UNDERTAKING OF OATH

The EAP hereby confirms:

- The correctness, to the best of his/her knowledge, of the information provided in the specialist reports and on information provided by Tronox. The information was accepted as being as reliable as information generated during an BA process and a feasibility study, and provided in good faith, can be;
- The inclusion of comments and inputs from stakeholders and I&APs;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

.

16 CONCLUSION AND WAY FORWARD

The overall objective of the BA is to provide sufficient information to enable informed decision-making by the competent authorities. This was undertaken through consideration of the proposed project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

It is the opinion of WSP that the information contained in this document (read in conjunction the EMPr) is sufficient for DMRE to make an informed decision for the EA being applied for in respect of this Project.

Mitigation measures have been developed, where applicable, for the above aspects and are presented within the EMPr. It is imperative that all impact mitigation recommendations contained in the EMPr (including the current EMPr for Fairbreeze Mine), of which the environmental impact assessment took cognisance, are legally enforced.

Considering the findings of the respective studies, no fatal flaws were identified for the proposed Project. Should the avoidance and mitigation measures prescribed be implemented, the significance of the considered impacts for all negative aspects pertaining to the environmental aspects is expected to be low. It is thus the opinion of the EAP that the Project can proceed, and that all the prescribed mitigation measures and recommendations are considered by the issuing authority.

WAY FORWARD

Please submit all comments or queries to:

WSP Group Africa (Pty) Ltd

Attention: Phindile Mashau

(T) +27 11 552 4300

(E) phindile.mashau@wsp.com

17 REFERENCES

Africa, D., 2020. Constitution of the Republic of South Africa, 1996. As adopted, 704, p.705.

African Union. 2009. Africa Mining Vision.

Anchor Environmental. 2023. Assessment of a Future Land Use Scenario on the Restoration of the Siyaya Estuary with Notes on Potential Impacts Arising from Controlled Releases from the Valley Return Water Dam (VRWD). Anchor Environmental Consultants Report No. 2128/1

Azrag, E.A., Ugorets, V.I. and Atkinson, L.C., 1998. Use of a finite element code to model complex mine water problems. In *Mine Water and Environmental Impacts (Proceedings of the International Mine Water Association Symposia, Johannesburg, South Africa)* (Vol. 1, pp. 31-41).

Bates, M., Branch, W., Bauer, A., Burger, M., Marais, J., Alexander, G. and De Villiers, M. (Eds.) (2014) *Atlas and Red List of the Reptiles of South Africa*, Lesotho and Swaziland. Pretoria: Suricata 1, South African Biodiversity Institute.

Bazelet, C. & Naskrecki, P. 2013a. *Arytropteris basalis*. Red List of South African Species. South African Biodiversity Institute. http://speciesstatus.sanbi.org/assessment/last-assessment/4349/. Accessed on 22/02/2023

Botha, G. A. 1997. The Maputaland Group: A provisional lithostratigraphy for coastal KwaZulu-Natal. Jn: Maputaland focus on the Quaternary evolution of the south-east African coastal plain (Ed.). *International Union for Quaternary Research Workshop Abstracts,* Council for Geoscience, Private Bag X 112, Pretoria, South Africa, 21-26.

Botha, G.A. (1997 b). Do all people "see" the same colours? Jn: Maputaland focus on the Quaternary evolution of the south-east African coastal plain (Ed.). *International Union for Quaternary Research Workshop Abstracts*, Council for Geoscience, Private Bag XI 12, Pretoria, South Africa, pg 87.

Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. *South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa*.

Conservation International. 2008. *Biological diversity in Maputaland-Pondoland-Albany*. Retrieved from http://editors.eol.org/eoearth/wiki/Biological_diversity_in_Maputaland-Pondoland-Albany. Accessed on 10/03/2023.

Couldridge, V. & Bazelet, C. 2018. *Physophorina livingstonii.* Red List of South African Species. South African Biodiversity Institute. http://speciesstatus.sanbi.org/assessment/last-assessment/4387/. Accessed on 22/02/2023.

CRUZ Environmental. 2020. Siyaya Estuary Environmental Assessment: July 2020. CRUZ Environmental Investigational Report No.38 of December 2020.

Dawson, J, Jackson, M and Clark, B. 2024. An Estuarine Compliance Statement for The Proposed Fairbreeze Mine Extension into Heleza Moya Farm, Kwazulu-Natal. Prepared by Anchor Environmental Consultants (Pty) Ltd

Department Of Water Affairs and Forestry (DWAF). (1996). *South African Water Quality Guideline for Domestic Use* (2nd edn.), Pretoria.

Department of Water Affairs and Forestry (DWAF). 2005. Final draft: A practical field procedure for identification and delineation of wetlands and Riparian areas.

Du Plessis, M., Annandale, J., Benade, N., van der Laan, M., Jooste, S., Du Preez, C., Barnard, J., Rodda, N., Dabrowski, J., Genthe, B. and Nell, P. 2017. *Risk Based, Site-Specific, Irrigation Water Quality Guidelines. Volume 2: Technical Support*. Water Research Commission Report No 2399/1/17. Water Research Commission, Pretoria, South Africa.

DWA, 2012. Aquifer Classification of South Africa. Directorate: Hydrological Services. SubDirectorate: Groundwater Information. Department of Water Affairs (DWA), Pretoria.

DWA, 2013. Aquifer Vulnerability of South Africa. Directorate: Hydrological Services. SubDirectorate: Groundwater Information. Department of Water Affairs (DWA), Pretoria

ENVASS. 2022. River Flow Velocity and Discharge Measuring for the Siyaya and Manzamnyama Rivers. MON-REP-401-19_20 (22-08) of August 2022.

Environmental, I.F.C., 2007. Health, and Safety (EHS) Guidelines. Environmental energy conservation.

Exigent Engineering Consultants. 2012. *Amended Final Basic Assessment Report for the Construction of the Fairbreeze Mine and Related Activities*.

Fund, S., 2015. Sustainable development goals. *Available at this link: https://www. un. org/sustainabledevelopment/inequality*.

Golder Associates. (2011). Biodiversity Impact Assessment for the proposed Exxaro KZN Sands Fairbreeze Mining Operations(Ore Body A,B and D and modifications).

Golder Associates. (2011). Social Impact Assessment for the proposed Exxaro KZN Sands Fairbreeze Mining Operations(Ore Body A,B and D and modifications).

Government Notice No. R982. (2014). Environmental impact assessment regulations . Government Gazette No. 38282. Cape Town, South Africa: Government Printer.

Grundling, A.T., van den Berg, E.C. and Pretorius, M.L. 2014. Influence of Regional and Environmental Factors on the Distribution, Characteristics and Functioning of Hydrogeomorphic Wetland

Types on the Maputaland Coastal Plain, KwaZulu-Natal, South Africa. *Water Research Commission Report 1923/1/13*, Pretoria.

International Finance Corporation (IFC) (2007): Environmental, Health and Safety Guidelines: 1.7 Noise, 52 – 53.

International Finance Corporation (IFC) (2007): Environmental, Health and Safety Guidelines: 1.7 Noise, 52 – 53.

Isingo Projects. (2018-2023). UMLALAZI LOCAL ECONOMIC DEVELOPMENT Strategy Review 2018-2023. Cogta. Retrieved from https://www.cogta.gov.za/cgta_2016/wp-content/uploads/2021/02/uMlalazi-LED-Review-Strategic-Framework-Report-June-2018.pdf.

Kelbe B. and Germishuyse T. 2010. Groundwater/Surface Water Relationships with Specific Reference to Maputoland. *WRC Report No. 1168/1/10*.

King Cetshwayo District Municipality. (2021). Review of the King Cetshwayo District Municipality Spatial Development Framework. Richards Bay: King Cetshwayo District Municipality. Retrieved from: http://www.kingcetshwayo.gov.za/images/PLANNING/SDF%20King%20Cetshwayo%20SDF%20June%202021.pdf.

King Cetshwayo District Municipality. (2021). Review of the King Cetshwayo District Municipality Spatial Development Framework. Richards Bay: King Cetshwayo District Municipality. Retrieved from http://www.kingcetshwayo.gov.za/images/PLANNING/SDF%20King%20Cetshwayo%20SDF%20June%202021.pdf

King Cetshwayo District. (2020). Profile and analysis, distrct development model. Cogta. Retrieved from https://www.cogta.gov.za/ddm/wp-content/uploads/2020/08/King-Cetshwayo-DDM-4-July-2020.pdf

Lindsey, P., Balme, G., Becker, M., Begg, C., Bento, C., Bocchino, C., Dickman, A., Diggle, R., Eves, H., Henschel, P. and Lewis, D., 2015. *Illegal Hunting and the Bush-Meat Trade in Savanna Africa*.

Maroni, M., Seifert, B. and Lindvall, T. eds., 1995. *Indoor air quality: a comprehensive reference book*. Elsevier.

Minnaar, A de V. (1992) Ushukela. *A history of the growth and development of the Sugar Industry in Zuluand; 1905 to the present*. Pretoria, HSRC

Mottram and Associates cc. (2023). ASSESSMENT OF AGRICULTURAL POTENTIAL OF HELEZA MOYA FARM PTN 3 OF LOT 88 OF EMOYENI 9105 .

Mucina, L. and Rutherford, M.C. (eds) (Reprint 2011) The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19*, South African National Biodiversity Institute (SANBI), Pretoria.

National Environmental Management Act (NEMA) 107 of 1998

National Water Act (NWA) 36 of 1998.

NOSA Occupational Hygiene Services (2019a): An Environmental Noise Survey at Selected areas of the Fairbreeze Mine – 04 & 05 June 2019. Report no: 19047EM01.F.Q1.Amended.v01.

NOSA Occupational Hygiene Services (2019b): An Environmental Noise Survey at Selected areas of the Fairbreeze Mine – 24 October 2019. Report no: 19047KM03.F.Q3.Amended.v01.

NOSA Occupational Hygiene Services (2020): An Environmental Noise Survey at Selected areas of the Fairbreeze Mine – 18 June 2020. Report no: 20120LB.Q1.

NOSA Occupational Hygiene Services (2021a): An Environmental Noise Survey at Selected areas of the Fairbreeze Mine – 14 January 2021. Report no: 20197LB08.Amended.v01.

NOSA Occupational Hygiene Services (2021b): An Environmental Noise Survey at Selected areas of the Fairbreeze Mine – 06 December 2021. Report no: 21231LB02.Q4.

NOSA Occupational Hygiene Services (2022a): Evaluation of Environmental Noise Levels measured by the Permanent Monitoring Station – 01 to 30 April 2022. Report no: 22048MP.ENV.04.

NOSA Occupational Hygiene Services (2022b): Evaluation of Environmental Noise Levels measured by the Permanent Monitoring Station – 01 to 31 May 2022. Report no: 22048MP.ENV.05.

NOSA Occupational Hygiene Services (2022c): An Environmental Noise Survey at Selected areas of the Fairbreeze Mine – 29 June 2022. Report no: 22048MP04.Q2.

Republic of South Africa (2020): National Environmental Management Act, 1998 (Act No. 107 of 1998) Procedures for the Assessment and Minimum criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation (Government Notice 320 of 2020, Government Gazette 43110).

Safetech (2010): Specialist Study on Noise Impacts – Exxaro KZN Sands Fairbreeze A,B,C,Cext & D Mining Project. Report no: 26/1248.

Samaras, Z and Sorensen, S.C., (1999): Mobile sources, In J. Fenger, O. Hertel and F. Palmgren (eds), Urban air pollution – European aspects, Kluwer Academic Publishers, Denmark.

SANBI. 2020. Species Environmental Assessment Guideline. Guideline for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1. 2020.

Smith, R.M.H., 2020. Biostratigraphy of the Cistecephalus Assemblage Zone (Beaufort Group, Karoo Supergroup), South Africa. *South African Journal of Geology 2020*, *123*(2), pp.181-190.

South African Government. (2006). National Spatial Development Perspective. Retrieved from https://www.gov.za/sites/default/files/gcis_document/201409/complete1.pdf

South African National Standards (2008): SANS – Code of Practice 10103:2008, The measurement and rating of environmental noise with respect to annoyance and to speech communication, Standards South Africa, 6th Edition (ISBN 978-0-626-20832-5).

SRK Consulting. 2020. Tronox Everglades Current and Proposed RSF and RWD: Surface and Groundwater Specialist Report.

SRK. (2023). Tronox Fairbreeze: Surface and Groundwater Hydrology - Heleza Moya.

SRK. 2011. Fairbreeze Project: Surface Water Hydrological Assessment. Report to Exxaro KZN Sands, (Pty) Ltd. Report 423404/1 of June 2011.

SRK. 2015. Tronox Fairbreeze: Surface and Groundwater Hydrology – Current State. Report to Exxaro KZN Sands, (Pty) Ltd. Report 468000 of March 2015.

SRK. 2021. Tronox Fairbreeze: Surface and Groundwater Hydrology – Future Scenarios. Report to Exxaro KZN Sands, (Pty) Ltd. Report 468000/10 of September 2021.

Stats SA. (2011). Census. Retrieved from https://www.statssa.gov.za/?page_id=993&id=emakhazeni-municipality.

Strategic Water Source Areas (SWSA). 2018. *South African National Biodiversity Institute*. Accessed at http://bgisviewer.sanbi.org. [Accessed 11 February 2023].

Tronox (2018): Social and Labour Plan 2018 – 2022. Available online at: https://www.tronox.com/download.php?path=14507

Tronox KZN Sands. (2023-2027). SOCIAL AND LABOUR PLAN, APPLICATION FAIRBREEZE MINE. Retrieved from https://www.tronox.com/download.php?path=14507.

Tronox KZN Sands. (2023-2027). SOCIAL AND LABOUR PLAN, APPLICATION FAIRBREEZE MINE. Retrieved from https://www.tronox.com/download.php?path=14507

Tronox KZN Sands. (2023-2027). Social labour Plan Application for Fairebreeze mine. uMlalazi Local Municipality. (2023-2024). Intergrated Development Plan Review. Retrieved from https://umlalazi.gov.za/index.php/integrated-development-plan/2022-2023.

uMhlathuze Local Municipality. (2020). Final IDP Review 2020/2021. Richards Bay: uMhlathuze Local Municipality. Retrieved from https://www.umhlathuze.gov.za/images/Final_IDP_Review_-_2020-2021_May_2020_DMS_1404166-1.pdf

United States Environmental Protection Agency (USEPA) (2011): Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors. Available online at: http://www.epa.gov/ttn/chief/ap42/index.html#toc.

United States Environmental Protection Agency (USEPA) (2011): Health Effects of Pollution. Available online at: http://www.epa.gov/region07/air/quality/health.htm.

United States Environmental Protection Agency (USEPA, 1983). Compilation of Air Pollutant Emission Factors, AP-42, Third Edition. Supplement 14. United States Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, 27711.

United States Environmental Protection Agency (USEPA, 1988). Supplement B to Compilation of Air Pollutant Emission Factors, AP-42, Fourth Edition, United States Environmental Protection Agency, Office of Air and Radiation Office of Air Quality Planning and Standards, North Carolina

Van Jaarsveld, A. (1998). Mtunzini. A history, from earliest times to 1995 Mtunzini.

Young, G. A. (2011). Visual Impact Assessment: Proposed Construction of Fairbreeze Mine, Kwazulu-Natal. Newtown Landscape Architects cc.

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com