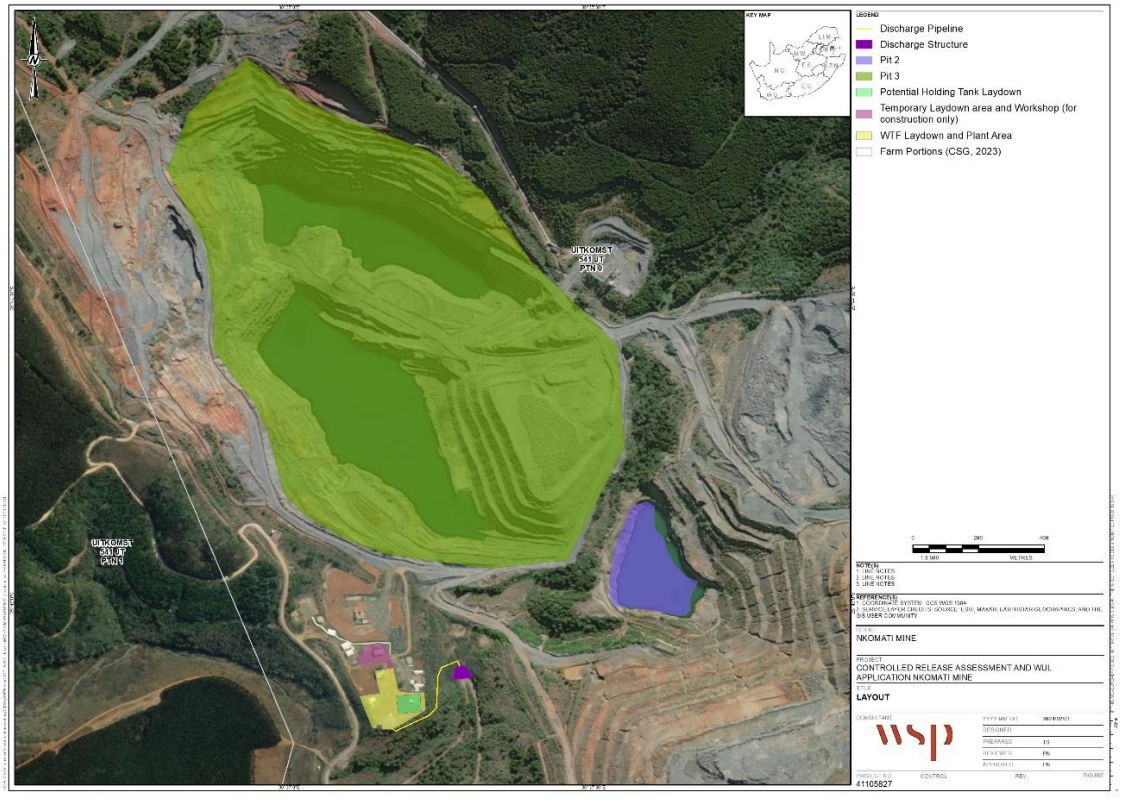
DMRE Reference Number: Converted Mining Rights 146MR and 147MR

Nkomati Joint Venture (A partnership between African Rainbow Minerals Limited and Norilsk Nickel Africa (Pty) Ltd)

PROPOSED WATER TREATMENT PLANT AT THE NKOMATI JOINT VENTURE MINE

Final Environmental Impact Assessment Report



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Final Environmental Impact Assessment Report

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 41105827

OUR REF. NO. 146MR AND 147MR

DATE: JULY 2024

Nkomati Joint Venture (A partnership between African Rainbow Minerals Limited and Norilsk Nickel Africa (Pty) Ltd)

PROPOSED WATER TREATMENT PLANT AT THE NKOMATI JOINT VENTURE MINE

Final Environmental Impact Assessment Report

WSP

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft EIA Report	Final EIA Report		
Date	June 2024	July 2024		
Prepared by	Patricia Nathaniel	Patricia Nathaniel		
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Checked by	Olivia Allen	Olivia Allen		
Signature		Digitally signed by olivia.allen@wsp.com Date: 25/July/2024		
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mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT 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: Nkomati Joint Venture (a partnership between African Rainbow Minerals Limited and Norilsk Nickel Africa (Pty) Ltd)
TEL NO: +27 13 712 8200
POSTAL ADDRESS: PO Box 562, Machadodorp, 1170
FILE REFERENCE NUMBER SAMRAD: Converted Mining Rights 146MR and 147MR

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 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.

OBJECTIVES OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—-

(i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

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

PUBLIC REVIEW OF THE DRAFT EIAR REPORT

The Draft Environmental Impact Report (EIR) was available for comment for 30 days **from 12 June to 14 July 2024** on WSP's website and at the public places in the project area listed in the below:

Name of Public Place	Address
WSP Website	https://www.wsp.com/en-za/services/public-documents
eManzana Public Library	Goodman St, Badplaas, eManzana, 1190
Emthonjeni Public Library	Emthonjeni, eNtokozweni, 1170

DUE DATE FOR COMMENT ON THE DRAFT EIR REPORT WAS 14 JULY 2024. THIS REPORT SERVES AS THE FINAL EIR.

Please submit comments to:

Patricia Nathaniel

WSP (Pty) Ltd

Tel: (011) 361 1398

E-mail: patricia.nathaniel@wsp.com

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GLOSSARY

Abbreviation	Definition
BPEO	Best Practicable Environmental Option
CA	Competent Authority
CARA	The Conservation of Agricultural Resources Act (No. 43 of 1983)
CBA	Critical Biodiversity Areas
CRR	Comments and Responses Report
CV	Curriculum Vitae
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Minerals Resources and Energy
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA Regulations	Environmental Impact Assessment Regulations, 2014, as amended (GNR 326)
EIAR	Environmental Impact Assessment Report
ESAs	Ecological Support Areas
FSR	Final Scoping Report
GA	General Authorisation
Ha	Hectares
MBCP	Mpumalanga Biodiversity Conservation Plan
MEGDP	Mpumalanga Economic Growth and Development Path
NDP	National Development Plan of 2030
NEMBA	National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004)
NEMA	National Environmental Management Act (No. 107 of 1998)

Abbreviation	Definition
NHRA	The National Heritage Resource Act (No. 25 of 1999)
NJV	Nkomati Joint Venture
NWA	The National Water Act (No. 36 of 1998)
ONAs	Other Natural Areas
PPP	Public Participation Process
RO	Reverse Osmosis
RWQ	Receiving Water Quality
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
S&EIR	Scoping and Environmental Impact Reporting
SR	Scoping Report
TSF	The Tailings Storage Facilities
UF	Ultrafiltration
WUL	Water Use License
WULA	Water Use License Application
WTP	Water Treatment Plant
ZLD	Zero-Liquid Discharge

1 INTRODUCTION

Nkomati Joint Venture (NJV), a partnership between African Rainbow Minerals Limited and Norilsk Nickel Africa (Pty) Ltd, proposes to develop to a mine Water Treatment Plant (WTP) at the Nkomati Joint Venture Mine (NJVM), located approximately 30 km east of the town eNtokozweni (Machadodorp) at the edge of the escarpment within the Mpumalanga Province, South Africa. The proposed development requires Environmental Authorisation (EA), supported by a Scoping and Environmental Impact Reporting (S&EIR) process in accordance with the National Environmental Management Act (No. 107 of 1998) (NEMA), Environmental Impact Assessment Regulations, 2014 as amended (GNR 326) (EIA Regulations).

WSP Group Africa (Pty) Ltd (WSP) has been appointed to undertake the Scoping and S&EIR process as the Environmental Assessment Practitioner (EAP).

1.1 PURPOSE OF THIS REPORT

This Draft Environmental Impact Report (EIR) documents the process and findings of the impact assessment phase of the S&EIR process for the proposed WTP.

The Environmental Impact Assessment (EIA) process is an interdisciplinary procedure to ensure that environmental considerations are included in decisions regarding projects that may impact the environment. The process identifies potential environmental impacts associated with a proposed project and management actions required to either mitigate or avoid the negative impacts or to enhance the positive impacts associated with a proposed project. In the context of this report, the purpose of the S&EIR process is to inform decision-makers and the public of the environmental consequences of the proposed project.

This Draft EIR is a technical tool that identifies, predicts, and analyses impacts on the physical environment, as well as social, cultural, and health impacts. The report identifies alternatives and mitigation measures to reduce the environmental impact of the proposed project; and it also serves an important procedural role in the overall decision-making process by promoting transparency and public involvement.

1.2 BACKGROUND INFORMATION

The NJVM (Converted Mining Rights 146MR and 147MR) is comprised of underground and opencast mining operations. Underground mining operations were halted during 2015, and open pit operations ceased in March 2021, at which time the mine was placed on care and maintenance.

Since then, dewatering of the underground mine has continued and the open pit has encountered ongoing influxes of groundwater and run-off from rainwater. NJVM is situated on the Eastern Escarpment, having a positive water balance (rainfall exceeding evaporation rate) and will require a WTP to treat the excess water to acceptable quality prior to releasing the water into the environment. A WTP capable of treating 13 million litres of water per day (13 000 cubic metres per day) is proposed to be developed

adjacent to Pit 3 within the existing Mining Right boundary. Mine affected water will be abstracted from Pit 3 and conveyed via pipeline to the WTP (**Figure 5-1**).

Treated water will be discharged to the Adit Stream which forms part of the Gladdespruit Catchment (Quaternary Catchment X11J). A 525V transformer will also be required to supply power to the WTP and will be located within the footprint of the WTP. It is likely that there will be storage of dangerous goods at the site during the construction phase; however, it is anticipated that the volume of dangerous goods stored will be 80 m^3 or less (the trigger for a listed activity in terms of the EIA Regulations) and the diesel storage facility on site is already authorised. Dewatered Sludge generated at the WTP will be loaded onto trucks and removed from site for disposal.

This application pertains only to the proposed WTP, and associated infrastructure required for its operation.

1.3 KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

NMJV is the project proponent (Applicant) with regards to this application for the development and operation of the WTP at the NJVM. **Table 1-1** provides the relevant details of the project proponent.

Table 1-1 – Details of Project Proponent

Proponent:	**Nkomati Mine Joint Venture**
Contact Person:	Mr. Marthinus de Jager
Postal Address	PO Box 562, Machadodorp, 1170
Telephone:	+27 13 712 8200
Email:	Marthinus.DeJager@Nkomati.co.za

1.3.2 COMPETENT AUTHORITY

The National Environmental Management Laws Amendment Act 2 of 2022 (NEMLAA) amended the NEMA to add the definition of “mining activity” amongst other changes.

Mining activity means an activity which requires a permission, right, permit or consent in terms of the Mineral and Petroleum Resources Development Act, 2002, including hydraulic fracturing and reclamation.

Based on the definition of “mining activity” the NEMLAA provide clarity that the Minister responsible for mineral resources is responsible for mining activities as defined.

Since the WTP is within an existing mining right area, the Department of Mineral Resources and Energy (DMRE) is the Competent Authority (CA). This was confirmed by the Department of Forestry, Fisheries and the Environment (DFFE).

1.3.3 COMMENTING AUTHORITIES

The commenting authorities for the project include but are not limited to:

- Inkomati Usuthu Catchment Agency (IUCMA);
- Gert Sibande District Municipality;
- Chief Albert Luthuli Local Municipality;
- South African Heritage Resource Agency (SAHRA); and
- Mpumalanga Department Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA).

Refer to the Stakeholder Engagement Report (SER) in **Appendix D** for a full list of commenting authorities.

1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP was appointed in the role of Independent EAP to undertake the S&EIR process for the proposed project. The Curriculum Vitae (CV) of the EAP is available in **Appendix A**. The EAP declaration of interest and undertaking is included in **Appendix B**. **Table 1-2** provides details the relevant contact details of the EAP.

Table 1-2 – Details of the EAP

EAP	WSP Group Africa (Pty) Ltd
Contact Person:	Patricia Nathaniel
Physical Address:	1st Floor, Pharos House, 70 Buckingham Terrace, Westville 3629 South Africa
Telephone:	011 361 1398
Email:	Patricia.Nathaniel@wsp.com
EAP Qualifications:	▪ BSc (Hons) Environmental Management ▪ BSc (Geography)
EAPASA Registration Number:	EAPASA (2020/1120)

1.3.5 STATEMENT OF INDEPENDENCE

Neither WSP nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any business, financial, personal or other interest that could be reasonably regarded as being capable of affecting their independence. WSP has no beneficial interest in the outcome of the assessment.

1.3.6 SPECIALISTS

Specialist input was required in support of this application for Environmental Authorisation (EA). The details of the specialists are provided in **Table 1-3** below. The specialist studies are attached in **Appendix G** and their declarations in **Appendix C**.

Table 1-3 – Details of Specialists

Assessment	Name of Specialist	Company	Sections in Report	Specialist Report attached as
Aquatic Biodiversity Assessment	Tebogo Khoza	WSP	▪ Section 6.1.9 and Section 7	Appendix G.1
Heritage Impact Assessment	Prof. A.C. van Vollenhoven	Archaetnos Culture & Cultural Resource Consultants	▪ Section 6.6.1 and Section 7	Appendix G.4
Desktop Assessment and letter of exemption for Palaeontology Impact Assessment	Marion.bamford@wits.ac.za	Marion Bamford	▪ Section 6.1.8 and Section 7	Appendix G.4
Surface Water Impact Assessment	Rachel Kganedi	WSP	▪ Section 6.1.9 and Section 7	Appendix G.3
Closure and Liability Assessment	Jill Chauke	WSP	▪ Section 7	Appendix G.6
Terrestrial Biodiversity Compliance Statement	Andrew Zinn	Hawkhead	▪ Section 7	Appendix G.2
Geotechnical Assessment	S Potgieter J Joubert J R Collina T Kekana	Agreenco	▪ Section 6.1.4.1 and Section 7	Appendix G.5

1.4 ENVIRONMENTAL IMPACT ASSESSMENT TERMS OF REFERENCE

The EIA Regulations identifies the proposed WTP and associated infrastructure as an activity being subject to an S&EIR process due to the applicability of listed activities as

contained in the Listing Notices (Listing Notice 1, 2 and 3) of the EIA Regulations. In order for the project to proceed, it will require an EA from the DMRE.

This EIR follows the Scoping Phase of the S&EIR process. The Scoping Phase involved consultation with Interested and Affected Parties (I&APs) and compilation of the Plan of Study for the EIA (POS for EIA) which culminated in the submission of a Final Scoping Report (FSR) to the DMRE on 12 February 2024.

As defined in Appendix 3 of the EIA Regulations, the objective of the EIA Phase is to, through a consultative process:

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

The Public Participation Process (PPP) is a requirement of the S&EIR process; it consists of a series of inclusive interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIR decision-making process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed project. The objectives of the PPP can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues and solutions.

1.5 ENVIRONMENTAL IMPACT REPORT STRUCTURE

As per Appendix 3 of the EIA Regulations, the legislated requirements must be adhered to and contained within an EIR for the CA to consider and come to a decision on the application. **Table 1-4** below details where the required information is located within this report.

Table 1-4 – Legislated Report Requirements as detailed in GNR 326

Appendix 1 of GNR 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 1.3.4 and Appendix A
3(1) (b)	The location of the activity	Section 5.1
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 5.1
3(1) (d)	A description of the scope of the proposed activity	Section 5.1
3(1) (e)	A description of the policy and legislative context within which the development is proposed	Section 2
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 4
3(1) (g)	A motivation for the preferred site, activity and technology alternative	Section 4 and Section 5
3(1) (h)	A full description of the process followed to reach the proposed alternative within the site	Section 5

Appendix 1 of GNR 326	Description	Relevant Report Section
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 3
3(1) (j)	An assessment of each identified potentially significant impact and risk	Section 7
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 7 ▪ Section 9
3(1) (l)	An environmental impact statement	Section 9
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 7 Appendix H
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 11
3(1) (o)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	Section 1.6
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 9
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	Appendix B
3(1) (s)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	Appendix G.4
3(1) (t)	Any specific information that may be required by the competent authority	N/A

Appendix 1 of GNR 326	Description	Relevant Report Section
3(1) (u)	Any other matters required in terms of section 24(4)(a) and (b) of the Act	N/A

1.6 ASSUMPTIONS AND LIMITATIONS

1.6.1 GENERAL ASSUMPTIONS AND LIMITATIONS:

- The EAP assumes that the information provided by the NJV on the proposed project is accurate and representative of the project.
- There were no limitations associated with the impact assessment related to the EIA phase of the project, as such the EAP is confident that the information within this report is sufficient to aid the CA in making a decision.

1.6.2 AQUATIC BIODIVERSITY IMPACT ASSESSMENT

- A reference site upstream of the proposed WTP site could not be accessed due to the dense vegetation along the banks of the Adit Stream.
- Based on the DWS PESEIS data (DWS, 2014), the mainstem river within the Nkomati Mine catchment is named as the Mngubhudle River and not the Gladdespruit as reported in the previous aquatic biomonitoring report (SAS, 2023). The current report therefore refers to this river reach as the Mngubhudle.

1.6.3 ARCHAEOLOGICAL HERITAGE IMPACT ASSESSMENT

- Cultural Resources are all non-physical and physical man-made occurrences, as well as natural occurrences associated with human activity. These include all sites, structures and artefacts of importance, either individually or in groups, in the history, architecture and archaeology of human (cultural) development. Graves and cemeteries are included in this.
- The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects.
- Cultural significance is site-specific and relates to the content and context of the site. Sites regarded as having low cultural significance have already been recorded in full and require no further mitigation. Sites with medium cultural significance may or may not require mitigation depending on other factors such as the significance of impact on the site. Sites with a high cultural significance require further mitigation.
- All recommendations are made with full cognisance of the relevant legislation.
- It has to be mentioned that it is almost impossible to locate all the cultural resources in a given area, as it will be very time-consuming. The applicant should however note that the EIA report should make it clear how to handle any other finds that might occur.
- The surveyed area was found to be disturbed by inter alia mining office buildings, parking, storage and maintenance infrastructure. Thus it is seen as a low risk area to contain heritage sites.

- In areas with no visible infrastructure, the vegetation cover was medium in height and dense and had a dense under footing. The horizontal and vertical archaeological visibility was influenced negatively by vegetation during the site assessment.

1.6.4 SURFACE WATER IMPACT ASSESSMENT

- Site-specific rainfall data was found to be short and discontinuous (i.e., missing data in some months). Design Rainfall Utility developed by (Smithers & Schulze, 2003) which utilises a regionalised L-moment Algorithm and scale invariance to estimate design rainfall at any 1' × 1' grid interval in South Africa was adopted to obtain design rainfall for various return periods for floodline modelling.
- A steady-state one-dimensional hydraulic model was run, which assumes that flow is continuous at the determined peak flow rates. This conservative approach results in higher flood levels.
- Hydraulic structures such as bridges and culverts were not included in the hydraulic model.
- No abstractions from the river section were considered; only proposed discharge into the river section was considered to model the impacts of the proposed WTP discharge.
- Although flood calculations and stormwater/peak discharges are executed with great care, the possibility always exists that a more severe flood could occur.
- This report presented floodline findings and WTP design that were not conducted by WSP but were assumed to be correct and accepted.

1.6.5 CLOSURE AND LIABILITY ASSESSMENT

1.6.5.1 General

- The closure costing of the WTP is based on the drawings and WTP concept major equipment list outlined in the Nkomati Nickel Mine Water Treatment Study (DRA, 2023).
- The closure costing only incorporates the infrastructure associated with the proposed WTP, and associated infrastructure required for its operation.
- The closure costs have been determined at present-day values and no escalation or discounting values have been applied.
- In accordance with the DMRE guideline, no cost off-sets due to possible salvage values were considered and gross rehabilitation costs are reported.
- The computed closure costs reflect the unscheduled and scheduled closure costs of the proposed 13 Mℓ/day facility.
- The NJVM closure cost, as computed, is therefore only in terms of the decommissioning and demolition of the NJVM WTP and associated infrastructure as well as the subsequent rehabilitation of these aspects.
- The closure costs furthermore do not consider potential costs associated with down-stream water users after 2024, as this matter would need to be addressed in future updates when more information is available to adequately quantify and cost these impacts.

1.6.5.2 Pit Areas

- Pit 3 currently contains ore (Chromitiferous Peridotite Mineralized Zone (PCMZ) and Main Mineralized Zone (MMZ)) and waste rock, which will remain in Pit 3 during closure. Mine water will be collected in the open-pit sump. It is assumed that Pit 3 will remain open in the event of both unscheduled closure once the WTP has been constructed and becomes operational, and eventual scheduled closure, and will be partially backfilled in the future. The remaining void will be flooded to form a natural lake. Waste rock will be placed in the pit to a final elevation of 1 395 mamsl, noting that costing of the latter is excluded from this cost assessment and is assumed is included in the existing mine-wide closure costs.
- The current waste rock that is placed in the pit will meet the EMP requirement of pit backfilling as it is understood that it was not the intention in the EMP that full backfill would be undertaken (Shangoni Management Services, 2016).

1.6.5.3 Roads

- Although not specified in the proposed the WTP layout plans, roads were costed for in the closure cost estimation as it was assumed that the roads will be required for access and monitoring during operations and thereafter removed and rehabilitated.
- Road quantities were extracted from the 2022 Nkomati Mine Closure Cost Assessment (SRK Consulting, 2022).

1.6.5.4 Pollution control and other dams

- The dams/discharge structures will be demolished and the footprints rehabilitated, and the area shaped to form a stable landform congruent with the surrounding landscape.

1.6.5.5 Decommissioning and site rehabilitation

- It was assumed that in the event of a future unscheduled closure, the NJVM site would be rehabilitated to a green-fields state, with the only notable exception being that the gypsum storage facilities will be rehabilitated in situ. Furthermore, for scheduled closure i.e. once the WTP and associated facilities is eventually decommissioned post-2027, the entire site could likely be rehabilitated to its original state, provided that all of the remaining gypsum is sold or otherwise removed and disposed off-site beforehand.
- Based on the above assumption, the full closure of the NJVM would likely comprise a number of cost components, some of which are not directly related to the physical closure and site rehabilitation process. This report therefore only addresses the decommissioning and rehabilitation costs, equating to an outside (third-party) contractor establishing on-site and conducting the rehabilitation-related work. Other components such as workforce matters, separation packages, re- training/re-skilling, etc. are outside the scope of this report.

  Dedicated contractors would be commissioned to conduct the demolition and rehabilitation work of the NJVM WTP and associated site disturbances. This would inter alia require establishment costs for the contractors and hence, the allowance for preliminary and general (P&Gs) matters and contingencies in the cost calculation.

Current experience indicates that generally higher allowances for these aspects are needed than has previously been the norm, due to increasingly stringent health and safety requirements and costs associated with labour sourcing and supply chain requirements, amongst others. Accordingly, the allowance for Ps&Gs is placed at 15% and the contingencies allowance is at 20%, as the water treatment process is relatively clean, and the nature of the demolition and rehabilitation work required is relatively straight forward. Minimal site contamination and other unforeseen aspects, that is normally catered for by the contingency allowance, is therefore expected to be encountered.

- Allowance has also been made for third-party contractors and consultants to conduct post closure care and maintenance work as well as compliance monitoring.
- Crushed concrete will be decontaminated on site and used as fill material for voids left after decommissioning of the water treatment infrastructure and/or as infill material for the holding dams voids. It is anticipated that authorisation will be needed to dispose of inert demolition waste in the dam cavities and any other voids on site, which should be secured during the operational lifespan of the WTP.

1.6.5.6 Post closure monitoring and maintenance

- A 10-year period of post closure maintenance and monitoring has been allowed for.

2 GOVERNANCE FRAMEWORK

2.1 NATIONAL LEGAL AND REGULATORY FRAMEWORK

The South African regulatory framework establishes well-defined requirements and standards for environmental and social management of industrial and civil infrastructure developments. Different authorities at both national and regional levels carry out environmental protection functions. The applicable legislation and policies are shown in **Table 2-1.**

Table 2-1 – Applicable National Legislation[1]

Legislation	Description of Legislation and Applicability
The Constitution of South Africa (No. 108 of 1996)	The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld in an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Environmental Management Act (No. 107 of 1998) **The DMRE is the CA**	In terms of Section 24(2) of the NEMA, the Minister may identify activities which may not commence without prior authorisation. The Minister thus published GNR 327 (Listing Notice 1), 325 (Listing Notice 2) and 324 (Listing Notice 3) listing activities that may not commence prior to authorisation (7 April 2017). The regulations outlining the procedures required for authorisation are published in GNR 326 [Environmental Impact Assessment Regulations (EIA)] (7 April 2017). Listing Notice 1 identifies activities that require a Basic Assessment (BA) process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require an S&EIR process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. WSP undertook a legal review of the listed activities according to the proposed project description to conclude that the activities listed in in this section are considered applicable to the development: A S&EIR process must be followed.

[1] It should be noted that all dimensions outlined in relation to Listing Notice 1, 2 and 3 are provisional and are subject to final design.

Legislation	Description of Legislation and Applicability
	An EA is required and has been applied for with the DMRE.
Listing Notice 1: GNR 327 **The DMRE is the CA**	***Activity 10 –*** *The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water,* *return water, industrial discharge or slimes –* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.* **Description:** It is envisaged that the abstraction pipeline will be approximately 2000 m in length with an internal diameter of approximately 0.45m. The gravity pipeline from the WTP to the discharge point is approximately 300m in length with a maximum internal diameter of 0.45m therefore this activity **applicable.** The site for the WTP is located within an existing Mining Right area and even though it is not considered urban, it is an already disturbed and within an existing developed footprint.
Listing Notice 1: GNR 327 **The DMRE is the CA**	***Activity 12 –*** *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs:* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding—* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;*

Legislation	Description of Legislation and Applicability
	(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; *(dd) where such development occurs within an urban area; [or]* *(ee) where such development occurs within existing roads, [or] road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the* *commencement of development and where indigenous vegetation will not be cleared.* **Description:** The discharge pipeline and associated discharge structure will be located within 32 metres from a watercourse therefore this activity **is applicable**
Listing Notice 1: GNR 327 **The DMRE is the CA**	***Activity 19*** *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* **Description:** It is likely that there will be dredging or depositing of material from and into the Adit Stream during construction of the discharge structure therefore this activity is applicable.
Listing Notice 1: GNR 327 **The DMRE is the CA**	***Activity 25*** *–* *The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.* **Description:** A WTP capable of treating 13 million litres of water per day (13 000 cubic metres per day) is proposed therefore this activity is **applicable.**
Listing Notice 1: GNR 327 **The DMRE is the CA**	***Activity 67*** *Phased activities for all activities—* *(i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;* **Description:** Option 2 for the WTP is a water treatment facility capable of treating 13 million litres per day, undertaken in 2 phases, being an initial 6.5 million litres per day, later expanded to the full 13 million litres per day;

Legislation	Description of Legislation and Applicability
Listing Notice 2: GNR 984 **The DMRE is the CA**	***Activity 6 –*** *The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation* *governing the generation or release of emissions, pollution or effluent, excluding—* *(i) activities which are identified and included in Listing Notice 1 of 2014;* *(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or* *(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.* **Description:** A Water Use Licence (WUL) is being applied for in terms of the National Water Act, 1998, for the proposed discharge of treated effluent into the receiving environment and hence renders this activity **applicable.**
National Environmental Management: Waste Act 59 of 2008 **Category C of the List of Waste Management Activities that have, or are likely to have, a detrimental effect on the environment**	**Category 3: Activity 2** The storage of hazardous waste at a facility that has the capacity to store in excess of 80m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste. It is expected that the amount of gypsum sludge generated will be in the range of 22 tons per day of dewatered solids containing approximately 30% moisture. The sludge will not be stored in lagoons therefore it does not trigger Activity 1 of Category 2. However, Nkomati must comply with Norms and Standards for Storage of Waste, 2013 for the storage of the gypsum sludge.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) **The DFFE is the CA**	The National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) (NEMBA) was promulgated in June 2004 within the framework of NEMA to provide for the management and conservation of national biodiversity. The NEMBA's primary aims are for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. In addition, the NEMBA provides for

Legislation	Description of Legislation and Applicability
	the establishment and functions of a South African National Biodiversity Institute (SANBI). SANBI was established by the NEMBA with the primary purpose of reporting on the status of the country's biodiversity and conservation status of all listed threatened or protected species and ecosystems. The biodiversity assessment identifies Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the NEM:BA – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. The site for the WTP is transformed and the proposed path of the discharge pipeline may result in the clearance of indigenous and riparian vegetation. The type of vegetation and associated conservation status on site will be confirmed during the assessment phase of the project.
The National Water Act (No. 36 of 1998) **The IUCMA and the DWS is the CA**	The National Water Act (No. 36 of 1998) (NWA) provides the framework to protect water resources against over exploitation and to ensure that there is water for social and economic development, human needs and to meet the needs of the aquatic environment. The Act defines water source to include watercourses, surface water, estuary or aquifer. A watercourse is defined in the Act as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which or from which water flows, and any collection of water that the Minister may declare a watercourse. Section 21 of the Act outlines a number of categories that require a water user to apply for a Water Use License (WUL) and Section 22 requires water users to apply for a General Authorisation (GA) with the Department of Water and Sanitation (DWS) if they are under certain thresholds or meet certain criteria. The list of water uses that require a WUL under section 21 are presented below: a) Taking water from a water resource; b) Storage of water; c) Impeding or diverting the flow of water in a watercourse; d) Engaging in a stream flow reduction activity; e) Engaging in a controlled activity; f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; g) Disposing of waste in a manner which may detrimentally impact on a water resource;

Legislation	Description of Legislation and Applicability
	h) Disposing in any manner of water which contains waste from, or which has been heated in. any industrial or power generation process; i) Altering the bed, banks, course or characteristics of a watercourse; j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and k) Using water for recreational purposes. Due to the discharge into the Adit Stream, a Section 21 (c), (f) and (i) WUL is applicable and is being applied for in a separate WULA Process.
The National Heritage Resources Act (No. 25 of 1999) **SAHRA is the CA**	The National Heritage Resource Act (No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by the South African Heritage Resources Agency (SAHRA), and lists activities that require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development. In terms of the Section 38 of NHRA, any person who intends to undertake a linear development exceeding 300m in length or a development that exceeds 5 000 m^2 must notify the heritage resources authority and undertake the necessary assessment requested by that authority. The area of the WTP exceeds 5000 m^2 and the total pipeline length exceeds 300m however it must be noted that there are several heritage studies previously conducted for the Nkomati Mine site, sites were identified, and the required permits were obtained from the relevant authorities therefore additional heritage assessments will not be conducted for the WTP. A HIA and a Desktop Palaeontology Assessment has been conducted for the proposed WTP and associated infrastructure.
The Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) **The DMRE is the CA**	The Mineral and Petroleum Resources Development Act of 2002 (MPRDA) came into effect in 2004 and establishes the state as the custodian of the nation's mineral and petroleum reserves. The legislative environmental framework supporting the MPRDA creates a licensing regime allowing for mineral and petroleum exploitation subject to national priorities, regulations and standards. Reconnaissance, exploration, and production rights are only granted upon the approval of relevant environmental impact assessment and cost analysis documentation. The WTP is located within the existing Nkomati Mining Right therefore the application will be reviewed by the DMRE.

Legislation	Description of Legislation and Applicability
NEMA: Regulations for Financial Provision, 2016	The purpose of these Regulations is to regulate the determine and making of financial provision as contemplated in the Act for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future. The WTP has been considered during the closure planning of the mine and therefore the costs associated with the decommissioning of the WTP will be included in the closure costs for the mine.

2.2 POLICIES AND PLANS

Table 2-2 summarised key policies and plans as an outline of the governance framework for the project.

Table 2-2 – Applicable Policies and Plans

Applicable Plan	Description of Plan
Mpumalanga Biodiversity Conservation Plan (MBCP), 2006	In 2006 the MTPA and the Department of Agriculture and Land Administration (DALA) initiated the development of the MBCP. As the first such plan produced for the Province, it was intended to guide conservation and land-use decisions in support of sustainable development. The MBCP provided a spatial framework that supported land-use planning and helped to streamline and monitor environmental decision-making. Since 2007, several technical advances and land use changes necessitated the need for an update of the MBCP. This resulted in the production of the Mpumalanga Biodiversity and Freshwater Sector Plans which provide a more comprehensive assessment of the biodiversity of the terrestrial and freshwater environment in Mpumalanga (MTPA, 2014). These sector plans classify all land areas within the province into Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and areas that have been irreversibly modified from their natural state (MTPA, 2014). The site for the WTP is located within a heavily modified area. It is located within the Northern Escarpment Quartzite Sourveld which has a conservation status of Least Concern. The site is however located within a Strategic Water Source Area (Mpumalanga Drakensberg) therefore considered as Very High Sensitivity from an aquatic perspective. An Aquatic Biodiversity Impact Assessment and a Terrestrial Biodiversity Compliance Statement has been conducted for the proposed WTP, the findings are presented within this report.

Applicable Plan	Description of Plan
Albert Luthuli Local Municipality Integrated Development Plan (IDP), 2022	The IDP of the Albert Luthuli Local Municipality is aligned with the National Development Plan of 2030 (NDP). The NDP identified 12 outcomes which must be considered during the planning process for each municipality. Outcome 10 will be considered during the EIA process for the WTP: *Outcome 10: Protection and enhancement of environment, assets and national resources.* The IDP also places emphasis on the Mpumalanga Economic Growth and Development Path (MEGDP) which highlights the importance of the mining sector for development.

2.2.1 ADDITIONAL PERMITS AND AUTHORISATIONS

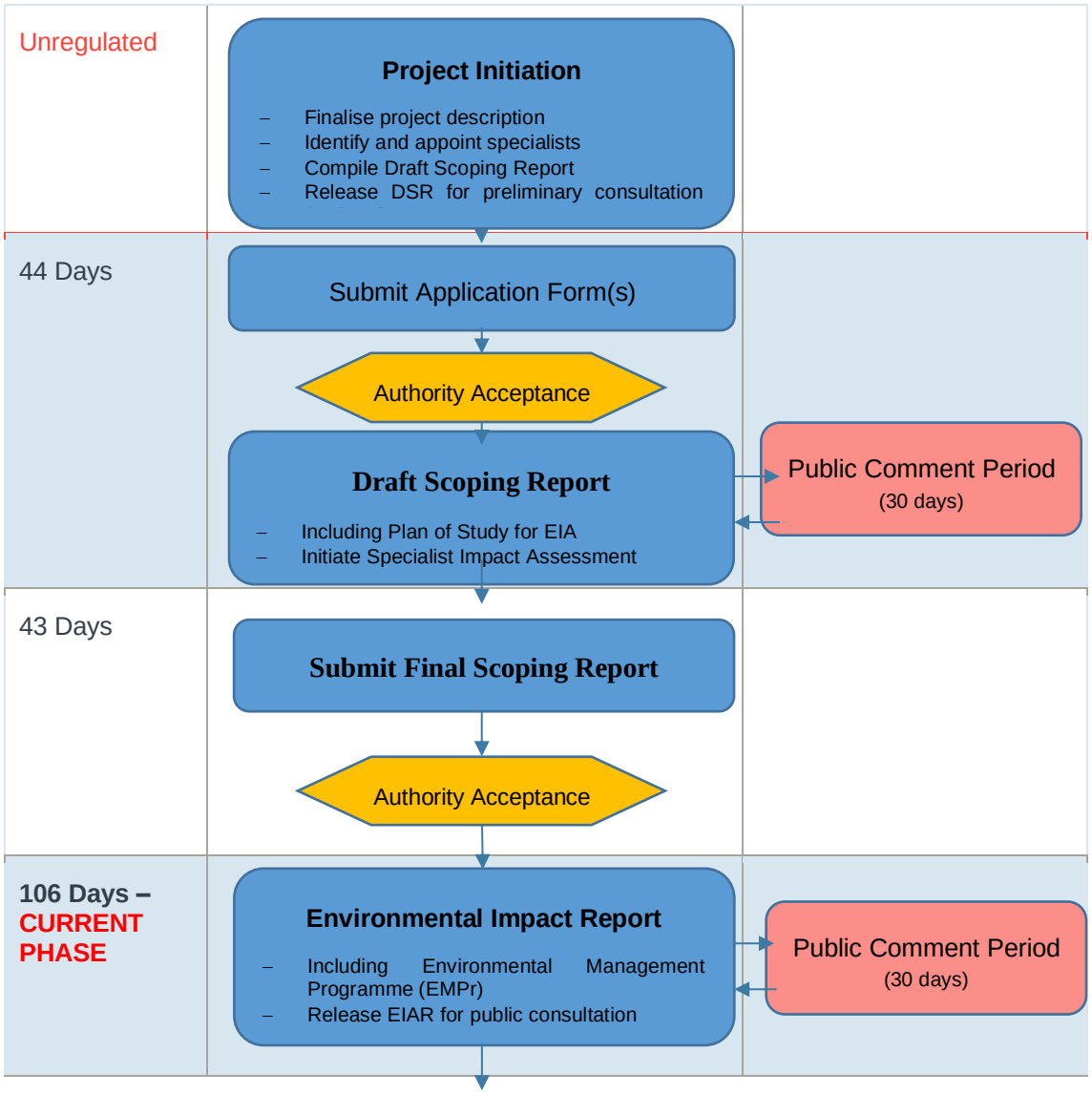
Table 2-3 – Additional Permits and Authorisations required for the Proposed Project

Permits / Authorisation	Legislation	Relevant Authority	Status
Section 38 (8) for the review of environmental documents	Section 38 (1) & (8) of the NHRA	SAHRA	Pending
WUL	Section 21 of the NWA	DWS	Pending
NEM:WA Registration of a waste storage facility for gypsum sludge generated	NEM:WA Norms and Standards for Storage of Waste, 2013	DFFE	Pending

3 EIA METHODOLOGY

3.1 PHASING OF THE S&EIR PROCESS

The S&EIR process consists of various phases with associated timelines as defined in the EIA Regulations. The process can generally be divided into four main phases, namely; (i) an unregulated pre-application phase, (ii) an Application and Scoping Phase, (iii) an Impact Assessment Phase (current phase) and (iv) Authorisation and Appeal Phase. The S&EIR process is shown in **Figure 3-1.**The main objectives and activities of the phases are described in the sections below.



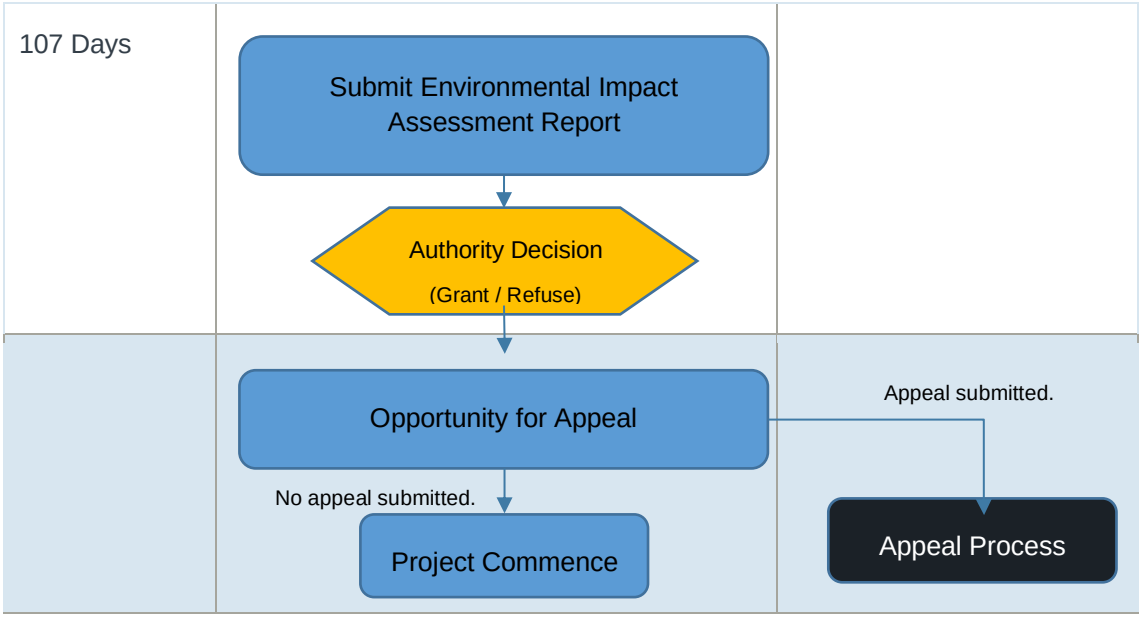


Figure 3-1 – S&EIR Process

3.1.1 PRE-APPLICATION PHASE

The following activities were already undertaken as part of the pre-application phase:

- Consultation meetings with the relevant authorities to confirm the required process and general approach to be undertaken;
- Identification of stakeholders, including neighbouring landowners/residents and relevant authorities;
- Compilation of a DSR describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase;
- Draft Terms of Reference for the specialist studies to be undertaken in the Impact Assessment Phase; and
- Inform stakeholders of the proposed project, feasible alternatives and the S&EIR process and afford them the opportunity to register and participate in the process and identify any issues and concerns associated with the proposed project.

3.1.1.1 Consultation with DMRE

A meeting was held between the DMRE and the NJV Representatives on 06 December 2023. During the meeting, it was confirmed that the DMRE will assess the application once submitted.

3.1.1.2 DFFE Web-Based Environmental Screening Tool

DFFE has developed the National Web-based Environmental Screening Tool in order 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 (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, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended (GN 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 Government Notice No. R326 in Government Gazette No. 38282 of 4 December 2014, as amended, is compulsory when submitting an application for EA 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 as well as the most environmentally sensitive features on the footprint based on the footprint sensitivity screening results for the application classification that was selected.

A DFFE Screening Report for the proposed WTP was generated on 24 October 2023 and is attached as **Appendix F**. 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 3-1 below provides a summary of the sensitivities identified for the development footprint and the associated specialist studies to be undertaken.

Table 3-1 – Sensitivities identified in the DFFE Screening Report

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity	Motivation for Specialist Study
Agricultural			x		The DFFE Protocol requires that a compliance statement be completed for the site. The site for the WTP is located within an existing mining area which is heavily disturbed and cannot be used for agricultural purposes. An Agricultural Compliance Statement was deemed not necessary.
Animal Species			x		The DFFE Protocol requires that a

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity	Motivation for Specialist Study
					compliance statement be completed for the site. Due to the disturbed nature of the proposed development footprint, the proposed site no longer functions as a habitat for animals; however the animal species theme has been considered in the Terrestrial Biodiversity Theme Compliance Statement.
Aquatic Biodiversity	x				The DFFE Protocol requires that an aquatic assessment be completed for the site. An Aquatic Assessment and a Hydrology (Surface Water) Assessment has been completed and the findings incorporated into this report.
Archaeological and Cultural Heritage				x	The DFFE Protocol requires that a site verification be undertaken by the EAP or a specialist however a HIA was undertaken, and the findings are presented within this report.
Civil Aviation				x	The DFFE Protocol requires that a site verification be undertaken by the EAP or a specialist.

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity	Motivation for Specialist Study
					Given the nature of the project and the location of the site, it is unlikely that there will be any impacts associated with the Civil Aviation Theme and therefore it was not further assessed in this report.
Defence				x	The DFFE Protocol requires that a site verification be undertaken by the EAP or a specialist. Given the nature of the project and the location of the site, it is unlikely that there will be any impacts associated with the Defence Theme and therefore it was not further assessed in this report.
Palaeontology	x				The DFFE Protocol requires that a site verification be undertaken by the EAP or a specialist. Based on a desktop survey of the site, the specialist confirmed that a PIA will not be required as the proposed location has been transformed by mining related and other activities and can no longer be considered High Sensitivity. A letter of exemption from conducting a PIA

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity	Motivation for Specialist Study
					has been drafted and included in **Appendix G** of this report.
Plant Species			x		The DFFE Protocol requires that a compliance statement be completed for the site. The Plant Species Theme has been included in the Terrestrial Biodiversity Compliance Statement and the findings have been presented in this report.
Terrestrial Biodiversity	x				The DFFE Protocol requires that a terrestrial assessment be completed for the site. However, it must be noted that the site is only considered as High Sensitivity for this theme as it is located within a Water Source Area and not within any critically endangered or endangered ecosystem. The vegetation type is considered least concern according to the MBCP. A Terrestrial Biodiversity Compliance Statement has been completed and the findings included in this report.

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report as determined by the screening tool:

- Archaeological and Cultural Heritage Assessment;
- Palaeontology Desktop Assessment and Letter of Exemption from conducting a PIA;
- Terrestrial Biodiversity Compliance Statement (including plant and animal species theme);
- Aquatic Compliance Statement; and
- Surface Water Assessment.

Additional studies undertaken in support of the EIR are:

- Geotechnical Assessment.
- Closure Assessment.

3.1.2 APPLICATION AND SCOPING PHASE

The following activities were already undertaken as part of the Scoping Phase:

- Compilation and submission of the application form to the DMRE;
- Payment of the relevant application fees;
- Incorporation of the comments received from stakeholders during the pre-application phase into the DSR;
- Release of the DSR for a 30-day comment period to provide stakeholders with the opportunity to review;
- Submission of the FSR, following the consultation period, to the relevant authority, in this case the DMRE, for acceptance/rejection; and
- Acceptance of the FSR by the DMRE.

3.1.2.1 Application

The application phase consisted of the completion of the application form by the EAP and the NJV as well as the subsequent submission of the application for EA with the DMRE on 2 February 2024.

A copy of the acknowledgement of receipt of the application is included in **Appendix D.**

Authority Consultation

WSP notified the commenting authorities of the proposed project and the release of the Draft Scoping Report (DSR) for comment via a notification letter, these included:

- Inkomati Usuthu Catchment Agency (IUCMA);
- Gert Sibande District Municipality;
- Chief Albert Luthuli Local Municipality;
- South African Heritage Resource Agency (SAHRA); and
- Mpumalanga Department Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA).

WSP did not receive any comment from any of the commenting or competent authorities during the PPP for the DSR.

3.1.2.2 Public Participation

Public participation is a requirement of the S&EIR process. It consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIR decision-making process. Effective engagement requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed project. The objectives of the stakeholder engagement process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues, and solutions.

A SER (**Appendix D**) has been compiled and included in the Draft EIR detailing the projects' compliance with Chapter 6 of the EIA Regulations.

Stakeholder identification

Stakeholders were identified and will continue to be identified through several mechanisms. These include:

- Utilising existing databases from other projects in the area;
- Networking with local business owners, non-governmental agencies, community-based organisations, and local council representatives;
- Field work in and around the project area;
- Advertising in the press;
- Placement of community notices;
- Completed comment sheets; and
- Attendance registers at meetings.

All stakeholders identified to date have been registered on the project stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the proposed project. Stakeholders were identified at the horizontal (geographical) and vertical extent (organisations level). A list of stakeholders captured in the project database is included in the Stakeholder Engagement Report (SER) included in **Appendix D**.

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') received to date have been documented and responded to in the SER included in **Appendix D**.

Stakeholder notification

Direct Notification

Notification of the proposed project was issued to potential I&APs, via direct correspondence (i.e., site notices and e-mail) on 9 and 12 February 2024 respectively. Proof of the notification letter that was circulated and the site notices that were erected are included in the SER (**Appendix D**).

Newspaper Advertisements

In accordance with Chapter 6 of the EIA Regulations, an advert was placed in one local newspaper. The purpose of the advertisement was to notify the public about the proposed project and to invite them to register as stakeholders. A copy of the advert is included in **Appendix D**. The relevant scoping phase advertisement date is listed in **Table 3-2** below.

Table 3-2 – Advertisement publication dates

Newspaper	Publication Date	Language
The Star	8 February 2024	English

Draft Scoping Report Availability

The DSR was available for public review from 12 February 2024 to 13 March 2024 at the following locations:

- Emthonjeni Public Library
- eManzana Public Library
- WSP website (https://www.wsp.com/en-za/services/public-documents).

Subsequently the DSR was finalised and submitted to the DMRE on 15 March 2024 as the FSR. The submission of the FSR was within 44 days of receipt of the application by the DMRE as required by the EIA Regulations.

Comment and Response Report

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') were documented and responded to in a comment and response report (CRR). The CRR records the following:

- List of all issues raised;
- Record of who raised the issues;
- Record of where the issues were raised;
- Record of the date on which the issue was raised; and
- Response to the issues.

The CRR capturing comments made during the scoping phase is included in **Appendix D.**

Final Scoping Report Availability

The FSR was made available for public information from 15 March 2024 on the WSP website (https://www.wsp.com/en-za/services/public-documents). There were no comments received on the FSR however all comments for the Scoping Phase are included in **Appendix D.**

3.1.2.3 Summary of the comments raised during the Scoping Phase

Table 3-3 provides a summary of the comments that were received during the Scoping Phase.

Table 3-3 – Comments received during the Scoping Phase

Name of Organisation	Issue Identified	Response
Member of the public	Importance of clean water to the natural and social environments. The importance of involving the public in the decision-making process.	The response highlighted the importance of the WTP and reiterated that only treated water will be discharged.
Mpumalanga Tourism and Parks Agency	None. Recommendations were made for rehabilitation during construction.	Recommendations were included into the EIA and EMPr.
SAHRA	HIA must be conducted. PIA must be conducted.	HIA has been conducted and included in the EIA. The palaeontologist confirmed that the high paleo-sensitivity no longer exists due to the anthropogenic activities already existing in the area. The letter of exemption was submitted on the SAHRIS website.

3.1.2.4 Findings of the Scoping Phase

The Scoping Phase identified impacts associated with the proposed WTP and associated structures and infrastructure. The findings of the preliminary significance ratings undertaken during the scoping phase for the construction phase and operational phase are included in the **Table 3-4** below. The impacts that were low to negligible in significance were not further assessed in the EIA Phase.

Table 3-4 – Potential Construction and Operational Phase Impacts

Aspect	Potential Impact	Nature	Probability	Consequence	Potential significance (Before Mitigation)	Further Assessment Required
Topography, & Geology	Excavations	Negative	3	1	Low	Yes (Geotechnical Assessment)
Soils, land use and land capability	Erosion and sedimentation	Negative	4	3	High	Yes
	Change in surface profile	Negative	4	3	High	
	Change in land use	Negative	4	3	High	
	Change in land capability	Negative	4	3	High	
	Soil contamination	Negative	4	3	High	
Surface water	Changes in water flow regime	Negative	4	3	High	Yes (Surface Water Impact Assessment)
	Changes in sediment volume	Negative	2	2	Low	
	Introduction and spread of alien vegetation	Negative	4	3	High	

Aspect	Potential Impact	Nature	Probability	Consequence	Potential significance (Before Mitigation)	Further Assessment Required
	Loss and disturbance of watercourse habitat and fringe vegetation	Negative	4	3	High	
	Changes in water quality	Negative	4	3	High	
	Loss of aquatic biota	Negative	4	3	High	
Groundwater	Ground Contamination	Negative	3	1	Low	No
Terrestrial Biodiversity	Direct loss and disturbance of habitat and associated flora Species of Conservation Concern	Negative	2	2	Low	Yes (Terrestrial Biodiversity Compliance Statement)
	Establishment And Spread of Alien Invasive Species	Negative	2	2	Low	

Aspect	Potential Impact	Nature	Probability	Consequence	Potential significance (Before Mitigation)	Further Assessment Required
	Loss And Fragmentation of Faunal Habitats	Negative	2	2	**Low**	
	Injury and mortality of faunal species of conservation concern	Negative	2	2	**Low**	
Heritage and Cultural Resources	Disturbance to known Cultural Resources	Negative	2	2	**Low**	**No, however a HIA was conducted**
	Chance Find of Cultural Resources	Negative	2	2	**Low**	
Palaeontology	Chance Find of Palaeontological resources	Negative	2	2	**Low**	**No, an exemption to conduct a PIA was compiled by a specialist**
Socio-Economic	Creation of local employment, training, and business opportunities	Positive	3	1	**Low**	**No**
	Impact of construction	Negative	2	1	**Very low**	

Aspect	Potential Impact	Nature	Probability	Consequence	Potential significance (Before Mitigation)	Further Assessment Required
	workers on local communities					
	Nuisance impacts associated with construction related activities	Negative	3	1	**Low**	
Air Quality	Dust Emissions	Negative	3	1	**Low**	**No**
Noise	Noise Emissions	Negative	3	1	**Low**	**No**
Traffic	Increased traffic generation around the study area by construction vehicles	Negative	3	1	**Low**	**No**
	Deterioration of the surrounding road network due to an increase of traffic around the site	Negative	2	1	**Very low**	
	Transportation of abnormal loads during the construction phase	Negative	3	1	**Low**	

Aspect	Potential Impact	Nature	Probability	Consequence	Potential significance (Before Mitigation)	Further Assessment Required
Aquatic Biodiversity	Indirect Loss of Wetland Habitat	Negative	2	2	**Low**	**Yes (Aquatic Assessment)**
	Establishment and Spread of Alien Invasive Species	Negative	2	2	**Low**	
	Catchment Land Use Changes and Activities	Negative	2	2	**Low**	

3.1.3 IMPACT ASSESSMENT PHASE (CURRENT)

The following activities were undertaken or are currently being undertaken as part of the EIA Phase:

- Continue to inform and obtain contributions from stakeholders, including relevant authorities, stakeholders, and the public and address their relevant issues and concerns;
- Assess in detail the potential environmental and socio-economic impacts of the project as defined in the DSR;
- Identify environmental and social mitigation measures to avoid and/or address the identified impacts;
- Develop and/or amend environmental and social management plans based on the mitigation measures developed in the Environmental Impact Assessment Report (EIAR);
- Submit the EIR and the associated EMPr to the competent authority to undertake the decision-making process;
- Authorisation and Appeal Phase;
- The DMRE to provide written notification of the decision to either grant or refuse EA for the proposed project; and
- Notify all registered I&APs of the decision and right to appeal.

3.1.3.1 Specialist Studies

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 Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. “the Protocols”), or Appendix 6 of the EIA Regulations, depending on which legislation apply to the assessment under consideration.

Specialist studies were undertaken during the EIA phase to consider and assess environmental impacts associated with the proposed project. The outcomes of these studies are included in the relevant reports contained in **Appendix G**. The table below provides a list of the Specialist Studies that have been undertaken.

Table 3-5 – Details of Specialists

Assessment	Name of Specialist	Company
Aquatic Biodiversity Assessment	Tebogo Khoza	WSP
Heritage Impact Assessment	Prof. A.C. van Vollenhoven	Archaetnos Culture & Cultural Resource Consultants
Letter of exemption for Palaeontology	Marion.bamford@wits.ac.za	Marion Bamford

Assessment	Name of Specialist	Company
Surface Water Impact Assessment	Rachel Kganedi	WSP
Closure and Liability Assessment	Jill Chauke	WSP
Terrestrial Biodiversity Compliance Statement	Andrew Zinn	Hawkhead
Geotechnical Assessment	S Potgieter J Joubert J R Collina T Kekana	Agreenco Environmental Projects (Pty) Ltd

3.1.3.2 Public Participation

Stakeholder and Authority Consultation

There has been ongoing communication between WSP and stakeholders throughout the S&EIR process. These interactions include the following:

- A letter was sent to all registered stakeholders providing them with an update of the proposed project and the release of the Draft EIR for public comment;
- Interactions with stakeholders have been recorded in the Comments and Responses Report (CRR);
- Feedback to stakeholders will take place both individually and collectively;
- Written responses (email, faxes or letters) will be provided to stakeholders acknowledging issues;
- Information requested (dependent on availability);
- As per the EIA Regulations, particular attention will be paid to landowners, and neighbouring communities and
- The release of the Final EIR to the public and the DMRE.

Public Review

The Draft EIR was placed on public review for a period of 30 days from 12 June 2024 to 14 July 2024, at the following public places:

- Emthonjeni Public Library
- eManzana Public Library
- WSP website (https://www.wsp.com/en-za/services/public-documents).

All registered stakeholders and authorising/commenting state departments was notified of the public review period as well as the locations of the Draft EIR via email and SMS. The final EIR is available on the WSP website and a hard copy has been delivered to the DMRE for the decision making process.

Comment and Response Report

The updated CRR has been included in the Final EIR in and will be made available to all stakeholders.

3.1.3.3 Submission and Decision Making

The EAP has submitted this Final EIR to the competent authority within 106 days of the acceptance of the FSR. The DMRE will be allocated 107 days to review the Final EIR in order to either grant or refuse the application. The DMRE must issue their decision within this specified timeframe.

3.1.3.4 Notification of EA

All stakeholders will receive a letter at the end of the process notifying them of the authority's decision, thanking them for their contributions, and explaining the appeals procedure as outlined in the National Appeal Regulations, 2014 (GNR 993 of 2014).

3.2 IMPACT ASSESSMENT METHODOLOGY

The EIR uses a methodological framework developed by WSP to meet the combined requirements of International Best Practice and the EIA Regulations.

As required by the EIA Regulations, the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact
- Significance of the Impact
- Consequence of the Impact
- Extent of the impact
- Duration of the Impact
- Probability if the impact
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

3.2.1 METHODOLOGY

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, indirect, secondary as well as cumulative 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 presented in **Table 3-6.**

Table 3-6 – Impact Assessment Criteria 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) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across 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

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
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**

3.2.2 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 projects' 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 3-2** below.

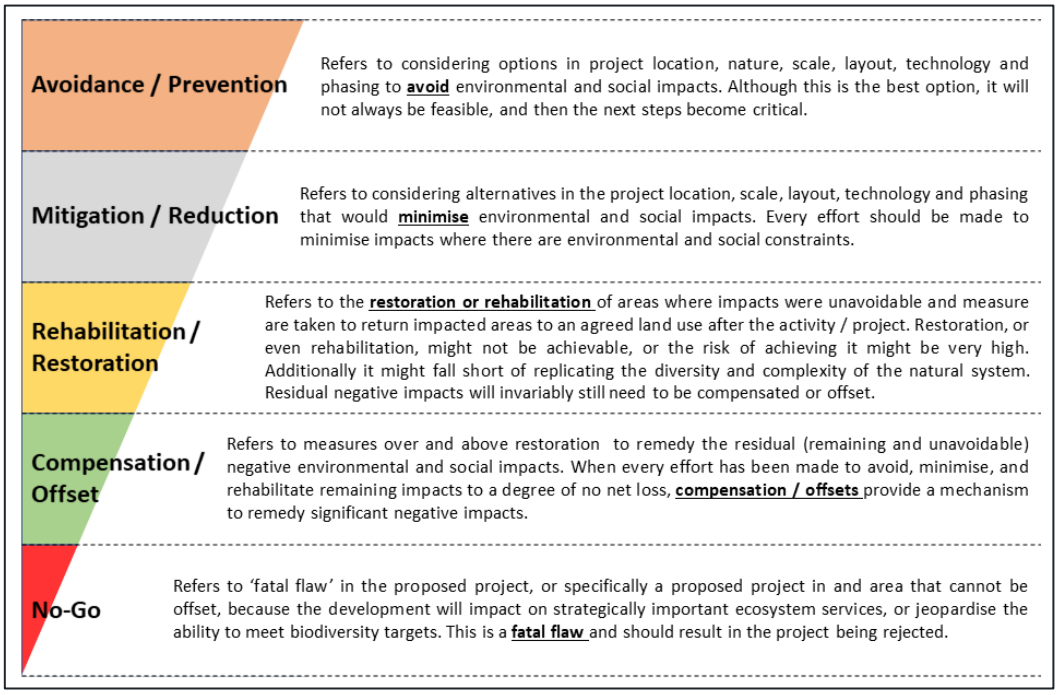


Figure 3-2 - Mitigation Sequence/Hierarchy

4 NEED AND DESIRABILITY OF THE PROJECT

The DEA&DP Guideline (2013) states that the essential aim of need and desirability is to determine the suitability (i.e., is the activity proposed in the right location for the suggested land-use/activity) and timing (i.e., is it the right time to develop a given activity) of the development. Therefore, need and desirability addresses whether the development is being proposed at the right time and in the right place. Similarly, the 'Best Practicable Environmental Option' (BPEO) as defined in NEMA is *"the option that provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term."*

The primary need for the WTP is to reduce stored water volumes and maintain the water level below the decant level at the Nkomati Mine site. This means that there must be a solution to facilitate the reduction in the volume of water stored in open pits at the lowest cost of treatment and ensure that the discharge quality meets the water quality limits as detailed in the WUL.

The excess water at Nkomati Mine is currently being collected in Pit 3. Assessing Nkomati's 2-year record of water quality parameters from the West abstraction point of Pit 3, it is evident that certain parameters have deteriorated whilst other parameters appear to be improving. It became evident that the water quality does not meet the WUL limit for discharge. The primary elements of concern were the Magnesium, Calcium and Sulphates which were above the WUL limit and were expected to gradually increase in concentration in future.

Based on the above, a WTP is proposed to treat and discharge 4,000,000 m^3/annum of water. The implementation of the WTP would result in a multiple step treatment process of feedwater which can be treated and eventually discharged in accordance with the Receiving Water Quality (RWQ) requirements and discharge limits as per the WUL.

Since it is not acceptable to discharge water with a high metal and contaminant content into the river systems, the WTP presents a solution for the treatment and discharge of acceptable quality water into the Adit Stream in the vicinity of the Nkomati Mine site. The WTP therefore has the benefit of providing a solution to the mine's stored water issue whilst ensuring that the water quality is acceptable for discharge resulting in maintaining of the health of the river system.

Table 4-1 – Need and Desirability Assessment

PART 1 - NEED	
Is the land use associated with the activity being applied for considered within the timeframe intended by the existing approved SDF agreed to be the relevant environmental authority? Should the development, or if applicable, expansion of the town/area concerned in terms of this land use occurs here at this point in time?	Based on the SDF, the site is located within an area earmarked as mineral resource region. However, the site is also situated in a High Sensitivity Water Management Area surrounded by rivers and streams which can be impacted upon if the proposed WTP is not implemented as the untreated water in the pit is expected to decant before or during the rainy season.
Does the community/area need the activity and the associated land use concerned? This refers to the strategic as well as local level.	Yes. Currently the mine water is contained within the pits at the NJVM, however it is expected that Pit 3 will decant into the receiving environment sooner than anticipated and may impact the receiving environment which includes nearby rivers and streams. The WTP is a critical component to aid in the much-needed water management at the NJVM site. Without the WTP untreated mine water will be released into the environment resulting in impacts on the surrounding water resources and water users.
Are the necessary services with adequate capacity currently available (at the time of application) or must additional capacity be created to cater for the development? Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of the services and opportunity cost)?	The site is situated within the existing Mining Right of the NJVM. The site currently does not have the capacity to cater for the volume of untreated water that will be decanted into the surrounding environment, the implementation of the WTP will allow for the release of treated water into the environment which is expected to have a low impact in terms of water quality and flow.
Is the project part of a national programme to address an issue of national concern or importance?	The proposed project is aligned with the DWS Mine Water Management Policy, 2022 which provides a guideline to address mine water related challenges.
PART 2 - DESIRABILITY	
Is the development the best practicable environmental option for this land/site?	Since the site for the WTP is situated on the existing NJVM site, it is the best practicable option for the WTP. It will be situated in the vicinity of Pit 3 which stores the untreated mine water.

Would the approval of this application compromise the integrity of the existing approved and credible IDP and SDF as agreed to by the relevant authorities?	No.
Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	The site for the WTP is located within a heavily modified area. It is located within the Northern Escarpment Quartzite Sourveld which has a conservation status of Least Concern. The site is however located within a Strategic Water Source Area (Mpumalanga Drakensberg) therefore considered as Very High Sensitivity from an aquatic perspective. However based on the findings of the Aquatic Assessment, the area is low in aquatic biodiversity. The WTP when implemented, will prevent further impacts on the surrounding water resources by releasing water that is of an acceptable quality into the Adit Stream. Therefore, it can be justified in terms of sustainability.
Do location factors favour this land use at this place? (this relates to the contextualization of the proposed land use on this site within its broader context).	The preferred location was chosen based on the following factors: ▪ The WTP will be located within the existing mining right area of the NJVM. ▪ The site is already transformed as a result of mining related activities therefore impacts have already been exerted onto the receiving environment. ▪ The proximity of the Adit Stream to the WTP allows for the treated water to be released with minimal impact to the surrounding receiving environment. ▪ According to the Aquatic Assessment the ecological integrity was determined to be *Critically Modified* at the Adit Stream therefore the WTP will not contribute to a further deterioration of the watercourse as the water will be treated to an acceptable quality prior to being released.
How will the activity of the land use associated with the activity being applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	▪ According to the findings of the specialist studies, the WTP is expected to have a low impact after mitigation as the WTP site is located on an already disturbed site and the discharge structure will be located within the Adit Stream and will have a low impact on water flow and quality of the stream if all mitigation measures are implemented effectively.

How will the development impact on people's health and well-being? (E.g. In terms of noise, odours, visual character and sense of place, etc.)?	Since the WTP will be located within the existing NJVM site, and the WTP will be designed to produce discharge water quality acceptable for release to the environment, it is anticipated that there will be no impact on the health and well-being of people.
Will the proposed activity or the land use associated with the activity being applied for, result in unacceptable opportunity costs?	No.
Will the proposed land use result in unacceptable cumulative impacts?	There will be no unacceptable cumulative impacts, should the WTP produce discharge water quality acceptable for release to the environment and the mitigation measures contained in this report be implemented. Cumulative impacts have been assessed during the EIA Phase.

5 PROJECT DESCRIPTION

This section provides a description of the location of the project area and the details associated with each phase of the project. The description encompasses the activities to be undertaken during the construction and operational phases as well as the consideration for site accessibility, water demand, supply, storage, and site waste management.

5.1 LOCATION OF THE PROPOSED PROJECT SITE

NJVM is located in quaternary catchment X11J, located in Mpumalanga Province between Machadodorp and Badplaas on the adjacent farms Slaaihoek 540 JT, Nkomati 770 JT (previously part of Uitkomst 541 JT and Vaalkop 708 JT), Uitkomst 541 JT and the farm Onverwacht 611 JT, approximately 12 km southeast of Uitkomst (SRK, 2020).

The WTP is located on Farm Uitkomst 541 and falls within the Albert Luthuli Local Municipality in the Gert Sibande District Municipality.

The locality of the site is depicted in **Figure 5-1.**

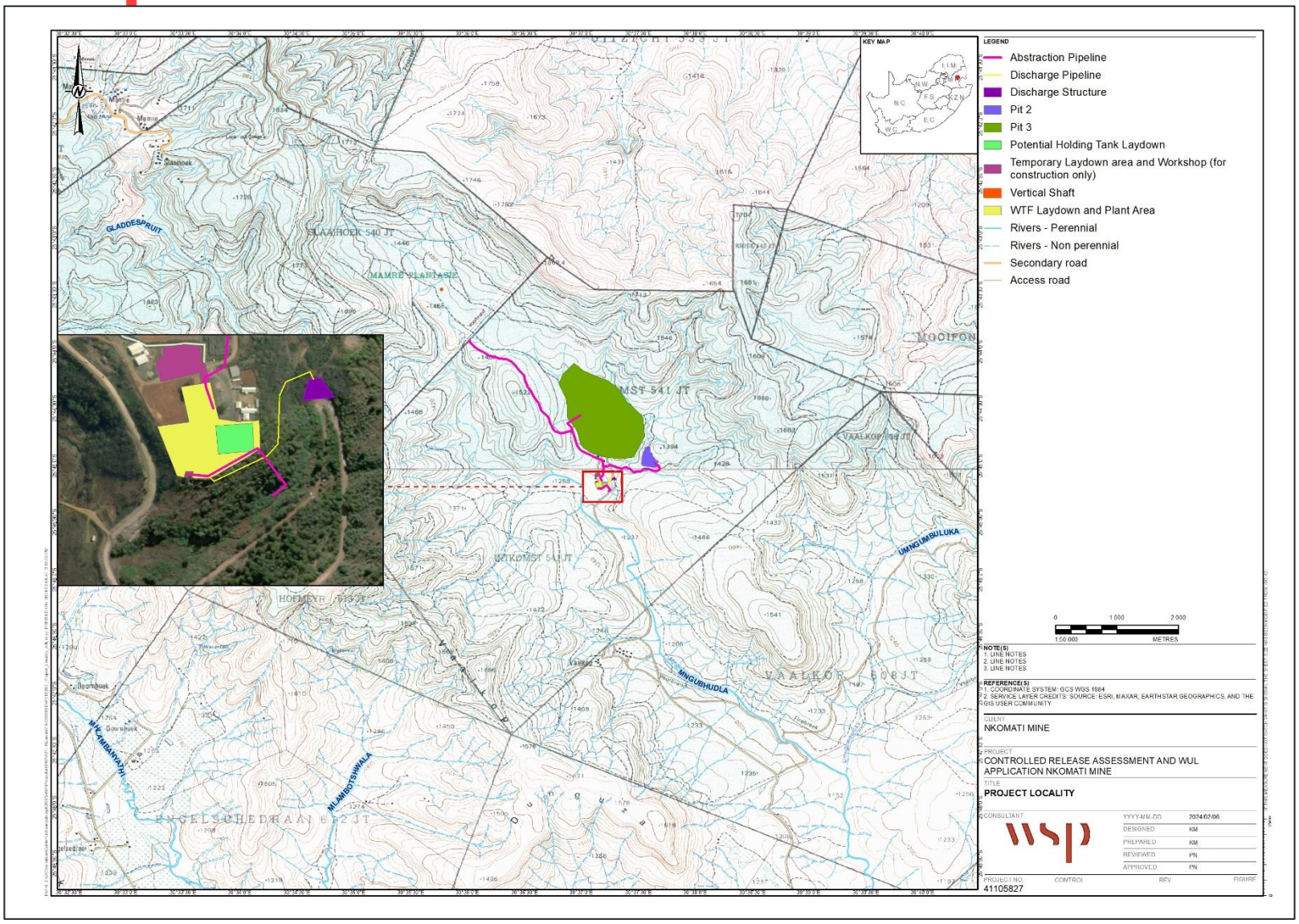


Figure 5-1 - Locality map of the Proposed WTP and associated infrastructure

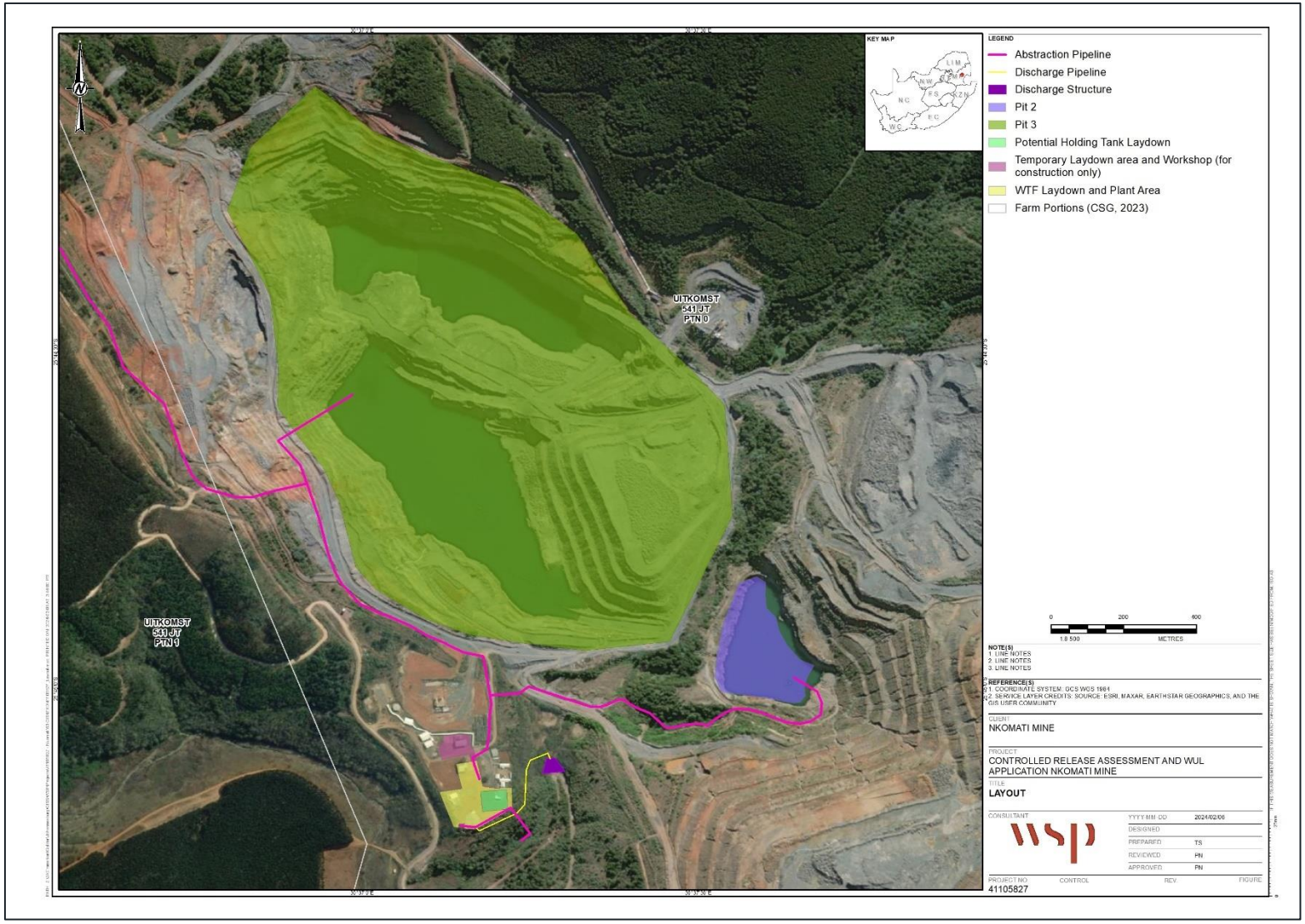


Figure 5-2 - Layout map of the Proposed WTP and associated infrastructure

Table 5-1 below indicates the cadastral information of the site and **Table 5-2** includes the co-ordinates of the site.

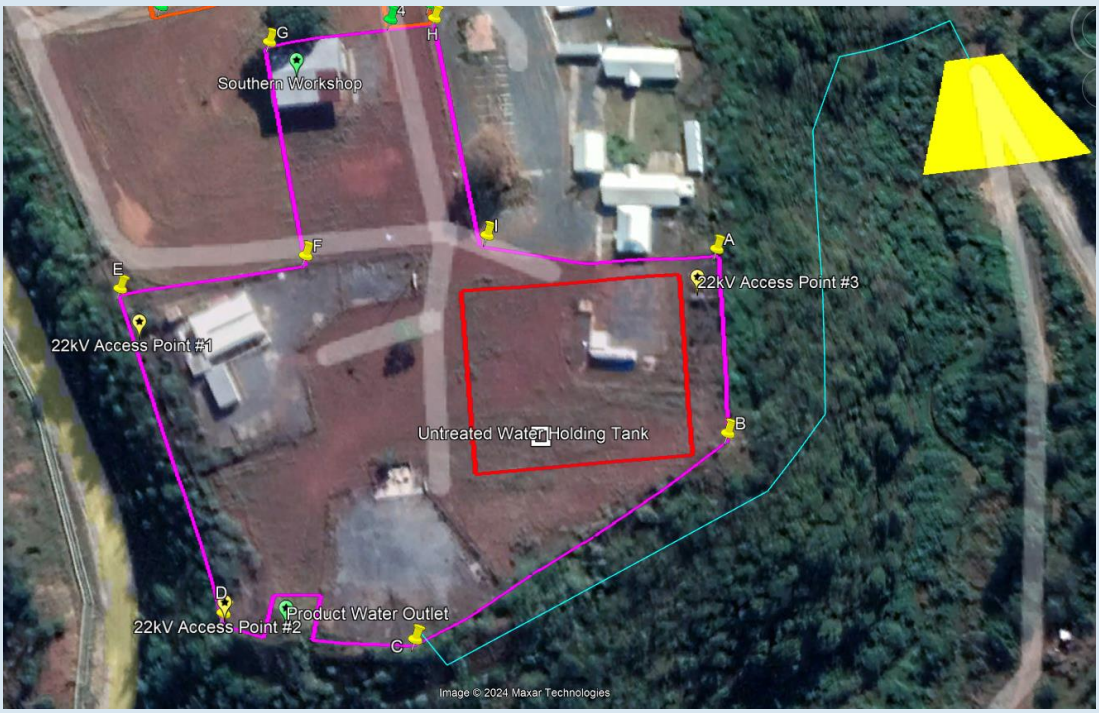
Table 5-1 –Cadastral Information of the Site

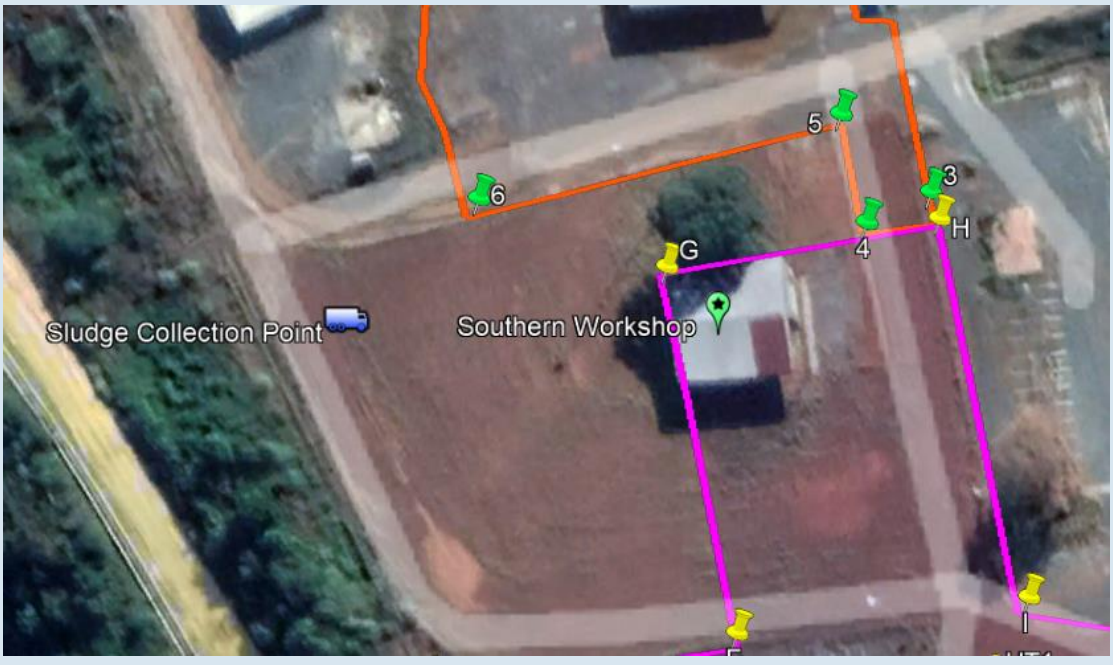
Details required as per GNR 326 Annex 1 (3)	Details
21 Digit Surveyor General Code of each Cadastral Land Parcel	T0JT00000000054100000
Physical Address and Farm Name	Portion 0 of Farm Uitkomst 541 JT
Land use Zoning	Mining
Municipality	Gert Sibande District and Albert Luthuli Local Municipalities

Table 5-2 – Coordinate Points of the Cadastral Land Parcel

Point	Latitude	Longitude	Area/dimensions
WTP and laydown area (Pink polygon)			
Corner A	25°45'8.89"S	30°37'13.23"E	1.92 Hectares
Corner B	25°45'10.69"S	30°37'13.29"E	
Corner C	25°45'12.59"S	30°37'10.04"E	
Corner D	25°45'12.36"S	30°37'8.04"E	
Corner E	25°45'9.28"S	30°37'6.80"E	
Corner F	25°45'8.98"S	30°37'8.81"E	
Corner G	25°45'6.80"S	30°37'8.34"E	
Corner H	25°45'6.51"S	30°37'10.15"E	
Corner I	25°45'8.77"S	30°37'10.75"E	
22kV Access Points			
Point 1	25°45'9.68"S	30°37'7.07"E	The access points for the transformer are located within the footprint of the WTP as above
Point 2	25°45'12.33"S	30°37'8.09"E	
Point 3	25°45'9.25"S	30°37'13.05"E	
Abstraction Pipeline			

Point	Latitude	Longitude	Area/dimensions
Start	25°43'54.04"S	30°36'0.60"E	Approximately 2000m in length with a maximum internal diameter of 0.45m
End	25°45'10.76"S	30°37'13.17"E	
Discharge Pipeline (green line)			
Start	25°45'12.46"S	30°37'10.18"E	Approximately 300m in length with a maximum internal diameter of 0.45m.
End	25°45'6.22"S	30°37'16.72"E	
Discharge Structure (yellow polygon)			
Corner 1	25°45'7.64"S	30°37'16.04"E	0.15 Hectares
Corner 2	25°45'7.41"S	30°37'18.07"E	
Corner 3	25°45'6.22"S	30°37'17.13"E	
Corner 4	25°45'6.39"S	30°37'16.39"E	
Potential Holding Tank laydown area within the footprint of the WTP (orange polygon)			
Corner 1	25°45'9.25"S	30°37'10.51"E	0.35 Hectares
Corner 2	25°45'9.07"S	30°37'12.85"E	
Corner 3	25°45'10.80"S	30°37'12.94"E	
Corner 4	25°45'11.01"S	30°37'10.72"E	

Point	Latitude	Longitude	Area/dimensions
			
Temporary Laydown Area (map overleaf)			
Corner 1	25°45'4.26"S	30°37'7.16"E	0.5 Hectares
Corner 2	25°45'4.19"S	30°37'9.56"E	
Corner 3	25°45'6.35"S	30°37'10.10"E	
Corner 4	25°45'6.54"S	30°37'9.66"E	
Corner 5	25°45'5.89"S	30°37'9.49"E	
Corner 6	25°45'6.39"S	30°37'7.10"E	
Corner 7	25°45'4.83"S	30°37'7.17"E	

Point	Latitude	Longitude	Area/dimensions
			
Topsoil Storage Area (yellow point)			
Topsoil	25°45'2.43"S	30°37'12.71"E	0.9 Hectares
Sludge Storage Area			
Sludge Storage Area	25°45'7.14"S	30°37'6.26"E	6 m^3 skips
			

5.2 SITE STATUS

Historical Aerial Imagery of the WTP site are provided in **Table 5-3** and site photographs provided in **Table 5-4.** The site is located within the Nkomati Mine boundary, predominantly surrounded by Sappi plantations and perennial and non-perennial streams.

Table 5-3 - Historical Aerial Imagery of the Proposed Project site

July 2003

April 2012

February 2016

December 2018

May 2022

Table 5-4 – Site Photographs

 Discharge point	 WTP site
 Access Road	 Pit 3

5.3 WATER MANAGEMENT ON SITE

5.3.1 BACKGROUND TO THE WATER MANAGEMENT ON SITE

Water at NJVM is currently managed where most excess water is collected and contained in Pit 3 (**Figure 5-3** and **Figure 5-4**). This is the intended source of water for treatment before discharge. In terms of water quality, Underground Water was historically pumped to the High Sulphide Return Water Dam for recycling at the Plant. Recently, since mining activities have ceased (2021), the water quality has improved. The Mine is currently pumping water from underground into the Evaporation Ponds (Pollution Control Dam) which is then pumped to the High Sulphide Return Water Dam to Pit 3.

Water from the Tailing Storage Facility (TSF) is pumped into the Return Water Dams (RWD) to maintain and ensure the stability and integrity of the tailings dams and ensure environmental compliance and other safety standards for tailings facilities.

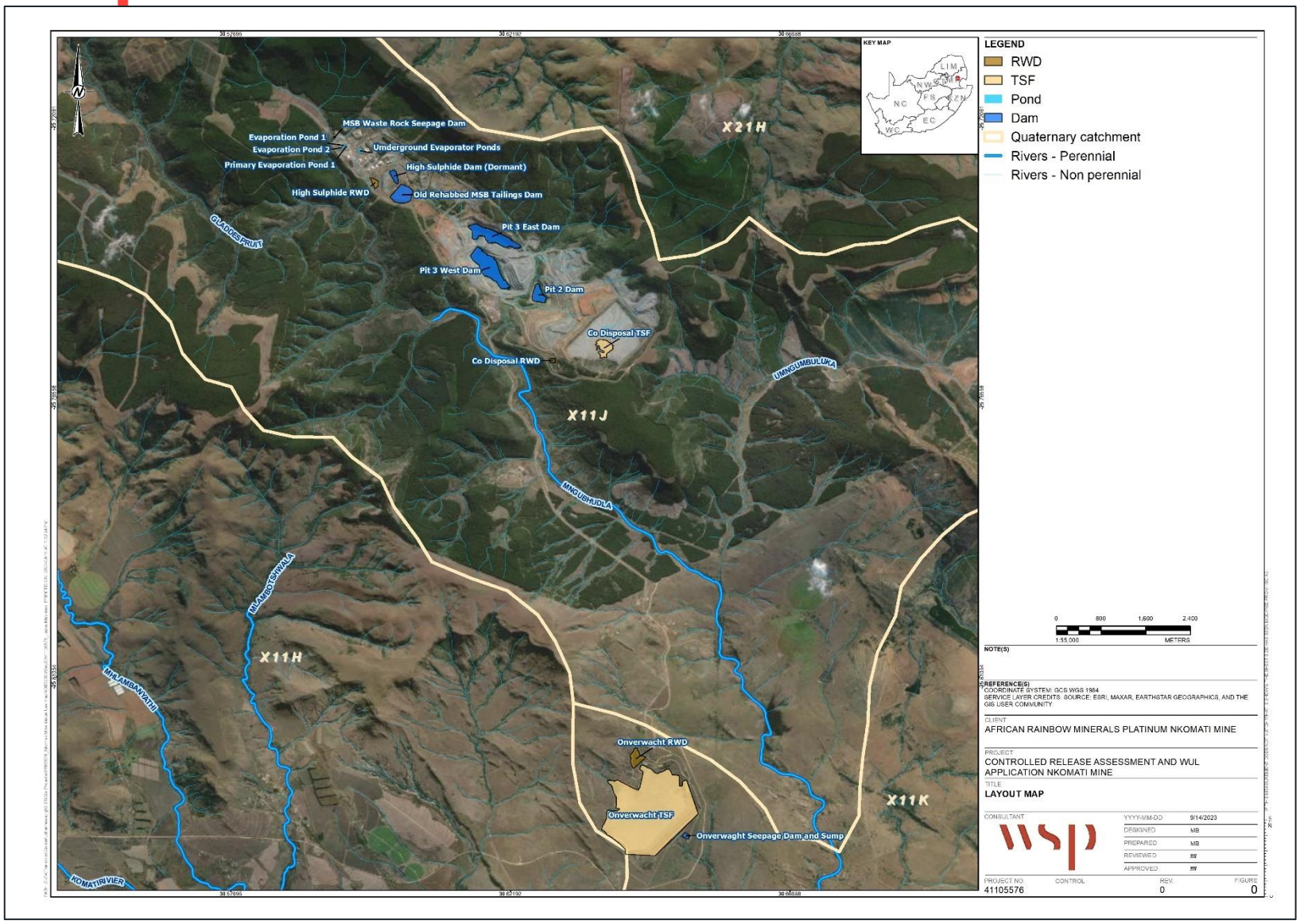


Figure 5-3 – Components of water management at the site

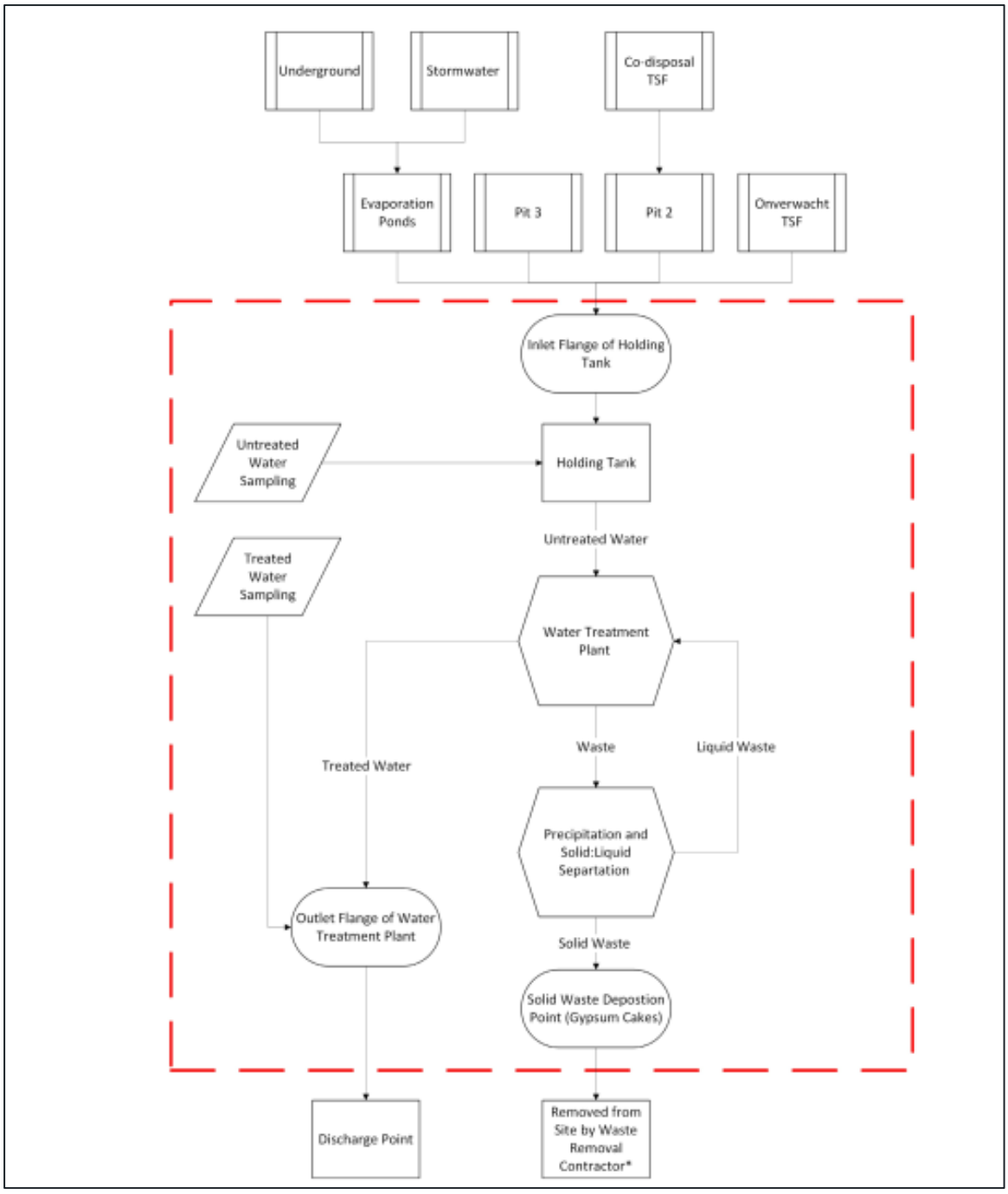


Figure 5-4 – Process flow schematic

The basis for the treatment of water is to ensure that the discharge quality meets the water quality limits as detailed in the mine's Water Use Licence (WUL) (Licence Number 05/X11J/ABCFGIJ/2351 issued on 22 November 2013). **Table 5-5** stipulates the feed water quality and associated discharge quality limits (as detailed in the WUL).

Table 5-5 - Water Use Licence Water Quality Parameters

Element	Unit	Feed Water Sample (Average)	Feed Water Sample (Maximum)	WUL Limit	Guaranteed parameters
Aluminium as Al	mg/ℓ	0.04	0.08	≤0.15	
Ammonia as NH_3	mg/ℓ	0.200	0.200	≤0.015	
Arsenic	µg/ℓ	Below detection limit		<0.01	
Calcium as Ca	mg/ℓ	178	247	<32	
Chloride as Cl	mg/ℓ	15	25	≤100	
Chromium as Cr^{3+}	µg/ℓ	Below detection limit		<24	
Chromium as C^{r6+}	µg/ℓ	Below detection limit		<14	
Cobalt	µg/ℓ	0.20	0.02	<0.05	
Conductivity	(mS/m)	146	187	<40	
Copper as Cu	µg/ℓ	1.0	2.0	<0.2	
Cyanide as CN	µg/ℓ	0.001	0.001	<0.001	
Faecal coliforms	counts/100 mℓ	Not measured		0	
Fluoride as F	mg/ℓ	0.20	0.31	≤1.00	
Free Chlorine	µg/ℓ	Below detection limit		<0.2	
Iron as Fe	mg/ℓ	0.03	0.08	≤1.00	
Magnesium as Mg	mg/ℓ	87	120	≤30	
Manganese as Mn	mg/ℓ	0.01	0.01	≤0.02	
Nickel as Ni	mg/ℓ	0.45	0.75	<0.20	
*Nitrate & Nitrite as NO_3 and NO_4	mg/ℓ	5.6	5.6	<2.0	

Element	Unit	Feed Water Sample (Average)	Feed Water Sample (Maximum)	WUL Limit	Guaranteed parameters
pH	pH units	7.9	8.1	5.5 to 8.8	
Phosphate as PO_4	mg/ℓ	0.10	0.14	≤0.07	
Potassium as K	mg/ℓ	14	23	≤50	
Sodium as Na	mg/ℓ	19	32	≤70	
Sulphate as SO_4	mg/ℓ	720	1000	<200	
Total Alkalinity	mg/ℓ	87	102	<60	
Total petrochemical hydrocarbons, incl. benzene, toluene, ethylbenzene, xylene, naphthalene	mg/ℓ	Not measured		<1	
Zinc as Zn	µg/ℓ	1.9	6.4	<1.0	

5.3.2 WTP FEED QUALITY

The Mine has been monitoring water quality as per the WUL condition and continues to monitor water quality at the regulated monitoring points. The 2-year trend of some of the parameters for the Pit 3 West point from where water is likely to be abstracted, is discussed below:

- The Conductivity (EC) exceeds the WUL limit and shows a deterioration in the quality of the water in Pit 3;
- The gradual increase is particularly evident in the analyses of Sulphate and Calcium and Magnesium which also exceed the WUL limit;
- Whilst Sodium and Chloride also showed a marginal deterioration, these appear to have stabilised and remain well within the WUL water quality limits;
- Alkalinity has improved slightly and is trending only marginally above the WUL limit; and
- The Nitrates have gradually reduced and is expected to continue decreasing (no nitrates entering the system due to there being no further blasting activity at the mine).

5.4 WTP SITE ALTERNATIVES

Two alternative WTP site options were considered as part of the mine's pre-feasibility study, with a focus on cost and engineering requirements. Given that both sites are located on heavily disturbed land within the mine's Mining Right boundary, away from sensitive receptors, environmental social considerations are the same for both Options 1 and 2.

5.4.1 WTP FOOTPRINT – PREFERRED ALTERNATIVE

The preferred alternative as depicted in **Figure 5-1** for the location of the WTP is in the vicinity of the offices near Pit 3. It is envisaged that water will be abstracted from Pit 3 and pumped through a pipeline to the WTP.

The elevation difference as determined from Google Earth from the abstraction point to the WTP is 47m.

5.4.2 WTP FOOTPRINT – OPTION 2

Option 2 for the location of the WTP is close to the entrance near the existing Metallurgical Plant. It is envisaged that water will be abstracted from Pit 3, pumped through a pipeline approximately 4200m long. The elevation difference from the abstraction point and the WTP as determined from Google Earth is 174m with a peak elevation difference along the pipeline of 223m. The calculated power requirement for abstraction and delivery to the Plant will therefore be approximately 250 kW for Option 2 (DRA, 2020).

Figure 5-5 - Position and envisaged pipe routing (including long section) – Option 2

5.4.3 COMPARATIVE ANALYSIS OF OPTIONS 1 AND 2 FOR THE FOOTPRINT AND LOCATION OF THE WTP

Having considered two options for plant position during the pre-feasibility stage of the project, the site close to Pit 3 is the most cost effective (preferred alternative). The following have also been considered during the selection of the preferred location alternative:

- Two alternative WTP site options were considered as part of the mine's pre-feasibility study, with a focus on cost and engineering requirements. Given that both sites are located on heavily disturbed land within the mine's Mining Right boundary, away from sensitive receptors, environmental social considerations would have been the same for both Options 1 and 2.
- The length of the pipeline for Option 1 is significantly lower (16 - 20% of that for Option 2). The reduced pipeline length for the preferred alternative equates to reduced cost and disturbance;
- The power consumption for pumping costs is also approximately 20% more of the ongoing energy requirement for Option 2. The preferred alternative will have a lower power consumption and therefore the associated pumping costs are lower;
- Security – both options have existing buildings and infrastructure, and existing security services are currently provided; and
- Road access for deliveries – both sites have an access gate relatively close to the envisaged locations. Although the road access is from Mbombela or Badplaas and possibly further from Middleburg than the entrance for position 2, this is unlikely to be material for delivery of chemicals and spares to the site.

The outcome of the Mine Water Study (DRA Water, 2023) therefore recommended that due to the lower capex cost and ongoing lower energy consumption, the site for **Option 1 is to be considered the preferred alternative for the plant and Option 2 will not be investigated as part of this S&EIR process.**

5.5 WTP DESIGN ALTERNATIVES

5.5.1 ALTERNATIVES FOR PLANT SIZING

Three (3) options were considered for the size of the WTP facility:

- **Preferred alternative** - is a water treatment facility capable of treating 13 million litres per day;
- **Option 2** - is a water treatment facility capable of treating 13 million litres per day, undertaken in 2 phases, being an initial 6.5 million litres per day, later expanded to the full 13 million litres per day; and
- **Option 3** - is a water treatment facility capable of treating 6.5 million litres per day.

Only Options 1 and 2 will be further investigated and Option 3 will not be investigated in the S&EIR process as it was eliminated on the basis that the treatment of 6.5 million litres per day maintains the water level at Pit 3, whereas a WTP capable of treating 13 million litres per day will allow for dewatering thereby fulfilling the need for the WTP.

Option 3 is flawed and will not be capable of achieving the treatment of 13 million litres of water per day from the start of operation.

5.6 WATER TREATMENT TECHNOLOGY

Figure 5-6 is the process flow diagram shows the intended water treatment units, with reference to stream numbers S0.0 (Feed water), S0.1 (RO Product before Nitrate Removal) and S0.2 (after Nitrate removal) (DRA, 2020).

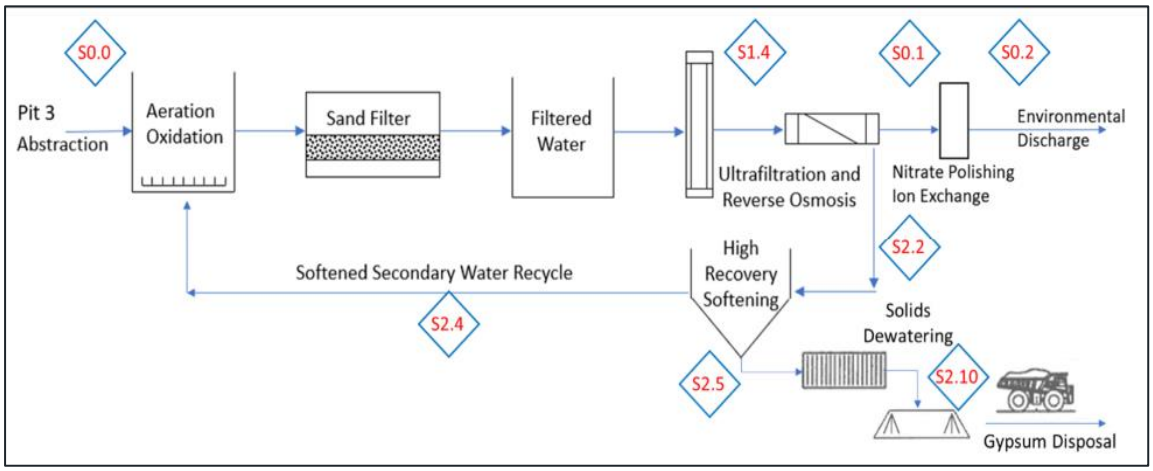


Figure 5-6 – WTP Process Flow Diagram

5.6.1.1 Feed water abstraction and oxidation

When Iron and Manganese enters the feedwater, aeration and chemical oxidation is implemented to ensure that the "fouling potential" does not impact the operation of the WTP.

The feed tank aeration may also provide oxygenation and to keep the feed water effectively mixed, and properly equilibrated with oxygen (DRA, 2020).

5.6.1.2 Sand filtration

Feed water is then pumped through sand filters which remove incoming suspended solids and where the sand may gradually become coated with manganese and will continue to provide a catalyst bed for further and more effective metal removal. The filters are backwashed automatically or as per operator request with the waste reporting the WTP's drain sump.

Filtered water is collected in a buffer tank which provides water necessary for backwashing and is used to feed the UF/RO units (DRA, 2020).

5.6.1.3 Ultrafiltration and Reverse Osmosis

Ultrafiltration and Reverse osmosis train will be used as the primary treatment resulting in desalination and the production of a high purity permeate suitable for discharge to the environment. The ultrafiltration units draw their feed from the filtered water tank and remove any remaining suspended solids. The ultrafiltration system undergoes an air scour sequence whereby process air is injected into the modules to loosen and scrub off accumulated solids.

The waste will report to the plant drain sump and the modules are refilled before returning to service (DRA, 2020).

5.6.1.4 Nitrate Polishing Ion Exchange

As a result of the probable need to remove Nitrate to exceptionally Low levels for discharge, Reverse Osmosis only provides for up to 80% removal of Nitrate. The next best available technology for this application is Ion Exchange using a Nitrate selective resin. Resin can become fouled with organics and other elements. The envisaged process is to polish the permeate from the RO before discharge.

Nitrate removal requires the following process:

1. Adsorption onto Ion Exchange Resin;
2. Elution from Ion Exchange resin using a Salt brine (NaCl); and
3. Biological treatment of the Salt Brine to convert Nitrate to Nitrogen (N_2), with recycle of the brine to the elution step.

The Nitrate removal process will ensure the reduction of Nitrate to meet the discharge standards, however, it introduces operational complexity and cost through the following:

- Attrition and make-up of the Ion Exchange Resin (approx. 10% per annum);
- Addition and top-up of Salt brine (NaCl) ;
- Addition of a biodegradable organic for biological nitrate removal; and
- Possibly the addition of other nutrients and pH control chemicals

Although there is a technical solution and a process suitable for the removal of Nitrates, it may not be required in the long term. It is expected that there will be a gradual reduction of Nitrates in the feedwater, eventually meeting the WUL discharge specification (DRA, 2020).

5.6.1.5 Secondary Water (High Recovery Treatment)

The Secondary Water (reject) from the reverse osmosis is supersaturated in gypsum, limestone and other low solubility salts and requires treatment in softening reactors. When considering the overall mine water and salt balance it is necessary to ensure that salts and elements which exceed the environmental discharge limits are removed from the system.

In this way the integrity of the mine salt balance remains correct. Lime and flocculant are added to precipitate solid gypsum ($CaSO_4$), limestone ($CaCO_3$) and magnesium hydroxide ($Mg(OH)_2$). Iron and Manganese having been removed in the pre-treatment to the UF/RO. At a high pH any residual Copper should also be removed. The solids are allowed to settle and can be collected as a sludge at a slurry concentration of 5 – 8% suitable for dewatering.

The softened water overflows from the reactors are dosed with acid for pH correction and is returned to the feed of the sand filters for further processing through sand filtration, UF and RO (alternatively the softened water may enter the plant's drain sump). This allows for reprocessing of this waste volume and increases the overall plant recovery.

This plant arrangement is a Zero-Liquid Discharge (ZLD) process as all liquid streams are reprocessed or used for other purposes. As such, the plant is salt neutral, and will not increase the overall salt loading on the mine (DRA, 2020).

5.6.1.6 Solids Dewatering

It is necessary to dewater the solids emanating from the high recovery precipitation reactors to ensure that the mine salt balance remains stable. These solids will be removed off site by a transporter to a suitable disposal site. The filtrate will be routed to the drains and returned to blend with the feedwater; alternatively, drains can be returned to the TSF or to Pit 2. It is necessary to note that the dewatered solids contain up to 30% moisture and this remains an avenue for the joint removal of other contaminants which are concentrated through the water treatment process (DRA, 2020).

5.6.1.7 Removal of solid waste from the site

The Salt and Mass Balance indicates that it is expected that the amount of gypsum sludge generated will be in the range of 22 tons per day of dewatered solids containing approximately 30% moisture. The dewatered solids will be removed off site by a transporter to a suitable disposal site (DRA, 2020).

5.7 DISCHARGE PIPELINE AND STRUCTURE ALTERNATIVES

Agreenco Environmental Projects (Pty) Ltd investigated three (3) options for the discharge point; these options are further discussed in the section below.

5.7.1 PIPELINE DISCHARGING WATER DIRECTLY INTO THE GLADDESPRUIT

The discharge structure will be designed for a maximum flow of 13Ml/day. For this option, a pipeline running from the outlet of the water treatment plant down towards the road crossing is proposed.

The pipeline will cross below the existing road and discharge treated water directly into the Gladdespruit River via the water discharge structure (**Figure 5-7**).

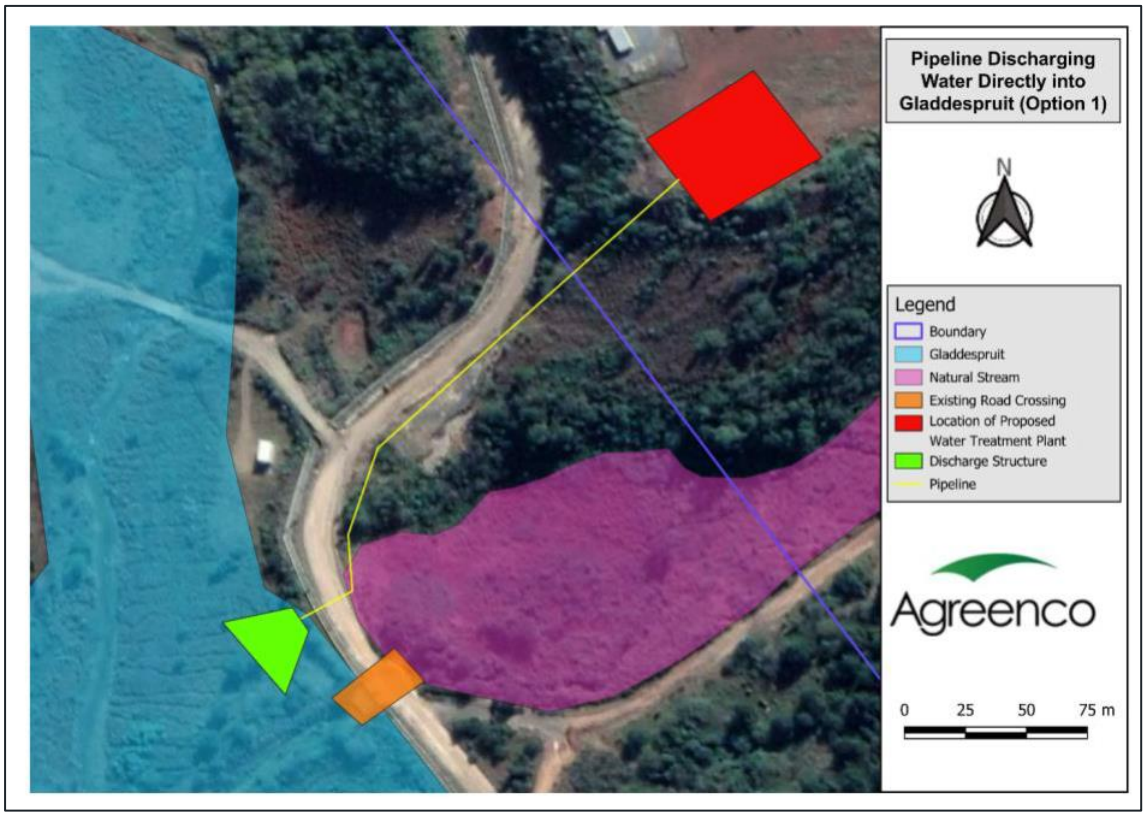


Figure 5-7 – Pipeline discharge into Gladdespruit River

The following have been considered for the Gladdespruit River discharge options and alternatives:

- **Elevation** - There is approximately a 30m elevation drop from the top of the facility down to the discharge point;
- **Turbulent and super critical outflow** - the significant pressure head the outflow that can be expected could be supercritical and turbulent. This would require large dissipation structures at the pipe outlet;
- **Erosion and scouring** - To avoid erosion and scouring the outlet structure would need to transition supercritical to sub-critical flow. This can be achieved by some sort of energy dissipation intervention; and
- **Scale of the discharge structure** - Taking all the above into account the scale of the discharge structure will be large. A large discharge structure will impact a larger area of the Gladdespruit River, in addition the costs for a larger structure are expected to be higher.

Based on the above, the **Gladdespruit River discharge** was eliminated as an option and **will not be further investigated in the S&EIR process.**

5.7.2 PIPELINE DISCHARGING WATER INTO THE NATURAL CHANNEL UPSTREAM OF THE EXISTING ROAD CROSSING

As with the Gladdespruit River discharge option, a pipeline will be constructed, but for this option, the water will be discharged upstream of the existing road crossing (**Figure 5-8**). Water discharged will flow into the existing stream towards the Gladdespruit River.

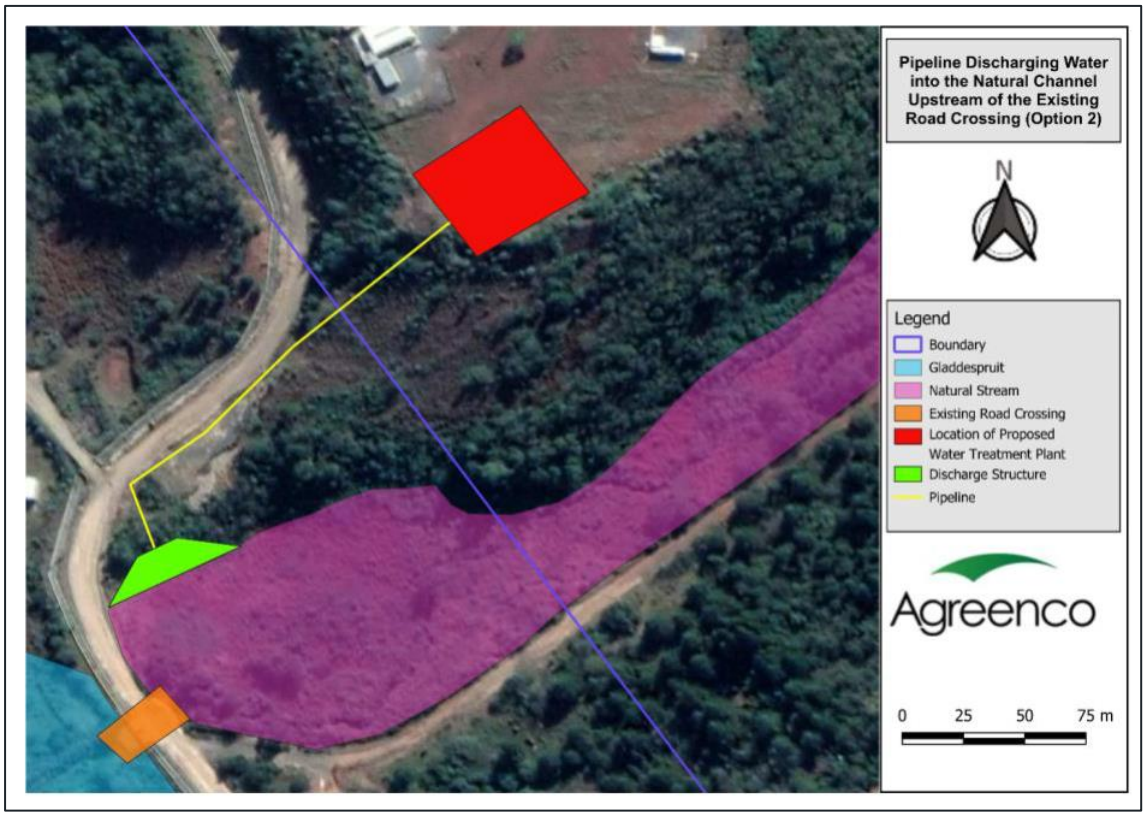


Figure 5-8 – Pipeline discharging water into the natural channel upstream of the existing road crossing

The following was considered for the natural channel discharge:

- **All design considerations and constraints** as identified for the Gladdespruit River discharge option; and
- **Impact on the floodline** - The floodline can be affected by discharging the water upstream of the existing water crossing. If the floodline changes, the likelihood of overtopping at the road crossing increases. This will need to be considered when designing the structure. If additional flood interventions are needed, the cost of construction will increase.

Based on the above, the **option to discharge into a natural channel stream is not a feasible or reasonable option and therefore has been eliminated in the design stage and will not be further investigated in the S&EIR process.**

5.7.3 PREFERRED OPTION FOR DISCHARGE - PIPELINE DISCHARGING WATER AT THE TOP OF THE NATURAL STREAM

For this option, a pipeline will transport the discharge water towards the top of the natural channel (in an upstream direction). The pipeline will discharge the water at the top of the natural stream (**Figure 5-9**).

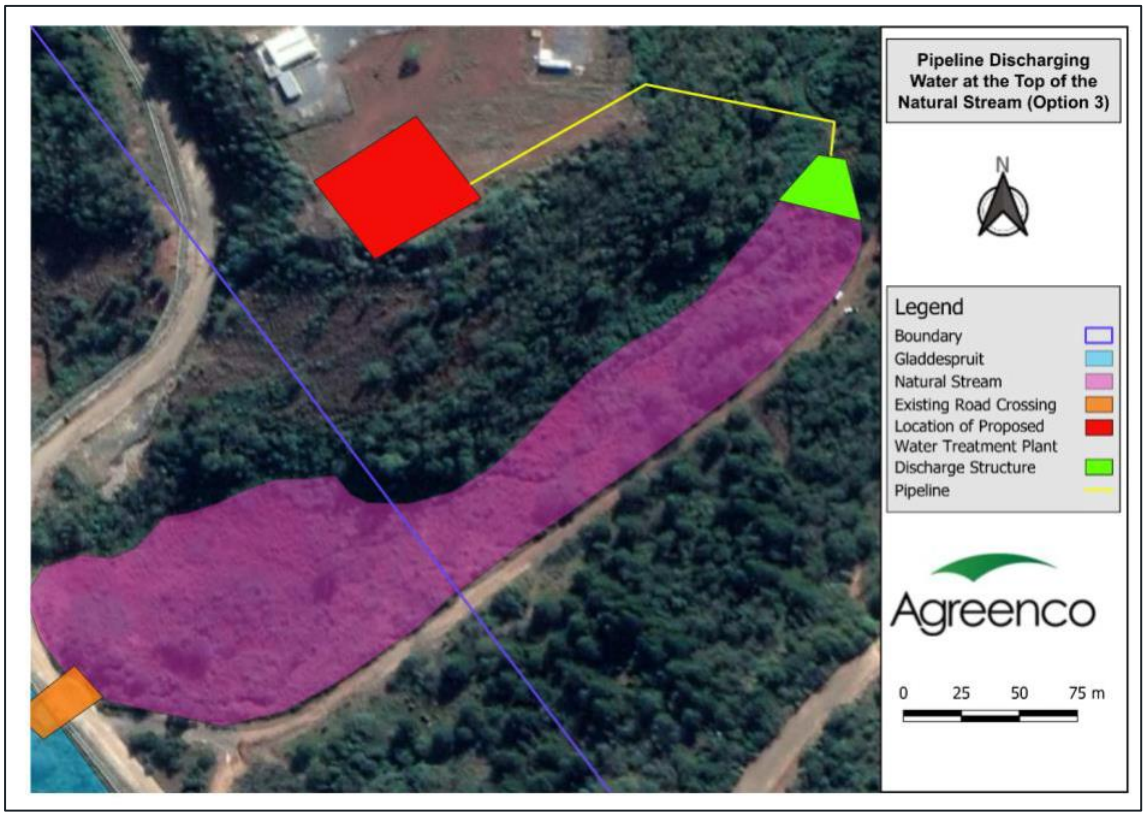


Figure 5-9 – Pipeline discharging water at the top of the natural stream

This option is preferred due to the following reasons:

- Reduced pressure head - by transporting the water back to the top of the natural stream, the pressure head at the outlet will be lower than in options 1 and 2;
- Reduced potential for scouring and erosion - A lower head will decrease potential scour and erosion. A smaller discharge structure and dissipation interventions will be needed; and
- Reduced costs – a smaller discharge structure equates to lower construction costs.

In addition, as with option 2, discharging water upstream of the existing water crossing could influence the flood lines. If the flood line changes, the likelihood of overtopping at the road crossing increases. This will need to be considered when designing the structure. If additional flood interventions are needed, the cost of construction will increase.

Based on the above, the discharging of water at the top of the natural stream will have a lower likelihood of erosion and scouring. It will have a smaller discharge structure than the alternatives which in turn will have a lower impact on the receiving stream and reduce construction costs. **Therefore this is the only option that will be further investigated and assessed during the S&EIR process.**

5.8 ELECTRICAL REQUIREMENTS

It is envisaged that a 525V transformer will be stepped down from the existing 22kV powerline. This facility will be located within the footprint of the WTP. There will be three (3) points investigated for the location of the 525V transformer (**Table 5-2**), these points are situated within the footprint of the WTP and will be further investigated during the impact assessment phase of the project.

5.9 GENERAL SITE PREPARATION

A temporary laydown area will be provided for the contractor during site preparation and construction works (see **Table 5-2**). Cranage, rigging and offloading of equipment will be mobilised from this area.

5.9.1 WATER AND SANITATION

Drinking water and ablution facilities are already available and will be used during construction and operation. The construction work area is equipped offices and toilets so there will be no latrine toilets/ or mobile toilets.

5.10 SUMMARY OF THE PREFERRED ALTERNATIVES TO BE FURTHER ASSESSED

The table below provides a summary of the alternatives presented in this section of the report and the selection of the preferred alternative to be further assessed and authorised.

Table 5-6 – Summary of the alternatives

Project Component	Alternatives Considered	Preferred to be assessed
WTP Site Alternatives	1. WTP to be located in the vicinity of Pit 3 2. WTP to be located near the entrance at the existing Metallurgical Plant	WTP to be located in the vicinity of Pit 3. Motivation: ▪ Length of pipework for Option 1 will be shorter therefore resulting in reduced disturbance and reduced costs. ▪ Power consumption for Option 1 is 20% lower resulting in lower pumping costs.
WTP Design Alternatives	1. WTP capable of treating 13 million litres per day. 2. Water WTP capable of treating 13 million litres of water per day undertaken in 2 phases initially 6.5 million then expanded to 13 million. 3. WTP capable of only treating 6.5 million litres per day.	Options 1 and 2 will be further assessed to be authorised with Option 1 being the preferred alternative. Motivation: A WTP capable of only treating 6.5 million litres of water per day will result in the mine's water levels at Pit 3 being maintained whereas the Options 1 and 2 designs allows for a WTP to treat 13 million litres of water per day which will allow for dewatering thereby fulfilling the need for the WTP.
WTP Technology	Reverse Osmosis	Ultrafiltration and Reverse Osmosis train will be used as the primary treatment resulting in desalination and the production of

Project Component	Alternatives Considered	Preferred to be assessed
		a high purity permeate suitable for discharge to the environment.
Discharge Structure and Pipeline	1. Discharge directly into the Gladdespruit River 2. Discharge into the natural channel upstream of the existing road. 3. Discharge at the top of the Adit Stream	The preferred alternative to be assessed further and authorised is the discharge into the Adit Stream. Motivation: ▪ Reduced pressure head - by transporting the water back to the top of the natural stream, the pressure head at the outlet will be lower than in options 1 and 2; ▪ Reduced potential for scouring and erosion - A lower head will decrease potential scour and erosion. A smaller discharge structure and dissipation interventions will be needed; and ▪ Reduced costs – a smaller discharge structure equates to lower construction costs. In addition, as with option 2, discharging water upstream of the existing water crossing could influence the flood lines. If the flood line changes, the likelihood of overtopping at the road crossing increases. This will need to be considered when designing the structure. If additional flood interventions are needed, the cost of construction will increase. Based on the above, the discharging of water at the top of the natural stream will have a lower likelihood of erosion and scouring. It will have a smaller discharge structure than the alternatives which in turn will have a lower impact on the receiving stream and reduce construction costs.
525V Transformer	3 locations within the footprint of the proposed WTP.	All 3 locations to be further assessed and considered for authorisation.
Sludge storage area	No alternatives considered. Site as described within **Table 5-2.**	The sludge storage area will be located within the NJVM Mining Right Area.

Project Component	Alternatives Considered	Preferred to be assessed
Topsoil storage area	No alternatives considered. Site as described within **Table 5-2.**	The sludge storage area will be located within the NJVM Mining Right Area.

6 BASELINE ENVIRONMENT

The following chapter presents an overview of the biophysical and socio-economic environment in which the proposed project is located. It is important to gain an understanding of the project area and its surroundings, as it will provide for a better understanding of the receiving environment in which the project is being considered.

The description of the baseline environment is essential in that it represents the conditions of the environment before the construction of the WTP (i.e., the current, or status quo, environment) against which environmental impacts of the proposed project can be assessed and future changes monitored.

The area has previously been studied to some extent and is recorded in various sources of information. Consequently, some components of the baseline have been generated based on literature review. However, where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed project.

The following characteristics of the receiving environment for the project area are described in the table below.

Table 6-1 – Characteristics of the receiving environment

Receiving Environment	Characteristics
Physical	▪ Climate ▪ Topography ▪ Geology ▪ Palaeontology ▪ Soil ▪ Land Capability ▪ Surface Water
Biological	▪ Vegetation ▪ Habitats ▪ Biodiversity Conservation Plans ▪ Plant Species ▪ Animal Species ▪ Avifauna
Social and Economic	▪ Heritage ▪ Socio-Economic

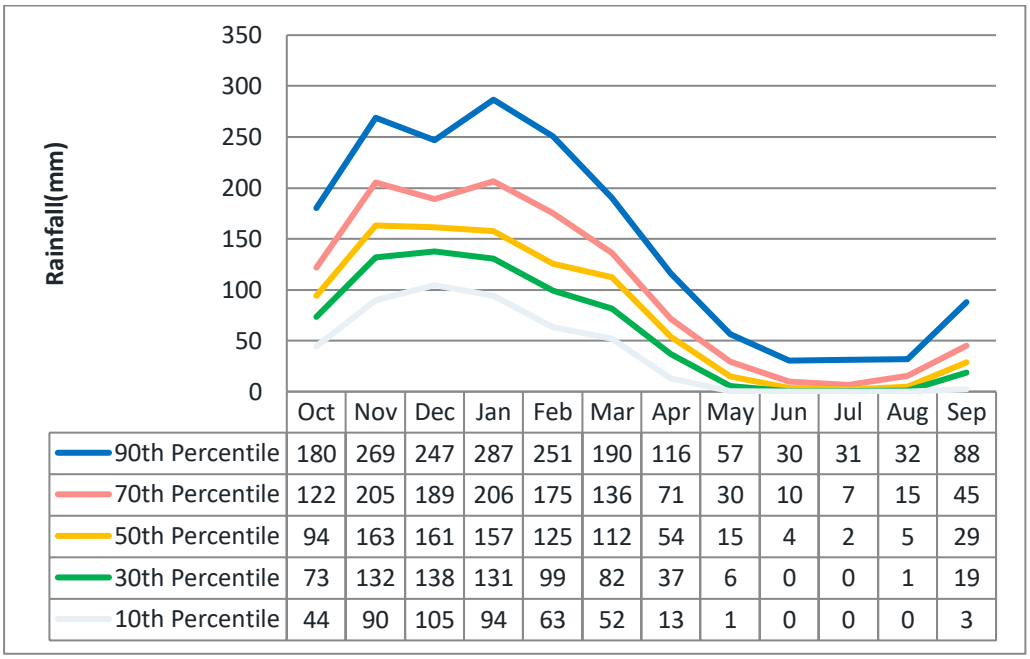
6.1 PHYSICAL ENVIRONMENT

6.1.1 CLIMATE

This section was supplemented with information from the *Surface Water Impact Assessment Report* (WSP, 2024).

The NJVM is in the subtropical highland climate (Cwb) of the Koppen-Geiger climate classification. This climate is characterised by dry winters and warm, wet summers. Average daily summer temperatures range between 26^{0}C and 21^{0}C, while winter daily temperatures range between 17^{0}C

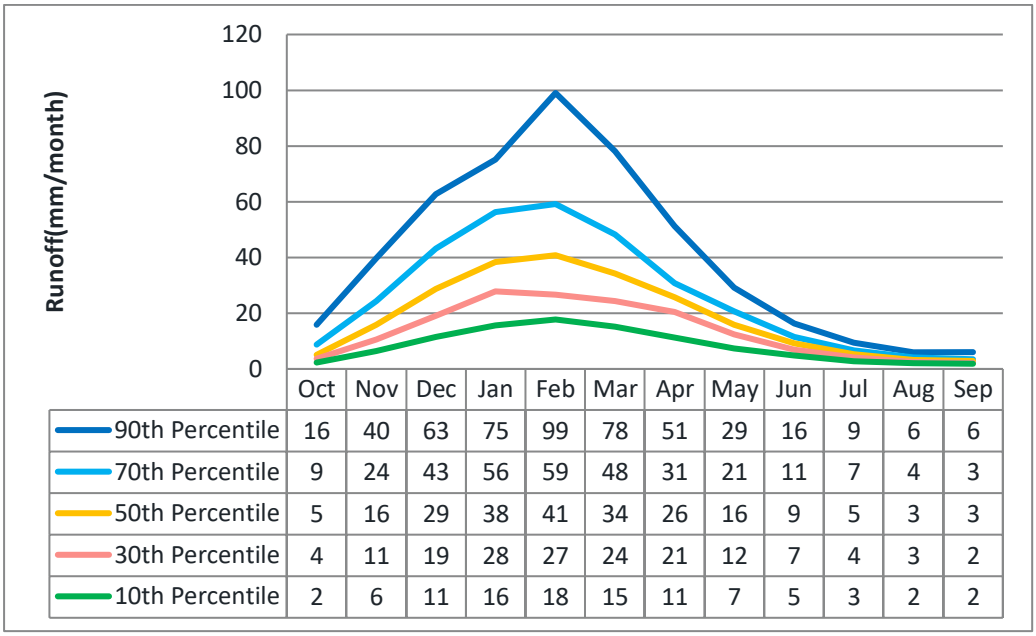
and 7^0C. The maximum temperatures are consistently experienced in January, with a mean monthly temperature of 26^0C, while minimum temperatures are experienced in June and July, with a mean minimum temperature of 7^0C. Based on the analysed rainfall dataset, the highest rainfall consistently occurs from October to March, while the lowest is experienced between April and September. The area's Mean Annual Precipitation (MAP) is approximately 1039mm. 90% of rainfall events during the wettest month of January are not expected to exceed 287 mm, while 90% of rainfall events during the driest month of June will be below 30 mm (**Figure 6-1**).



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
90th Percentile	180	269	247	287	251	190	116	57	30	31	32	88
70th Percentile	122	205	189	206	175	136	71	30	10	7	15	45
50th Percentile	94	163	161	157	125	112	54	15	4	2	5	29
30th Percentile	73	132	138	131	99	82	37	6	0	0	1	19
10th Percentile	44	90	105	94	63	52	13	1	0	0	0	3

Figure 6-1 - Monthly Rainfall Distribution

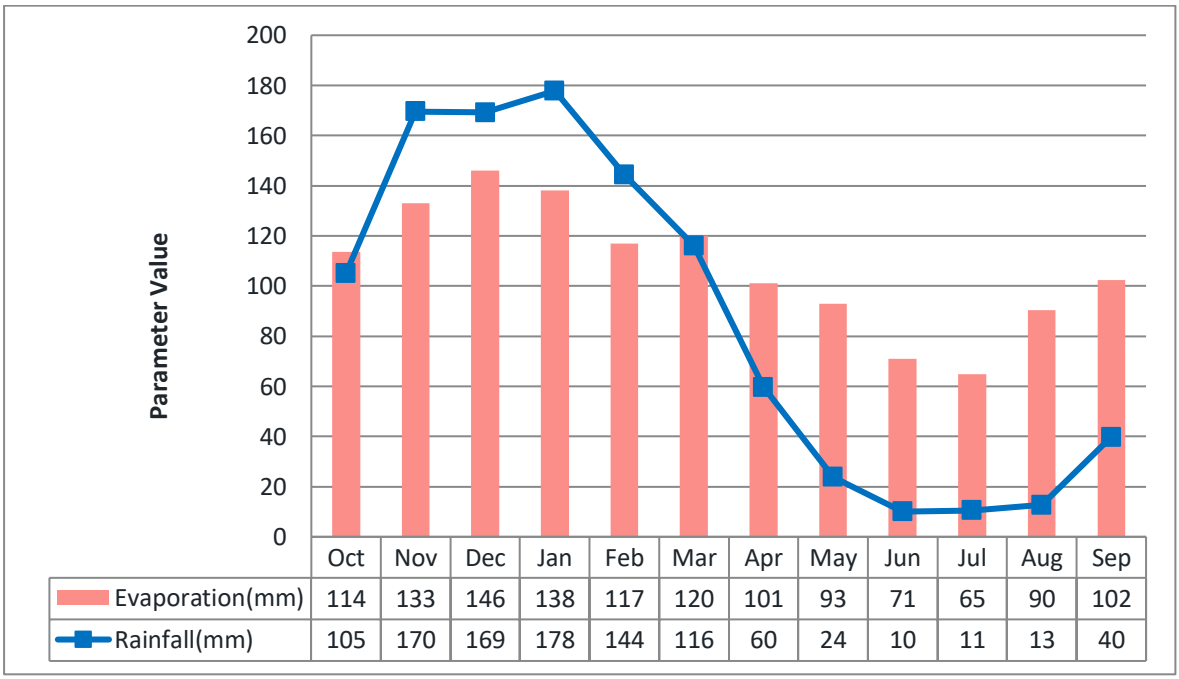
The Mean Annual Runoff (MAR) depth was calculated to be 266 mm, meaning approximately 26% of the MAP is redistributed as surface runoff. The highest runoff occurs in February, mainly because of antecedent soil moisture from January. The 90th percentile runoff event for February is 99 mm, while the 10th percentile runoff event in the same month is 18 mm, as shown in **Figure 6-2.**



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
90th Percentile	16	40	63	75	99	78	51	29	16	9	6	6
70th Percentile	9	24	43	56	59	48	31	21	11	7	4	3
50th Percentile	5	16	29	38	41	34	26	16	9	5	3	3
30th Percentile	4	11	19	28	27	24	21	12	7	4	3	2
10th Percentile	2	6	11	16	18	15	11	7	5	3	2	2

Figure 6-2 - Monthly Runoff Distribution

Figure 6-3 highlights the low summer evaporation potential, resulting in net positive summer rainfall. The region's Mean Annual Evaporation (MAE) is 1389 mm.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Evaporation(mm)	114	133	146	138	117	120	101	93	71	65	90	102
Rainfall(mm)	105	170	169	178	144	116	60	24	10	11	13	40

Figure 6-3 – Mean Annual Evaporation

6.1.2 AIR QUALITY

There are no major emitters of air pollutants in the area and, consequently, the air is generally free of particulate matter. The two pollutants expected to occur in the area are: dust lifted from disturbed land and untarred roads by wind and moving vehicles (the mine currently wets the road on a regular

basis to minimise the creation of dust); smoke produced by the burning of plantation fire breaks, occasional plantation fires, burning of debris (in areas where plantations have been felled) and fires in the nearby veld.

6.1.3 TOPOGRAPHY AND DRAINAGE

This section was supplemented with information from the *Surface Water Impact Assessment Report* (WSP, 2024).

NJVM is located within the eastern escarpment between the highveld and lowveld regions of the Mpumalanga Province. The area is characterised by its undulating topography and steep valley sides, mainly due to its position at the foot of the escarpment and because of the large number of mountain streams and tributaries cutting through the topography. The central valley in the Nkomati Mine area is northwest-southeast trending and drained by the Gladdespruit. The site's altitude ranges from 1 103 meters above mean sea level (mamsl) at the Onverwacht TSF in the escarpment foothills to 1 517 mamsl at the PCMZ plant in the northwest. To the north and west of Nkomati, the escarpment rises further to over 2 000 mamsl altitudes. To the south-east of the area, the land descends to altitudes of 1 000 mamsl in the Komati valley.

The mine is in the Inkomati-Usuthu Water Management Area (WMA) in quaternary catchment X11J (Pits, mine infrastructure in the MSB Area and proposed WTP) and X11K (Onverwacht Tailings Dam in the Onverwacht Area). A small portion of the infrastructure around the Onverwacht Tailings Dam lies on the boundary with the X11H Quaternary catchment. The Gladdespruit, a tributary of the Komati River, is the primary drainage feature in the area. The water from this area ultimately drains to the Indian Ocean in Mozambique. The topography and hydrological setting of the area are shown in **Figure 6-4**.

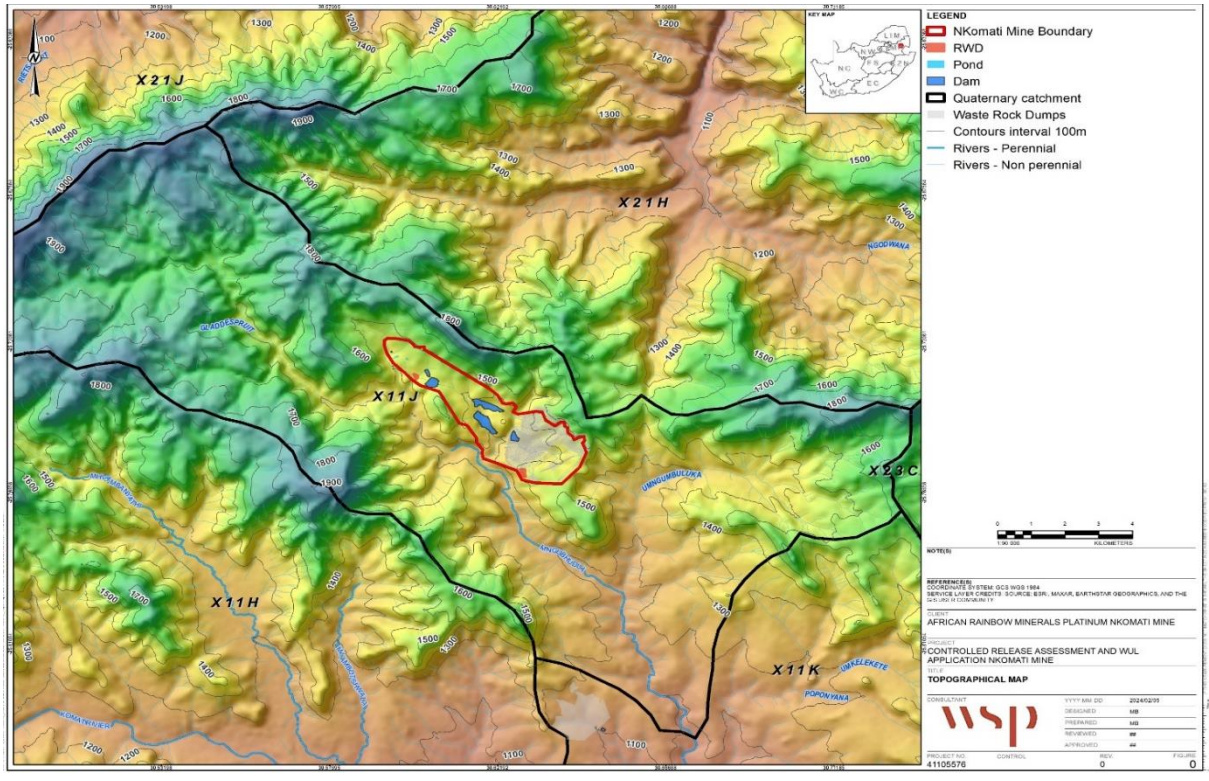


Figure 6-4 – Topography and Drainage of the NJVM (WSP, 2024)

6.1.4 GEOLOGY

This section was supplemented with information from the *Geotechnical Assessment Report for Water Treatment Plant Area* (Agreenco, 2024)

6.1.4.1 General Geology and Soil Conditions

Stratigraphy

According to the published geological map, the project area is located on or near a geological contact.

The project area is typically underlaid by:

- Compact, poorly bedded dolomite and limestone with chert layers, transition zone of shale and thin interlayered quartzite and dolomite at base.
- Quartzite with pebble layers in places.
- Adjacent pyroxenite, chromitite, peridotite and gabbro to be noted.

The soil profiles in test pits confirmed complex and variable sub-surface geological conditions.

A regional geological map of the NJVM is provided in **Figure 6-5** below.

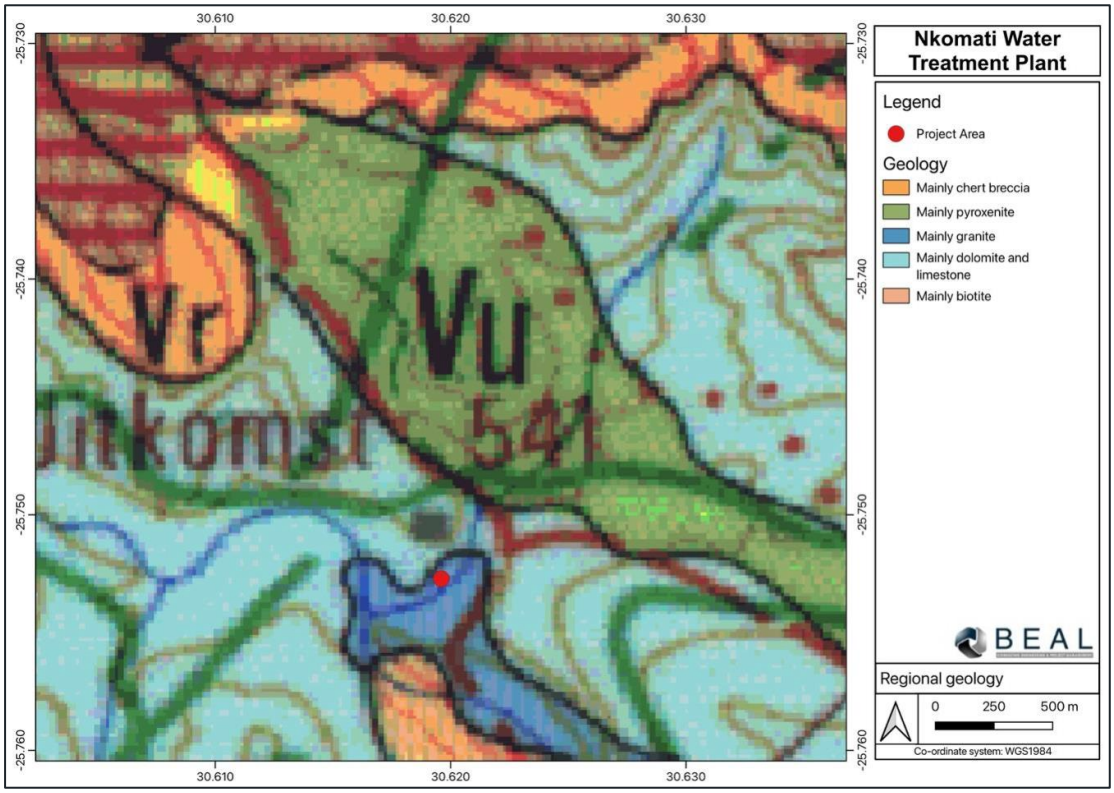


Figure 6-5 – Geological map of the general project area (Agreenco, 2024)

Dolomite land

The WTP is underlaid by water-soluble strata as defined by SANS 1936 (2012) and, as such, classifies as dolomite land.

Structural geology

The available published information indicates the presence of several linear structures, deemed to represent dolerite dykes and sills.

Dykes, sills and faults

The faults which have been mapped are generally NE - SW trending. However, two major faults in the area also have a NW - SE trend, namely the Pit 3 Shear Zone and a thrust type fault in the Pit 2 and Pit 1 area, referred to as the Pit 2 Thrust Fault Zone. The base of the Uitkomst Complex also shows signs of faulting, called the Basal shear zone. Preferential weathering and fracturing are furthermore associated with the Uitkomst Complex and Malmani Dolomite contact and may be associated with the Basel shear zone and contact faulting/fracturing.

Numerous diabase sills and occasional younger dykes have intruded both the country rocks and the Uitkomst Complex. The sills range in thickness from a few centimetres to 70 m. The combined thickness of diabase sills is about 120 m, compared to the total thickness of the complex of about 670 m. Some of the sills also contain more than one intrusive phase, displaying internal chill zones.

Three sets of dykes are evident in the area. These strike northwest/southeast, north northeast/ south-southwest, and north/south and are composed of diabase and dolerite. The first set is closely spaced and form prominent features in the basement granite. The second two sets are more widely spaced and tend to form negative features. Xenoliths, or inclusions, of Transvaal Supergroup rock are also present within the Uitkomst Complex, consisting of calc-silicate and skarn to quartzitic inclusions.

Geohydrology

Perched groundwater conditions were not encountered during the geotechnical investigation. The deeper aquifer was not assessed as part of this phase of the geotechnical investigation. The potential acidic nature of the groundwater should be noted, especially in combination and interaction with dolomite, that may lead to dissolution, karstification and subsidence.

Mineral deposits and undermining

The project area is located in the direct vicinity of open pit and underground mining activities and may be at risk of adverse effects associated with mining and undermining.

Regional seismicity

With regards to the regional seismicity, the ground conditions are deemed to be classified as Ground Type 1 and 2. According to SANS 10160, the project area falls in Seismic Zone I with a potential for only natural seismic activity. However, it is noted that the project area is also potentially at risk of mining-induced seismic events.

The proposed structure to be established is deemed to classify as Importance Class II with an Importance Factor of 1,0 but may also be classified as Class IV with an Importance Factor of 1,4.

6.1.4.2 Site Specific Geology (site investigation)

Generalised soil profile

The entire proposed plant area is characterized by significant historical earthworks. These include cut and fill as well as end-tipping and bulldozing. No evidence of an engineered or suitably compacted fill was observed. The source of fill material is unknown but may be inclusive of mining related rock dump

or waste. The fill material typically extends to a depth of between 0,3 and 2,0 m, except for NTP 04 on the southern perimeter, where it is expected to be more than 3,3 m.

The residual soil profile below the fill material is variable. The excavation of trenches was mostly terminated near refusal on highly weathered rock (i.e., dolomite and chert, dolerite, or gabbro at a depth of between 1,3 and 2,9 m. No refusal on rock was encountered in NTP 04 and 05 on the southern perimeter of the project area.

Expansiveness

The completely weathered shale is deemed to be moderately expansive and the residual dolerite moderately to highly expansive. This results in an expected soil movement of between 15 and in excess of 25 mm for the relevant soil horizons within the project area, depending on the thickness of the horizon and depth below surface.

Collapsibility

The material tested is not deemed to be potentially collapsible.

Compressibility

The entire soil-like overburden is deemed to be slightly to moderately compressible. The result is an expected range of total soil movement of between 15 and in excess of 150 mm, depending on the foundation load and extent.

Slope stability

Due to the near level terrain, instability of natural slopes is not expected. Slumping and/or toppling may occur within trenches, especially during or after rainfall events. The potential fill area along the perimeter of the project area is deemed to be susceptible to slope failure.

Dispersity

No evidence of potentially dispersive material (e.g., a weakly to strongly developed prismatic soil structure), considered highly prone to erosion especially under the influence of gully or sheetwash, was observed in the test pits or at surface.

Erodibility

The near level slope in the area is not conducive to erosion. The far outer perimeter of the project area along the steep slope of the fill embankment is susceptible to erosion.

Excavatability

Excavatability is in general not deemed to be a problem with soft excavation possible to a depth of between 1,3 and 3,3 m with an average of 2,4 m. The fill material of the embankment on the outer perimeter of the project area did not show signs of refusal within 3,3 m.

Groundwater seepage

No groundwater seepage was encountered.

Corrosiveness

The material tested proved to be potentially highly corrosive and aggressive.

Bearing capacity

The typical bearing capacity of the soil-like overburden can vary depending on several factors, including the specific properties of the soil or rock, degree of weathering, the presence of any structural defects or discontinuities, level of the groundwater, etc. With the varying soil profile encountered within the project area, bearing capacity assumptions cannot be made to any degree of accuracy.

6.1.5 SOIL

This section is supplemented with information from the *Soil Contamination Specialist Study for the Closure Phase of Nkomati Mine: Phase I Environmental Site Assessment* (SRK, 2020).

Most of the mining infrastructure is located on escarpment slopes where soils are generally well drained. The Glenrosa, Hutton and Clovelly soil forms predominate. These soil forms are moderately erodible and have low to moderate fertility. Rock outcrops and associated poorly weathered Mispah frequently interrupt patches of these soils. Stones and boulders weathered from outcrops are strewn over soils downslope from the outcrops. Consequently, the surface layer of non-stony, deeply weathered soils, is often stoney and gives a false impression that they are shallow stoney soils.

The Glenrosa and Mispah soils in the vicinity of Slaaihoek and Uitkomst are generally 100 to 400 mm deep. The Hutton and Clovelly soils range in depth from 200 to over 1 200 mm. The texture of soils on Slaaihoek and Uitkomst is generally of a sandy-clay or sandy-clay-loam nature. The clay content of the soils is high – between 30 and 50% clay in the A horizon and up to 60% clay in the B horizon. In well-defined watercourses, soils are poorly drained and Katspruit and Swartland formspredominate.

Valley bottoms only comprise 3 - 5% of the landscape and the corresponding occurrence of the valley bottom soils is low (SRK, 2003). The main soils forms at the Onverwacht TSF are Glenrosa and Catref, which cover 50 to 70% of the landform, and Hutton, Avalon and Glencoe, which cover 15 to 25% of the landform. Longlands, Kroonstad and Wasbank soil forms become more abundant on foot slopes. Kroonstad and Katspruit soil forms dominate in valley bottoms. The texture of the soils is generally sandy or sandy loam. The clay content is not high – generally less than 20%. Only patches of Hutton soils feature clay contents of 25 to 40%.

6.1.6 LAND USE

This section is supplemented with information from the *Soil Contamination Specialist Study for the Closure Phase of Nkomati Mine: Phase I Environmental Site Assessment* (SRK, 2020).

Prior to mining operations, most of the land on Slaaihoek and Uitkomst was used for forestry by Sappi and Mondi. Slaaihoek has been afforested since the 1960s and plantations were established on Uitkomst in the 1970s. The land on Onverwacht, where the TSF is located, was generally grassland used for grazing by subsistence cattle farmers.

The area surrounding Nkomati is utilised for pine plantations, while the land surrounding the Onverwacht TSF is still used for grazing. Along the main transport route to Machadodorp, the land is used for grazing, trout farming and tourism.

The Vygeboom Dam is located to the south of Nkomati and was constructed by the Department of Water Affairs and Forestry (DWAF), now DWS, to supply water to Eskom for power generation.

6.1.7 LAND CAPABILITY

Land in the surrounding properties is suitable for grazing. Crop production capability is limited due to the shallow soils and surface stone.

The area is currently predominantly under forestry. These plantations range from: mature trees soon to be felled; through felled plantations ready to be replanted; to plantations with trees younger than 15 years. Although stoniness necessarily decreases the rate of growth of trees, the stony soils are relatively suited to afforestation. In places poor growth rate reflects the poor land use potential.

6.1.8 PALAEONTOLOGY

This section is supplemented with information from the *Letter of Exemption to conduct a Palaeontology Impact Assessment* (Bamford, 2024).

The existing mine is located on non-fossiliferous rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex (Cawthorn et al., 2006) and the infrastructure is to the south on potentially very highly sensitive rocks of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup) that might preserve trace fossils such as stromatolites. The proposed WTP footprint is on an already highly disturbed site, therefore it is very unlikely that any fossils remain.

The very high palaeo-sensitivity (red in **Figure 6-6**) is no longer the case because of previous mining activities and infrastructure.

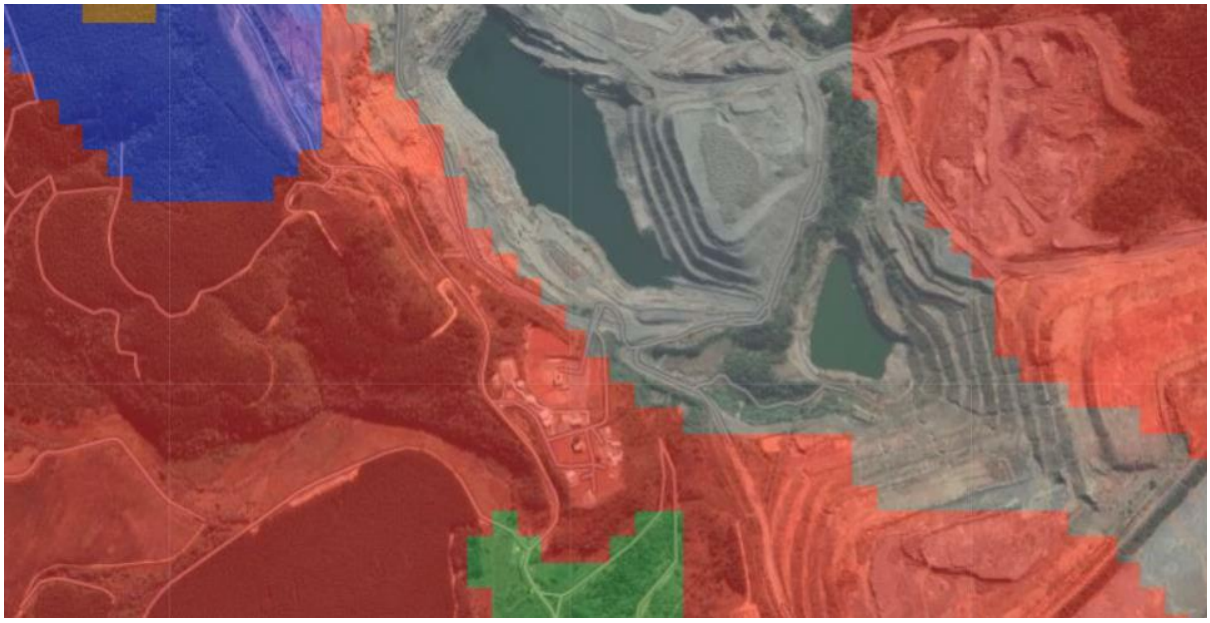


Figure 6-6 – SAHRIS palaeosensitivity map for the site for the proposed WTP for Nkomati Nickel Mine within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

6.1.9 HYDROLOGY AND AQUATIC BIODIVERSITY

This section was supplemented with information from the *Surface Water Impact Assessment Report* (WSP, 2024) and the *Aquatic Biodiversity Impact Assessment Report* (WSP, 2024).

The proposed NJVM WTP and associated infrastructure falls within the primary drainage region X of the Inkomati-Usuthu WMA and the X11J quaternary catchment. The Sub-Quaternary Reach (SQR) of focus is the Mngubhudle River (X11J-01106). This is a first order stream with an approximate length of 38 km. **Figure 6-7** presents the quaternary catchments and freshwater resources associated with the proposed project.

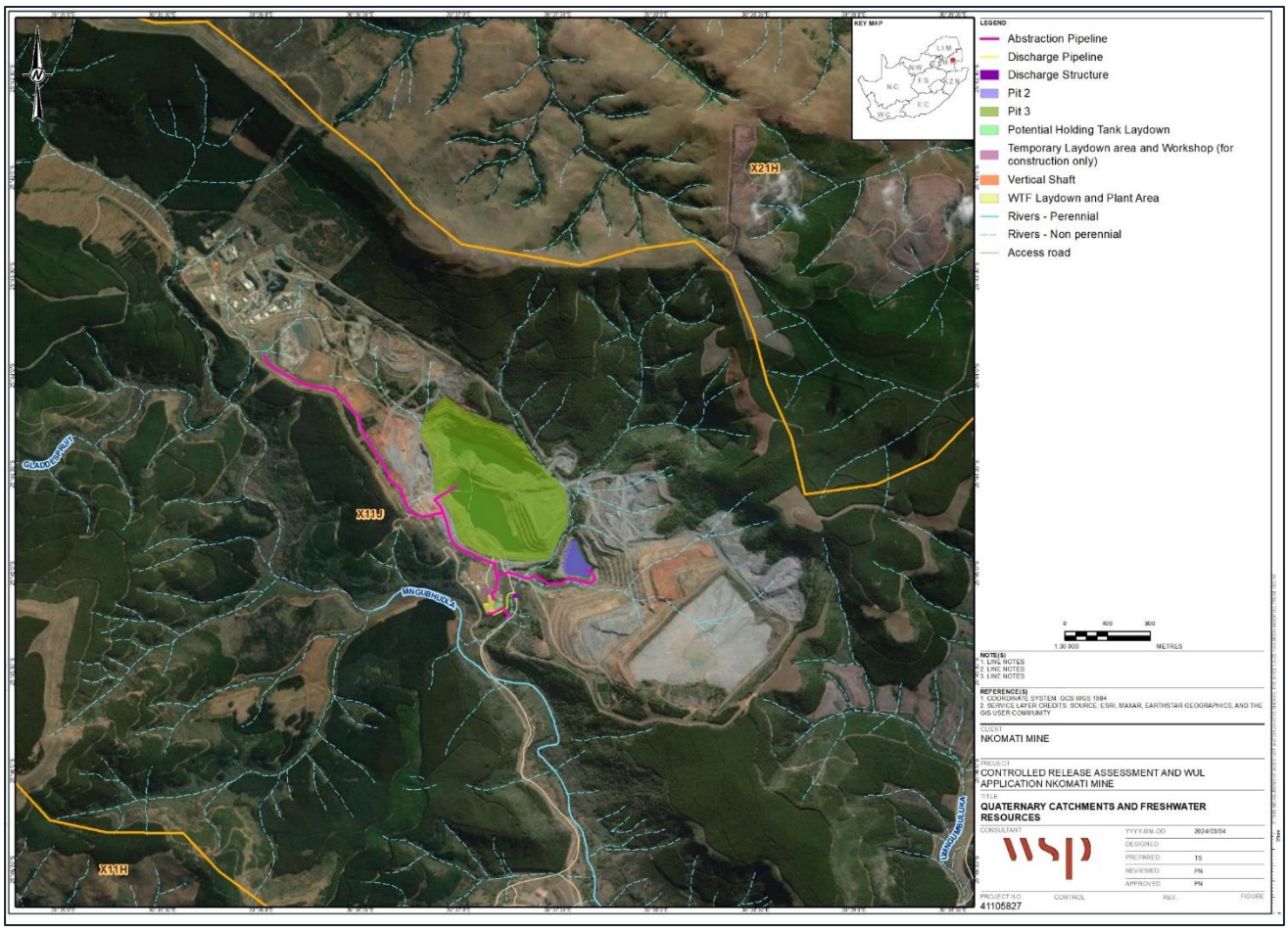


Figure 6-7 – Quaternary catchments and freshwater resources associated with the proposed WTP

6.1.9.1 Freshwater Ecoregions

Ecoregions are regions characterised by a relative similarity in the type of ecosystems and ecosystem components, i.e. biotic and abiotic. The project area is located within the Zambezian Lowveld freshwater ecoregion. This ecoregion is defined by low-lying portions of the coastal rivers south of the Zambezi Delta to Lake St Lucia.

6.1.9.2 National Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project represents a collaboration of multiple organisations including the South African National Biodiversity Institute (SANBI), Council for Scientific and Industrial Research (CSIR), Water Research Commission (WRC), Department of Environmental Affairs (DEA), Department of Water and Sanitation (DWS), Worldwide Fund for Nature

(WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks).

The project is aimed to "*provide guidance on how many rivers, wetlands and estuaries, and which ones should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act 36 of 1998), the National Environmental Management: Biodiversity Act (Act 10 of 2004) and the National Environmental Management: Protected Areas Act (Act 57 of 2003)*" (Water Research Commision, 2011).

Based on the current outputs of the NFEPA project, there are no NFEPA features within the catchment of focus (**Figure 6-8**). An area marked as "River FEPA & associated sub-quaternary catchment" occurs within the X21H Ngodwana catchment approximately 2km to the north of the project site. River FEPAs achieve biodiversity targets for river ecosystems and threatened/near threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). Their FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources.

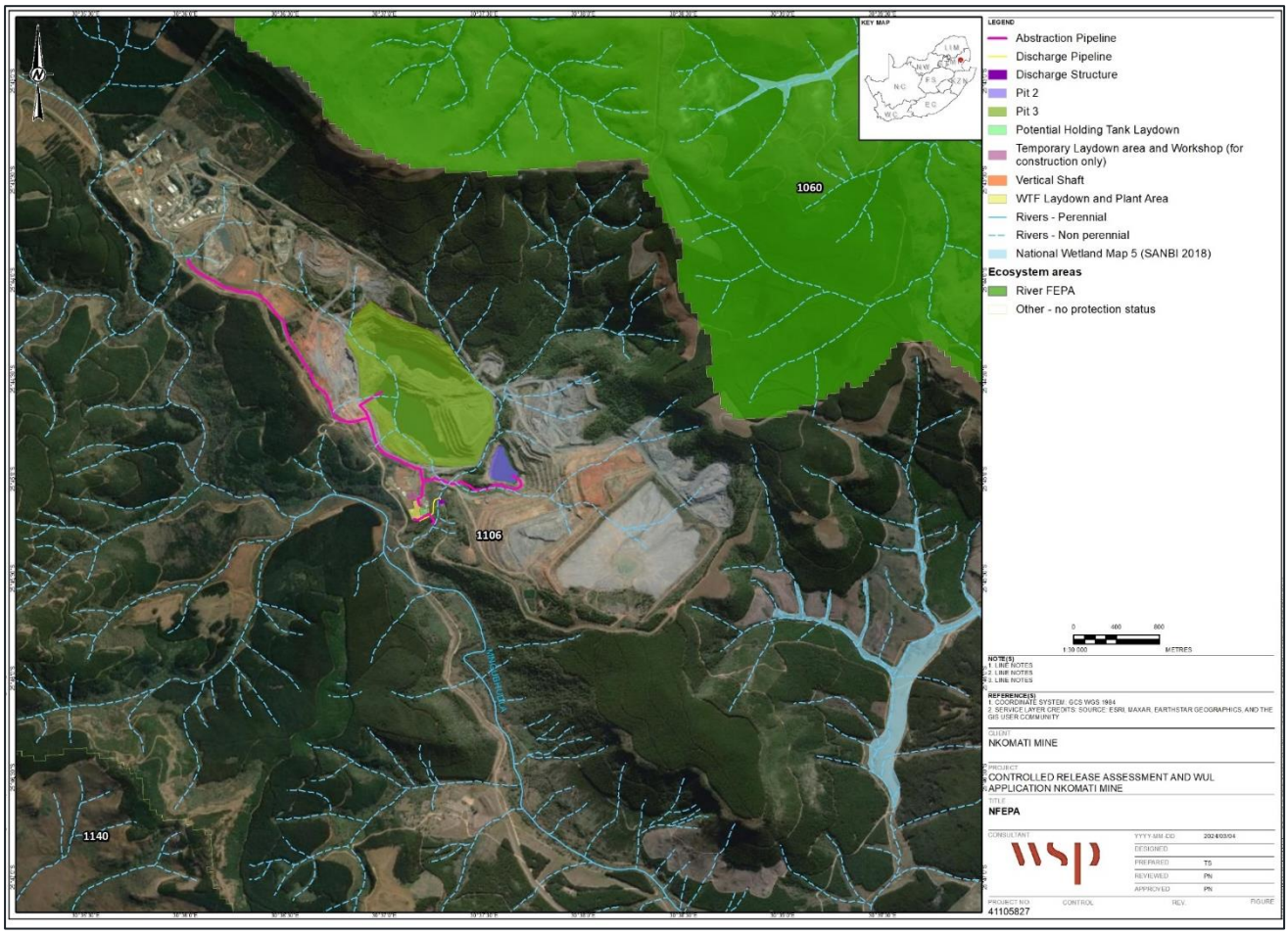


Figure 6-8 – Project Areas relative to the NFEPA features Map

6.1.9.3 Mpumalanga Biodiversity Sector Plan for freshwater resources

The proposed WTP lie within an area mapped as Heavily Modified whilst the Mngubhudle River reach of focus has been mapped as Other Natural Areas (**Figure 6-9**).

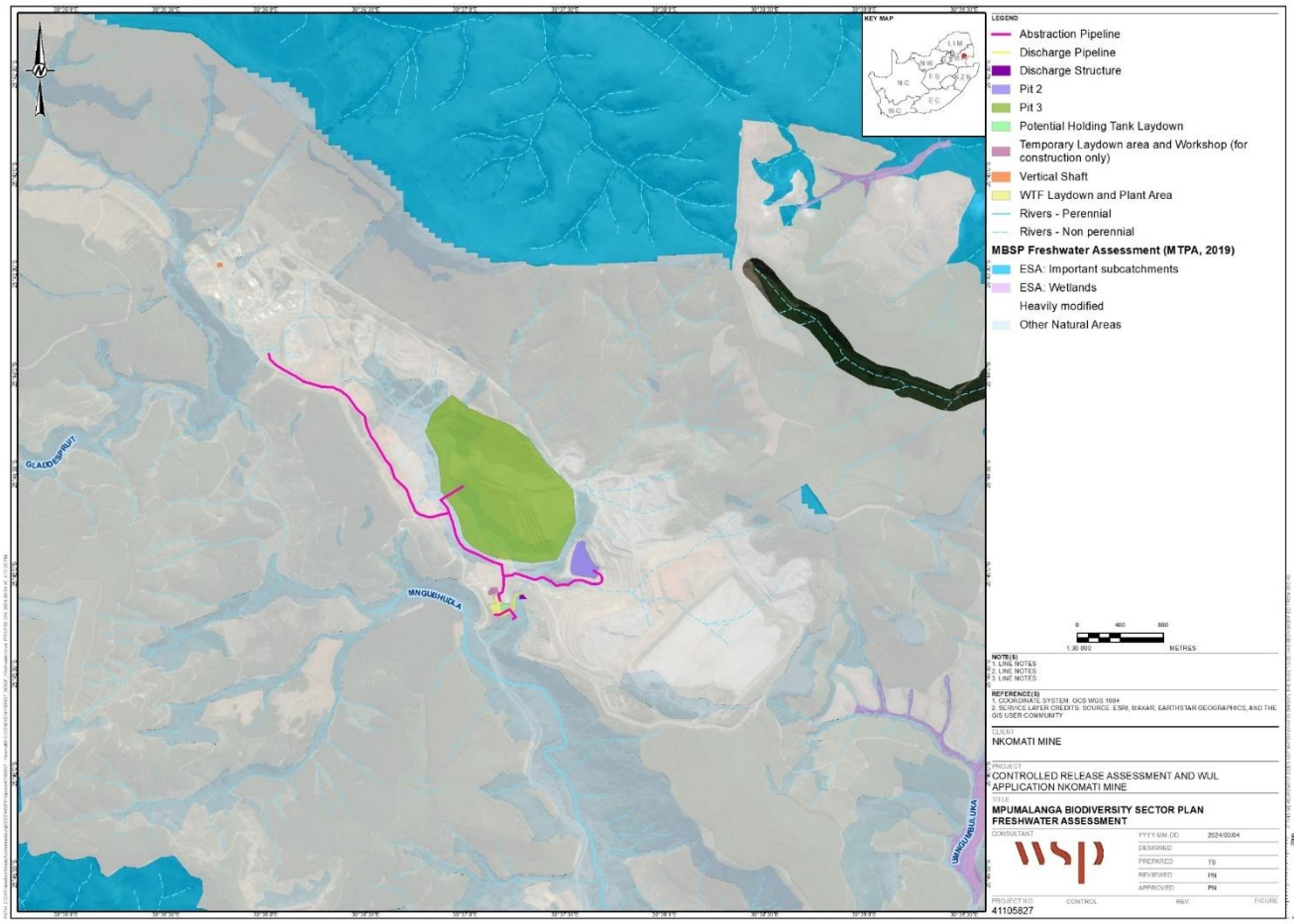


Figure 6-9 – Project Areas relative to the Mpumalanga Biodiversity Plan

6.1.9.4 Present Ecological State, Importance and Sensitivity

The Present Ecological Status (PES) for the Mngubhudle River (SQR X11J-01106) is Largely Modified (Ecological Category D) with an Ecological Importance (EI) class of High and an Ecological Sensitivity (ES) class of Very High. This Sub-Quaternary Reach (SQR) is expected to host a total of 54 aquatic macroinvertebrates taxa and 9 fish species. The following are impacts and respective significance affecting the SQR (DWS, 2016):

- Serious/Abundant – Forestry;
- Large – Abstraction, runoff/effluent, Mining;
- Moderate – Algal growth, bed and channel disturbance, alien vegetation, roads, sedimentation, vegetation removal; and
- Small – Low water crossing, farm dams, erosion, inundation.

The expected fish species for the Mngubhudle River (SQR X11J-01106) are presented in the table below.

The nine expected fish species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species. These species' tolerances to water quality modifications and no-flow conditions are as follows:

- Five are intolerant to water quality modifications and no-flow conditions;

- Two are moderately tolerant to water quality modifications and moderately intolerant to no-flow conditions;
- One species (*Enteromius anoplus*) is moderately tolerant to water quality modifications and to no-flow conditions; and

One species is (*Clarias gariepinus*) tolerant to water quality modifications and to no-flow conditions.

Table 6-2 - Expected fish species, their conservation status and tolerance to water quality and flow conditions

Fish Species	Common Name	IUCN Status	Tolerance to modifications	
			Water Quality	No-Flow
Amphilius natalensis	Natal Mountain Catfish	Least Concern	Intolerant	Intolerant
Amphilius uranoscopus	Common Mountain Catfish	Least Concern	Intolerant	Intolerant
Chiloglanis pretoriae	Shortspine suckermouth	Least Concern	Intolerant	Intolerant
Clarias gariepinus	Sharptooth catfish	Least Concern	Tolerant	Tolerant
Enteromius anoplus	Chubbyhead Barb	Least Concern	Moderately Tolerant	Moderately Tolerant
Labeobarbus marequensis	Largescale yellowfish	Least Concern	Moderately Tolerant	Moderately Intolerant
Labeobarbus polylepis	Bushveld Smallscale Yellowfish	Least Concern	Moderately Tolerant	Moderately Intolerant
Pseudocrenilabrus philander	Southern Mouthbrooder	Least Concern	Intolerant	Intolerant
Tilapia sparrmanii	Banded Tilapia	Least Concern	Intolerant	Intolerant

6.1.9.5 Flow Conditions and General Observations

This section is supplemented with information based on the aquatic biomonitoring assessment undertaken on the 30th of November 2023 are discussed in the below sub-sections.

The results have been presented from upstream site to downstream site for ease of interpretation. Where possible, the collected data is compared against findings from the previously undertaken aquatic biomonitoring assessment by SAS in 2023.

Flow conditions influence the processes that determine the size, shape, structure and dynamics of the aquatic ecosystems, and subsequently linked to habitats and biotic communities. Thus, flow conditions and water levels aid in the interpretation of biological results.

The assessed upstream (site UP) section of the Mngubhudle River was wide (>2-5 metres), with a variable stream depth (<0.5 to 1.5 metres) and characterized by moderate flow above the culvert and fast flow below the culvert (**Figure 6-10**). The Adit Stream was predominantly narrow (<1 metres) and shallow (<0.5 metres) and characterized by fast flow above the culvert and moderate flow below the culvert (**Figure 6-11**). The Mngubhudle River downstream site G was characterized by variable stream width (<0.5 to 5 metres) and depth (<0.5 to 2 metres) with moderate flow above the culvert and fast

flow below (**Figure 6-12**). It is worth noting that the project area had received significant rain the day before the field survey was conducted.

Habitat characteristics at the assessed Mngubhudle River sites were similar. Both upstream and downstream sites were dominated by cobbles and sand. There was a lack of instream aquatic vegetation, however the vegetation cover along the stream banks was high and composed of grasses and trees. The assessed adit stream was dominated by gravel and lacked instream aquatic vegetation however the vegetation cover along the stream banks was high and composed of grasses and trees.

There were no recent impacts observed at the time of the survey (other than the flood conditions). Existing impacts include forestry plantations, vegetation removal adjacent the roads and road crossings.

Figure 6-10 - Predominant flow conditions at the assessed Mngubhudle River upstream site UP. Moderate flows (left) and fast flows (right)

Figure 6-11 - Predominant flow conditions at the assessed Adit Stream site D. Fast flows (left) and moderate flows (right)

Figure 6-12 - Predominant flow conditions at the assessed Mngubhudle River downstream site G. Moderate flows (left) and fast flows (right)

6.1.9.6 Index of Habitat Integrity

Results from the Index of Habitat Integrity (IHI) are presented in **Table 6-3**. The IHI is a tool developed to assess river habitat integrity and forms part of the River EcoStatus Monitoring Programme (REMP).

A desktop level and reach based IHI was applied in the current study due to the small number of sampling sites per river reach. Observations made during the field survey were used to supplement the data used within the index.

Findings from the IHI indicate that the instream and riparian habitat integrity within the assessed Mngubhudle reach were *Largely Natural* (Ecological Category B) and *Largely Modified* (Ecological Category D) respectively. The major impacts within this system were indigenous vegetation removal, exotic vegetation encroachment, channel modification and inundation due to the presence of culverts and the flood conditions at the time of the survey.

The instream and riparian habitat integrity within the assessed Adit Stream were *Largely Modified* (Ecological Category D) and *Seriously Modified* (Ecological Category E) respectively. Major impacts within this system were water quality modification (as indicated by elevated EC level of 1952 µS/cm), Flow and stream bed modification, indigenous vegetation removal and exotic vegetation encroachment.

Table 6-3 - Reach-based Index of Habitat Integrity scores obtained during the current survey

Watercourse	Habitat Component	IHI Score	Category	Major Impacts
Mngubhudle	In-stream	80.5	**B**	Channel modification and inundation
	Riparian	57.2	**D**	Indigenous vegetation removal and exotic vegetation encroachment
Adit	In-stream	47.3	**D**	Water quality modification and channel modification
	Riparian	38.2	**E**	Indigenous vegetation removal and exotic vegetation encroachment

6.1.9.7 Integrated Habitat Assessment System

The Integrated Habitat Assessment System (IHAS) was developed by McMillan (1998) for use in conjunction with the South African Scoring System (SASS5) bioassessment. Results from the current study are provided in **Table 6-4.**

The assessed ecosystems lie within the upper foothills geomorphological zone (class D). Characteristic channel features within this geomorphological zone include moderately steep, cobble-bed or mixed bedrock-cobble bed channel, with plain-bed, pool-riffle or pool-rapid reach types. Length of pools and riffles/rapids similar. Narrow flood plain of sand, gravel or cobble often present (Rowntree et al., 2000).

Based on the obtained IHAS scores, sites D and G presented *Good* macroinvertebrate habitat availability, whilst site UP presented *Adequate* habitat availability. Each of the sites exhibited a variety of habitat features within various flow and depth profiles, therefore expected to host macroinvertebrate assemblages comprising of high diversity of taxa especially at sites D and G.

Table 6-4 - Integrated Habitat Assessment System scores

Site	Stones in current	Vegetation	Other Habitat	Physical Stream Condition	Score	Description
Site UP	11	7	16	25	59	Adequate
Site D	18	5	16	36	75	Good
Site G	20	10	14	31	75	Good
Max possible scores	20	15	20	45		

6.1.9.8 Aquatic Macroinvertebrates: Ecological Condition

The SASS5 protocol was conducted to sample macroinvertebrates. This protocol provides a general indication of the current state of the macroinvertebrate community and subsequently the 'health' of the river. The collected SASS5 data is provided in **Table 6-5** and discussed below.

A total of 20 (out of the expected 54 taxa) aquatic macroinvertebrate taxa were collected from the three assessed sites. The number of taxa collected ranged from nine at site D to eleven at site G. The collected macroinvertebrate assemblages were dominated by pollution-tolerant taxa (i.e., with a SASS5 sensitivity score of less than seven) with only two taxa that are moderately tolerant to pollution (*Lestidae* and *Aeshnidae*) recorded, both of which were collected at site G and only *Aeshnidae* as collected at site A.

Table 6-5 – SASS5 data for the current survey

Site	SASS5	# of Taxa	ASPT
Site UP	48	10	4.8
Site D	40	9	4.4

Site	SASS5	# of Taxa	ASPT
Site G	55	11	5

The SASS5 data obtained was used in the MIRAI to determine the Present Ecological State (PES, or Ecological Category) of the associated macroinvertebrate assemblage. The MIRAI provides a habitat-based cause-and-effect basis to interpret the deviation of the aquatic macroinvertebrate community from the reference condition. Results for the site-based MIRAI are shown in **Table 6-6**. These results should be interpreted with caution as the flood conditions may have altered the macroinvertebrate community distribution, with some being washed off into downstream reaches for example, and the collected sample.

Based on the MIRAI, the ecological condition of the aquatic macroinvertebrate communities was *Critically Modified* (Ecological Category F) at each of the assessed sites. The modified states recorded were as a result of the change from reference conditions, especially within the water quality metric and the overall low diversity present within the assessed systems. Furthermore, the historic and on-going land use activities (mainly mining and forest plantations) within the study area have significantly impacted the receiving environment and subsequently the indigenous fauna and flora including aquatic biota.

Table 6-6 – MIRAI data for the current survey

Site	Metric Group	% change from Reference	MIRAI Value	EC	Description
Site UP	Flow Modification	88	11.7	**F**	Critically Modified
	Habitat	88			
	Water Quality	90			
Site D	Flow Modification	85	16.7	**F**	Critically Modified
	Habitat	83			
	Water Quality	82			
Site G	Flow Modification	81	16.2	**F**	Critically Modified
	Habitat	84			
	Water Quality	88			
EC = Ecological Category					

6.1.9.9 Ichthyofauna

The composition of fish communities is often altered by anthropogenic activities in the catchment. Changes in water quality, flows and habitat can result in the absence or addition of species, ultimately altering the biotic integrity of the system. Thus, fish can effectively give an indication into the degree of modification of the aquatic environment.

Fish sampling was undertaken by means of the electroshocking technique at each site however a single species (*Chiloglanis pretoriae* or Shortspine Suckermouth) was collected at site G only. This species is known to occur in shallow rocky reaches, riffles and rapids wherein it uses its large ventrally directed mouth to cling to stones, and feeds on aquatic macroinvertebrates such as mayfly, caddis fly and blackfly larvae (Le Roux & Steyn, 1968; Skelton, 2001). According to the IUCN Red List of

Threatened Species (IUCN, 2023), this fish is categorized as Least Concern, however the population trend is unknown and identified threats include residential and commercial development, natural system modifications and pollution. Photographs of the collected specimen are provided in **Figure 6-13**.

Figure 6-13 - Photograph of *Chiloglanis pretoriae* taken during the current survey. Bottom photo showing the mouth parts

6.1.9.10 Biotic Integrity Based On Fish Communities

The Fish Response Assessment Index (FRAI) was applied to determine the ecological integrity of the fish community assemblages within the monitoring sites for the current study. The FRAI forms part of the River EcoStatus Monitoring Programme (REMP) which replaced the River Health Programme (RHP) in 2016 and is a component of the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP) (Kleynhans, 2007b).

The FRAI is based on a combination of fish species habitat preferences, as well as intolerance to habitat changes, and the present frequency of occurrence (FROC) of species compared to the reference FROC (Kleynhans, 2007b), thus provides a cause-and-effect basis to interpret the deviation of the fish assemblage from the reference condition.

Fish Habitat Potential Assessment

Fish habitat potential refers to the presence and abundance of suitable conditions for fish to inhabit, depending on the expected species' preferences for the particular river reach. The considered habitat metric groups are velocity-depth and cover – with five types of cover within each of the four velocity-depth classes **(Table 6-7).**

Table 6-7 - Fish habitat potential assessment metric groups

Slow-Deep	Slow-Shallow	Fast-Deep	Fast-Shallow
Overhanging veg.	Overhanging veg.	Overhanging veg.	Overhanging veg.
Undercut banks	Undercut banks	Undercut banks	Undercut banks
Substrate	Substrate	Substrate	Substrate
Aquatic veg.	Aquatic veg.	Aquatic veg.	Aquatic veg.
Water column	Water column	Water column	Water column

The sampled fish habitat potential was rated between 0 to 5 (1 = rare; 2 = sparse; 3 = common; 4 = abundant; 5 = very abundant) at each of the assessed sites (**Figure 6-14**) and these were considered in the determination of the expected frequency of occurrence (FROC) for each fish species.

The dominant fish habitat cover types were as follows:

- Substrate and water column within the fast shallow and fast deep velocity-depth classes at site UP;
- Overhanging vegetation and substrate within the slow shallow and fast shallow velocity-depth classes at site D;
- Overhanging vegetation, substrate and water column within the slow deep and fast deep velocity-depth classes at site G.

Thus, the expected fish species were largely those with a preference for the available habitat types within each of the river reaches.

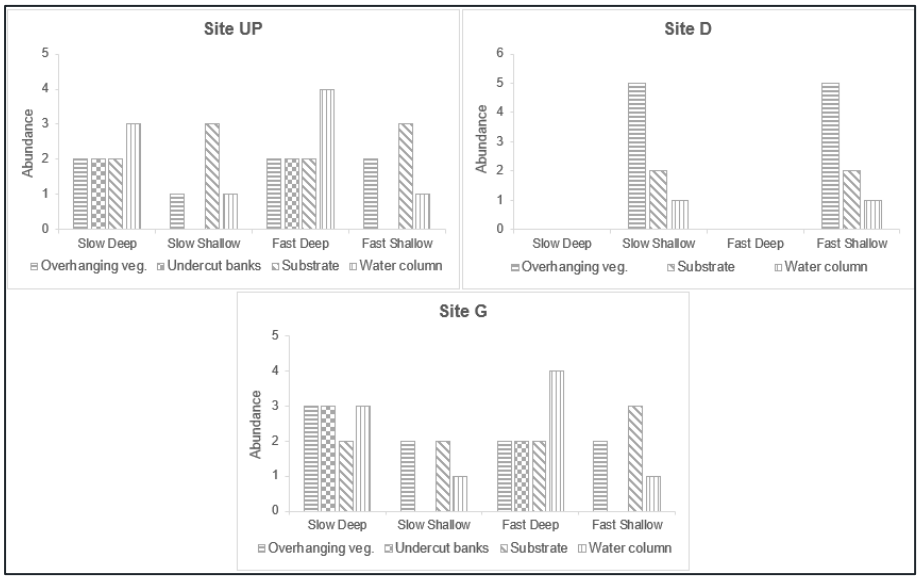


Figure 6-14 - Fish habitat metric group abundances at each site

Fish Response Assessment Index (FRAI)

The FRAI Index is based on a combination of fish species habitat preferences as well as intolerance to habitat changes, and the present/observed frequency of occurrence (FROC) of species compared to the reference FROC.

The FRAI-based PES for the assessed sites is provided in (**Table 6-8**). Ratings for the FROC were based on the species habitat preferences. Each site was characterised by suitable fish habitat and all nine species reported to occur within the catchment were expected at the time of the current survey. None of these species were collected at sites UP and D whilst a single species was collected at site G. The subsequent Ecological Categories were *Critically Modified* at sites UP and D and *Seriously Modified* at site G.

The absence of fish communities at the accessed sites was likely attributed to cumulative impacts associated with historical land use activities, mainly mining and forestry. The collected species are known to be congregatory however a single specimen was collected, thus it is suspected to have been displaced from upstream reaches to site G due to the flash flood which occurred several hours prior to the survey.

Table 6-8 - FRAI results for the assessed river reaches

Site	FRAI Score	Ecological Category	Description
Site UP	20.0	E/F	Critically Modified
Site D	20.0	E/F	Critically Modified
Site G	25.7	E	Seriously Modified

6.1.9.11 Integrated EcoStatus Determination

The EcoStatus is defined as: "*The totality of the features and characteristics of the river and its riparian areas that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services*". Thus the EcoStatus represents an integrated ecological state representing the drivers (hydro-morphology and physico-chemical) and responses (riparian vegetation, aquatic invertebrates and fish. The integrated EcoStatus for the sampled sites are presented in **Table 6-9**.

Following integration of the defined ecological conditions obtained for the riparian component (i.e. IHI from riparian vegetation assessment) and the instream biological integrity (i.e. MIRAI from aquatic invertebrates and FRAI from fish), it was determined that sites UP and D represented an integrated EcoStatus of *Seriously Modified* conditions and site G *Largely to Seriously Modified* conditions.

In relation to the Recommended Ecological Category (REC) of *Largely Modified* (EC of D) – gazetted in April 2016 (*Classes of water resources and resource quality objectives for the catchments of the Inkomati in Terms of Section 13(1) and 63(1)(a) of the National Water Act, 1998 (Act No. 36 of 1998)*, the assessed river reaches were observed to have deteriorated.

Table 6-9 – Integrated EcoStatus categories for the current study – EcoStatus version 1.02 (Kleynhans and Louw, 2007)

Site	Response Indices				EcoStatus	
	Riparian Vegetation EC (IHI)	MIRAI EC	FRAI EC	Instream EC	Score	Category
Site UP	57.2	11.7	20.0	14.9	37.5	**E**
Site D	38.2	16.7	20.0	18.0	28.8	**E**
Site G	57.2	16.2	25.7	19.8	39.8	**D/E**

6.1.9.12 Surface Water Quality

This section is supplemented with information from the *Surface Water Impact Assessment* (WSP, 2024).

Nkomati Mine undertakes comprehensive surface water monitoring at various monitoring points in and around the mine water resources to comply with the IWUL requirements. Water quality data have been received from Nkomati Mine for surface water sampling locations on the Slaaihoek, Adit and Mngubhudle/Gladdespruit streams, upstream and downstream of Nkomati Mine, as indicated in **Table 6-10**, and represented in **Figure 6-15.**

Table 6-10: Surface Water Quality Monitoring Points

Catchment	Point ID	Description	Latitude	Longitude
Gladdespruit	O	An IWUL compliance point is immediately upstream of the confluence with the Slaaihoek stream. It's upstream of all Nkomati Mine activities but downstream of Mamre and forestry activities.	S 25.736017	E 30.59714
	G	An IWUL compliance point is located at a concrete bridge in Uitkomst. It is downstream of all mining activity and represents the water quality leaving the area affected by mining and forestry.	S 25.75845	E 30.6196
	GDS	An IWUL compliance point on Gladdespruit, it monitors downstream quality before the confluence with the Komati River.	S 25.86795	E 30.66021
	VYG	An IWUL compliance point. It represents the quality of water leaving the canal and entering Vygeboom Dam. It shows the	S 25.87699	E 30.62128

Catchment	Point ID	Description	Latitude	Longitude
		impact of Gladdespruit and Poponyane on the dam.		
Slaaihoek Stream	K	An IWUL compliance point is located on the stream above the confluence with the northeastern tributary. It represents general catchment runoff from forestry areas upstream of all mining activity.	S 25.71953	E 30.59186
	S	An IWUL compliance point is located on the stream below Slaaihoek Dam. It monitors the effects of runoff and seepage from the mine activities.	S 25.73532	E 30.59693
	L	An IWUL compliance point on the drainage line (fountain) from the area between the plant area and HS TSF. Any overflows from the HS RWD would enter the Slaaihoek via this drainage line.	S 25.73528	E 30.59724
Adit	D	An IWUL compliance point upstream of the confluence with Gladdespruit and downstream of OPOP (Pit 2) and the proposed WTP. It represents the quality of water prior to the confluence with Gladdespruit.	S 25.7554	E 30.61809
	Pit 2 (OPOP)	An IWUL compliance point that monitors the potential impact on the environment due to seepage and overflow.	S 25.74916	E 30.625294
	Pit 3 E	Pit 3 East – these are storage limits – not for discharge		
	Pit 3 W	Pit 3 West these are storage limits – not for discharge		
Onverwacht unnamed stream	OVDS	An IWUL compliance point downstream of Onverwacht TSF on the Onverwacht tributary. It	S 25.84012	E 30.65233

Catchment	Point ID	Description	Latitude	Longitude
		monitors the potential impacts of Onverwacht TSF.		
	ORWD	An IWUL compliance point on Onverwacht RWD. It monitors the potential environmental impact due to seepage and accidental overflow.	S 25.82547°	E 30.64163°
-	OPUG	Underground monitoring point	-	-

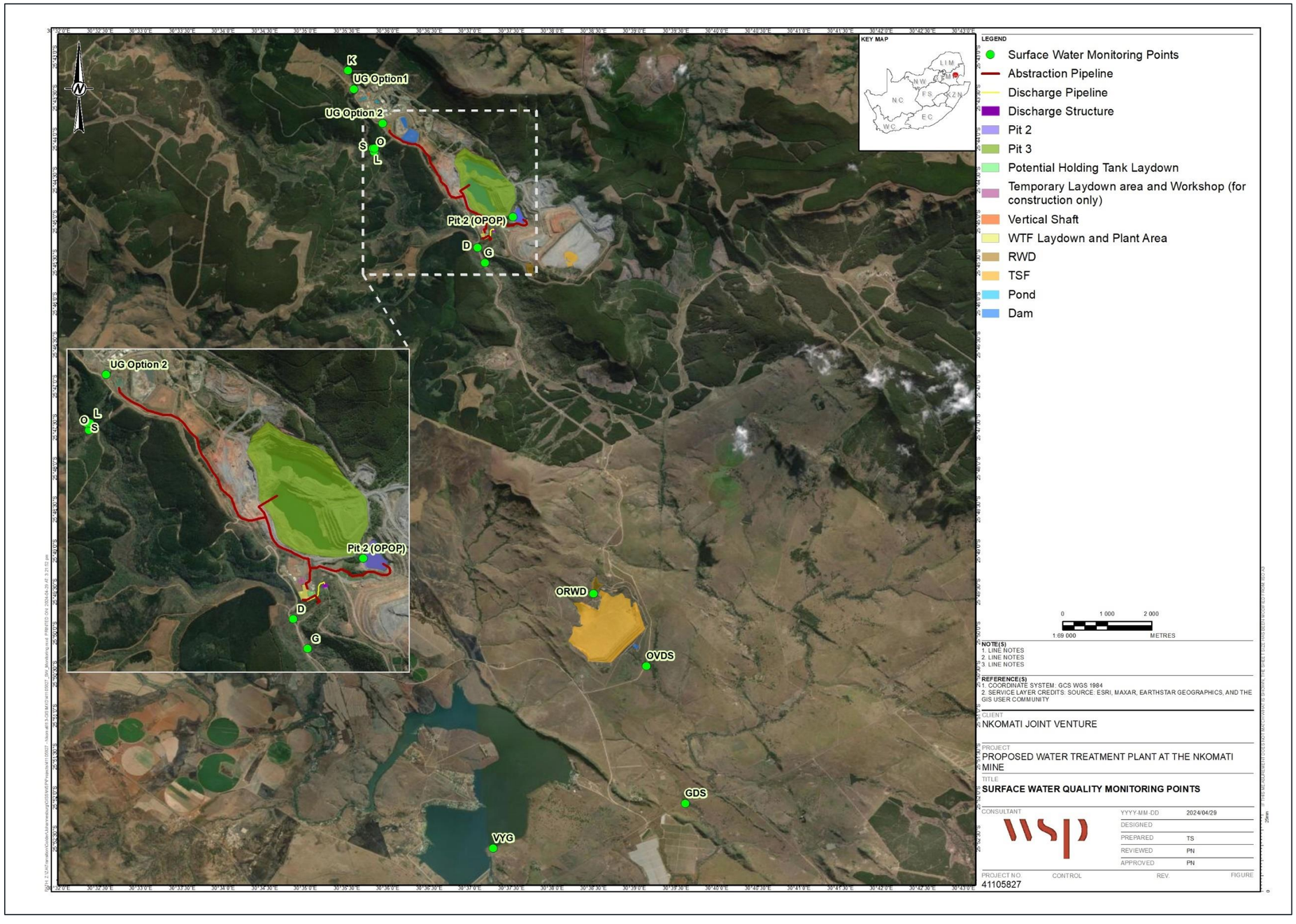


Figure 6-15 Surface Water Monitoring Points

6.1.9.13 Summary of Water Quality Results

The monitoring points of interest for the Project are as follows:

- Point D, located on an Adit stream upstream of the confluence with Gladdespruit and downstream of the proposed WTP, will monitor the water quality from the WTP before it reaches the Gladdespruit.
- Point G, located on Gladdespruit downstream of all mining activity, represents the water quality leaving the area.
- Point O, located on Gladdespruit upstream of the confluence with the Slaaihoek stream and all Nkomati Mine activities, will determine the water quality status before the discharge from the WTP.

An average of water quality results for parameters of concern from July 2006 to March 2024 was used to describe the baseline water quality of the receiving environment before the WTP discharge. These parameters were benchmarked against the Resource Quality Objectives (RQOs) and Water Quality Planning Limits (WQPL) applicable to the Gladdespruit and surrounding streams in the catchment (see **Table 6-11**).

Generally, the water quality results for the rivers indicate that the receiving surface water resources (i.e. point G and O) in the vicinity of the Project area shows general compliance to the WQPL/RQO, with minimal exceedances observed for few parameters. However, the Adit stream downstream of Pit 3 West (i.e. point D) has elevated levels for parameters such as Total Dissolve Solids (TDS), Sulphate (SO_4), Calcium (Ca), Electric Conductivity (EC), Free saline and Ammonia (NH_3), Zinc (Zn) and Copper (Cu), which exceed permissible limits. Some water quality impact has already reached Gladdespruit downstream of the Nkomati mining activity. The WTP discharge quality is well within the WQPL/RQO and is expected to improve the water quality in the Adit stream and Gladdespruit over the long term**.** Minimal impact on the receiving catchment water resources is expected with the addition of the WTP discharge.

Table 6-11 - Compliance of water quality against Receiving water Quality Objectives/Limits

Discharge	TDS	Nitrate & Nitrite as N	Chloride as Cl	Total Alkalinity	Fluoride as F	Sulphate as SO4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Electrical Conductivity as (EC)	Nickel as Ni (RQO)	Aluminium as AL	Free & Saline Ammonia as N(NH3)	Ortho Phosphate PO4 (RQO)	Zinc as Zn (RQO)	Copper as Cu	pH	
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mS/m	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	pH units	
Ideal	200	6	40	20	0.7	80	10	70	70	25	0.1	0.05	30	≤ 0.2	≤ 0.02	0.015	≤ 0.2	≤ 0.2	0.015	≤6.5	≥ 8.4
Acceptable	350	10	120	120	1	165	80	100	92.5	50	0.3	0.15	50		0.065	0.044			0.03		
Tolerable	800	20	175	300	1.5	250			115	100	1	1	85		0.105	0.073			0.045		
Unacceptable	>800	>20	>175	1200	>1.5	>250	>80	>100	>115	>100	>1	>1	>85		>0.105	>0.07			>0.045		
WTP Discharge Quality	175.7	1.5	68.4	3	0.2	69.9	8.2	9.8	52.9	14.6	0		40		0	0.2			0.03	7	
Monitoring Point D	905.03	11.71	23.12	87.06	0.22	468.28	125.78	73.31	17.55	3.32	0.10	0.07	107.68	0.16	0.06	0.29	0.09	1.54	0.49	7.82	
Monitoring Point G	135.34	1.20	4.12	33.88	0.20	56.93	16.15	10.60	5.58	0.82	0.20	0.06	20.06	0.02	0.07	0.26	0.09	3.32	4.78	7.53	
Monitoring Point O	52.25	0.29	2.56	15.15	0.21	19.24	5.33	3.37	4.48	0.39	0.46	0.08	7.95	0.01	0.08	0.25	0.09	2.32	7.77	7.28	

6.1.9.14 Floodlines

Figure 6-16 shows the sub-catchments that were delineated for floodline modelling purposes for watercourses contributing to the flow in the Adit stream, which discharges into the Gladdespruit.

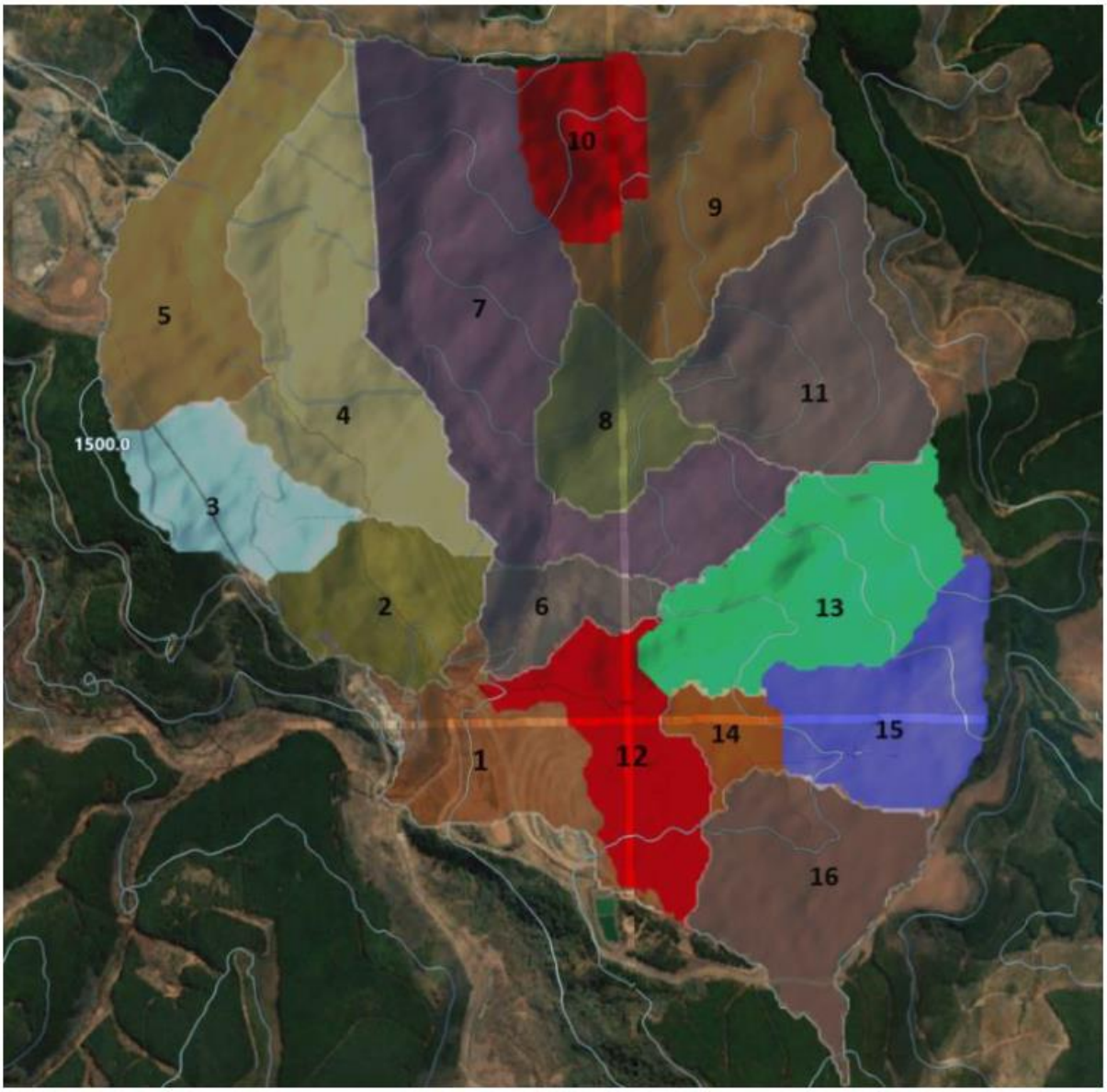


Figure 6-16 - Delineated sub-catchments (Agreenco Environmental Projects (Pty) Ltd, 2024)

The Adit stream is in sub-catchments 1 and 2, thus will influence the site's floodline, so the design flood peaks were only estimated for the two sub-catchments. The rational method was used to estimate peak flows, and flows are shown in **Table 6-12.**

Table 6-12 - Design Peak Flows (Agreenco Environmental Projects (Pty) Ltd, 2024)

Sub-catchment	Design Peak Flows (m^3/s)	
	I:50 year	I:100 year
SC 1	46.97	64.71
SC 2	9.52	13.12

Figure 6-17 shows the modelled 1 in 100-year floodline. The floodline was modelled before and after the 13ML/day discharge (pre and post development). It can be concluded that the additional discharge from the proposed WTP will not significantly affect the floodline.

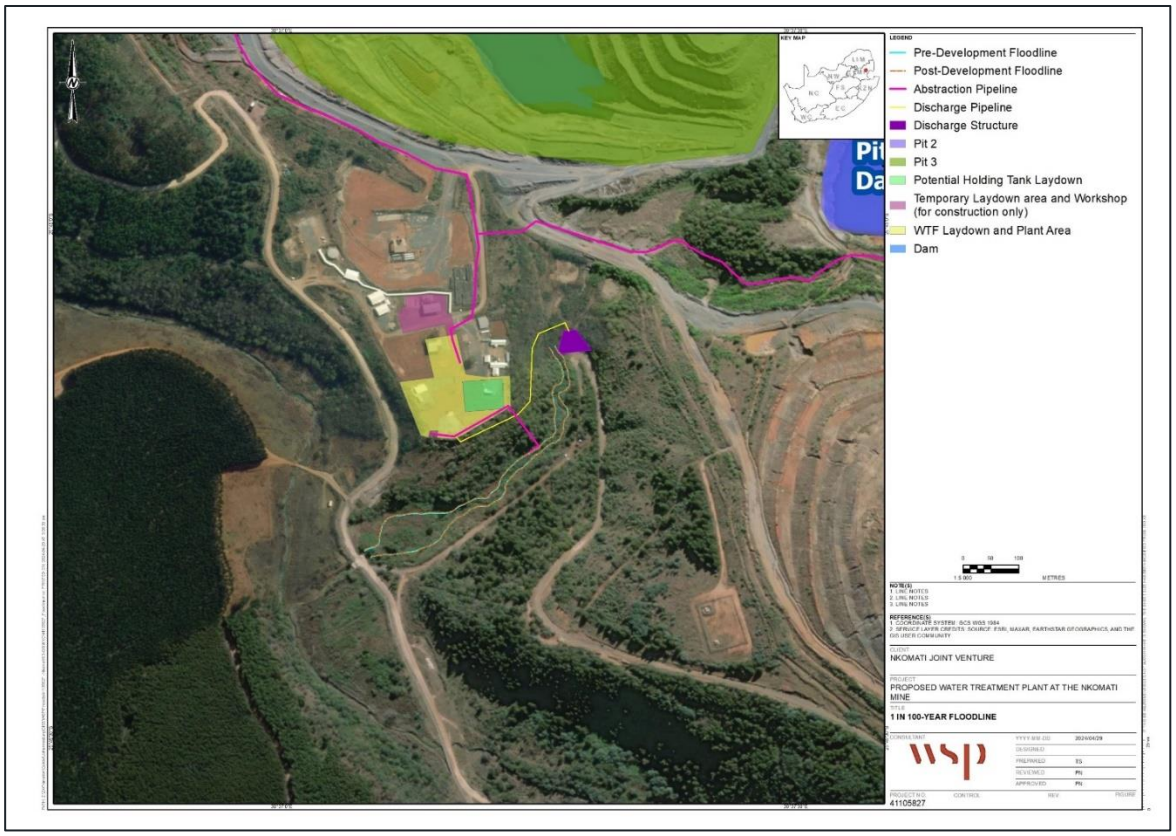


Figure 6-17 - 1 in 100-year Floodline (Agreenco Environmental Projects (Pty) Ltd, 2024)

6.1.9.15 Water users in the area

The two main water users downstream of the mine are the farmers who abstract water from the Vygeboom Canal and Eskom, which uses water in Vygeboom Dam for power generation. The Gladdespruit catchment supplies most of the flow in the Vygeboom Canal but only 10% of the flow to the Vygeboom Dam.

There are six (6) farmers who abstract water. Each user is allowed to abstract a maximum of 6 000 m^3/ha/y. This means a maximum of 9.57 million m^3/y may be abstracted from the canal. The

farmers use water for domestic purposes, livestock watering and irrigation of crops. Among the crops grown, tobacco is the most sensitive to water quality.

6.1.10 GEOHYDROLOGY

This section is supplemented with information from *Nkomati Mine: Pit 3 Water Management – Operational and Closure Report* (GCS, 2019) and *Nkomati Mine IWWP* (Precious Environmental Consultants, 2020).

The Nkomati Mine is situated in a relatively confined hydrogeological sub-catchment of the larger Gladdespruit hydrological catchment. No groundwater users, except for Nkomati Mine, are situated within the Nkomati Mine or Slaaihoek-Uitkomst groundwater catchment. No primary aquifer is present within the existing and proposed open pit mining area. Aquifers are of a secondary nature, associated with fracturing and weathering of the host geology and as such the majority of the groundwater flows are associated with individual faults or fracture networks.

Groundwater recharge occurs in the mountainous areas consisting of Transvaal Supergroup rocks, as well as the valley slopes of the Uitkomst Complex. Groundwater discharge occurs at several springs and as baseflow in the main water courses such as the Slaaihoek, Adit Stream and Gladdespruit rivers.

6.1.10.1 Groundwater flow

The groundwater flow direction generally follows the topography of the area and thus flows in a south westerly direction. The direction in Pit 1 is therefore towards the north, in Pit 2 to the south-west and in Pit 3 towards the south-east.

6.1.10.2 Depth of water table

Groundwater levels were recorded in selected exploration boreholes prior to the commencement of the mining operations. The results indicated that the depth to the water table varied between 20 m to 64 m below the surface. Groundwater levels were also recorded from the ground water monitoring boreholes in the vicinity of the exploration shaft, waste dump and tailings dam. The results indicated that the depth of the groundwater levels in this area varied between 12 m to 35 m. A depth of 28 m has been recorded in the general vicinity of the High Sulphide Dam.

6.1.10.3 Groundwater levels

Data from pre-mining studies measured groundwater levels from monitoring boreholes, hydrogeological test boreholes and ore exploration boreholes, totalling around 200 observation points. Most boreholes indicate a depth to groundwater of between 10 and 30 m below ground level (ERM, October 2008). The mean depth to groundwater level in the region is around 18 mbgl (GCS, February 2014) with a range of 1 to 60 mbgl.

In the Pit 3 area the groundwater flow is directed towards the southeast along the valley and in turn contributes to baseflow of the Adit Stream in the west. Water flow also locally from the topographic high ridges in the north. In the vicinity of the WRD (Waste Rock Dump) and Pit 2 the groundwater flow directions are directed towards the west. Average ambient groundwater flow gradients were calculated to be around 1:12 in the WRD and Pit 2 area where groundwater flow directions are towards the west and southwest. Towards the Pit 3 area the ambient groundwater flow gradients were around 1:30.

6.2 BIOLOGICAL ENVIRONMENT

This section is supplemented with information from the report titled *Nkomati Treatment Plant: Terrestrial Biodiversity Compliance Statement (WSP, 2024)*.

6.2.1 REGIONAL BIODIVERSITY CONTEXT

Much of the NJVM project area is considered transformed; however, areas exist within the project area that can provide adequate habitat conditions necessary to sustain various faunal species.

6.2.1.1 Vegetation Types

The following vegetation types occur in the project area: Northern Escarpment Dolomite Grassland (Gm 22)-Endangered and Northern Escarpment Quartzite Sourveld (Gm 23)-Vulnerable.

Northern Escarpment Dolomite Grassland (Gm 22)

This grassland occurs in the Mpumalanga Province: From the dolomite grasslands of the Blyde River areas in the north and southwards along the Northern Escarpment to Kaapsehoop. The grasslands are characterised by a very diverse shrub layer at altitudes of 1 000–1 620 m. The unit receives summer rainfall, ranging between 700 mm to 1 420 mm with temperatures ranging from 15ºC in the south to 17ºC in the north. The Northern Escarpment Dolomite Grassland is Endangered with Only 2% protected within the Blyde River Canyon National Park, but larger portion protected in private Driekop Caves and London heritage sites in the north and in the Mooifontein and Mondi Cycad Reserve heritage sites in the south. More than half of this unit has been transformed by plantations and cultivated lands. This region support species usually associated with the Wolkberg Centre of Plant Endemism and Sekhukhune Centre of Plant Endemism and is rich in endemic plants (Mucina and Rutherford, 2011).

Northern Escarpment Quartzite Sourveld (Gm 23)

This grassland occurs in Limpopo and Mpumalanga Provinces along the Northern Escarpment, from Haenertsburg in the north past Blyde River Canyon and as south to Kaapsehoop. The landscape is rugged, with steep east-facing cliffs with an altitude of 1 000–1 740 m. This escarpment is intersected in some areas with large east-flowing rivers and short, closed grassland rich in forb species with scattered trees and shrubs. The unit experiences summer rainfall, with a Mean annual precipitation oof 1 176 mm and a mean annual temperature of 16.6ºC. The Northern Escarpment Quartzite Sourveld is Vulnerable with only 15% protected within the Lekgalameetse and Blyde River Canyon National Park. As much as 38% of this unit has been transformed by plantations and cultivated areas. This region support species associated with the Wolkberg Centre of Endemism and is rich in endemic plants (Mucina and Rutherford, 2011).

The proposed site for the WTP is located outside of any areas of pristine vegetation and is located within the Northern Escarpment Quartzite Sourveld vegetation type (**Figure 6-18**) which is considered least concern according to the Red List of Ecosystems, 2021 (**Figure 6-20**). In addition, the site is considered heavily transformed according to the MBSP, 2022 (**Figure 6-19**).

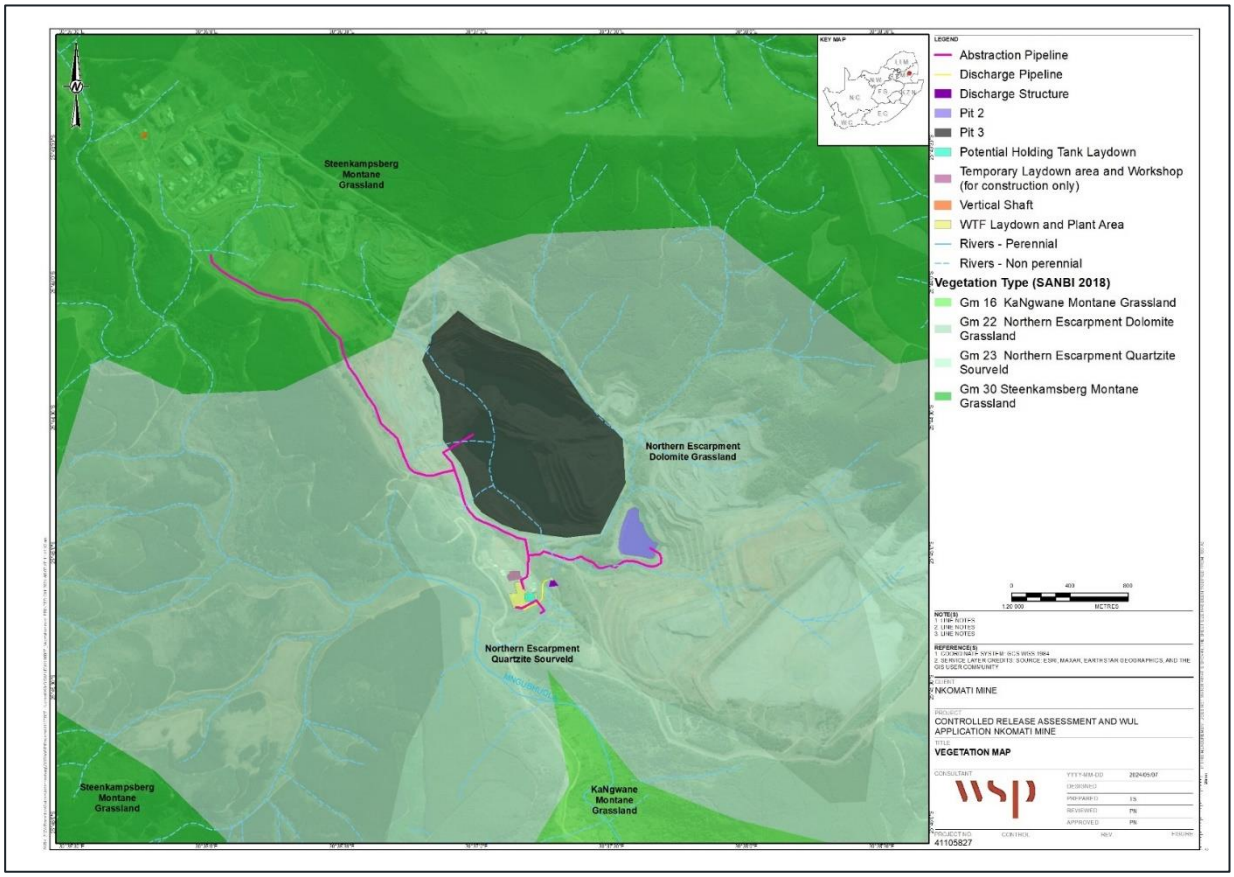


Figure 6-18 - Vegetation types at the WTP site

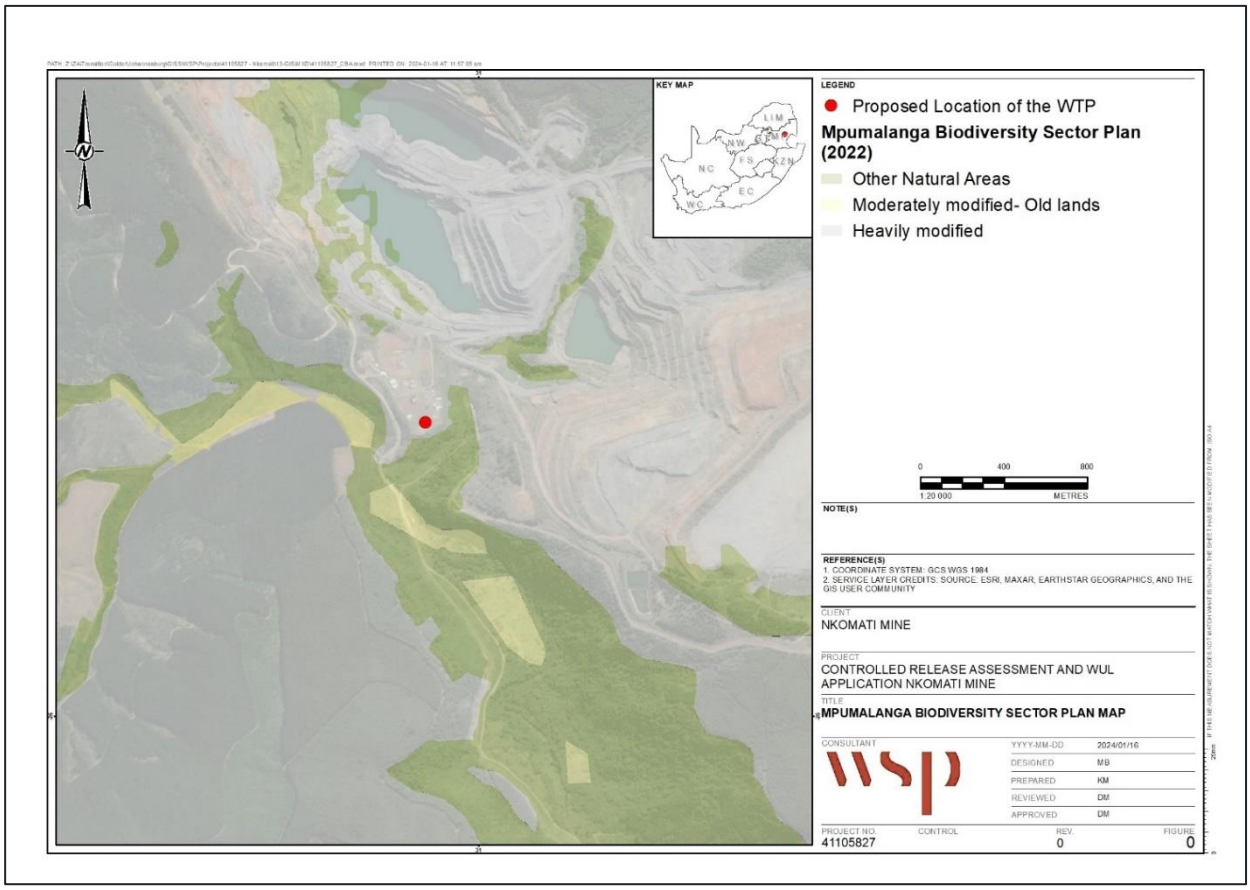


Figure 6-19 - Vegetation status of the site according to the MBSP

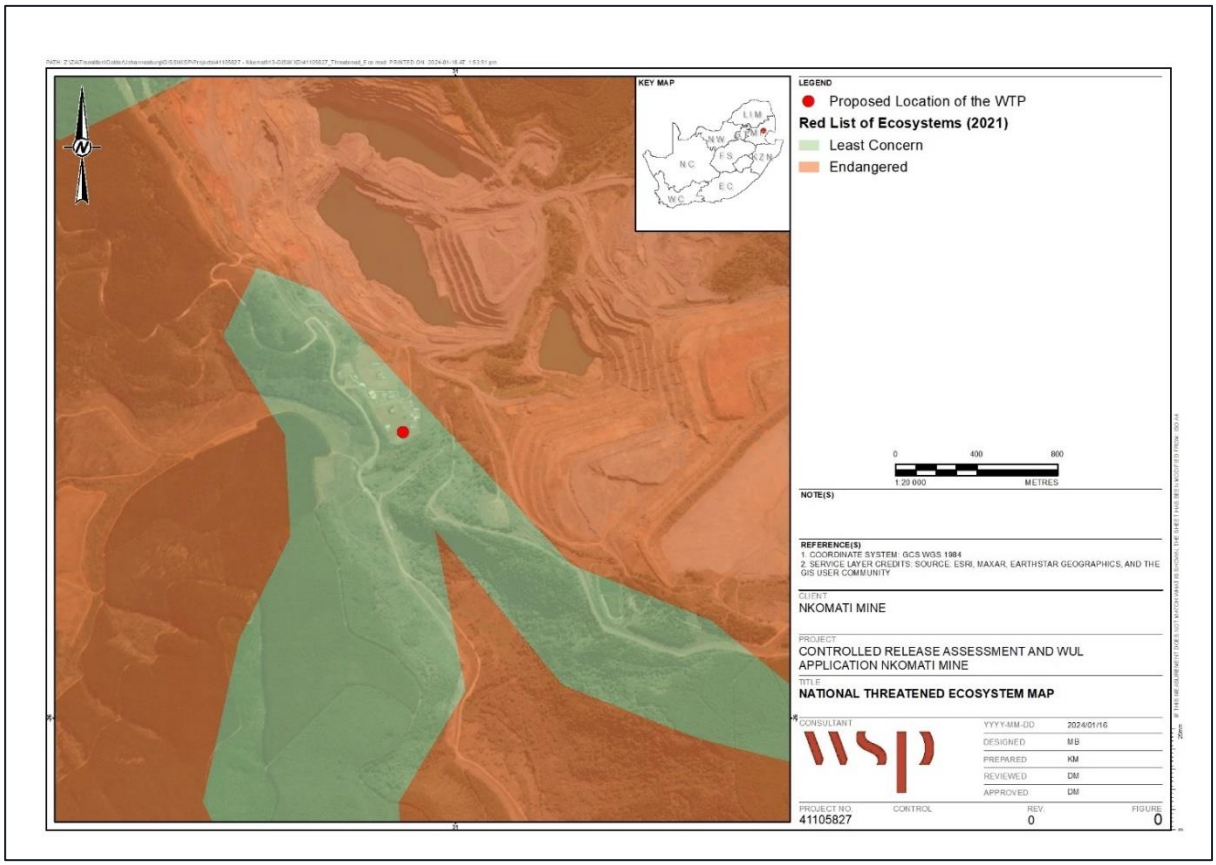


Figure 6-20 - Vegetation status of the site according to the Red List of Ecosystems

6.2.1.2 Important Bird Areas (IBA)

The Project area sits South of Blue Swallow Natural Heritage Site now known as Kaapsehoop (**Figure 6-22**).

This IBA once held the largest Blue Swallow (*Hirundo atrocaerulea*) breeding population in Mpumalanga. All the nests were restricted to the primary grassland south of Kaapsehoop village. However, in 2012 only three birds were reported, and no breeding activity was observed. Since then, there have been limited sightings of individual birds. The site holds numerous restricted-range and biome-restricted species such as Bush Blackcap (*Lioptilus nigricapillus*) Striped Flufftail (*Sarothrura affinis*), Buff-streaked Chat (*Campicoloides bifasciata*), Barratt's Warbler (*Bradypterus barratti*), Yellow-throated Woodland Warbler (*Phylloscopus ruficapilla*), Olive Bush-Shrike (*Chlorophoneus olivaceus),* Swee Waxbill (*Coccopygia melanotis*), Forest Canary (Crithagra scotops) and Gurney's Sugarbird (*Promerops gurneyi*).

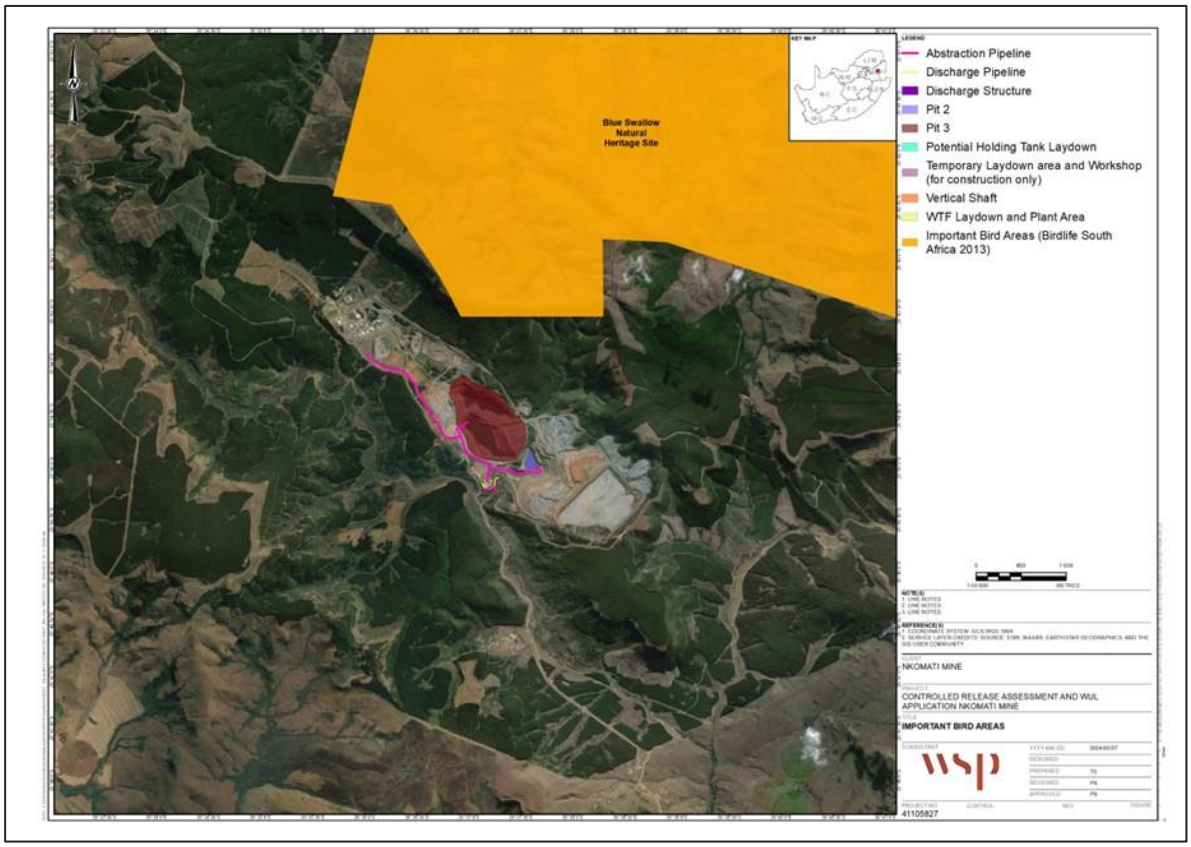


Figure 6-21 – WTP in relation to the Blue Swallow Natural Heritage Site IBA

6.2.2 TERRESTRIAL FAUNA

6.2.2.1 Mammals

The national screening tool indicates five sensitive mammal species that are expected to occur in the project area. These include five mammals: Oribi (*Ourebia ourebi*)-Endangered, Rough-haired golden mole (*Chrysospalax villosus*)-Vulnerable, Robust Golden Mole (*Amblysomus robustus*)-Vulnerable, African Marsh Rat (*Dasymys robertsii*)-Vulnerable and Spotted-necked Otter (*Hydrictis maculicollis*)-Vulnerable. However, given the transformed habitat condition of the Project area, in addition to no mammals being observed during ground-truthing, it is unlikely that these species would occur.

Oribi (*Ourebia ourebi*)-Endangered

Oribi inhabit savannah woodlands, floodplains and other open grasslands, they reach their highest density on floodplains and moist tropical grasslands, especially in association with large grazers. They prefer open grassland in good condition containing a mosaic of both short grass for feeding and long grass for feeding and shelter (Rowe-Rowe 1994; Perrin & Everett 1999, Stears 2015). However, within these grasslands they avoid feeding within and close to woodland patches even if these patches are small (for example, 2–6 m in diameter; Stears and Shrader 2015).

Rough-haired golden mole (*Chrysospalax villosus*)-Vulnerable

The Rough-haired Golden Mole occurs in sandy soils in grasslands, meadows and along edges of marshes in Savannah and Grassland biomes of South Africa. Some specimens have been recorded

from gardens and parklands, and in dense stands of Kikuyu Grass (*Pennisetum clandestinum*) and marginally on golf courses adjoining natural grasslands.

Robust Golden Mole (*Amblysomus robustus*)

Robust golden moles are not particularly selective about their habitat. They have been found in marshes and grasslands of the Steenkampsberge mountains mainly, but also in developed areas near human activity (such as gardens and farmlands). They are terrestrial and fossorial and are commonly found in South African grassland biomes.

African Marsh Rat (*Dasymys robertsii*)-Vulnerable

These species have been recorded from a wide variety of habitats, including forest and savannah, swampland and grasslands, but they rely on intact wetlands in these areas. They have not been recorded from agricultural landscapes or dam areas. They occur specifically in reed beds and among semi-aquatic grasses in wetlands or swampy areas or along rivers and streams, as well as in grassy areas close to water wherein they co-occur with Otomys spp. (Skinner & Chimimba 2005). African Marsh Rats construct complex, intricately woven nests in holes along the banks of rivers and ponds (Pillay 2003). Nests extend into water and might serve as a bolt hole during attack from predators. Sub- and above-surface runways extend from the nest cavities and would serve as travel routes.

Spotted-necked Otter (*Hydrictis maculicollis*)-Vulnerable

Spotted-necked Otters are thought to inhabit freshwater habitats where water is not silt-laden, and is unpolluted, and rich in small fishes (Perrin & Carugati 2000a; d'Inzillo Carranza & Rowe-Rowe 2013).

6.2.2.2 Herpetofauna

The national screening tool indicates no sensitivities in terms of support of amphibian or reptile species; in addition to no reptile or amphibians being observed during ground-truthing, it is unlikely that these species would occur.

6.2.2.3 Avifauna

The national screening tool indicates no sensitivities in terms of support of avifauna species. Despite occurring near the Kaapsehoop IBA, the level of transformation present is unlikely to provide suitable nesting or breeding habitat for any SCC species. This is supported by no SCC species being recorded during the ground-truthing.

6.2.2.4 Invertebrates

The national screening tool flags one insect species, Northern Scarlet Flash (Chrysoritis phosphor borealis)-Endangered and three invertebrates are also flagged: Lalande's Black-winged Clonia (*Clonia lalandei*)-Vulnerable, *Doratogonus praealtus*-Vulnerable and Badplaas black millipede (*Doratogonus furclifer*)-Endangered. None of these species were recorded during the ground-truthing.

Due to the lack of species recorded and transformed nature of the Project area an Animal Compliance statement is motivated in line with the protocol.

6.2.3 TERRESTRIAL FLORA

The national screening tool indicates seven sensitive plant species that could be expected to occur in the project area, included in this list is three Vulnerable, one Critically Endangered, Two Endangered

and one Rare plant species, all of these apart from *Streptocarpus denticulatus* (VU), may not appear in the final EIA report nor any of the specialist reports released into the public domain.

6.3 TERRESTRIAL BIODIVERSITY THEME

The DFFE Screening Tool rendered the site to be Very High in sensitivity in relation to the Terrestrial Biodiversity Theme. However, it must be noted that the site is only considered as High Sensitivity for this theme as it is located within a Water Source Area and not within any critically endangered or endangered ecosystem.

6.4 BIODIVERSITY DRIVERS OF CHANGE

Results from the field verification site visit indicated that the proposed project infrastructure will be situated in a largely transformed landscape, interspersed by cultivated fields, exotic tree plantations and mines, from which a high level of impact has occurred through habitat transformation. Barriers to faunal movement in the shape of dirt roads and boundary fencing occur throughout the project area.

6.5 MOTIVATION FOR SUBMISSION OF A COMPLIANCE STATEMENT

The DFFE National Web-based Environmental Screening Tool indicated that the project area within which the proposed WEF is to be to be located is rated as 'Medium' sensitivity under the Animal Species Theme sensitivity due to the potential presence of a total of nine SCC species. The Project area occurs near the Kaapsehoop Important Bird Area and consists of Northern Escarpment Dolomite Grassland (Gm 22)-Endangered and Northern Escarpment Quartzite Sourveld (Gm 23)-Vulnerable.

None of the SCC flagged by the screening tool was observed on site. Due to the highly transformed nature of the entirety of the project area, the usage by these species for breeding, or foraging on a regular basis, is considered unlikely.

Table 6-13 - Screening Tool Verification

Screening Tool Theme	Screening Tool	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Animal Theme	**Medium**	**Low**	Disputed – Terrestrial habitat is highly transformed and exists in a disturbed state. Fauna SCC were not recorded and are not expected.
Plant Theme	**Medium**	**Low**	Disputed – Terrestrial habitat is highly transformed and exists in a disturbed state. No flora SCC were recorded.
Terrestrial Theme	**Very High**	**Low**	Disputed – Habitat is highly fragmented and exists in a disturbed state. SCC were not recorded and are not expected.

Since the proposed project infrastructure and activities, and the anticipated area of influence for animal species, is situated within areas that are of low sensitivity further to the verification process conducted as part of this study, an animal species compliance statement is therefore motivated, in line with the protocol. It is nevertheless essential that all the recommended mitigation and management measures be strictly implemented to ensure that any potential impacts to fauna species as a result of the proposed activities are avoided/minimised.

6.6 SOCIAL AND ECONOMIC ENVIRONMENT

6.6.1 ARCHAEOLOGICAL AND CULTURAL HERITAGE

This section is supplemented with information from the *Archaeological Heritage Impact Assessment (HIA) Report for the WTP* (Archaetnos, 2024)

A survey of literature was undertaken in order to obtain background information regarding the area. The field survey was conducted according to generally accepted HIA practices and was aimed at locating all possible objects, sites, and features of cultural significance in the area of proposed development.

Figure 6-22 indicates the track routes of the field survey.

Figure 6-22 - Track route of the HIA survey in blue

6.6.1.1 Observations

The surveyed area is largely disturbed due to past human activities, that took the form of mining-related activities and infrastructure (**Figure 6-23**). Vegetation in the surveyed area varies in height, with low vegetation in areas where there are still activities and high in others (**Figure 6-24**) The areas where the vegetation growth was higher and denser, consist largely of pioneer plants. These are indications that these areas were disturbed in the recent past (**Figure 6-25**).

Figure 6-23 - View of office buildings in the surveyed area

Figure 6-24 - View of low vegetation growth in the surveyed area

Figure 6-25 - View of low vegetation growth in the surveyed area

6.6.1.2 Findings

No new heritage sites were identified during the survey. One cemetery is located approximately 70 m to the east-southeast of the proposed development, on the opposite side of a gravel road (**Figure 6-26**). This cemetery was constructed as part of a grave relocation project, conducted in 2016 (Steyn & De Jager 2016). During the survey, the cemetery was overgrown and not visible (**Figure 6-27**).

A few heritage reports were completed around the towns of Badplaas, Machadodorp and Belfast (SAHRA's SAHRIS database; Archaetnos database). The sites found in these reports fall far outside of the impacted area of this survey except for the cemetery that was indicated in the report of Steyn & De Jager (2016).

Figure 6-26 - Location of relocated cemetery

Figure 6-27 - View of the location of the cemetery from the surveyed area

6.6.2 SOCIO-ECONOMIC

This section is supplemented with information from the report titled *Socio-Economic Impact Assessment for Nkomati Mine Closure, Mpumalanga* (SED, 2020).

The proposed site for the WTP is located on Farm Uitkomst 541 JT within the Albert Luthuli Local and Gert Sibande District Municipalities.

6.6.2.1 Demographics

The population growth rates in Chief Albert Luthuli LM was below the national average of 1.5% or the provincial rate (Mpumalanga) of 1.4%. This suggests out-migration from these local municipalities from job seekers living in these areas in search of job opportunities elsewhere. As is the case nationally, the number of households in all the municipalities (especially in Chief Albert Luthuli LM) outpaced the growth in population due to the splitting-off of larger households into smaller units. Despite the relatively high growth rate in the households, the average household size in Chief Albert Luthuli LM is still higher than the other municipalities and national averages, indicating to the still dominant rural nature of the municipality. The relatively faster growth in households in all municipalities places greater pressure on the respective municipalities to provide basic services. This is especially relevant to Chief Albert Luthuli LM.

6.6.2.2 Gender, Age, Race and Nationality

There is a relatively higher percentage of females in Chief Albert Luthuli LM compared to the provincial and national averages. This could indicate high historic and sustained out-migration of dominantly male job seekers to economic centres elsewhere in the country. The exception in the municipal area could be in Badplaas and Carolina town areas area. This observation is supported by the relatively high portion of the population in those areas that fall in the economically active age group (18-64 years) as well as the relatively higher portion of immigrants present in those areas.

6.6.2.3 Communities within the vicinity of the Nkomati Mine

A high-level estimate of the population sizes of local communities suggests that close to 6,000 people (1,700 households) could be staying in the immediate vicinity of Nkomati Mine. The majority of the smaller communities (Vaalkop, Mhlabatini, Engelse Draai, Slaaihoek and Uitzicht) are represented by a local mining community forum, the Umgubudla Forum.

Engelse Draai is located on the gravel road that connects the R38 with the R541. The road services several communities including a school and some informal settlements (about 400 people). Vygeboom Dam is used as a recreational dam and hosts a number of 'weekend' visitors and informal communities.

6.6.2.4 Access to water

There are service delivery challenges in terms of household water supply, basic sanitation and waste removal services in Chief Albert Luthuli LM. In the case of Chief Albert Luthuli LM, its main service centre Carolina is situated in the west, while almost 80% of its population lives in the north-eastern section of the municipality mainly in old Kangwane homeland territory.

Some water supply services are available through communal taps or taps on neighbouring stands. However, close to 12% of households in Chief Albert Luthuli LM had no access to an improved water source (Community Survey, 2016).

Water sources in all areas include rivers and dams that are subject to sporadic droughts and low rainfall during winter months. The Komati River serving Chief Albert Luthuli LM is highly utilised with limited additional surplus available beyond current irrigation developments.

6.6.3 NOISE

The only significant sources of noise in the area forestry activities, such as the felling of trees and transportation of harvested logs. Vehicles on untarred roads can be a source of noise but the traffic density is low that the levels of noise from this source are unlikely to be disturbing.

6.6.4 TRAFFIC AND ROADS

Some of the roads used to access the NJVM include the R36, R541 and the R539. The conditions of roads were impacted upon by regular movement of vehicles to the plantation and the mine as well as other industries in the area such as the Sappi Mill.

7 ENVIRONMENTAL IMPACT ASSESSMENT

The EIA phase of the S&EIR process has determined potential impacts associated with the proposed WTP and associated infrastructure. The anticipated environmental and social impacts have been identified and assessed by the various specialists according to the phases of the project's development.

The EIA considers the following:

- The construction, operation and decommissioning of a WTP initially capable of treating 6.5 million litres of water per day with extended operations to include the treatment of an additional 6.5 million litres of water per day.

7.1 AIR QUALITY

7.1.1 CONSTRUCTION PHASE

The impacts on air quality are limited to the construction phase. Construction activity is a source of dust emissions that can have a significant but transient impact on local air quality. The amount of dust emitted from construction operations depends on the area of land being worked, the proportion of land lying exposed at any time, the clearing and dozing equipment used, the number and type of vehicles on temporary roads, and the duration of the construction phase.

Although the increased dust and emissions from construction activities may not significantly impact air quality, increased dust can be a nuisance to the nearby receptors and site workers. Considering the temporary nature of construction and the nature of the proposed activities, impact on air quality is anticipated to be moderate. With the implementation of appropriate control measures, the impact on sensitive receptors will be reduced to be low.

The site is remote, and the nearest population settlement is the forestry houses at Vaalkop and Mahlabathini village (about 5 and 8 km to the south-east)

The potential impact on air quality during construction is indicated in **Table 7-1**.

Table 7-1 – Impact on ambient air quality during construction

Potential Impact: Impact on air quality during construction	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	1	2	5	**35**	**Moderate**	(-)
With Mitigation	1	2	1	2	5	**30**	**Low**	(-)
Mitigation and Management Measures	▪ Limit the duration of the construction phase to as short a timeframe as possible. ▪ Where possible, minimise the area under construction. ▪ Make use of wet suppression techniques to minimise dust entrainment during periods of high wind speeds. ▪ Where possible, minimise speed limits.							

Potential Impact: Impact on air quality during construction	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	▪ Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and soil/material stockpiles especially. This includes wetting of exposed soft soil surfaces and not conducting activities during high wind periods which will increase the likelihood of dust being generated. ▪ All stockpiles (if any) must be restricted to designated areas and may not exceed a height of two (2) metres. ▪ Ensure that all vehicles, machines and equipment are adequately maintained to minimise emissions. ▪ It is recommended that the clearing of vegetation from the site should be selective, be kept to the minimum feasible area, and be undertaken just before construction so as to minimise erosion and dust potential. ▪ All materials transported to, or from, site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. ▪ No burning of waste, such as plastic bags, cement bags and litter is permitted. ▪ Once construction is complete, initiate rehabilitation (e.g., re-vegetation) procedures to reduce wind speed across exposed surfaces.						

7.1.2 OPERATIONAL PHASE

Dust and emission generation applicable to the operational phase of proposed project is expected to occur because of the movement of vehicles to the site. However, this is expected to have negligible impact on the ambient air quality.

Operational phase air quality impacts are not considered further.

7.1.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

7.2 NOISE

7.2.1 CONSTRUCTION PHASE

Various construction activities (construction of laydown areas, the hard standing areas, excavation and concreting of foundations and the erection of the WTP and other infrastructure) taking place simultaneously during the day will likely increase ambient sound levels due to air-borne noises. It is proposed that construction activities will only take place during the day and no night-time construction will take place.

Table 7-2 – Increase in daytime ambient sound levels

Potential Impact: Impact on ambient sound levels during construction	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	1	2	4	**28**	**Low**	(-)
With Mitigation	2	2	1	2	4	**28**	**Low**	(-)
Mitigation and Management Measures	▪ The significance of the noise impact is low for daytime construction activities and no additional mitigation is recommended.							

7.2.2 OPERATIONAL PHASE

The proposed activities at the WTP will not contribute significantly to an increase in the ambient noise levels, the impact is expected to be negligible therefore operational phase noise and vibration impacts are not considered further.

7.2.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

7.3 SOIL, LAND USE AND LAND CAPABILITY

7.3.1 CONSTRUCTION PHASE

This phase has the largest direct impact on soils. This phase includes site preparation prior to construction activities, involving vehicular movement (transportation of construction materials) and the removal of vegetation within the development footprint and associated disturbances to soil, and access to the site. Site preparation is followed by erection of the structures and infrastructure.

The below-listed potential impacts were considered on soils within the project area. It must be noted that majority of the site for the WTP is located on existing transformed land however these impacts as described below may be exerted in the vicinity of the discharge pipeline and structure which is undisturbed by human activities.

7.3.1.1 Soil erosion and sedimentation

Clearing of vegetation, movement of vehicles, mobile plant and equipment, as well as earthworks required for establishment of structures is very likely to result in increased loose material being exposed.

As the discharge pipeline and structure will be located within and in close proximity to the Adit Stream, the potential impact of sedimentation is linked to that of erosion. Although the magnitude and extent of erosion and sedimentation are likely to be limited if the recommended mitigation measures are properly implemented, some erosion is likely when clearing an area and erosion and sedimentation are not easily reversible. Mitigation should focus on limiting earthworks and vehicle movement to

demarcated areas, as well as limiting the duration of the construction activities where possible. Soil stripping should be undertaken in the dry season and silt fences erected.

Table 7-3 – Soil erosion and sedimentation

Potential Impact: Increased erosion and sedimentation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	2	4	**44**	**Moderate**	(-)
With Mitigation	1	1	3	1	4	**24**	**Low**	(-)
Mitigation and Management Measures	▪ Limit earthworks and vehicle movement to demarcated paths and areas. ▪ Limit the duration of construction activities where possible, especially those involving earthwork / excavations within the Adit Stream. ▪ Access roads associated with the development should have gradients or surface treatment to limit erosion, and road drainage systems should be accounted for. ▪ Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces and soil stockpiles should be re-vegetated or stabilised as soon as is practically possible. ▪ During periods of strong winds, stockpiles should be covered with appropriate material (e.g. cloth, tarpaulin). ▪ Soil stripping should be undertaken in the dry season and silt fences erected if unexpected weather washes loose soil into the relatively nearby watercourse. ▪ Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure. ▪ Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction. ▪ Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow. ▪ Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses. ▪ All vehicles must be frequently inspected for leaks.							

7.3.1.2 Soil contamination

Movement of vehicles and plant / equipment on site could result in leaks, spills of hazardous materials, such as fuels, oils, chemicals, etc. Contaminated soil is expensive to rehabilitate and contamination entering the soils of the project area infiltrate into the ground as well as migrate from site during rainfall events.

Table 7-4 – Soil contamination

Potential Impact: Soil contamination	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	2	4	**44**	**Moderate**	(-)
With Mitigation	1	1	3	1	4	**24**	**Low**	(-)
Mitigation and Management Measures	▪ On-site vehicles should be well-maintained. ▪ Drip trays should be placed under stationary vehicles / plant. ▪ On-site pollutants/hazardous materials should be contained in a bunded area and on an impermeable surface. ▪ Ensure proper control of dangerous substances entering the site. ▪ Adequate disposal facilities should be provided. ▪ A non-polluting environment should be enforced. ▪ Extra care should be taken when constructing the discharge pipeline and structure within the Adit Stream. ▪ Chemicals and other potential contaminants must be stored 50 m or more away from any water resources. ▪ A spill response plan must be developed and adhered to. ▪ High rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems. ▪ Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions. ▪ All vehicles must be frequently inspected for leaks. ▪ No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat. ▪ All waste must be removed and transported to appropriate waste facilities.							

The presence of construction workers has the potential to increase litter on site in the absence of adequate waste receptacles. This results in an unsightly working environment and possible entry into surrounding environment. Furthermore, waste materials may attract pest species / vectors into working areas leading to potential health implications for construction staff and community members.

Spoil material unsuitable for reuse as backfill and bedding material has the potential to disrupt land use and habitats if inappropriately manage or disposed illegally.

Waste generation (domestic waste, mixed industrial and metal waste) and a lack of appropriate separation, temporary storage and recycling (i.e., not aligned with the Waste Hierarchy) has the potential to result in unnecessary waste material to landfill.

Hazardous waste generation and inappropriate management and disposal has the potential to lead to contamination of soil, groundwater and surface water.

Table 7-5 – Impact of improper waste management during construction

Potential Impact: Improper waste management during construction	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	2	5	**50**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Despite the modest volumes of waste anticipated to be generated by the project, recycling opportunities should be sought in order to reduce the volume of waste to landfill and harness commercial benefits for both the project team and local community. ▪ General waste (i.e., construction waste, building rubble, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) generated during the construction phase should be stored in a designated area within suitable waste collection bins and skips (or similar). ▪ Provisions of suitable waste receptacles for temporary storage of hazardous waste (in compliance with Material Safety Data Sheets). ▪ Collection and disposal of hazardous waste at appropriately licences landfills and proof of disposal to be retained by contractors and facility operators. ▪ Bins/skips must be emptied regularly and collected by a licensed contractor for disposal at an appropriate, licensed facility. Bins/skips must not be allowed to overflow. ▪ Solid waste must be managed to avoid risk to local fauna and to avoid attracting animals to the site and to ensure containment and regular collection for disposal at a licenced landfill site. ▪ Maintain good housekeeping on site and minimise the generation of waste.							

Sanitation services are required to accommodate workers on site, contractor's yard and at site camps. Temporary ablution facilities (chemical toilets) are proposed to appropriately contain and treat waste for offsite disposal. The incorrect siting of chemical toilets (i.e., within close proximity to a watercourse or stream) and loss of containment could lead to pollution of the receiving environment (soil, groundwater and surface water), leading to secondary health impact to ecosystems and communities (ground and surface water users).

Sanitary waste, if not correctly contained, has the potential to enter surface water via runoff and increase organic matter loading in water systems.

Table 7-6 – Improper disposal of sanitation waste

Potential Impact: Improper disposal of sanitation waste	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	2	5	**50**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Chemical toilet facilities are to be supplied and serviced by an approved contractor. ▪ Ablution facilities must be located in a specific area agreed to by the ECO prior to placement and must be located away from sensitive environments. ▪ Spillages must be prevented during cleaning or servicing. ▪ Ablution facilities must be effectively secured to prevent toppling or being wind-blown. ▪ Ablution facilities must be maintained in a hygienic state and serviced regularly.							

7.3.2 OPERATIONAL PHASE

This phase refers to the period of operation of the WTP and associated infrastructure. As indicated above, the identified impacts to soil take place during the construction phase. However, considering the nature of the project soil contamination is a potentially impact relating to the storage and removal of gypsum sludge from the site.

7.3.2.1 Soil contamination

Everyday movement of vehicles and employees once the development is operational could lead to some soil contamination however this impact is considered negligible as the site is operational at present.

The main source of potential soil contamination during operation is likely to be the storage and handling of the gypsum sludge, and potential pipeline leaks. An estimated 22 tons of gypsum sludge will be stored and removed from the site weekly and it possible that there may be contamination of the soil when storing or transporting the sludge from the site if not properly handled and managed.

Table 7-7 – Soil contamination

Potential Impact: Soil contamination from waste handling and potential pipeline leaks	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character

Without Mitigation	3	3	3	2	4	**44**	**Moderate**	(-)
With Mitigation	1	1	3	1	4	**24**	**Low**	(-)
Mitigation and Management Measures	▪ The sludge must be stored in skips in a designated storage area. ▪ The skips should be located on an impermeable hardstanding surface. ▪ Hardstanding should be monitored for cracks. ▪ Ensure proper control of the removal of sludge from the site. ▪ Safe removal slips should be maintained for record keeping and auditing purposes. ▪ An emergency spill procedure for the gypsum sludge must be developed and maintained throughout the operational process.							

Table 7-8 – Impact of improper handling and disposal of waste

Potential Impact: Improper waste management during operation particularly the handling and disposal of gypsum sludge	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	2	5	**50**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Despite the modest volumes of waste anticipated to be generated by the project, recycling opportunities should be sought in order to reduce the volume of waste to landfill and harness commercial benefits for both the project team and local community. ▪ General waste generated during the operational phase should be stored in a designated area within suitable waste collection bins and skips (or similar). ▪ Provisions of suitable waste receptacles for storage of hazardous waste (in compliance with Material Safety Data Sheets). ▪ Collection and disposal of hazardous waste particularly gypsum sludge at appropriately licences landfills and proof of disposal to be retained by facility operators. ▪ Bins/skips must be emptied regularly and collected by a licensed contractor for disposal at an appropriate, licensed facility. Bins/skips must not be allowed to overflow.							

7.3.3 DECOMMISSIONING PHASE

The decommissioning phase will be similar to the construction phase as large vehicles will be on site and earth will be moved. Erosion and sedimentation, and soil contamination are the most likely negative potential impacts.

7.4 GEOLOGY

7.4.1 POTENTIAL GEOTECHNICAL RISKS

The results of the investigation revealed the following potential geotechnical risks:

Primary risks:

- Dolomite land.
- Slope instability.
- Slightly to highly expansive shale (movement between 15 and in excess of 25 mm).
- Slightly to moderately compressible soil-like overburden (movement of between 15 and in excess of 150 mm).
- Variable unknown bearing capacity.

Secondary constraints:

- Mining induced seismicity.
- Highly corrosive and aggressive nature of the material tested.
- Unknown source of fill material.
- Potentially complicated groundwater-surface water interaction with dolomite and subsequent dissolution, karstification and overburden subsidence or instability.

Although the project area exhibits geotechnical characteristics deemed to have an adverse effect on the proposed development, these characteristics do not disqualify the site from being used, but rather require the strict implementation of site-specific precautionary measures with regard to design and construction.

Table 7-9 – Potential geotechnical risks during construction

Potential Impact: Slope instability Mining induced seismicity Dolomite land Expansive geology	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	5	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	1	4	**22**	**Low**	(-)
Mitigation and Management Measures	▪ The extent of and depth to competent bedrock should be determined. A (Multichannel Analysis of Surface Waves) MASW geophysical survey should be considered. ▪ The extent of the fill embankment and slope stability along the perimeter of the project area should be confirmed or defined, depending on the layout and load of the proposed WTP. ▪ The source and extent of fill material should be confirmed, especially with regards to waste and potentially hazardous waste products and legislation. ▪ A dolomite stability investigation should be conducted in order to determine the inherent hazard of the dolomite and subsequent potential loss of support, especially due							

Potential Impact: Slope instability Mining induced seismicity Dolomite land Expansive geology	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
to the acid groundwater-surface water-dolomite interaction over time. This study should include a micro-gravity survey and the drilling of at least 3 to 4 boreholes as a first phase. ▪ Detailed relevant geotechnical footprint investigations beneath proposed structures should be conducted as and where deemed necessary. <u>Foundations</u>: ▪ Founding of intricate or heavy load bearing structures is not recommended within the soil-like overburden without a carefully designed solution. ▪ Provision should be made in the design and construction for the variable and potentially limited bearing capacity of the entire soil-like overburden. ▪ Structures should take cognisance of the heave and settlement characteristics of the soil-like overburden material, especially differential movement, and the varying nature of the different soil horizons. ▪ Inferred high corrosivity and aggressivity of the soil moisture within the soil-like overburden with regard to steel and concrete should be considered during design and construction. ▪ The design of structures should take cognizance of the potential loss of support due to the formation of subsidence and/or sinkholes in dolomite. ▪ The extent and stability of the fill embankment on the outer perimeter of the project area should inform the design of foundations. ▪ Structural designs should take cognizance of the potential mining induced seismicity within the project area. <u>Earth works</u>: ▪ The soil-like overburden is deemed unsuitable for use as fill in its natural state. Although the material tested as G7 and G8 (TRH 14), the corrosiveness and aggressiveness of the material tested high to very high. The extent of the different fill material horizons is variable. The in-situ soil-like material is not deemed suitable as founding or construction material in its natural state. ▪ Material should be sourced commercially. <u>Drainage</u>: ▪ Proper site drainage is essential to prevent seasonal ponding of surface water and large-scale changes in soil moisture beneath and near the structure.							

Potential Impact: Slope instability Mining induced seismicity Dolomite land Expansive geology	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	▪ Incorporation of suitable damp-proofing measures within the foundation is essential to protect against the effects of rising damp.						

7.5 TERRESTRIAL BIODIVERSITY

7.5.1 CONSTRUCTION PHASE

7.5.1.1 Direct loss and disturbance of vegetation

The development of the WTP will occur on transformed land within the existing Mining Right of the NJVM. However, the footprint of the proposed discharge pipeline is undisturbed and will result in the loss and disturbance of vegetation.

Table 7-10 – Direct loss and disturbance of vegetation

Potential Impact: Direct loss and disturbance of vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	5	5	60	Moderate	(-)
With Mitigation	2	1	3	1	3	21	Low	(-)
Mitigation and Management Measures	▪ Vegetation clearing should be restricted to the proposed project infrastructure footprints only. ▪ The footprints to be cleared should be clearly demarcated prior to construction to prevent clearing outside of this area. ▪ Prior to the commencement of construction works, a dedicated vegetation and flora survey should be carried out to identify any indigenous plant or tree species that can be preserved for use in rehabilitation activities and map the locations of AIS so that these can be managed before they are inadvertently spread via earthworks during construction. ▪ As appropriate, barrier/fences should be erected to prevent fauna gaining access to construction and operational areas where they have a high probability of being killed or injured. ▪ A low-speed limit (recommended 20 km/h in areas of highest risk e.g. where roads are located near riparian/wetland habitat) should be enforced to reduce the risk of potential wildlife collisions.							

Potential Impact: Direct loss and disturbance of vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	▪ The handling, poisoning or killing of fauna by construction workers must be strictly prohibited. ▪ Following completion of construction, all litter, building rubble, etc. must be removed and disposed of at an appropriate site. ▪ Any areas that were cleared of topsoil must be revegetated and the site left in a safe, stable and environmentally friendly condition. ▪ Soils should be replaced around excavated/disturbed areas in the correct order, i.e. subsoils at the bottom, topsoils on the top. ▪ If any indigenous plant species were removed from the site prior to construction, these should be replanted, with locations for planting to be specified, and planting overseen by a ecologist or botanist. ▪ Any remaining areas of bare soils must be overseeded with an appropriate grass seed mix including a binding creeping grass and a nurse species selected for its rapid growth properties to provide stability to the disturbed soils. If necessary, seeded areas should be further stabilised with a biodegradable (jute) mesh that is pegged in place. The seed mixture should be manually sown over the prepared soils. ▪ Any imported plants used for revegetation purposes should match the indigenous vegetation of the area.						

7.5.1.2 Establishment and spread of alien and invasive plant species

Disturbances caused by earth works during construction will facilitate the spread of alien invasive species that are already established at the site. Alien plant infestations can spread exponentially, suppressing or replacing indigenous vegetation, which could result in the impairment of ecosystem functioning and loss of biodiversity, and could also compromise vegetation restoration efforts subsequent to completion of construction.

Development of a site alien vegetation management plan to mitigate and prevent spread during construction and operation is expected to reduce the probability of the impact occurring, resulting in a residual impact of low significance.

Table 7-11 – Establishment and spread of alien and invasive plant species

Potential Impact: Establishment and spread of alien and invasive plant species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	5	5	**60**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ An alien invasive species control programme must be developed, or any existing AIS management programmes expanded, to include the active control of alien invasive species that may establish/spread as a result of proposed project activities. ▪ Alien and invasive species management to be prioritised for the following alien and invasive species control areas: • Areas where vegetation cover is disturbed. • Areas where soils imported from external sources are applied. • All rehabilitated areas. • Areas within the development area that are already invaded by alien species. • Road fringes.							

7.5.1.3 Injury and mortality of faunal species

The bulk earthworks involved in site development have the potential to injure/kill individual faunal species of concern that may be present in the study area. In particular, this impact could affect small mammals and reptile species that are ground-dwelling and relatively slow moving, and as such are vulnerable to heavy machinery movements and site clearance activities. The bulk earthworks and associated heavy machinery activity could also affect breeding fauna (e.g. nesting birds) through sensory disturbances which may reduce the quality/desirability of the currently established breeding sites/dens in nearby areas.

Without mitigation, the magnitude of the potential impact on fauna and the probability of occurrence of impacts on fauna are both expected to be low due to the low suitability of the on-site habitats for fauna support, amounting to an impact of low significance. Once mitigation measures are implemented, the magnitude and probability of the potential impact occurring can be further reduced, resulting in a residual impact of very low significance.

Table 7-12 – Injury and mortality of faunal species

Potential Impact: Injury and mortality of faunal species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)
With Mitigation	2	2	3	1	1	**8**	**Very Low**	(-)
Mitigation and Management Measures	▪ Employees and contractors should be made aware of the presence of, and rules regarding fauna through suitable induction training and on-site signage. ▪ Movement across the Project area should be facilitated by providing suitably sized gaps in fencing and/or culverts/passageways under roads for fauna.							

7.5.2 OPERATIONAL PHASE

7.5.2.1 Spread of alien and invasive plant species

The spread of alien invasive species in, and immediately adjacent to the project site will continue to be an impact of concern during the operational phase. Areas of disturbance such as the discharge pipeline site is susceptible to the establishment of alien invasive species. Considering that at baseline, alien invasive species were already present, this impact could be of high magnitude, and extend to the local geographic scale. This impact is potentially of long-term duration, ceasing with the decommissioning and rehabilitation of the project site. Prior to the implementation of recommended measures, this impact will be of moderate impact significance; but can be reduced to a low impact significance following the implementation of the required mitigation measures.

Table 7-13 – Spread of alien and invasive plant species

Potential Impact: Spread of alien and invasive plant species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)
With Mitigation	2	1	3	4	3	**30**	**Low**	(-)
Mitigation and Management Measures	▪ An alien invasive species control programme must be developed, or any existing AIS management programmes expanded, to include the active control of alien invasive species that may establish/spread as a result of proposed Project activities. ▪ Alien and invasive species management to be prioritised for the following alien and invasive species control areas:							

Potential Impact: Spread of alien and invasive plant species	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	• Areas where vegetation cover is disturbed. • Areas where soils imported from external sources are applied. • All rehabilitated areas. • Areas within the development area that are already invaded by alien species. • Road fringes.						

7.5.2.2 Loss and fragmentation of fauna habitat

Some fauna habitat will be permanently lost immediate vicinity of the discharge pipeline due to the presence of the pipeline, which will interrupt habitat continuity particularly for smaller, less mobile fauna species, such as invertebrates and ground-dwelling mammals, if present. The magnitude of the potential impact is considered low, and the likelihood of the impact occurring is also considered low, since the site is already surrounded by the mine, and as such is already isolated from nearby areas of natural habitat – resulting in an impact of low significance prior to mitigation. With the successful implementation of the recommended mitigation measures, it is anticipated that the potential magnitude and probability of the impact occurring can be further reduced.

Table 7-14 – Loss and fragmentation of faunal habitat

Potential Impact: Loss and fragmentation of fauna habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	5	2	**24**	**Low**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ The working construction area should be clearly demarcated and construction works is not to extend into the surrounding receiving environment. ▪ Unnecessary disturbance to the vegetation must be strictly prohibited. ▪ Construction personnel must take special care when working in the vicinity of the Adit Stream as the surrounding riparian habitat is undisturbed and may serve as a habitat for various small faunal species.							

7.5.3 DECOMMISSIONING PHASE

7.5.3.1 Spread of alien and invasive plant species

Site closure/rehabilitation activities as part of the decommissioning phase of the project are likely to facilitate spread of invasive plant species, through frequent vehicular movements, earth moving works, and the creation of bare ground conditions ideal for the establishment of self-seeding, highly invasive plants.

The magnitude of the potential impacts is considered moderate, and the extent of impacts could be local as site closure/rehabilitation works could facilitate the spread of these species along the road network within the locality; spread of these species could also occur via wind and bird dispersal. The duration of the impact is considered permanent, resulting in an impact of Moderate significance prior to mitigation; however, the impact can be reduced to one of Low significance with the implementation of the specified mitigation measures.

Table 7-15 – Spread of alien and invasive plant species

Potential Impact: Spread of alien and invasive plant species	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	2	3	5	5	**60**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ An alien invasive species control programme must be developed, or any existing AIS management programmes expanded, to include the active control of alien invasive species that may establish/spread as a result of proposed Project activities. ▪ Alien and invasive species management to be prioritised for the following alien and invasive species control areas: • Areas where vegetation cover is disturbed. • Areas where soils imported from external sources are applied. • All rehabilitated areas. • Areas within the development area that are already invaded by alien species.							

7.6 SURFACE WATER

7.6.1 CONSTRUCTION PHASE

7.6.1.1 Sedimentation and siltation of water resources

The following impacts on surface water have been identified during the construction phase:

- Sedimentation and siltation of surface water resources may result in deteriorated water quality.
- Dust generation may lead to the siltation of the nearby rivers.

Table 7-16: Sedimentation and siltation of water resources

Potential Impact: Sedimentation and siltation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	5	60	Moderate	(-)
With Mitigation	2	2	3	5	2	24	Low	(-)
Mitigation and Management Measures	▪ Site preparation for the proposed infrastructure should be confined to demarcated footprint areas to minimise soil disturbance and the probability of sedimentation and siltation of nearby watercourses. ▪ Construction should be undertaken during the dry period to minimise soil erosion by overland flow and subsequent sedimentation in nearby watercourses since there will be minimal to no occurrence of rainfall during this period. ▪ Install effective sediment and erosion control measures before starting work to minimise sediment entry into the watercourse, such as erosion berms or silt traps. ▪ Implement erosion management at construction sites to reduce the velocity of water flowing downslope. This can be done by implementing a series of berms across the construction site after vegetation clearance, which can be removed as construction progresses. ▪ Disturbed areas remaining after construction activities should be rehabilitated timeously. ▪ Regularly monitor TSS, TDS, turbidity, oils, and grease in surface waters upstream and downstream of construction activities to facilitate the prompt implementation of remedial actions, if necessary.							

7.6.1.2 Contamination of surface water resources

Contamination of water resources by unplanned spills or leaks during construction or excavation and runoff from contaminated surfaces.

Table 7-17: Contamination of surface water resources

Potential Impact: Contamination of surface water resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	3	4	52	Moderate	(-)
With Mitigation	2	2	3	3	2	20	Low	(-)

Potential Impact: Contamination of surface water resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
Mitigation and Management Measures	▪ All storage areas for fuels, grease, and oils used during construction activities should be appropriately bunded and spill kits should be in place. ▪ Construction workers should be trained in using spill kits, to contain and immediately clean up any potential leakages or spills. ▪ Administer timely clean-ups in the event of spillages occurring. ▪ Washing and servicing of vehicles and machinery should be undertaken at designated, appropriately designed areas						

7.6.1.3 Alteration of channel geometry

The construction of the pipeline and the discharge infrastructure will result in the alteration of channel geometry.

Table 7-18: Alteration of channel geometry

Potential Impact: Alteration of channel geometry	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	5	4	60	Moderate	(-)
With Mitigation	2	1	3	2	3	24	Low	(-)
Mitigation and Management Measures	▪ Channel bed and banks should be re-profiled after installation of linear infrastructure to enable flows to continue undisturbed. ▪ The natural channel slopes should be maintained to limit or prevent increased flow velocity. ▪ Energy dissipators should be installed to reduce flow velocity.							

7.6.2 OPERATIONAL PHASE

7.6.2.1 Alteration in flow rate and stream quality from the WTP discharge into the stream

The operation of the WTP is expected to have a positive impact on the water quality as only treated water will be discharged into the stream. The operation of the WTP will eliminate the controlled discharge of untreated water into the receiving environment during high rainfall periods when the pits are full and require decanting.

Table 7-19: Alteration of flow and water quality

Potential Impact: Alteration of flow and water quality after discharge	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	3	4	4	60	Moderate	(-)
With Mitigation	2	2	3	2	2	18	Low	(-)
Mitigation and Management Measures	▪ Ensure adherence to daily discharge limits in terms of flow. ▪ Ensure that discharge quality complies with the catchment water quality objectives. ▪ Regular inspections must be conducted to identify any compromise of infrastructure, especially pipelines and pumps, that requires repairs. Inspection checks must be added to the maintenance procedure.							

7.6.2.2 Contamination of surface water resources

Water resources could be contaminated by unplanned spills from pipelines or leaks during operation, or as a result of discharge of inadequately treated water from the WTP.

Table 7-20: Contamination of surface water resources

Potential Impact: Contamination of surface water resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	4	56	Moderate	(-)
With Mitigation	2	2	3	2	2	18	Low	(-)
Mitigation and Management Measures	▪ Administer timely clean-ups in the event of spillages occurring. ▪ Washing and servicing of vehicles and machinery should be undertaken at designated, appropriately designed areas							

7.6.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase. The following mitigation measures must be adhered to during the decommissioning phase:

- Re-profile the rehabilitated landscapes to suit desired post-mining land use as much as is practically possible.

- Demolition should be undertaken during the dry winter to reduce sedimentation in the proximal watercourses since there will be minimal to no rainfall during this period and ensure the immediate revegetation of cleared areas.
- Maintain the sediment and erosion control measures until demolition and rehabilitation activities are completed to minimise sediment entry into watercourses.
- Minimise the footprint of disturbance, as far as practicable. Demarcate the proposed areas for rehabilitation and closure works to minimise the unnecessary expansion of the footprint of disturbance, movement of vehicles and machinery should be confined to designated haul and access roads, as far as practicable.
- Strategic removal of surface infrastructure should be implemented so that potentially contaminated runoff is diverted away from designated clean water areas. This may be achieved by temporarily retaining stormwater infrastructure to divert dirty water from clean areas while the potentially contaminating sources are decommissioned.
- Care must be taken during flushing and cleaning of the feedwater pipelines as it could result in contamination.
- Use of accredited contractors for removal or demolition of infrastructure during decommissioning is recommended; this will reduce the risk of waste generation and accidental spillages.
- All personnel should be trained to handle hazardous chemical waste to minimise spillages. The use of spill kits is highly recommended. All storage facilities should be bunded.
- Washing and servicing of vehicles and machinery should only be undertaken at designated, appropriately designed areas.
- Administer effective and timely clean-ups in the event of spillages occurring.
- Ensure maintenance and management of remaining infrastructure and stormwater infrastructure around the area to prevent water quality contamination from runoff from the remaining areas.
- Ensure that the infrastructure (e.g., pipelines, fuel storage areas) are first emptied of all residual material before decommissioning.

7.7 AQUATIC BIODIVERSITY

7.7.1 CONSTRUCTION PHASE

The main foreseeable aquatic-related impacts associated with the construction phase are vegetation clearing, soil disturbance and the establishment of infrastructure. Vegetation clearing and soil disturbances result in bare land which increase surface runoff, erosion and subsequently the amount of suspended and dissolved solids and potentially pollutants from the construction site and or areas down gradient of the construction site (hazardous substances from unearthed soil, cement, and concrete composites) entering the associated watercourses. Similarly, the main impact associated with the establishment of infrastructure, is the mobilisation of pollutants and sediments that reach associated watercourses.

7.7.1.1 Impact of run off and clearing on aquatic habitats

Erosion and runoff into the associated aquatic ecosystems can result in increased sedimentation and degradation of habitat. This can directly alter aquatic habitats after deposition, which in turn will negatively impact biotic community structures by displacing biota that favour the affected habitat. Suspended solids can also directly impact aquatic biota through the accumulation of silt on respiratory organs (i.e. gills) and by decreasing visibility (i.e. increasing turbidity), which will affect feeding habits of specific taxa. Erosion and runoff from cleared land can also alter water quality by increasing

turbidity, as aforementioned, and by increasing the number of contaminants entering the watercourses. This is expected to alter the physio-chemistry of water and deter water quality sensitive biota.

Vegetation clearing near watercourses can result in the introduction of alien invasive species (both fauna and flora) which often negatively impact indigenous species. This can lead to the loss of invertebrates such as dragonflies, which in turn, has the potential to alter biological community structure. Most alien invasive trees are taller and characterised by a greater root depth and are responsible for the increased uptake of water thereby decreasing both surface water runoff and groundwater recharge. This can significantly affect hydrological conditions and river flows.

Vegetation clearing along the proposed pipeline route and the construction of the WTP and pipeline installation were the identified activities associated with the construction phase of the project.

The clearing of vegetation along the proposed pipeline route will pose risks including: contaminants (unearthed soil, oil spills etc.) reaching nearby watercourses and the introduction of alien invasive species. These impacts will lead to water quality and habitat modifications and subsequently the loss of biodiversity, i.e. through the increase in turbidity, sedimentation and loss of indigenous vegetation. Potential impacts upon the receptors (Adit stream and Mngubhudle River) were determined to be Moderate pre-mitigation and Very low post-mitigation.

Similarly, construction of the WTP and installation of the pipeline will pose risks including: contaminants (oil spills, cement and other construction material) reaching the Adit stream. These impacts will lead to water quality modifications, negatively affecting inhabiting biota within downstream reaches of the Mngubhudle catchment. Potential impacts upon the receptors were determined to be Moderate pre-mitigation and Very low post-mitigation.

These impacts can be reduced by avoiding the rainy season, and through effective implementation of the other recommended sediment and pollutant control mitigation measures.

Table 7-21: Impact of runoff on aquatic habitats

Potential Impact: Impact of runoff on aquatic habitats Risk of contaminants reaching watercourses (unearthed soil, oil spills etc.) leading to water quality and habitat modifications. Risk of erosion, an increase in flows due to bare surfaces and the introduction of alien invasive species.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	3	3	2	4	**44**	**Moderate**	(-)
With Mitigation	1	1	3	1	1	**6**	**Very Low**	(-)
Mitigation and Management Measures	▪ Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, vegetation areas (riparian or aquatic related) should be revegetated as soon as possible.							

Potential Impact: Impact of runoff on aquatic habitats Risk of contaminants reaching watercourses (unearthed soil, oil spills etc.) leading to water quality and habitat modifications. Risk of erosion, an increase in flows due to bare surfaces and the introduction of alien invasive species.	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
▪ Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure. ▪ Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction. ▪ Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow. ▪ Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses. ▪ Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions. ▪ All vehicles must be frequently inspected for leaks. ▪ No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed project and must be removed immediately without destroying habitat. ▪ All waste must be removed and transported to appropriate waste facilities. ▪ If possible, high rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.							

7.7.2 OPERATIONAL PHASE

The main foreseeable aquatic-related impacts associated with the operational phase are: discharging water into the Adit Stream, altering the hydrological regime of the Mngubhudle River and downstream reaches. Discharging inadequately treated mine water and the management and maintenance activities such as the maintenance of infrastructure, vegetation clearing around the WTP and pipeline, handling and disposal of general and hazardous waste pose risks such as water quality deterioration and the spread of alien invasive species within areas down gradient of the project site.

The disruption of flow in terms of natural flow levels and in-flow patterns is considered the most significant impact for aquatic biota. Other impacts include the alteration of water temperature, distribution of nutrients. Intermittent water releases will have impacts including: increase in erosion, sediment increase, and habitat destruction which will in turn will negatively affect the aquatic biota.

Furthermore, increased anthropogenic activities near watercourses increase the risk of introducing alien invasive species. Introduced fish species threaten local fish populations, through predation and habitat destruction for example. The continued spread of alien trees invading riparian zones will decrease river flows through uptake of water, thereby altering the hydrological regime of the watercourses.

Table 7-22: Impact of changes in surface water flow on aquatic habitats

Potential Impact: Altering the natural flow regime.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	5	4	**60**	**Moderate**	(-)
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ Impact mitigation on surface water to be implemented. ▪ It must be ensured that the flow regime defined in the Ecological Water Reserve (EWR) is maintained to support aquatic biota within the downstream watercourses. ▪ Runoff from the WTP site should not be allowed to flow into the nearby watercourses, unless authorised by the DWS (or the competent authority). ▪ Storm water runoff from the WTP site must be managed in accordance with a storm water management plan to ensure that erosion and release of runoff containing contaminants to the environment is limited. ▪ Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.							

7.7.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

7.8 HERITAGE AND CULTURAL RESOURCES

No new heritage sites were identified during the survey and hence no impacts on heritage and cultural resources are anticipated. The following recommendations were however made by the specialist in the HIA:

- During past relocation of graves within the Nkomati Mine, the mortal remains from a cemetery were moved to a new cemetery located at the coordinates of 25°45'19.5"S 30°37'10.9"E. The applicant needs to ensure that this cemetery is not impacted by the proposed WTP development.
- It should be noted that the subterranean presence of archaeological and/or historical sites, features or artefacts is always a distinct possibility. Care should therefore be taken when

development commences that if any of these are discovered, work on site cease immediately and a qualified archaeologist be called in to investigate the occurrence.

- In this regard the following 'Chance find Procedure' should be followed:
  - Upon finding any archaeological or historical material all work at the affected area must cease.
  - The area should be demarcated to prevent any further work there until an investigation has been completed.
  - An archaeologist should be contacted immediately to provide advice on the matter.

7.9 PALAEONTOLOGY

The proposed WTP footprint is located on an already highly disturbed site, therefore it is very unlikely that any fossils remain. Since there is minimal chance of fossils occurring in the project footprint, the specialist requested exemption from any further Palaeontological Impact Assessment (PIA).

The palaeontology chance find protocol must be implemented in the event of discovering fossils:

- Upon finding any fossils all work at the affected area must cease.
- The area should be demarcated to prevent any further work there until an investigation has been completed.
- A palaeontologist should be contacted immediately to provide advice on the matter.

7.10 TRAFFIC

7.10.1 CONSTRUCTION PHASE

Due to the proposed location and nature of the project, traffic related impacts are already being experienced in the vicinity of the site. The project will require approximately 1 or 2 trucks per day during the construction phase, which is anticipated to result in an impact of negligible significance.

7.11 SOCIAL IMPACT ASSESSMENT

7.11.1 CONSTRUCTION PHASE

The construction phase of the project will extend over a period of approximately 12 months and create approximately 25 employment opportunities (5 new skilled and 20 new unskilled). Members from the local communities in the area would be in a position to qualify for most of the low skilled and semi-skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. The potential for influx of foreigners into the local communities seeking employment opportunities is considered to be low, given the nature and location of the proposed project. Nuisance impacts such as dust, noise and traffic on surrounding landowners and neighbouring communities are anticipated to be of low significance.

Table 7-23 – Impact on employment opportunities during the construction phase

Potential Impact: Employment opportunities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	1	2	5	**30**	**Low**	(+)
With Mitigation	1	2	1	2	5	**30**	**Low**	(+)
Mitigation and Management Measures	▪ Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment. ▪ Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. ▪ The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. ▪ Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. ▪ The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.							

Table 7-24 – Impact of influx of people during the construction phase

Potential Impact: Influx of people	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	3	2	3	**24**	**Low**	(-)
With Mitigation	1	2	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ A 'locals first' policy with regard to construction and operational labour needs. ▪ The community and surrounding businesses should be able to contact the site manager or his/her representative to report any issues which they may have. The site manager and his/her representative should be stationed within the area and should therefore be available on hand							

	to deal with and address any concerns which may be raised. ▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes. ▪ The applicant and the contractors should develop a Code of Conduct for the project. The code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers. For example, access to land that is not part of the development will not be allowed.

Table 7-25 – Nuisance impacts on surrounding landowners and neighbouring communities during the construction phase

Potential Impact: Nuisance impacts such as dust, noise and traffic on surrounding landowners and neighbouring communities	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	3	3	2	3	**30**	**Low**	(-)
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ No construction workers, with the exception of security personnel, should be allowed to stay on the site overnight. ▪ The surrounding landowners should be able to contact the site manager to report any issues which they may have. The site manager should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised. ▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes. ▪ The applicant should develop a Code of Conduct for the project. The Code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers. ▪ The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis. ▪ The applicant should implement measures to assist and, if needed, fairly compensate affected surrounding landowners whereby damages to property as a result of construction activities.							

7.11.2 OPERATIONAL PHASE

Although the WTP serves as mitigation to the potential decant of untreated water into the receiving environment, should, in an unforeseen event, the water not be treated to an acceptable water quality for discharge to the environment, existing water users in the catchment could be affected.

The applicant will therefore need to ensure that the discharged water meets the required water quality for discharge to the environment to prevent impacts on other water users. If adequately treated and tested, the discharged water is expected to improve the overall water quality of the Adit stream and Gladdespruit over the long term.

Other potential impacts include:

- Nuisance impacts on surrounding landowners and communities as a result of dust, noise and traffic (**Table 7-27**).

Table 7-26 – Impact of discharge of inadequately treated water on other water users in the area

Potential Impact: Impact on other water users in the area	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	4	4	**44**	**Moderate**	(-)
With Mitigation	2	2	3	2	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	▪ Water quality monitoring should continue downstream and upstream of the discharge point to ensure compliance with the Water Quality Planning Limits (WQPL) applicable to the Gladdespruit and surrounding streams in the catchment.							

Table 7-27 – Impact on surrounding landowners during the operational phase

Potential Impact: Surrounding landowners and communities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	3	2	3	**30**	**Low**	(-)
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operational processes.							

Potential Impact: Surrounding landowners and communities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	▪ These are to be investigated and rectified in accordance with the appropriate operational policies associated with the proposed chemical warehouse.							

7.11.3 DECOMMISSIONING PHASE

Although some employment opportunities will be generated as a result of decommissioning activities, the permanent employees at the WTP will lose their job which will impact on the household income (if not re-deployed to the mine). Nuisance impacts on surrounding landowners and communities as a result of dust, noise and traffic from decommissioning activities are also likely. These will be the same as for the construction phase.

Table 7-28 – Impact of job loss and household income

Potential Impact: Job loss and household income	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	2	3	**24**	**Low**	(-)
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ Implement training and skills transfer during operations to increase opportunities for re-deployment							

Table 7-29 – Nuisance impacts on surrounding landowners and neighbouring communities during the construction phase

Potential Impact: Nuisance impacts such as dust, noise and traffic on surrounding landowners and neighbouring communities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	3	2	3	**30**	**Low**	(-)
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ No workers, with the exception of security personnel, should be allowed to stay on the site overnight. ▪ The surrounding landowners should be able to contact the site manager to report any issues which they may							

	have. The site manager should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised. ▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes. ▪ The applicant should develop a Code of Conduct for the project. The Code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers. ▪ The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis. ▪ The applicant should implement measures to assist and, if needed, fairly compensate affected surrounding landowners whereby damages to property as a result of construction activities.

8 CUMULATIVE IMPACT ASSESSMENT

Although the objective of the EIA process is to undertake an impact and risk assessment process, inclusive of cumulative impacts, which is essential to assessing and managing the environmental and social impacts of projects, it may be insufficient for identifying and managing the incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed project. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts. Within this context, it is important to understand that the proposed WTP will be developed within a mining area that has been subjected to mining related impacts for many years, albeit opencast mining is in currently non-operational.

8.1 SOIL, LAND USE AND CAPABILITY

The general area for which the proposed development is planned is already transformed with exception to the discharge pipeline and discharge structure in the vicinity of the Adit Stream. As the site is already transformed by previous mining activities, only the potential impacts of erosion and sedimentation, and contamination in the vicinity of the discharge pipeline and structure are likely to cumulatively add to those of surrounding activities, and only if mitigation and monitoring requirements are not undertaken adequately.

Table 8-1 – Cumulative impact on soil

Potential Impact: Soil erosion, sedimentation and contamination	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	3	4	**44**	**Moderate**	(-)
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ All mitigation measures relating to soil erosion, sedimentation and contamination presented within the impact assessment section of this report must be implemented for the impact significance to be reduced to low for cumulative impacts.							

8.2 TERRESTRIAL BIODIVERSITY

Permanent loss of habitat as a result of discharge pipeline will contribute to cumulative impacts of loss in this locality. However, given the widespread transformation of the area due to plantation and mining related activities the significance of the impact is expected to be low after mitigation.

Table 8-2 – Cumulative Impact on Terrestrial Biodiversity

Potential Impact: Cumulative Impact on Terrestrial Biodiversity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ All mitigation measures relating to flora and fauna presented within the impact assessment section of this report must be implemented for the impact significance to be reduced to low for cumulative impacts.							

8.3 AQUATIC BIODIVERSITY AND SURFACE WATER

Presently, the primary land-use activities within the project area are those associated with forestry plantations. Illegal mining activities have been observed to occur in the study area. Potential impacts associated with the above-mentioned land use activities include water quantity alterations (presence of farm dams, water abstraction for irrigation and uptake of water by the plantations); water quality deteriorations (contamination due to diffuse surface runoff), vegetation clearing and the introduction of exotic species, and solid waste disposal.

Consequently, increased sedimentation and invasive species encroachment within riparian zones within the reaches of the Mngubhudle River as a result of the proposed WTP project could cumulatively contribute to existing impacts. However, the discharge of treated water from the WTP to the Adit Stream and Gladdespruit could improve the water quality of the streams over the long term, which are currently impacted by illegal mining activities and other potential contributors to water quality deterioration.

Table 8-3: Cumulative impacts on surface water quality, flow and quantity

Potential Impact: Cumulative impacts on surface water quality, flow and quantity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	3	5	**45**	**Moderate**	(-)
With Mitigation	2	1	3	3	2	**12**	**Low**	(-)
Mitigation and Management Measures	▪ All mitigation measures relating to surface water and aquatic biodiversity presented within the impact assessment section of this report must be implemented for the impact significance to be reduced to low for cumulative impacts.							

8.4 NO GO ALTERNATIVE

Should the proposed WTP not be constructed and operated, untreated decant water from the mine will be released into the receiving environment, resulting in negative impacts on surface water resources, aquatic biodiversity and other water users.

Table 8-4: Decanting of untreated water into the receiving environment

Potential Impact: Decanting of untreated water into the receiving environment	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	5	5	5	90	High	(-)
With Mitigation (construction and operation of the WTP)	3	3	1	5	5	60	Moderate	(+)

9 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).

The conclusions of this EIA are the result of comprehensive assessments. These assessments were based on issues identified through the EIA process and public participation undertaken to date. The EIR 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 EIR will be updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

9.1 IMPACT SUMMARY

It is anticipated that all impacts associated with the proposed project can be reduced to low significance provided the recommended mitigation measures as presented within this EIR and the associated specialist studies are implemented. The table below is a summary of the impacts associated with the proposed project.

Table 9-1 – Summary of impacts associated with the proposed project

Aspect	Impact Description	Character	Without Mitigation	With Mitigation
Construction Phase				
Air Quality	Impact on air quality during construction	Negative	**Moderate**	**Low**
Noise and Vibration	Impact on ambient sound levels during construction	Negative	**Low**	**Low**
Soil	Increased erosion and sedimentation	Negative	**Moderate**	**Low**
	Soil Contamination	Negative	**Moderate**	**Low**

Aspect	Impact Description	Character	Without Mitigation	With Mitigation
Geology	Geotechnical Constraints relating to slope instability, mining induced seismicity, dolomite land expansive geology	Negative	**Moderate**	**Low**
Terrestrial Biodiversity	Direct loss and disturbance of vegetation	Negative	**Moderate**	**Low**
	Establishment and spread of alien and invasive plant species	Negative	**Moderate**	**Low**
	Injury and mortality of faunal species	Negative	**Low**	**Very Low**
Surface water	Sedimentation and siltation of water resources	Negative	**Moderate**	**Low**
	Contamination of surface water resources	Negative	**Moderate**	**Low**
	Alteration of channel geometry	Negative	**Moderate**	**Low**
Aquatic Biodiversity	Impact of run off and clearing on aquatic habitats	Negative	**Moderate**	**Low**
	Impact of changes in surface water flow on aquatic habitats	Negative	**Moderate**	**Low**
Heritage	No impact	N/A	N/A	N/A
Palaeontology	No impact	N/A	N/A	N/A
Traffic	Road degradation	Negative	**Moderate**	**Low**
	Dust	Negative	**Low**	**Low**
	Intersection safety	Negative	**Low**	**Low**
Social Impacts	Improved household income	Positive	**Low**	**Low**
	Influx of people	Negative	**Moderate**	**Low**
	Surrounding landowners	Negative	**Low**	**Low**
Waste Management	Improper waste management during construction	Negative	**Moderate**	**Low**
	Improper disposal of sanitation waste	Negative	**Moderate**	**Low**
Operational Phase				
Soil	Soil contamination	Negative	**Moderate**	**Low**
Terrestrial Biodiversity	Spread of alien and invasive plant species	Negative	**Moderate**	**Low**
	Loss and fragmentation of fauna habitat	Negative	**Low**	**Low**

Aspect	Impact Description	Character	Without Mitigation	With Mitigation
Surface Water	Alteration of flow and water quality as a result of discharge into the Adit Stream	Negative	**Moderate**	**Low**
Surface Water	Contamination of surface water resources as a result of unplanned leaks	Negative	**Moderate**	**Low**
Aquatic Biodiversity	Impact of changes to surface water flow on aquatic habitats	Negative	**Moderate**	**Low**
	Surrounding landowners	Negative	**Low**	**Low**
	Impact on other water users in the area (if water is not adequately treated before discharge)	Negative	**Moderate**	**Very Low**
Waste Management	Improper waste management during operation	Negative	**Moderate**	**Low**
Decommissioning Phase				
Noise	Impact on ambient sound levels during decommissioning	Negative	**Low**	**Low**
Soil	Increased erosion and sedimentation	Negative	**Moderate**	**Low**
	Soil Contamination	Negative	**Moderate**	**Low**
Terrestrial Biodiversity	Spread of alien and invasive plant species	Negative	**Low**	**Low**
Surface water	Sedimentation and siltation of water resources	Negative	**Moderate**	**Low**
	Contamination of surface water resources	Negative	**Moderate**	**Low**
	Alteration of channel geometry	Negative	**Moderate**	**Low**
Aquatic Biodiversity	Impact of changes in surface water flow on aquatic habitats	Negative	**Moderate**	**Low**
Social Impacts	household income	Negative	**Low**	**Low**
Waste Management	Improper waste management during construction	Negative	**Moderate**	**Low**
	Improper disposal of sanitation waste	Negative	**Moderate**	**Low**
Cumulative Impacts				
Soil	Erosion, sedimentation and contamination	Negative	**Moderate**	**Low**

Aspect	Impact Description	Character	Without Mitigation	With Mitigation
Terrestrial Biodiversity	Permanent loss of vegetation and faunal habitat	Negative	**Low**	**Low**
Surface Water and Aquatic Biodiversity	Surface water quality and natural flow regime	Negative	**Moderate**	**Low**
No Go (no construction and operation of the WTP)				
Surface water resources	In the event that the WTP is not constructed and operated, the pits will decant untreated water into the receiving environment which will have significant impacts on surface water resources, aquatic biodiversity and other water users.	Negative	**High**	**Moderate (positive – when the WTP is constructed and operated)**

9.2 SITE SENSITIVITY

Table 9-2 and **Figure 9-1** illustrate the overall sensitivity of the site in relation to the proposed project, there were no no-go areas identified on the proposed site.

Table 9-2 - Environmental sensitivities identified by specialists

Specialist study	Sensitivity Rating/Fatal Flaw Analysis
Soil and land capability	The area is currently predominantly under forestry and mining related activities. These plantations range from: mature trees soon to be felled; through felled plantations ready to be replanted; to plantations with trees younger than 15 years. Although stoniness necessarily decreases the rate of growth of trees, the stony soils are relatively suited to afforestation. In places poor growth rate reflects the poor land use potential. No commercial agriculture production has taken place, but subsistence cattle farming was observed.
Surface Water	Generally, the water quality results for the rivers associated with the site indicate that the receiving surface water resources (i.e. point G and O) in the vicinity of the Project area shows general compliance to the WQPL/RQO, with minimal exceedances observed for few parameters. However, the Adit stream downstream of Pit 3 West (i.e. point D) has elevated levels for parameters such as Total Dissolve Solids (TDS), Sulphate (SO_4), Calcium (Ca), Electric Conductivity (EC), Free saline and Ammonia (NH_3), Zinc (Zn) and Copper (Cu), which exceed permissible limits. Some water quality impact has already reached Gladdespruit downstream of the Nkomati mining activity. Generally, the water quality results for the rivers indicate that the receiving surface water

Specialist study	Sensitivity Rating/Fatal Flaw Analysis
	resources (i.e. point G and O) in the vicinity of the Project area shows general compliance to the WQPL/RQO, with minimal exceedances observed for few parameters. However, the Adit stream downstream of Pit 3 West (i.e. point D) has elevated levels for parameters such as Total Dissolve Solids (TDS), Sulphate (SO_4), Calcium (Ca), Electric Conductivity (EC), Free saline and Ammonia (NH_3), Zinc (Zn) and Copper (Cu), which exceed permissible limits. Some water quality impact has already reached Gladdespruit downstream of the Nkomati mining activity.
Aquatic Ecology	The assessed systems have low aquatic biodiversity, likely attributed to cumulative impacts associated with historical and present land use activities, which included mainly mining and forestry plantations. Furthermore, the macroinvertebrate assemblages collected as part of the site survey were dominated by pollution-tolerant taxa, thus indicating that water quality modifications have influenced instream aquatic biota over long periods.
Terrestrial Ecology	Most of the study area is transformed as a result of previous mining activities. The site is situated outside of natural areas and sensitive ecosystems and is considered disturbed in terms of the Mpumalanga Biodiversity Sector Plan. The footprint associated with the discharge pipeline and structure in the vicinity of the Adit Stream is relatively undisturbed however the significance of impacts after mitigation can be reduced to low.
Heritage	The site is very low in sensitivity.
Palaeontology	The site is considered historically Very High in paleo-sensitivity; however, given the already exerted impacts to the receiving environment to the site, the site is now considered to be of Low sensitivity.
Geotechnical	Geotechnical constraints were identified however these constraints did not render the project fatally flawed and can be mitigated with the prescribed recommendations as found within the Geotechnical Assessment.

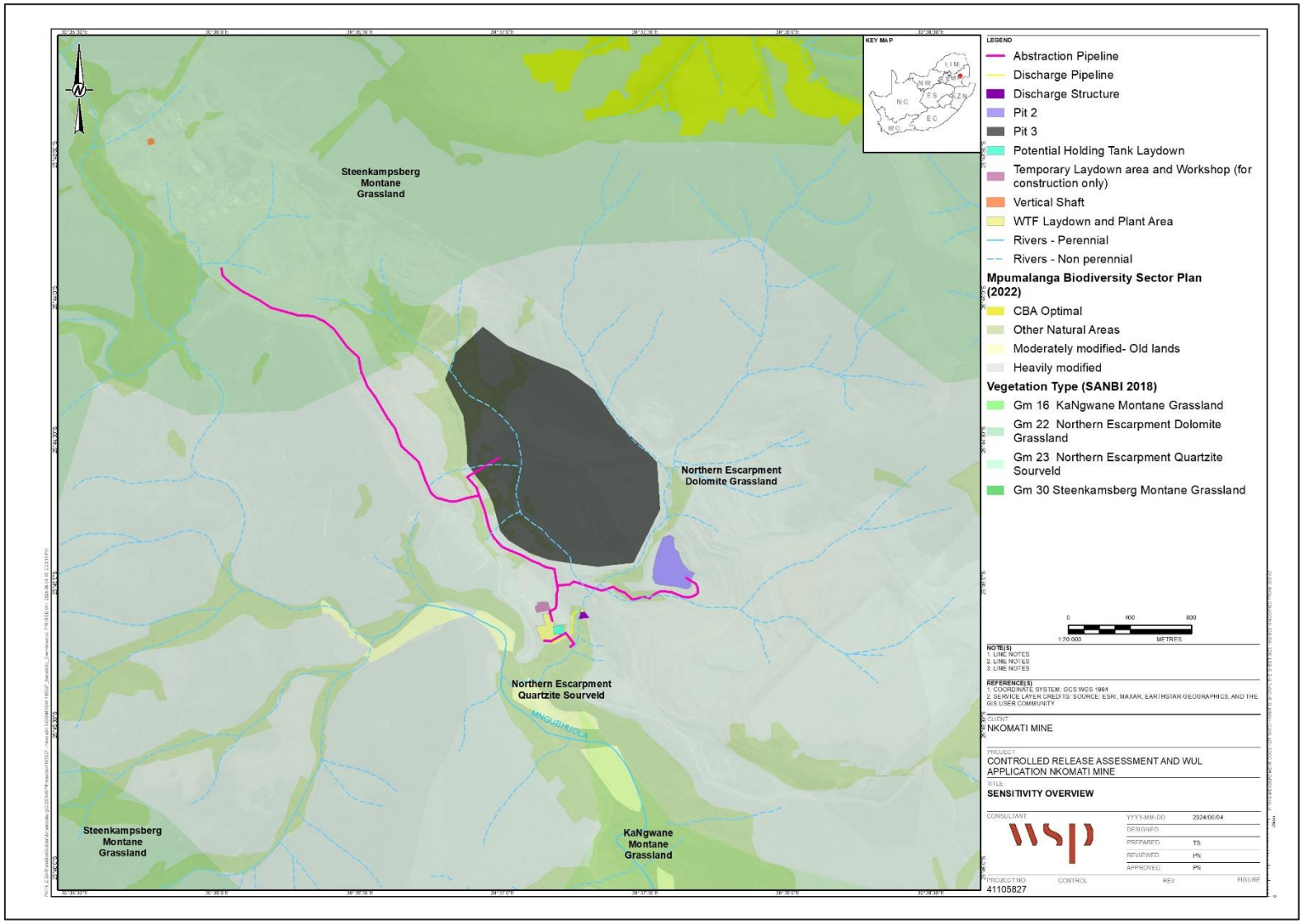


Figure 9-1 - Combined Sensitivity Map for the proposed WTP and associated infrastructure

9.3 SPECIALISTS' CONCLUSIONS AND REASONED OPINIONS

9.3.1 TERRESTRIAL BIODIVERSITY

The proposed site for the WTP is located outside of any areas of pristine vegetation and is located within the Northern Escarpment Quartzite Sourveld vegetation type (**Figure 6-18**) which is considered least concern according to the Red List of Ecosystems, 2021 (**Figure 6-20**). In addition, the site is considered heavily transformed according to the MBSP, 2022 (**Figure 6-19**).

The specialist recommended the project proceed with implementation of the prescribed mitigation measures.

9.3.2 AQUATIC BIODIVERSITY

Based on the findings of the current aquatic biodiversity and impact assessment study, potential negative impacts due to activities of the proposed project are likely to occur upon the main receiving receptor (the Mngubhudle Catchment). The significance of impacts is predicted to be *Moderate* during the construction phase and reduced to *Very Low* upon implementation of mitigation measures; similarly, impact significance is expected to be *Moderate* during the operational phase and reduced to *Low* and *Very Low* upon implementation of mitigation measures.

The development of the WTP is intended to treat mine impacted water which poses a risk or reaching nearby watercourses. This has a potential to decimate aquatic biota within the catchment, disrupting ecosystem functioning throughout the catchment and potentially within the interlinking catchments. Therefore, the predicted negative impacts of the WTP upon the receptors are outweighed by the positive impacts associated with the installation of the WTP. Thus, no fatal flaws were identified during the current study and the proposed project may proceed.

The aquatic biomonitoring programme should be implemented pre-construction, and throughout the various phases of the project, to ensure that no deterioration of the associated watercourses occurs. The proposed project should adopt a water and habitat quality preservation mindset throughout the life of the project to prevent the deterioration of the aquatic ecosystems.

9.3.3 SURFACE WATER

The findings of the Surface Water Impact Assessment are as follows:

- The expected WTP discharge quality is well within the WQPL/RQO and is expected to improve the water quality in the Adit stream and Gladdespruit over the long term. Minimal impact on the receiving catchment water resources is expected with the addition of the WTP discharge.
- The 1 in 100-year floodline was modelled for the Adit stream downstream of the proposed WTP before and after the 13ML/day discharge. It is concluded that the additional discharge from the proposed WTP will not significantly affect the floodline.
- The impacts associated with the construction, operation, decommissioning phases of the proposed WTP were rated as moderate prior to the implementation of any mitigative measures.
- With the suggested mitigative measures and recommended monitoring programme, the impacts were rated as low.

9.3.4 HERITAGE AND PALAEONTOLOGY

The heritage specialist concluded that the site is of Very Low sensitivity from a heritage perspective and only one new grave site was identified which will not be impacted upon by the proposed project.

Regarding palaeontology, the site is considered historically Very High in paleo-sensitivity; however, given the previous mining related impacts to the site, the site is now considered to be of Low sensitivity. the specialist did however recommend that a Chance Find Protocol be implemented.

9.3.5 GEOTECHNICAL ASSESSMENT

The Geotechnical Assessment concluded that although the project area exhibits geotechnical characteristics deemed to have an adverse effect on the proposed development, these characteristics do not disqualify the site from being used, but rather require the strict implementation of site-specific precautionary measures with regard to design and construction.

The following recommendations were provided:

- The extent of and depth to competent bedrock should be determined. A MASW geophysical survey should be considered.
- The extent of the fill embankment and slope stability along the perimeter of the project area should be confirmed or defined, depending on the layout and load of the proposed WTP.
- The source and extent of fill material should be confirmed, especially with regards to waste and potentially hazardous waste products and legislation.
- A dolomite stability investigation should be conducted in order to determine the inherent hazard of the dolomite and subsequent potential loss of support, especially due to the acid groundwater-surface water-dolomite interaction over time. This study should include a micro-gravity survey and the drilling of at least 3 to 4 boreholes as a first phase.
- Detailed relevant geotechnical footprint investigations beneath proposed structures should be conducted as and where deemed necessary.
- A competent person should inspect excavations and/or operations during construction in order to verify that the materials exposed are not at variance with those described in the report.

9.4 IMPACT STATEMENT

The overall objective of the EIA is to provide sufficient information to enable informed decision-making by the 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.

In assessing the environmental feasibility of the WTP and associated infrastructure, the requirements of all relevant legislation have been considered. The identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience and the relevant legislation (where applicable).

The EIA process has found that the proposed project will involve activities which will lead to a number of direct and indirect negative impacts on the biophysical and socio-economic environment. These impacts were found to vary in terms of their consequence and probability. Positive impacts are limited to the creation of some employment opportunities and improvement of the water quality in the Adit stream and Gladdespruit over the long term, as a result of the WTP discharge.

Mitigation measures have been developed where applicable for identified impacts and are presented within the EMPr. The mitigation measures are necessary to ensure that the project is planned, constructed, operated and decommissioned in an environmentally responsible manner. It is imperative

that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

It is the opinion of WSP that the information contained in this document is sufficient for the DMRE to make an informed decision for the environmental authorisation being applied for in respect of this project. The findings of this S&EIR process and associated specialist studies conclude that there are no fatal flaws associated with the proposed development. Negative environmental impacts associated with the proposed WTP can be mitigated to acceptable levels. It is therefore the opinion of the EAP that the project can proceed, and that all the listed mitigation measures and recommendations are considered by the DMRE.

10 ENVIRONMENTAL MANAGEMENT PROGRAMME

10.1 PURPOSE OF THE EMPR

An EMPr is defined as "*an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced*."

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, in compliance with section 24N of NEMA, with the purpose of ensuring that negative impacts are reduced, and positive effects are enhanced through a process of continual improvement, during the construction, operational and decommissioning phases of the proposed project.

To facilitate compliance to the EMPr by appointed contractors and sub-contractors, it is required that all onsite personnel are aware of the requirements of the EMPr as well as the prescribed penalties should a non-conformance be identified during the construction, operation and decommissioning activities.

Further to the above, appointed contractors and sub-contractors will also be required to comply with all relevant legislation and standards.

10.1.1 EMPR OBJECTIVES

The EMPr has the following objectives:

- Identify mitigation measures and environmental specifications which are required to be implemented for the planning, construction, operation, rehabilitation and decommissioning phases of the Project in order to manage and minimise the extent of potential environmental impacts associated with the facility;
- Ensure that all the phases of the proposed project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced;
- Identify entities responsible for the implementation of the measures and outline functions and responsibilities;
- Create management structures that address the concerns and complaints of I&APs with regards to the proposed project;
- Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation; Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Train onsite personnel with regard to their environmental obligations; and
- Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the BA process.

10.1.2 ENVIRONMENTAL OBJECTIVES AND TARGETS

To facilitate compliance to the EMPr, the project proponent must comply with all relevant legislation and standards and make all personnel aware of the requirements of the EMPr, as well as the prescribed penalties should a non-conformance be identified during the different phases of the proposed project.

It is recommended that environmental objectives (as outlined in this document) be emphasised as minimum requirements. Objectives include:

- Encourage good management practices through planning and commitment to environmental issues; and provide rational and practical environmental guidelines to:
  - Minimise disturbance of the natural environment;
  - Minimise fugitive emissions;
  - Minimise impact of added traffic into the area;
  - Ensure surface and groundwater resource protection;
  - Prevent or minimise all forms of pollution;
  - Protect indigenous flora and fauna;
  - Prevent soil erosion;
  - Promote sustainable use of resources;
  - Adopt the best practical means available to prevent or minimise adverse environmental impacts;
  - Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
  - Promote the reduction, reuse, recycling and recovery of waste;
  - Develop waste management practices based on prevention, minimisation, recycling, treatment or disposal of waste;
- Describe all monitoring procedures required to identify impacts on the environment;
- Define how the management of the environment is reported and performance evaluated; and
- Train onsite personnel on their environmental obligations.

10.2 PROJECT INFRASTRUCTURE AND CONSTRUCTION ACTIVITIES

Table 10-1 provides a summary of the project infrastructure and the associated methods that will be implemented during construction.

The table below provides a summary of the alternatives presented in this section of the report and the selection of the preferred alternative to be further assessed and authorised.

Table 10-1 – Summary of the project infrastructure and construction methods

Project Component	Description	Construction Activities
WTP and laydown areas	A WTP capable of only treating 6.5 million litres of water per day will result in the mine's water levels at Pit 3 being maintained whereas the Options 1 and 2 designs allows for a WTP to treat 13 million litres of water per day which will allow for dewatering thereby fulfilling the need for the WTP.	**Site preparation and establishment** – includes clearing of vegetation and any bulk earthworks that may be required. **Transport of components and equipment to site -** All construction material, machinery and equipment (i.e. graders, excavators, trucks, cement mixers etc.) will be transported to site utilising the national, regional and local road network. Larger components (may be defined as
Pipelines (abstraction from Pit 3 and discharge pipeline)	It is envisaged that the abstraction pipeline will be approximately 2000 m in length with an internal diameter of approximately 0.45m.	

Project Component	Description	Construction Activities
	The gravity pipeline from the WTP to the discharge point is the discharge pipeline approximately 300m in length with a maximum internal diameter of 0.45m	abnormal loads in terms of the Road Traffic Act (No. 29 of 1989). In such cases a permit may be required for the transportation of these loads on public roads. **Establishment of a laydown area on site -** Construction materials, machinery and equipment will be kept at relevant laydown and/or storage areas. Laydown areas of approximately up to 1.92 ha have been proposed (including the WTP footprint). The laydown area will limit potential environmental impacts associated with the construction phase by limiting the extent of the activities to one designated area. **Construction of the WTP, laying of the pipework and construction of the discharge structure** – Construction of the WTP will be on transformed land however the construction of the discharge structure within the Adit Stream will require extra caution. **Post Construction and Rehabilitation –** will include general surface rehabilitation, removal of all construction equipment and waste from site and re-vegetation
Discharge structure	The discharge pipeline will carry the treated water to the discharge structure located within the Adit Stream.	
525V Transformer	It is envisaged that a 525V transformer will be stepped down from the existing 22kV powerline. This facility will be located within the footprint of the WTP. The three (3) points investigated for the location of the 525V transformer are all located within the footprint of the WTP.	
Sludge storage area	The sludge storage area will be located within the NJVM Mining Right Area.	
Topsoil storage area	The sludge storage area will be located within the NJVM Mining Right Area.	

10.2.1 OPERATIONAL PHASE

During operation, the key activities will include:

- Abstraction of untreated water from Pit 3;
- Transfer of untreated water to the WTP;
- Treatment of water at the WTP by Reverse Osmosis;
- Discharge of treated water into the Adit Stream; and
- Disposal of gypsum sludge (off-site).

10.2.2 DECOMMISSIONING AND CLOSURE PHASE

The infrastructure areas closure measures are described in the section below.

10.2.2.1 Closure measures

The site decommissioning and rehabilitation activities are structured according to the format routinely used for the presentation of closure costs for mine sites, as per the following categories, and are summarised below:

- Infrastructural areas;
- Associated operating structures areas;
- General surface rehabilitation;
- Pre-site relinquishment aspects; and
- P&Gs, Contingencies and additional allowances.

Note that the unscheduled closure scenario measures indicated below would apply for potential future unplanned closure of the WTP once it has been constructed and becomes operational, as currently no plant exists.

Infrastructure areas

The closure measures for the infrastructure areas are described below.

Table 10-2 – Infrastructure areas closure measures

Closure cost component	Unscheduled closure	Scheduled closure
Dismantling of water treatment plant infrastructure	Demolish and remove concrete structures and brick buildings as follows: ▪ Demolish infrastructure superstructure. ▪ Remove concrete footings and foundations to 1 000 mm below the final surface topography. ▪ Crush and decontaminate concrete and brick demolition waste as required and use as backfill in infrastructure area voids and/or holding dams.	▪ Same as unscheduled
Demolition of steel buildings and structures	▪ Dismantle all steel superstructures, roofing as well as other related steel structures. ▪ Sell salvageable scrap metal and dispose of non-salvageable waste at a registered landfill site.	▪ Same as unscheduled
Access roads	Assume access roads are gravel. Rehabilitation of gravel roads and tracks: ▪ Confirm which gravel roads and tracks have no beneficial use once NJVM site is rehabilitated, and rehabilitate as indicated under general surface rehabilitation.	▪ Same as unscheduled
Demolition waste	▪ Establish dedicated sorting and screening and decontamination bay within existing plant footprint to receive demolition waste. ▪ Transport demolition waste to the above area/s, and sort, crush and	▪ Same as unscheduled

Closure cost component	Unscheduled closure	Scheduled closure
	decontaminate demolition waste as required. ▪ Confirm that crushed concrete is benign/non-contaminating and use as backfill material as indicated. ▪ Establish re-use and salvage agreements for crushed road surface material and scrap metal respectively and facilitate removal from site as needed. ▪ Confirm that the nearest municipal landfill site has sufficient capacity to receive general demolition waste, and transport for disposal.	
Hazardous waste	▪ Remove any other potential hazardous material that cannot be disposed in the gypsum disposal facilities and transport to Holfontein hazardous waste facility for safe disposal.	▪ Same as unscheduled

Operational areas closure measures

The operational areas closure measures are listed in **Table 10-3.**

Table 10-3 – Operational areas closure measures

Closure cost component	Unscheduled closure	Scheduled closure
Discharge structures and dams	▪ Remove any potential contaminated material from the dams and dispose in the gypsum storage facility before rehabilitation. ▪ Investigate the possibility of repairing and removing the dam liners for re-use, based on their integrity at the time of closure. If not feasible, remove and dispose of the liners as required. ▪ Doze dam wall material back into the dam voids and profile as required to be free draining.	▪ Same as unscheduled
Gypsum storage facilities	▪ Cover installation: • Shape and profile side walls to a final gradient of 1:5 ▪ Install Class A cover consisting of the following configuration:	▪ It is assumed that there will be no gypsum at scheduled closure as it will be sold or otherwise removed and disposed off-site beforehand

Closure cost component	Unscheduled closure	Scheduled closure
	• 300 mm topsoil layer placed (load and haul under 1 km) • Geocells with geocell anchors (0.5 m x 1 m x 400 m) • Hidrain 750 7x7 laminate • 1.5 mm HDPE single extruded geomembrane • Protection geotextile over entire area - Bidim A8 (1 000 g/m2) ▪ Water management: ▪ Install surface water drains and stormwater chutes to facilitate adequate drainage of runoff from the upper surface and side slopes of the rehabilitated facility, as well as around the toe of the facility.	

General surface rehabilitation measures

The general surface rehabilitation measures are listed in **Table 10-4.**

Table 10-4 - General surface rehabilitation measures

Closure cost component	Unscheduled closure	Scheduled closure
General surface rehabilitation	▪ Excavate any residual contaminated soil and consolidate with sludge storage facility prior to its rehabilitation. ▪ Shape and level all infrastructure footprint areas once all demolition waste has been removed and cavities filled with decontaminated, crushed demolition waste and/or suitable soil material. ▪ Compact backfilled voids as needed to prevent settlement and non-free draining conditions from occurring. ▪ Rip areas where infrastructure has been removed or compaction has occurred. ▪ Apply soil amelioration measures if required. ▪ Vegetate all disturbed areas with a suitable pioneer species mixture.	▪ Same as unscheduled

Post-closure measures

The post-closure closure measures are listed in **Table 10-5.**

Table 10-5 - Post-closure closure measures

Closure cost component	Unscheduled closure	Scheduled
Water monitoring	▪ Conduct groundwater monitoring at 18 locations as identified in WUL, for a period of 10 years after unscheduled closure, as per requirements of GN R. 1147. ▪ Conduct surface water monitoring at 10 locations as identified in WUL, for a period of 10 years after unscheduled closure, as per requirements of GN R. 1147.	▪ Same as unscheduled
Rehabilitation monitoring	▪ Monitor rehabilitated areas for 10 years after closure, as per requirements of GN R. 114	▪ Same as unscheduled
Care and maintenance	▪ Maintain rehabilitated areas for 10 years after closure, as per requirements of GN R. 1147.	▪ Same as unscheduled

Additional Allowances

The additional allowances closure measures are listed in **Table 10-6.**

Table 10-6 – Additional allowances

Closure cost component	Unscheduled closure	Scheduled
Preliminaries and General	▪ Ps&Gs allowance of 15% of the total demolition and site rehabilitation costs (subtotal 1 of closure costs) has been included, based on increasingly stringent health and safety requirements, and increased costs associated with labour sourcing and supply chain and other requirements.	▪ Same as unscheduled
Contingencies	▪ Additional allowance of 20% of the total demolition and site rehabilitation costs (subtotal 1 of closure costs) has been included, based on the relatively simple nature of the work and limited likelihood of unforeseen requirements.	▪ Same as unscheduled
Additional allowances	Additional allowance to conduct closure-related environmental	▪ Same as unscheduled

Closure cost component	Unscheduled closure	Scheduled
	authorisation has been included, including: ▪ Amendments to existing licenses and authorisations. ▪ Approval to dispose of inert demolition waste in dam cavities and other voids on site. ▪ Conducting a contaminated land assessment to determine specific closure-related remediation requirements.	

10.2.2.2 Closure costs

The closure costs are structured according to the format routinely used for the presentation of closure costs for mine sites as per the following categories:

- Infrastructural areas
- Operation areas
- General surface rehabilitation
- Water management
- Post-closure aspects
- Additional allowance

The 2024 closure liability for the proposed NJVM WTP and associated infrastructure for routine scheduled closure (exclusive of VAT) are summarised below and presented in **Table 10-7**. The unscheduled closure costs should be determined in future updates, once the WTP construction has commenced and subsequently becomes operational.

- Scheduled closure: R 35.7 million

Table 10-7 - NJVM proposed WTP scheduled closure costs

	Closure Component	NJVM proposed WTP	Total
1	Infrastructural aspects	R 17 059 337.02	R 17 059 337.02
2	Operation areas	R 2 642 637.58	R 2 642 637.58
3	General surface rehabilitation	R 2 383 913.80	R 2 383 913.80
4	Surface runoff measures	R -	R -
	Sub-Total 1:	R 22 085 888.40	R 22 085 888.40
5	Pre-site relinquishment aspects		
5.1	Surface water monitoring	R 2 655 840.00	R 2 655 840.00
5.2	Groundwater monitoring	R 2 367 648.00	R 2 367 648.00

	Closure Component	NJVM proposed WTP	Total
5.3	Rehabilitation monitoring	R 743 984.64	R 743 984.64
5.4	Care and maintenance - low intensity	R 150 984.00	R 150 984.00
5.5	Care and maintenance - high intensity	R -	R -
6	P&Gs, Contingencies and Additional Allowances		
6.1.1	Preliminary and general	R 3 312 883.26	R 3 312 883.26
6.1.2	Additional studies	R -	R -
6.2	Contingencies	R 4 417 177.68	R 4 417 177.68
6.3	Provisional amount for closure related social aspects	R -	R -
	Sub-Total 2:	R 13 648 517.58	R 13 648 517.58
7	Post-closure aspects		
7.1	Post-closure aspects	R -	R -
7.2	Contingencies on post-closure	R -	R -
	Sub-Total 3:	R -	R -
	Grand Total Excl. VAT. (Sub-total 1 + 2 + 3):	R 35 734 405.98	R 35 734 405.98

10.3 MANAGEMENT PROCEDURES AND ADMINISTRATIVE REQUIREMENTS

10.3.1 ORGANISATIONAL STRUCTURE AND RESPONSIBILITIES

Formal responsibilities are necessary to ensure that key management measures/procedures are executed. The NJV (the Project Company) (via the appointed Engineering, Procurement, and Construction (EPC) contractor/contractor/principal contractor), will be responsible for the overall control of the project site during the pre-construction, construction, operation, decommissioning and rehabilitation phases of the project. NJV responsibilities (via the appointed EPC contractor/contractor/principal contractor) will include the following:

- Appointing an independent Environmental Control Officer (ECO) for the duration of the Contract during construction and as specified by the DMRE during operation;
- Being fully familiar with the EIR, EA conditions and the EMPr;
- Applying for an amendment of the EA from the DMRE as and when required in line with the prevailing legislation;
- The overall implementation of the EMPr;
- Ensuring compliance, by all parties, and the imposition of penalties for non-compliance;
- Implementing corrective and preventive actions, where required;
- Ensuring that any other necessary permits or licences are obtained and complied with;
- Preventing pollution and actions that will harm or may cause harm to the environment;

- Notifying the DMRE within 30 days that construction activity will commence;
- Notifying the DMRE in writing within 24 hours if any condition in the EA cannot be or is not adhered to; and
- Notifying the DMRE 14 days prior to commencement of the operational phase.

Table 10-8 provides a high-level outline of the various roles and responsibilities of the project.

Table 10-8 – Roles and Responsibilities

Designation	Roles and Responsibilities
DMRE	▪ Is the designated authority responsible for authorising this EMPr and has overall responsibility for ensuring that the proposed Project complies with this EMPr, and any conditions listed in the EA. ▪ Shall also be responsible for approving any significant amendments that may be required to the EMPr. ▪ May further perform random site inspections to check compliance with the EMPr.
Project Manager/Engineer/Site Engineer	▪ Ensure that NJV and the relevant contractor/s are aware of all specifications, legal constraints pertaining to the project during construction, specifically with regards to the environment. ▪ Ensure that all stipulations within the EMPr and conditions of the environmental authorisation are communicated and adhered to by NJV and its contractor(s). ▪ Monitor the implementation of the EMPr and conditions of the environmental authorisation throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes. ▪ Be fully conversant with the EIR for the project, the conditions of the EA and all relevant environmental legislation.
Site Manager (EPC Contractor)	▪ Be fully conversant with the EIR, the conditions of the EA and the EMPr. ▪ Approve method statements. ▪ Provide support to the ECO. ▪ Be fully conversant with all relevant environmental legislation and ensure compliance thereof. ▪ Have overall responsibility for the implementation of the EMPr and conditions of the environmental authorisation. ▪ Ensure that audits are conducted to ensure compliance to the EMPr and conditions of the environmental authorisation. ▪ Liaise with the Project Manager or his delegate, the ECO and others on matters concerning the environment. ▪ Prevent actions that will harm or may cause harm to the environment and take steps to prevent pollution and unnecessary degradation onsite. ▪ Confine construction activities to demarcated areas.
Environmental Officer (EO) (EPC Contractor)	The EO must be appointed by the Contractor and is responsible for managing the day-to-day onsite implementation of the EMPr, and for the compilation of weekly environmental monitoring reports during construction. During the operational phase environmental monitoring reports may be as specified by the DMRE (such as annually) by the external EO or ECO. In addition, the EO must act as liaison and advisor on all environmental and related issues, seek advice from the ECO when necessary, and ensure that any complaints received from I&APs are duly processed and addressed and that conflicts are resolved in an

Designation	Roles and Responsibilities
	acceptable and timely manner. The EO shall be a full-time dedicated member of the Contractor's team and must be approved by NJV (Project Company). The following qualifications, qualities and experience are recommended for the individual appointed as the EO: ▪ A relevant environmental diploma or degree in natural sciences, as well as a minimum of three years' experience in construction site monitoring, excluding health and safety; ▪ A level-headed and firm person with above-average communication and negotiating skills. The ability to handle and address conflict management situations will be an advantage; and ▪ Relevant experience in environmental site management and EMPr compliance monitoring. The EO's responsibilities include, but not limited to: ▪ Monitoring, on a daily basis, environmental specifications on site and compliance with the conditions of the EA, environmental legislation and EMPr; ▪ Keeping a register of compliance / non-compliance with the environmental specifications; ▪ Identifying and assessing previously unforeseen, actual or potential impacts on the environment; ▪ Ensuring that a brief weekly environmental monitoring report is submitted to the ECO; ▪ Conducting site inspections during the defects liability period, and bringing any environmental concerns to the attention of the ECO and Contractor; ▪ Advising the Contractor on the rectification of any pollution, contamination or damage to the construction site, rights of way and adjacent land; ▪ Attending site meetings (scheduled and ad hoc); ▪ Presenting the environmental awareness training course to all staff, Contractors and sub-contractors, and monitoring the environmental awareness training for all new personnel on-site, as undertaken by the Contractor; ▪ Ensuring that a copy of the EA and the latest version of the EMPr are available on site at all times, and maintaining a records-keeping system of all compliance and environmental documentation; ▪ Ensuring that the Contractor is made aware of all applicable changes to the EMPr that are approved by the DFFE; ▪ Assisting the Contractor in drafting environmental method statements and/or the Environmental Policy where such knowledge/expertise is lacking; ▪ Undertaking daily environmental monitoring to ensure the Contractor's activities do not impact upon the receiving environment. Such monitoring shall include dust, noise and water monitoring; and ▪ Maintaining the following on site: • A weekly site diary. • A non-conformance register (NCR). • An I&AP communications register, and • A register of audits. • Records of all communication received in relation to compliance actions. The EO will remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is handed over to the Operator.

Designation	Roles and Responsibilities
Independent ECO	A suitably qualified independent ECO must be appointed by NJV to monitor the project compliance with the EMPr and conditions of the environmental authorisation on a monthly basis during construction. During the operational phase environmental monitoring may be undertaken as specified by the DMRE (such as annually) by this external ECO. Proof of external ECO appointment must be maintained onsite. Responsibilities of the ECO include: ▪ Be fully conversant with the EIR, the conditions of the EA and the EMPr; ▪ Be fully conversant with all relevant environmental legislation and ensure compliance thereof; ▪ Approve method statements; ▪ Remain employed until the completion of the construction activities; and ▪ Report to the Project Manager, including all findings identified onsite. In addition, the ECO will: ▪ Undertake independent inspections of the site and surrounding areas in order to audit compliance with the EMPr and conditions of the EA; ▪ Take appropriate action if the specifications contained in the EMPr and conditions of the environmental authorisation are not followed; ▪ Monitor and verify that environmental impacts are kept to a minimum, as far as possible; and ▪ Ensure that activities onsite comply with all relevant environmental legislation.
Contractors, Staff and Service Providers	▪ Prepare Method Statements as per the EMPr, and ensure all activities are conducted as per the approved Method Statements. ▪ Regular on-site auditing to assess performance against the requirements of this EMPr. ▪ Completion of the appropriate training requirements as specified in the training program. ▪ Implementation and maintenance of environmental management controls as set out in the project's environmental management documentation.

10.4 ENVIRONMENTAL AWARENESS PLAN

Legislation requires that NJV (via the appointed EPC contractor/contractor/principal contractor) must develop an environmental awareness plan that describes the manner in which NJV intends to inform employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment. In recognition of the need to protect our environment, environmental management should not only be seen as a legal obligation but also as a moral obligation.

It is important to ensure that all relevant personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and ongoing minimisation of environmental degradation and harm.

To achieve effective environmental management, it is important that employees, contractors (including subcontractors) are aware of the responsibilities in terms of the relevant environmental legislation and the contents of the EMPr, conditions of the environmental authorisation.

NJV will provide appropriate resources to facilitate social and environmental awareness training during the construction, operational and decommissioning phases of the project. NJV will require that all managers associated with the project adhere to the mitigation/management measures detailed in the EMPr and identify, evaluate, and minimise risks to the social, physical and biophysical environments. This will be implemented by educating employees in social and environmental matters and responsibilities relating to performance of their assigned tasks. Furthermore, employees will be entrusted to maintain the necessary level of environmental performance for their activities. Contractors, and their associated sub-contractors, will also need to demonstrate compliance to mitigation/ management measures included in the EMPr.

The following methodology described must be used to implement and ensure environmental and social awareness and competence:

10.4.1 INTERNAL COMMUNICATION

Internal Communication of environmental issues to ensure environmental awareness will be achieved by using any combination of the following means:

- Meetings;
- Memos;
- Notice boards;
- Briefs;
- Reports;
- Monthly themes;
- Daily operational bulletins;
- Newsletter;
- E-mail;
- Telephone; and
- Induction training.

10.4.2 STANDARD MEETINGS

The following standard meetings will be held at specific times to ensure that environmental and social awareness; potential problems; complaints etc. are heard and addressed proactively:

- Safety, Health and Environmental Meetings will be held monthly by the Senior Management;
- Safety, Health and Environmental Meetings will be held weekly (during construction) and monthly (during operation) by the relevant personnel, environmental and social issues will form part of the agenda;
- Communication between all personnel and Senior Management will be facilitated through the appropriate reporting lines, or by using complaint and incident forms.

10.4.3 ENVIRONMENTAL AND SOCIAL TALK TOPICS

Monthly environmental and social talk topics must be compiled and distributed/shared to relevant personnel and must be displayed on appropriate notice boards or shared by whatever means established on site. As a minimum, the following topics must be considered during the course of the construction phase:

- Working within sensitive areas such as the construction of the discharge structure within the Adit Stream;

- Air Quality i.e. dust;
- Waste Management;
- Fauna and Flora;
- Emergency Procedures;
- Incidents Reporting;
- Systems;
- Noise;
- Landowner Etiquette;
- Speed Limits;
- Health Risks (such as HIV/ Aids); and
- General Awareness (e.g. World Environment Day, National Arbour Day).

10.4.4 GENERAL COMMUNICATIONS

Communication to the community, government, landowners, neighbouring landowners, environmental groups, non-government organisations and other stakeholders will be communicated to ensure environmental and social awareness by means of the following:

- Fax or E-mail;
- Telephone; or
- Formal meetings.

10.4.5 TRAINING

It is important to ensure that all personnel, contractors and their sub-contractors have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. As a minimum environmental training must include the following:

- Employees must have a basic understanding of the key environmental features of the site and the surrounding environment.
- Employees will be thoroughly familiar with the requirements of the EMPr and the environmental specifications as they apply to the project.
- Employees must undergo training for the operation and maintenance activities associated with project and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- Awareness of any other environmental matters, which are deemed to be necessary by the Environmental Officer.
- Training must include the environment, health and safety as well as basic HIV/AIDS education.

The following facets to training form part of this Environmental and Social Awareness Plan:

- **Induction:** Environmental and social awareness training will be given at induction when personnel join the company and/or return from leave. Induction training will also be given to visitors entering the site. Induction training will include, inter alia:
  - A discussion on the environment concept, what does it comprise of and how do we interact with it;
  - A description on the components and phases of the specific renewable power generation facility;
  - A general account of how the facility and its associated activities can affect the environment, giving rise to what are called environmental impacts;

- A discussion on what staff can do in order to help prevent the negative environmental impacts from degrading the environment i.e. environmental impact management.

- **Job Specific Training:** Job specific training programmes will be developed as and when required. The programs will be based on the significant environmental and social aspects/ impacts that are identified during regular audits and site inspections. Supervisory staff will be equipped with the necessary knowledge and information to guide their employees on environmental and social aspects applicable to performing a specific task.
- **Competency Training:** The Environmental Officer will be responsible for the environmental and social competency and awareness training of Middle Management and supervisors. This training will be performed both on a one-on-one basis and through workshops and presentations. Competence and the effectiveness of training and development initiatives will be determined through the following methods:

  - Trend analysis of incidents reported; and
  - Analysis of work areas during visits and audits.

  The process to declare competency of personnel is documented in the ISO9001:2000 procedure. This plan will be amended periodically in light of operational changes, learning experienced during its implementation and other activities that can affect the risk profiles.
- **Training Records**: Training can be done either in a written or verbal format but will be in an appropriate format for the receiving audience. Persons having received training must indicate in writing that they have indeed attended a training session and have been notified in detail of the contents and requirements of the EMPr. The attendance registers must be kept on file.

To ensure accountable and demonstrated implementation of the EMPr, a number of reporting systems, documentation controls and compliance mechanisms must be in place.

10.5 MONITORING

The EPC contractor's EO will monitor the day-to-day site activities on an ongoing basis and will produce weekly monitoring reports during construction. The independent, external ECO will undertake monthly audits to ensure compliance with the EMPr and conditions of the environmental authorisation during the construction activities and will report to the Site Manager should any non-compliance be identified, or corrective action deemed necessary.

During the operational phase, NJV (via the appointed EPC contractor/contractor/principal contractor) will establish, implement and maintain a procedure to monitor and measure, on a regular basis, the key characteristics of the operations that may have a significant environmental impact. The procedure shall include the documenting of information to monitor performance, applicable operational controls and conformity with the operation's environmental objectives and targets.

NJV will ensure that all instruments and devices used for the measurement or monitoring are calibrated and appropriately operated and maintained. Calibration records must be kept on site or in close proximity to the equipment for ease of availability.

All the conditions outlined in the EMPr will be subject to required internal day-to-day monitoring and external compliance monitoring.

10.5.1 AQUATIC BIO-MONITORING

An aquatic biomonitoring programme has been developed for the monitoring and preservation of the aquatic ecosystems assessed for the project. The programme is aimed at better determining the ecological health of the ecosystems, provide long term trends in ecosystem integrity as well as aid in early detection of potential impacts that might severely affect the expected aquatic biota in the associated riverine systems.

Table 10-9 outlines the aquatic monitoring methods to be undertaken at the monitoring points set out above on a biannual basis by a suitably qualified aquatic ecologist. The annual programme comprises of a single survey in winter (or low flow season) for the project area and a single survey in summer (or high flow season) at the monitoring points indicated. This will determine the PES for the assessed aquatic ecosystems which will further determine whether the proposed project is impacting the associated aquatic ecology and to what extent.

Table 10-9 – Proposed aquatic biomonitoring programme

Method and Aquatic Component of Focus	Details	Goal/Target	REC
Water Quality: In situ water testing focusing on temperature, pH, conductivity and oxygen content. Ex situ analysis of selected chemical parameters: ▪ Major cations; ▪ Physico-chemical parameters; and ▪ Trace elements. By means of the Inductively Coupled Plasma Optical Emission spectroscopy (ICP-OES) technique.	Water quality should be tested on a biannual basis at each monitoring site to determine the extent of change from baseline results. Grab samples must be collected at the monitoring sites and transported to a South African National Accreditation System (SANAS) accredited laboratory for analysis.	No noticeable change from determined baseline (current report) water quality for each respective season.	Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users. The river water should not be toxic to aquatic organisms or be a threat to human health.
Habitat Quality: ▪ Instream and riparian habitat integrity; and ▪ Availability/suitability of macroinvertebrate habitat at each monitoring site.	The application of the IHI should be done for the associated Mngubhudle reaches; The IHAS must be applied at each monitoring site prior to sampling.	The Ecological Category determined for each assessed site must be improved for the watercourses under study) The baseline IHAS scores should improve.	Must be in a Moderately Modified or better condition ≥ D (≥ 42)
Aquatic Macroinvertebrates:	This must be done through the application of the latest SASS protocol,	The baseline SASS5 scores should not noticeably deteriorate.	Must be in a Moderately Modified or

Method and Aquatic Component of Focus	Details	Goal/Target	REC
▪ Aquatic Macroinvertebrate assemblages must be assessed biannually.	incorporated with the application of the MIRAI as outlined in this Aquatic Study.	Baseline Ecological Categories should not be allowed to drop in category for each assessed site	better condition ≥ D (≥ 42)
Fish: ▪ Fish assemblages must be assessed biannually	Sampling of fish must be undertaken by utilising the electro-narcosis technique at sites presenting suitable fish habitat.	Baseline Ecological Categories should not be allowed to drop in category for each assessed site. The main goal for the Project must be to conserve the expected sensitive species.	Must be in a Moderately Modified or better condition ≥ D (≥ 42)
Whole Effluent Toxicity (WET): ▪ Also known as Direct Estimation of Ecological Effect Potential (DEEEP) ▪ tests are used as exposure indicators to give an estimation for the probability of an effect on the environment.	Water samples must be collected at designated monitoring sites and transported to a SANAS accredited laboratory for screening-level analysis.	No noticeable change from determined baseline findings from each respective season.	Not available.
Diatoms Assemblages: ▪ Samples must be collected biannually and sent to the laboratory for analysis	The diatom assessment will improve the understanding of the potential impacts from the surrounding activities on the water quality	The diatom based ecological water quality must not deteriorate from the baseline conditions.	Not available.
REC = Recommended Ecological Category			

10.5.2 SURFACE WATER MONITORING

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented. Monitoring frequencies specific to different phases of the project are described in this monitoring plan. Water quality should be benchmarked against the Water Quality Planning Limits (WQPL) applicable to the Gladdespruit and surrounding streams in the catchment. The surface water monitoring plan for the proposed project is summarised in **Table 10-10**.

Table 10-10 – Surface water monitoring programme

Monitoring Aspect / Impacts requiring monitoring	Monitoring and Inspection Methodology	Frequency	Duration	Location of monitoring stations	Reporting schedule	Performance indicator	Responsibility
Water Quality	Nkomati mine has a water quality monitoring programme in progress; therefore, it is recommended that water sampling continue as per the existing water quality monitoring schedule. The following should be ensured: ▪ Monitoring continues in all existing points. ▪ Continue monitoring the parameters that form part of the new WUL. ▪ Continue monitoring the parameters against the catchment WQPLs and RQOs.	Monthly monitoring is performed during construction, operation, and decommissioning, and for at least three (3) years after closure or until rehabilitation has reached a sustainable state with no further changes.	Throughout the project life	As per the existing protocol	Monthly	High TSS, Sulphate and EC.	Environmental Officer
Water quantity	▪ Streamflow monitoring should be conducted to detect any changes in the flow regime that might be resulting from project-related activities. ▪ The weir at the Vygeboom canal, can be used to monitor the discharge volumes, or	Daily flow meter data records should be kept in areas with an automatic monitoring system.	Operational Phase		Daily	Excessive streamflow	Environmental Officer

Monitoring Aspect / Impacts requiring monitoring	Monitoring and Inspection Methodology	Frequency	Duration	Location of monitoring stations	Reporting schedule	Performance indicator	Responsibility
	▪ Real-time streamflow data loggers can be used to capture real-time flows.						
WTP and Discharge Infrastructure performance	▪ Regular infrastructure inspections should be conducted to determine their condition and identify any anomalies and system malfunctions. ▪ Pipelines and discharge infrastructure should be inspected for hydraulic integrity, and the overall infrastructure performance must be monitored on a regular basis.	Weekly	Operational Phase		Monthly	Irregular discharge rate	Environmental Officer
Rainfall data	▪ Real-time rainfall measurements using a tipping bucket rain gauge, if possible; and ▪ Alternatively, a bulk rain gauge can be used to capture the total amount of rainfall for each event.	After a rainfall event	Throughout the project life		Daily	Gaps in data	Environmental Officer

10.6 NON-CONFORMANCE AND CORRECTIVE ACTION

The auditing of the construction and operational activities may identify non-conformances to the EMPr and conditions of the EA. Non-conformances may also be identified through incidents, emergencies or complaints recorded. In order to correct non-conformances, the source must be determined, and corrective actions must be identified and implemented.

10.6.1 COMPLIANCE WITH THE EMPR AND CONDITIONS OF THE EA

- A copy of the EMPr and conditions of the EA will be available onsite at all times for the duration of the construction and operational activities;
- All persons employed by a contractor or their sub-contractors will abide by the requirements of the EMPr and conditions of the EA;
- Any members of the workforce found to be in breach of any of the specifications contained within the EMPr and conditions of the EA may be ordered by the Site Manager to leave the site. A contractor will not direct a person to undertake any activity which would place them in contravention of the specifications contained within the EMPr and conditions of the EA;
- Should a contractor be in breach of any of the specifications contained in the EMPr and conditions of the EA, the Site Manager will, in writing, instruct the contractor responsible for the incident of non-compliance regarding corrective and/or remedial action required, specify a timeframe for implementation of these actions, implement a penalty and/or indicate that work will be suspended should non-compliance continue;
- Should non-compliance continue, further written notification will be forwarded to the contractor responsible for the incident of non-compliance outlining the required corrective and/or remedial action, the timeframe for implementation, penalties and/or work will be suspended as specified previously; and
- Departmental officials will be given access to the property referred to in the EIR and EMPr for the purpose of assessing and/or monitoring compliance with the EMPr and conditions of the EA, at all reasonable times.

10.6.2 DUTY OF CARE

All personnel involved with the construction and operational activities onsite will be responsible for implementing measures to prevent pollution or degradation of the environment from occurring, continuing or recurring. Failure to comply with the above conditions is a breach of the duty of care. If such harm is unavoidable, steps must be taken to minimise and rectify such pollution or degradation of the environment.

10.7 DOCUMENTATION AND REPORTING

The following documentation must be kept onsite in order to record compliance with the EMPr and conditions of the environmental authorisation:

- Record of complaints; and
- Record of emergencies and incidents.

The contractor will be required to report on the following:

- Environmental incidents involving contractor/ employees and/or the public;
- Environmental complaints and correspondence received from the public; and
- Incidents that cause harm or may cause harm to the environment.

The above records will form an integral part of the ECO's reports and records thereof maintained for the duration of the project. These records will be kept with the EMPr and conditions of the EA, and will be made available for scrutiny if so requested by the Site Manager or his delegate and the ECO.

The contractor will ensure that the following information is recorded for all environmental complaints/incidents/emergencies:

- Date of complaint/incident/emergency;
- Location of complaint/incident/emergency;
- Nature of complaint/incident/emergency;
- Causes of complaint/incident/emergency;
- Party/parties responsible for causing complaint/incident/emergency;
- Immediate actions undertaken to stop/reduce/contain the causes of the complaint/incident/emergency;
- Additional corrective or remedial action taken and/or to be taken to address and to prevent reoccurrence of the complaint/incident/emergency;
- Timeframes and the parties responsible for the implementation of the corrective or remedial actions;
- Procedures to be undertaken and/or penalties to be applied if corrective or remedial actions are not implemented; and
- Copies of all correspondence received regarding complaints/incidents/emergency.

10.8 PUBLIC COMPLAINTS

The Contractor shall keep a Complaints Register on site to allow the general public to document any comments on or complaints regarding the activities of the site.

The Complaints Register must:

- Have numbered pages – any missing pages must be accounted for by the Contractor;
- Be tabled during monthly site meetings;
- Be made available to the SE/Contract Manager, the ECO, the Project Company, and/or any authority at any time if requested; and
- Include a section for the documentation of the action taken to address the complaint.

All complaints must be investigated, responded to, and recorded in the Complaints Register within 28 calendar days.

10.9 SITE SPECIFIC ENVIRONMENTAL CONTROLS

The EMPr contains guidelines, operating procedures, rehabilitation and pollution control requirements which will be binding to the onsite personnel working for, or on behalf of the NJV. It is essential that the EMPr be carefully studied, understood, implemented and adhered to at all times.

In instances where the method statements provided by the contractor conflict with the EMPr, such conflicts will be discussed between the Site Manager, ECO and contractor and if unresolved the EMPr will take precedent.

The EMPr identifies various actions which are undertaken throughout the construction and operational phases of the proposed project. Not every action will be required during the entire course of activities. Therefore, the actions identified in the EMPr have been given priority timeframes for proposed implementation. The columns in the structure of the EMPr have been described **Table 10-11** below.

Table 10-11 – Structure of EMPr

Column	Description
Activity/Aspect	Highlights the various activities/aspects associated with the project i.e. the contractors' activities that will interact with the environment.
Impact Management Outcome	The desired outcomes from effectively minimising negative impacts and/or enhancing positive impacts.
Impact Management Actions/Measures	Indicates the actions required to prevent and /or minimise the potential impacts on the environment that are associated with the project.
Indicator and Compliance Management	Items that will assist with determining compliance against management actions.
Responsibility	Indicates the party responsible for implementing the environmental measures and action plans laid out in the EMPr. Please note that the Site Manager will have authority to stop works if/as necessary.
Priority Timeframe	Indicates when the actions for the specific aspect must be implemented and/or monitored.

Table 10-12 – Contractor laydown area and site access: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
CONTRACTOR LAYDOWN AREA AND SITE ACCESS			
Impact Management Outcome: ▪ To implement measures to minimise impacts on the environment from the initiation of construction activities through planning, careful site access route selection and implementation of mitigation measures.			
Indicator and Compliance Mechanism: ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Visual inspection of the signage indicating the 'no-go' areas. ▪ Close-out on incidents. ▪ Monitoring and audit reports. ▪ Inductions training and register. ▪ Environmental awareness programme/toolbox talks.			
Project initiation of construction activities	Appoint an ECO to manage and verify compliance with the EA and EMPr.	▪ Project Manager ▪ EO ▪ Contractor (Site Manager)	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Construction activities may take place only within the designated areas as indicated in the layout plan. This includes laydown, material storage, cement mixing, earth deposition and storage etc. that will result from the construction activities. The no-go areas for any construction activities (except when constructing the discharge pipeline and discharge structure within the Adit Stream) includes any water resources surrounding the site. The rivers and streams must not be impacted by construction related activities.		
	All personnel and contractors to undergo Environmental Awareness Training, including awareness of the surrounding area to inform importance of these areas and their conservation. A signed register of attendance must be kept for proof.		▪ Pre-Construction ▪ Construction ▪ Operation

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
			▪ Decommissioning
	Site clearing must be limited to the approved footprint only.		▪ Pre-Construction ▪ Construction ▪ Decommissioning
	Laydown and construction preparation activities (such as cement mixing, temporary toilets, etc.) must be demarcated as per the layout plan**.** If additional laydown areas are required, this must selected upon the guidance of the ECO.		
	Locate firefighting measures at laydown areas and vehicles, such as fire extinguishers, and make personnel aware of fire prevention and firefighting measures.		
	The existing Fire Management Plan of the NJV must be adhered to.		
	Firefighting equipment must be securely placed and inspected monthly.		
	Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted unless prior permission is sought from the competent authorities. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials.		

Table 10-13 – Vehicle, Equipment and Machinery Management: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
VEHICLE, EQUIPMENT AND MACHINERY MANAGEMENT			
Impact Management Outcome: ▪ To implement measures to minimise impacts on the environment from poorly maintained equipment, machinery and vehicles onsite.			
Indicator and Compliance Mechanism: ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Close-out on incidents. ▪ Monitoring and audit reports. ▪ Equipment, machinery and vehicle checklists. ▪ Incident classification and reporting procedure.			
Operation of Equipment, Machinery and Vehicles	Ensure that the equipment, machinery and vehicles are adequately maintained so as to: ▪ Reduce the potential for spillages of oil, diesel, fuel or hydraulic fluid. ▪ Ensure roadworthiness. ▪ Reduce emissions. Evidence of such maintenance must be recorded and maintained onsite for verification.	▪ EO ▪ Contractor	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	The movement of vehicles into and out of the site must be managed to ensure that there is no impact on the surrounding environment. The planned routes and designated vehicle and machinery storage areas must be located within the transformed areas on site. Management measures includes ensuring that abnormal loads are moved outside of peak traffic hours, and reasonable measures are taken to ensure that public and staff safety is managed adequately.		

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	All construction and maintenance motor vehicle operators should be advised of the speed limits. Speed limits must be enforced to ensure that road killings and erosion is limited.		
	No storage of vehicles or equipment must be allowed outside of the designated laydown areas.		
	All vehicles and personnel must make use of the existing roads and walking paths, especially construction/operational vehicles.		
	No servicing of plant and equipment should take place on site unless necessary. Drip trays must be utilized if emergency servicing/repairs are required.		

Table 10-14 – Fuel and Chemical Management: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
FUEL AND CHEMICAL MANAGEMENT			
Impact Management Outcome: ▪ To ensure the correct storage, handling and disposal of fuels and chemicals in order to prevent impacts to the surrounding environment.			
Indicator and Compliance Mechanism: ▪ Maintenance records ▪ Safe disposal certificates (if applicable) ▪ Material safety data sheets (MSDS) (if applicable) ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Chemicals management procedure (to be developed). ▪ Monitoring and audit reports. ▪ Training records.			
Fuel and Chemical Management	Fuel, oil, chemicals and other hazardous materials that will be required for the duration of the construction process must be stored within the laydown area on the site in an area designated for the storage of such hazardous materials.	▪ EO ▪ Contractor	▪ Pre - Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Indicate the location of the fuel and chemical storage area on the layout plans.		
	Label all liquids (chemicals and hydrocarbons) stored onsite for easy identification. MSDS for onsite chemicals, hydrocarbon materials and hazardous substances must be readily available. MSDS must include mitigation measures to ameliorate potential environmental impacts which may result from a spill, incorporating health and safety mitigation measures.		
	A spill management plan must be in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. Drip trays		

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.		
	No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers for safe disposal.		
	In cases where a surface leak occurs during loading and off-loading of construction materials , the spill material will be cleaned using a spill kit.		
	Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.		
	The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site.	▪ EO ▪ Contractor ▪ Operator	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.	▪ EO ▪ Contractor ▪ Operator	▪ Pre-Construction ▪ Construction ▪ Decommissioning
	All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.	▪ EO ▪ Contractor ▪ Operator	▪ Pre-Construction ▪ Construction ▪ Decommissioning

Table 10-15 – Waste Management: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
WASTE MANAGEMENT			
Impact Management Outcome: ▪ To ensure the correct handling, storage, transportation and disposal of general waste and hazardous waste.			
Indicator and Compliance Mechanism: ▪ Induction training and records. ▪ Waste Management Protocol ▪ Relevant SANS Codes of Practice. ▪ Waste manifests and safety disposal certificates (all waste streams). ▪ Emergency preparedness and response procedure. ▪ Incident classification and reporting management procedure (to be developed). ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Monitoring and audit reports.			
General Waste Management	General waste generated as a result of construction and operational activities must be managed in accordance with a waste management protocol for the project.	▪ EO ▪ Contractor	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Train and inform all onsite personnel regarding general waste minimisation, management and disposal.		
	Place an adequate number of labelled or colour coded general waste bins around the laydown area and at the construction area in order to minimise littering. The bins must be removed from the site on a regular basis for disposal at a registered or licensed disposal facility.		

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site as and when required basis to prevent rodents and pests entering the site.		
	Any litter, spills, fuels, chemical and human waste in and around the project area must be removed and disposed of timeously and responsibly.		
	Refuse bins shall be emptied as required and secured.		
	Temporary storage of domestic waste shall be in covered waste skips.		
	Maximum domestic waste storage period shall be weekly.		
	Retain records such as waybills and waste manifests associated with waste removal, transportation and disposal (safe disposal certificates).		
	Prohibit the mixing of general waste with hazardous waste. Should general waste be mixed with hazardous waste, it will be considered hazardous waste. There should be waste segregation implemented on site (e.g. chemicals, oil contaminated rags, paper, plastic) and management on the site.		
	Waste may never be stored in an open pit where it is susceptible to the elements such as wind and rain.		
	Recover, recycle and reuse general waste as far as possible.		
Hazardous Waste Management	Hazardous waste generated because of construction, operational and decommissioning activities must be disposed of to a registered landfill (including gypsum sludge).	▪ ECO ▪ EO ▪ Contractor	▪ Pre-Construction ▪ Construction ▪ Operation

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas		▪ Decommissioning
	Train and inform all onsite personnel regarding hazardous waste minimisation, management and disposal.		
	Ensure that all hazardous wastes temporarily stored on site are stored in a covered sealed skip.		
	Clean areas where hazardous waste spills have occurred and dispose of the hazardous material appropriately. Key personnel must be trained on handling spillages.		
	Retain records of appropriate safety disposal certificates associated with hazardous waste removal, transportation and disposal.		
	Ensure that waste manifest documentation (as per the Waste Classification and Management Regulations – GNR 634) is prepared and maintained for the generation, transportation and disposal of waste.		
	All spills should be reported to the authorities as per the emergency preparedness and response frequencies / specifications.		

Table 10-16 – Water Management: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
WATER MANAGEMENT (SURFACE WATER AND STORMWATER)			
Impact Management Outcome: ▪ To implement measures to prevent the contamination on surface and groundwater resources. ▪ To prevent erosion.			
Indicator and Compliance Mechanism: ▪ Induction training and records. ▪ Incident classification and reporting management procedure (to be developed). ▪ Environmental awareness programme/toolbox talks.			
Stormwater	Stormwater control measures must be implemented for the duration of the construction phase of the project.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction
	Containment of all contaminated water by means of careful run-off management on site.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Install effective sediment and erosion control measures before starting work to minimise sediment entry into the watercourse, such as erosion berms or silt traps.		
	Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out for the project and strictly enforced.		
	Acquire spill kits to clean up any hydrocarbon or chemical spills during construction, operation and closure to prevent seepage. All spillage incidents must be reported to the responsible site officer as soon as they occur.		

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Any cement mixing shall be completed on impervious hardstanding surfaces to prevent spillage to the environment.		▪ Construction ▪ Decommissioning
	Onsite staff are to be provided with an appropriate potable water supply, safe and healthy sanitary facilities and protection against exposure to environmentally dangerous or unhealthy situations or conditions.		▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Appropriate ablution facilities should be provided for construction workers during construction or existing facilities at the NJVM should be made available for use by contractor personnel. If temporary ablution facilities are required, these must be situated 50m or more away from the water resources.		
Stream profile	Channel bed and banks should be re-profiled after installation of linear infrastructure to enable flows to continue undisturbed. The natural channel slopes should be maintained to limit or prevent increased flow velocity. Energy dissipators should be installed to reduce flow velocity.	▪ Site Manager ▪ Contractor ▪ EO	▪ Construction ▪ Decommissioning
Stream flow and water quality	Ensure adherence to daily discharge limits in terms of flow. Ensure that discharge quality complies with the catchment water quality objectives. Regular inspections must be conducted to identify any compromise of infrastructure, especially pipelines and pumps, that requires repairs. Inspection checks must be added to the maintenance procedure.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.	▪ Site Manager ▪ Aquatic specialist	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning

Table 10-17 – Air Quality: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
AIR QUALITY			
Impact Management Outcome: ▪ To ensure that impacts to air quality of the surrounding environment are minimised.			
Indicator and Compliance Mechanism: ▪ Complaints register. ▪ Incident reporting system. ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Incident classification and reporting management procedure (to be developed). ▪ Equipment, machinery and vehicle maintenance.			
Dust Management	Before the commencement of any site works and during the operation, as much vegetation as possible must be retained, including patches and strips to minimise dust.	▪ EO ▪ Contractor	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Activities with high dust-causing potential, such as excavating and moving of soil, must not be carried out close to the sensitive areas during adverse wind conditions.		▪ Pre-Construction ▪ Construction ▪ Decommissioning
	All stockpiles (if any) must be restricted to designated areas and may not exceed a height of two (2) metres.		
	Excavation activities have the potential to generate large amounts of dust. Pre-planning of earth-moving works can reduce dust emissions by limiting the time the site is exposed. Options for dust control can include the following: ▪ Plan excavation activities so that they are completed just prior to the time they are needed;		

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	▪ Observe weather conditions and do not commence or continue excavation activities if conditions are unsuitable e.g., under conditions of strong winds; and ▪ Pre-water areas to be disturbed.		
	Cover trucks hauling any loose material that could produce dust when travelling. Minimise transfer points.		
	Re-vegetate disturbed areas as soon as possible to prevent excessive dust from occurring.		
	Dampen exposed soil to suppress dust if required. Use watering sprays on materials to be loaded and during loading. No non-environmentally friendly dust suppressants may be used.		
	Where possible, minimise speed limits, vehicle weights and the number of vehicles using unpaved roads.		

Table 10-18 – Noise: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
NOISE			
Impact Management Outcome: ▪ To ensure that noise impacts to the surrounding environment are minimal or mitigated.			
Indicator and Compliance Mechanism: ▪ Complaints register. ▪ Incident reporting system. ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Incident classification and reporting management procedure (to be developed). ▪ Equipment, machinery and vehicle maintenance.			
Noise	Fit equipment, machinery and vehicles generating excessive noise with appropriate noise abatement measures if practical and possible and undergo regular maintenance to ensure optimum efficiency during operation.	▪ EO ▪ Contractor/Operator	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Provide complaints register to report any excessive noise incidents. Manage all complaints as per the Incident Classification and Reporting Management Procedure.		
	Regular maintenance of equipment to reduce the generation of additional unwanted noise.		
	Construction activities must be restricted to daylight hours.		
	Employees / contractors are to be provided with appropriate hearing protection when undertaking noisy activities.	▪ EO ▪ Contractor/Operator	▪ Pre-Construction ▪ Construction ▪ Operation

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
			▪ Decommissioning
	Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	▪ EO ▪ Contractor/Operator	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning

Table 10-19 – Soil, Land Use and Agriculture: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
SOIL AND LAND USE			
Impact Management Outcome: ▪ To prevent any disturbance, erosion or contamination of soil resources.			
Indicator and Compliance Mechanism: ▪ Induction training and records. ▪ Incident classification and reporting management procedure (to be developed). ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Monitoring and audit reports. ▪ Stormwater Management Plan (SWMP) (to be developed).			
Soil and Land Management	Land clearance must only be undertaken immediately prior to construction activities and only within the approved project footprint. Unnecessary land clearance must be avoided particularly within the riparian areas of the Adit Stream.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Decommissioning
Erosion Management	A system of stormwater management, which will prevent erosion, must be implemented on site.	▪ Site Manager ▪ Contractor ▪ Operator/Developer ▪ EO	▪ Pre-Construction ▪ Construction ▪ Decommissioning
	Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring.		
	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation or stored topsoil to prevent erosion from high winds and rainfall events.		

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Any indigenous woody material that is removed during construction can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent erosion. Large, wooded stumps or branches may be used to enhance the local habitat features and encourage herpetofauna.		
	Rocks removed during the construction phase may not be dumped but can be used in areas where erosion control needs to be performed. Alternatively, they may be piled to create useful habitat features for herpetofauna.		
	Topsoil should only be stripped in areas that are excavated.		
	Across the majority of the site, including construction laydown areas, it will be much more effective for rehabilitation, to retain the topsoil in place.		
	It will be advantageous to have topsoil and vegetation cover around the facility during the operational phase to control dust and erosion.		▪ Operation

Table 10-20 – Terrestrial Biodiversity: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
TERRESTRIAL BIODIVERSITY			
Impact Management Outcome: ▪ Prevent the unnecessary destruction of, and fragmentation of the biodiversity of the area. ▪ No excess habitat loss within sensitive areas. ▪ Revegetation of cleared areas. ▪ Alien vegetation clearing & control. ▪ Reduce erosion.			
Indicator and Compliance Mechanism: ▪ Induction training and records. ▪ Incident classification and reporting management procedure (to be developed). ▪ Environmental awareness programme/toolbox talks. ▪ Monitoring and audit reports. ▪ Alien Invasive Management Plan.			
No-go areas	The areas to be developed (or activity areas) must be specifically demarcated to prevent the movement of staff or equipment/vehicles into the surrounding environment. Signs must be erected enforce this.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	All laydown, chemical toilets etc. must be restricted to demarcated areas. Any materials may not be stored for extended periods of time and must be removed from the area once the construction phase has been concluded.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
Species of Conservation Concern (SCC)	Any individual protected plant that may be observed needs a relocation or destruction permit if it will be removed or destroyed as a result of the activities.	▪ Site Manager ▪ Contractor	▪ Pre-Construction ▪ Construction

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Preferably, the plants should be relocated to an area that will not be impacted on by future activities.	▪ EO	▪
Fauna	No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this. These actions are illegal in terms of provincial environmental legislation.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	A qualified ECO must be on site when clearing begins. The area must be walked though prior to construction to ensure that no faunal species remain in the habitat and get killed. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪
	Any holes/deep excavations must be dug in a progressive manner in order to allow burrowing animals time to move off and to prevent trapping. Should the holes remain open overnight they must be covered temporarily to ensure no fauna species fall in.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪
	Should any SCC fauna be observed nesting within the proposed footprint area before or during construction, all activities must cease immediately. A relevant faunal specialist must be consulted in order to facilitate the capture or removal of any SCC animals	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Decommissioning
	As appropriate, barrier/fences should be erected to prevent fauna gaining access to construction and operational areas where they have a high probability of being killed or injured.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Decommissioning
Rehabilitation	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds and to support the adjacent habitat. This will also reduce the likelihood of encroachment by more alien invasive plant species.	▪ Contractor ▪ EO	▪ Post Construction

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	All disturbed areas are to be rehabilitated and appropriately landscaped. Rehabilitation to be undertaken in accordance with the Closure Plan included in the EMPr.		
Alien Vegetation Management	An Alien Invasive Plant management Plan must be developed and implemented.	▪ Site Manager ▪ Contractor ▪ EO ▪ Operator	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	All alien vegetation occurring within construction and operational areas must be removed and monitored for re-growth.		
	No plant species whether indigenous or exotic may be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.		
	Walked Surveys of the project perimeter, access roads and other areas adjacent to hard infrastructure to monitor for alien vegetation and re-growth.		

Table 10-21 – Aquatic: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
AQUATIC BIODIVERSITY			
Impact Management Outcome: ▪ Prevent the unnecessary destruction of, and fragmentation of the biodiversity of the area. ▪ Revegetation of cleared areas. ▪ Alien vegetation clearing & control. ▪ Reduce erosion. ▪ Reduce sedimentation			
Indicator and Compliance Mechanism: ▪ Induction training and records. ▪ Incident classification and reporting management procedure (to be developed). ▪ Environmental awareness programme/toolbox talks. ▪ Monitoring and audit reports. ▪ Alien Invasive Management Plan.			
Aquatic Biodiversity	Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Decommissioning
	Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow		
	Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses	▪ Site Manager ▪ Contractor	▪ Pre-Construction ▪ Construction

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions.	▪ EO	▪ Operation ▪ Decommissioning
	No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed project and must be removed immediately without destroying habitat.		
	Channel bed and banks should be re-profiled after installation of linear infrastructure to enable flows to continue undisturbed. The natural channel slopes should be maintained to limit or prevent increased flow velocity. Energy dissipators should be installed to reduce flow velocity.	▪ Site Manager ▪ Contractor ▪ EO	▪ Construction ▪ Decommissioning
	Bare surfaces downstream from the developments, where silt traps are not an option, should be well vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants.	▪ Site Manager	▪ Operation
	Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.	▪ Specialist	▪ Operation
	The water discharge rate should be closely monitored to ensure adherence to the daily discharge limits.	▪ Site Manager ▪ ECO	▪ Operation
	Water quality monitoring should continue downstream and upstream of the discharge point to ensure compliance with WQPL and WULs. Water quality is expected to improve with the WTP discharge.	▪ Site Manager ▪ ECO	▪ Operation
	Regular inspections must be conducted to identify any compromise of infrastructure that requires repairs. Inspection checks must be added to the maintenance procedure. Pipelines and discharge infrastructure should be inspected for hydraulic integrity, and the overall infrastructure performance must be monitored on a regular basis.	▪ Site Manager ▪ ECO	▪ Operation

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	Streamflow monitoring should be conducted daily to detect any changes in the flow regime that might be resulting from project-related activities. The weir at the Vygeboom canal, can be used to monitor the discharge volumes, or Real-time streamflow data loggers can be used to capture real-time flows.	▪ Site Manager ▪ ECO	▪ Operation
	Real-time rainfall measurements using a tipping bucket rain gauge, if possible; and alternatively, a bulk rain gauge can be used to capture the total amount of rainfall for each event.	▪ Site Manager ▪ ECO	▪ Operation

Table 10-22 – Archaeological and Cultural Heritage: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
ARCHAEOLOGICAL AND CULTURAL HERITAGE			
Impact Management Outcome: ▪ To ensure that sites/artefacts of heritage value are identified and protected.			
Indicator and Compliance Mechanism: ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Incident classification and reporting management procedure (to be developed). ▪ Monitoring and audit reports.			
Chance Finds	If any evidence of archaeological sites or remains (e.g., remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments and charcoal/ash concentrations) are found during construction activities, the finds must be reported, and the Chance Find Protocol must be implemented: ▪ Upon finding any archaeological or historical material all work at the affected area must cease. ▪ The area should be demarcated to prevent any further work there until an investigation has been completed. ▪ An archaeologist should be contacted immediately to provide advice on the matter. ▪ Should it be a minor issue, the archaeologist will decide on future action. ▪ Depending on the nature of the find, it may include a site visit. ▪ SAHRA must also be notified. ▪ If needed the necessary, permit will be applied for with SAHRA. This will be done in conjunction with the appointed archaeologist. ▪ The removal of such archaeological material will be done by the archaeologist in lieu of the approval given by SAHRA, including any conditions stipulated by the latter.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Decommissioning

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	▪ Work on site will only continue after the archaeologist/ SAHRA has agreed to such a matter.		

Table 10-23 – Palaeontology: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
PALAEONTOLOGY			
Impact Management Outcome: ▪ To ensure that palaeontological material is identified and protected.			
Indicator and Compliance Mechanism: ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Incident classification and reporting management procedure (to be developed). ▪ Monitoring and audit reports.			
Chance Finds	If any palaeontological material is exposed during construction works, the finds must be reported, and the Chance Find Protocol must be implemented: ▪ All construction activity in the vicinity of the remains is to cease immediately. ▪ The find location must be recorded, and all remains must be left in place. ▪ A palaeontologist should be contacted to investigate. ▪ Potential significance of the remains will be assessed and mitigative options will be identified. ▪ If the significance of the remains is judged to be sufficient to warrant further action and they cannot be avoided, then the investigating archaeologist or palaeontologist in consultation with the Archaeology, Palaeontology and Meteorite (APM) unit of the SAHRA will determine the appropriate course of action. ▪ In the case of human remains, the SA Police pathologist must be contacted to determine if it is of an archaeological nature. If not, the remains will be dealt with by the SAP. ▪ If the remains are assessed to be archaeological, an archaeologist with experience in archaeological burial sites should be contacted who will in consultation with the Graves and Burial unit of SAHRA determine the course of	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Decommissioning

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
	action to be taken. Options could include avoidance or respectful removal and reburial.		

Table 10-24 – Socio-Economic: EMPr Mitigation and Management Measures

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
SOCIO-ECONOMIC			
Impact Management Outcome: ▪ To ensure that the negative socio-economic impacts are mitigated and managed. ▪ To ensure that the positive socio-economic impacts are enhanced.			
Indicator and Compliance Mechanism: ▪ Induction training and records. ▪ Health, safety, environmental and community incident and complaints management system register. ▪ Monitoring and audit reports. ▪ Incident classification and reporting management procedure (to be developed). ▪ PPE Register. ▪ Occupational health and safety plan (to be developed). ▪ Health and safety protocol (to be developed). ▪ Employment records and community engagement local enterprise development records.			
Employment	Opportunities for the training of unskilled and skilled workers from local communities should be maximized.	▪ Site Manager ▪ Contractor ▪ Developer	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.		
	Exploring ways to enhance local community benefits with a focus on broad-based BEE and preferential procurement.		
	A ‘locals first’ policy with regard to construction and operational labour needs.		

Activity/Aspect	Impact Management Actions/Measures	Responsible Person	Priority Timeframe
Employee Management	The applicant and the contractors should develop a Code of Conduct for the project. The code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers.	▪ Site Manager ▪ Contractor ▪ Developer	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	The applicant should implement measures to assist and, if needed, fairly compensate any surrounding businesses for damage to property as a result of construction activities		▪ Pre-Construction ▪ Construction ▪ Decommissioning
	No construction workers, with the exception of security personnel, should be allowed to stay on the site overnight.	▪ Site Manager ▪ Contractor	▪ Pre-Construction ▪ Construction ▪ Decommissioning
	The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.		
Complaints	A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes.	▪ Site Manager ▪ Contractor ▪ EO	▪ Pre-Construction ▪ Construction ▪ Operation ▪ Decommissioning
	Surrounding businesses should be able to contact the site manager to report any issues which they may have. The site manager should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.		

11 RECOMMENDATIONS

The following key aspects are recommended to be included as conditions of authorisation:

- The mitigation measures included in the EMPr must be adhered to.
- The final EMPr must form part of all contractual documents with contractors during construction, operational and decommissioning phases of the project. Furthermore, an independent ECO must be appointed to ensure compliance to all EA conditions and EMPr commitments throughout the construction phase.
- The discharge from the WTP must comply with the Water Quality Planning Limits (WQPL) applicable to the Gladdespruit and surrounding streams in the catchment.
- The aquatic biomonitoring programme should be implemented pre-construction, and throughout the various phases of the project.
- The recommended surface water quality monitoring programmes must be implemented.
- Streamflow monitoring should be conducted to detect any changes in the flow regime that might be resulting from project-related activities.
- Regular infrastructure inspections should be conducted to determine their condition and identify any anomalies and system malfunctions.
- Pipelines and discharge infrastructure should be inspected for hydraulic integrity, and the overall infrastructure performance must be monitored on a regular basis.

12 CONCLUSION

The overall objective of the EIA is to provide sufficient information to enable informed decision-making by the 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 is sufficient for DMRE to make an informed decision for the EA being applied for in respect of the proposed WTP.

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, 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 acceptable. 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 DMRE.

The Final EIR (this report) will be made available to the public and the DMRE. All I&APs on the database (included in the SER (**Appendix D** of the EIR) will be notified of the release of the Final EIR, EMPr and specialist reports.

All issues and comments submitted to WSP during the public review period of the Draft EIR has been incorporated in the CRR (**Appendix D** of the EIR (i.e. SER)). The Final EIR has been submitted to the DMRE, as the CA, for decision-making.

If you have any further enquiries, please feel free to contact:

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Appendix A

EAP CV

Appendix B

EAP DECLARATION

Appendix C

SPECIALIST DECLARATIONS

Appendix D

STAKEHOLDER ENGAGEMENT REPORT

Appendix E

MAPS

Appendix F

DFFE SCREENING TOOL REPORT

Appendix G

SPECIALIST STUDIES

Appendix G.1

AQUATIC BIODIVERSITY IMPACT ASSESSMENT

Appendix G.2

TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

Appendix G.3

SURFACE WATER IMPACT ASSESSMENT

Appendix G.4

HIA AND LETTER OF EXEMPTION FOR PIA

Appendix G.5

GEOTECHNICAL ASSESSMENT

Appendix G.6

CLOSURE ASSESSMENT

Appendix H

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