

# Wonderstone Limited

## Wonderstone – Driekuil Extension Project Consolidation Project



In terms of Section 24 of the National Environmental Management Act, 1998 (NEMA) and Regulation 34, read with Regulation 37 of the NEMA Environmental Impact Assessment (EIA) Regulations, 2021

### Report Purpose

Application for the extension of their approved Converted Mining Right (398MR) (CMR) area by adding portions of the approved New Order Mining Right (397MR) (NORM) to the CMR area, with the additional inclusion of a section of Portion 8 of the farm Gestoptefontein 349 IO. At the same time, certain portions of approved areas of the NOMR will be abandoned. In addition to this, the mine will also be applying for new mining activities as an expansion to the existing operations.

### Report Status

Draft for Stakeholder Review and Comment

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Departmental Ref.: NW30/5/1/2/2/397MR (Partial Abandonment)  
Mining Right Ref: NW30/5/1/2/2/398MR

### Report Author

Tanja Bekker  
*MSc. Environmental Management; Pr.Sci.Nat*  
*EAPASA Reg No: 306/2019; SACNASP Reg No: 400198/09*

### Report Reviewer

Michelle Pretorius  
*SACNASP Reg No: 400003/15*

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## Author

Tanja Bekker is registered as a Professional Natural Scientist in the field of Environmental Science with the South African Council for Natural Scientific Professions (SACNASP) and is also a registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA), a legal requirement stipulated by the National Environmental Management Act, 1998. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include BSc. Earth Sciences (Geology and Geography), BSc. (Hons.) Geography and MSc. Environmental Management. In addition to her tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advancement Programme at Wits Business School.

With more than 20 years' experience in environmental management and the consulting industry, she follows a methodical and practical approach in attending to environmental problems and identifying environmental solutions throughout the planning, initiation, operation and decommissioning or closure of projects.

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Wonderstone – Driekuil Mining Expansion and Consolidation Project  
Mining Right Ref: NW30/5/1/2/2/398MR

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## Executive Summary

### Introduction

Wonderstone Mine Ltd (WST) is located outside Ottosdal, approximately 300km west of Johannesburg in the North West Province. Wonderstone has been mining a uniquely pure Pyrophyllite deposit since 1937. The mining operation takes place on Portion 44 of the farm Gestoptefontein 349 IO and is located in the quaternary catchment C31C in the Lower Vaal Water Management Area (WMA). The mine is located in a rural area of which agriculture and mining are the main contributors to the local Gross Domestic Product (GDP). There are no distinct topographic features along this region and most of the terrain is relatively flat.

Wonderstone holds the mineral rights over Portions 5, 7, 9, 10, 11, remainder of Portion 15 (a portion of Portion 1), 20, 24 (a portion of Portion 5), 40 (a portion of Portion 41, now known as Portion 44) of the farm Gestoptefontein 349 IO and the remainder of Portion 1, Portions 2, 4, 7 (a portion of Portion A), and the Remainder of the Farm Driekuil 280 IP.

Up until recently, the mine has been operating under the legal entitlement, Mining Licence: ML1-97, converted to Mining Right: NW30/5/1/2/2/398MR (Registered Right dated 23 December 2014). The issued mining right authorises the extraction of Pyrophyllite for a period of 30 years over the farm Gestoptefontein 349 IO:

- Portion 44 of the farm Gestoptefontein 349 IO.
- Area measuring 135.916ha.

Mining takes place by means of open cast mining, comprising of hydraulic hammering and excavator loading with no drilling and blasting required.

In addition, WST also holds an approved New Order Mining Right (NOMR) NW30/5/1/2/2/397MR (signed 20 March 2019) over various portions of the farms Gestoptefontein 349 IO and Driekuil 280 IP:

- Portions 5, 7, 9, 10, 11, remainder of Portion 15 (a portion of Portion 1), 20, 24 (portion of Portion 5), 40 (a portion of Portion 41, now known as Portion 44) of the farm Gestoptefontein 349 IO; and
- Remainder of Portion 1, Portions 2, 4, portion 7 (a portion of portion A) and the remainder of farm Driekuil 280 IP.
- Area measuring: 4 595.4239ha

### Project Description

WST is applying for the extension of their approved Converted Mining Right (398MR) (CMR) area by adding portions of the approved New Order Mining Right (397MR) (NORM) to the CMR area, with the additional inclusion of a section of Portion 8 of the farm Gestoptefontein 349 IO. At the same time, certain portions of approved areas of the NOMR will be abandoned. In addition to this, the mine will also be applying for new mining activities as an expansion to the existing WST.

During a pre-application meeting with the Department of Mineral Resources and Energy (DMRE) on 15 November 2021, the Department indicated that WST will be expected to submit a Section 102 Amendment Application. The amendment application will allow for the consolidation of the areas of both rights into one right as well as the abandonment of selected areas and the inclusion of the additional area.

For the aforementioned reasons the proposed project will involve an application, firstly in terms of Section 24 of the National Environmental Management Act, Act No. 107 of 1998 (NEMA) for the development of new activities, and secondly for the abandonment of unused surface portions, and thirdly for the amendment and consolidation of the existing Environmental Management Programme (EMPr) in terms of Regulation 34, read with Regulation 37 of the NEMA.

This Consolidated Environmental Authorisation Application Process pertains to the following main aspects –

- The New Project Expansion;
- The Abandonment and Consolidation of certain Mining Rights Areas; and
- The Consolidation and Update of the Current Environmental Management Programmes (EMPr's).

## New Project Expansion

The mine will continue mining from the existing Wonderstone Opencast Pit located on Portion 44 of the farm of the farm Gestoptefontein 349 IO but proposes to include an additional five (5) mining blocks. The mineral to be mined is Pyrophyllite, an aluminium silicate of the phyllosilicate family, with the chemical formula  $Al_2Si_4O_{10}(OH)_2$ .

The Pyrophyllite is mined via opencast methods with a hydraulic hammer mounted on an excavator that separates the stones' natural partings. The loose stone is then loaded onto dump trucks that transport usable (colour and cracks dependant) stone to the processing plant for further processing and the stone with varying colours and cracks to the low-grade stockpile (current Waste Rock Dump (WRD)) for possible use in future. Historically, there is little to no topsoil on Wonderstone deposits, due to the resource being a natural outcrop. In areas where there is however topsoil present, the topsoil will first be stripped to expose the Pyrophyllite. This topsoil, on completion of the mining process, will be used during the rehabilitation process. The Pyrophyllite will be mined using an excavator equipped with a hydraulic hammer that will break the stone loose, whereafter an excavator with a shovel will load the usable stone onto dump trucks that will transport the stone to the processing plant. Unusable stone will be transported to the low-grade stockpile (current WRD) for possible use in future or to a new WRD which will be located in close proximity to the proposed new mining blocks.

One (1) area is demarcated, as a Waste Rock Dump, for the temporary storage of overburden which will be used for backfilling of the opencast pits in the future, sorting of low-grade and high-grade material and the placement of topsoil.

Existing haul roads will be used but will have to be extended to the new mining area.

No electricity is required in new areas.

No water storage will be required, and chemical toilets will be provided where activities are undertaken.

Dust control on haul roads will be done with the mine's own water bowser and water will be extracted from Driekuilspruit Dam that is included in the mine's existing Water Use Licence (WUL). This 2015 WUL will also be amended as part of this Environmental Authorisation process.

## Abandonment and Consolidation of Mining Rights Areas

Up until recently the mine has been operating under the legal entitlement, Mining Licence: ML1-97, converted to Mining Right: NW30/5/1/2/2/398MR (Registered Right dated 23 December 2014) (Converted Mining Right [CMR]). The issued mining right authorises the extraction of Pyrophyllite for a period of 30 years over the farm Gestoptefontein 349IO:

- ☞ Portion 44 of the farm Gestoptefontein 349 IO.
- ☞ Area measuring 135.916ha in extent.

Mining takes place by means of open cast mining, comprising of hydraulic hammering and excavator loading with no drilling and blasting required.

In addition, WST also holds an approved New Order Mining Right NW30/5/1/2/2/397MR (signed 20 March 2019) (NOMR) over various portions of the farms Gestoptefontein 349IO and Driekuil 280IP:

- ☞ Portions 5, 7, 9, 10, 11, Remainder of Portion 15 (a portion of Portion 1), 20, 24 (a portion of Portion 5), and 40 (a portion of Portion 41, now known as Portion 44) of the farm Gestoptefontein 349 IO; and
- ☞ Remainder of Portion 1, Portions 2, 4, 7 (a portion of Portion A) and the Remainder of the farm Driekuil 280 IP.
- ☞ Area measuring 4 595.4239ha in extent.

The mining rights combined (i.e. CMR and NOMR) cover an area of approximately 4 750ha of which just under 30ha has been disturbed by mining activities to date. A large portion of the northern section of the WST mining area on the farm Gestoptefontein 349IO has been rehabilitated.

WST would like to combine its existing mining rights into a single, consolidated right, in an attempt to ease the administrative duties and compliance requirements associated with multiple mining authorisations per site.

At the same time, the operation would like to abandon some portions of the areas currently included and authorised as part of the approved NOMR area in order to minimise its legal responsibility footprint to that of only the areas currently being mined and those to be mined as far as practically possible. The new mining area will be in the order of 2 050ha, resulting in about 2 768ha to be abandoned. This will result in a reduction of the approved Mining Rights Area of about 58%.

During a pre-application meeting with the Department of Mineral Resources and Energy (DMRE) on 15 November 2021, the Department indicated that WST will be expected to submit a Section 102 Amendment Application. The

amendment application will allow for the consolidation of the areas of both rights into one right, and allow for the abandonment of selected areas.

WST decided to apply for the extension of the approved CMR (398MR) area by adding portions of the approved NOMR (397MR) to the CMR area. At the same time, certain portions of approved areas of the NOMR will be abandoned.

In this regard, a Section 102 Amendment Application will be submitted to apply for the extension of the CMR area by adding Portions of the approved NOMR, and one additional portion of land (Portion 8 of the farm Gestoptefontein) to the CMR area, in addition to abandoning Portions of the approved NOMR.

### **Consolidation and Update of EMPr's (Regulation 34 Amendment)**

In addition to the Consolidated Environmental Authorisation Process, and to allow for its effective implementation, this Application includes the consolidation and update of the current EMPr's in terms of Regulation 34, read with Regulation 37, of the NEMA Environmental Impact Assessment (EIA) Regulations, 2014, as amended.

In this regard, note that Wonderstone conducted a Regulation 34 of the NEMA EIA Regulations, 2014 Environmental Audit during 2019. The audit was completed and submitted to the DMRE on 5 December 2019.

In accordance with Regulation 35 of the NEMA EIA Regulations, 2014; the DMRE provided Wonderstone with a letter of response, dated 13 February 2020 in which the Department acknowledged receipt of the Regulation 34 Environmental Audit Report and made, *inter alia*, the following stipulations:

- ☞ Acknowledged that there are non-compliances and partial compliances with certain provisions of the approved EMPr and that there are aspects which are “unachievable conditions or measures for implementation”,
- ☞ The DMRE acknowledged the observations made in terms of the WRD having been constructed on a water resource.
- ☞ Requested that the mine indicate a plan on how and when the contraventions indicated in the Audit report will be rectified.
- ☞ Requested a review on the adequacy of the Financial Provision previously submitted in the form of a bank guarantee on 29 March 2011.

Based on the outcomes of the Regulation 34 Audit, and the request issued by the DMRE, the mine has appointed external consultants to conduct the consolidation and update of the Wonderstone EMPr to address the shortcomings of the current EMPr's. In addition to this, various specialist studies have been commissioned to consider the current site conditions and to provide site specific considerations in terms of Best Practical Environmental Management Options to be implemented on site, as the management measures provided in the current EMPr's are very broad, which results in uncertainty in the implementation of specific requirements.

The consolidation of the two (2) Mining Rights as mentioned before, will necessitate the consolidation of the two (2) existing EMPr's. The intention of the consolidation and update of the EMPr's, is for the mine to operate under one effective Environmental Management Tool. During previous Environmental Audits, it has been determined that the management measures currently stipulated are not clear and site-specific and for this reason should be updated to reflect the current site conditions and provide site-specific management measures. This, as well as the consolidation of the Mining Rights, will ensure that a holistic EMPr is available on site, addressing the consolidated project. This will aid the operation in understanding the holistic management requirements for all approved activities on site. The update will further enhance environmental planning on site in terms of any potential future changes required, by making management objectives and requirements clear for defined activities.

### **Listed Activities**

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), there are three (3) listing notices which should be considered for this application. These listing notices were amended during 2017 and again 2021. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full Environmental Impact Assessment (EIA) Process. Listing Notice 3 (Regulation 985) activities require a Basic Assessment Process if the area falls within certain geographic zones.

The following table details the listed activities relevant to this project.

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m <sup>2</sup> )	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE AUTHORISATION
<b>Combined clearance:</b>	Approximately 30ha	x	<b>Listing Notice 2, Activity 15:</b> The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity.	-	-
<b>Opencast Mining</b>	Existing opencast pit: 15ha New Opencast blocks: 14ha	x	<p><b>Listing Notice 1, Activity 12:</b> The development of-</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs-</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p><b>Listing Notice 1, Activity 19:</b> 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</p> <p><b>Clearance included in the combined activity before.</b></p> <p><b>Listing Notice 3, Activity 10:</b> The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if applicable).</p> <p><b>Listing Notice 3, Activity 14:</b> The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p>	-	Section 21c&i depending on specialist outcomes.
<b>Establishment of access roads.</b>	Eastern Road at 1.9km length and 6m width Western Road at 1.8km length and 6m width About 2.5ha	x	<p><b>Listing Notice 1, Activity 12:</b> The development of-</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs-</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p>	-	Section 21c&i depending on specialist outcomes.

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m <sup>2</sup> )	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE AUTHORISATION
			<p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p><b>Listing Notice 1, Activity 19:</b> 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.</p> <p><b>Listing Notice 1, Activity 24:</b> The development of a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road — which is 1 kilometre or shorter.</p> <p><b>Listing Notice 3, Activity 4:</b> The development of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p><b>Listing Notice 3, Activity 12:</b> The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan.</p> <p><b>Listing Notice 3, Activity 14:</b> The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p>		
<p><b>Overburden Stockpiles</b></p>	<p>Two Areas of 3.4 and 3.2ha each for topsoil stockpiling. The existing Waste Rock Dump will remain operational at 13.4ha</p>	<p>x</p>	<p><b>Clearance included in the combined activity before.</b></p> <p><b>Depending on Outcomes of Specialist investigations:</b></p> <p><b>Listing Notice 1, Activity 12:</b> The development of-</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs-</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p><b>Listing Notice 1, Activity 19:</b> The infilling or depositing of any material of more than 10 cubic metres into, or</p>	<p><b>Regulation 921, as amended by Regulation 633 dated 24 July 2015:</b></p> <p><b>Waste Management Activity, Category B, Activity 11:</b></p> <p>The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and</p>	<p>Section 21(g)</p>



NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m <sup>2</sup> )	LISTED ACTIVITY	APPLICABLE LISTING NOTICE ( <i>GNR 983, GNR 984 or GNR 985</i> )	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE AUTHORISATION
			<p>the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.</p> <p><b>Listing Notice 3, Activity 14:</b> The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p><b>Listing Notice 3, Activity 12:</b> The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan.</p>	<p>Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).</p>	
<p><b>Waste Rock Dump and PCD</b></p>	<p>The mine is planning on establishing a new WRD, which will be below 5ha in extent. This may also include a new Pollution Control Dam (PCD).</p> <p>The existing Waste Rock Dump will remain operational at 13.4ha</p>	<p>x</p>	<p><b>Depending on Specialist Studies: Listing Notice 1, Activity 12:</b> The development of-</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs-</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p><b>Listing Notice 1, Activity 13:</b> The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more (depending on the Return Water Dam requirements).</p> <p><b>Listing Notice 1, Activity 19:</b> 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.</p> <p><b>Clearance included in the combined activity before.</b></p> <p><b>Listing Notice 2, Activity 6:</b> The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or</p>	<p><b>Regulation 921, as amended by Regulation 633 dated 24 July 2015:</b></p> <p><b>Waste Management Activity, Category B, Activity 11:</b> The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).</p>	<p>Section 21(g) Section 21(c&amp;i)</p>

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m <sup>2</sup> )	LISTED ACTIVITY	APPLICABLE LISTING NOTICE ( <i>GNR 983, GNR 984 or GNR 985</i> )	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE AUTHORISATION
			<p>license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. – this activity is triggered as the proposed dam would require approval in terms of a new Water Use (Section 21g) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).</p> <p><b>Listing Notice 3, Activity 14:</b> The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p>		
<p><b>Abandonment of Rights and Consolidation of Rights</b></p>	<p>The operation would like to abandon some portions of the areas currently included and authorised as part of the approved NOMR area in order to minimise its legal responsibility footprint to that of only the areas to be mined as far as practically possible. The new mining area will be in the order of 2 000ha, resulting in about 2 545ha to be abandoned. This will result in a reduction of the approved Mining Rights Area (combined CMR and NOMR areas) of about 58%. No mining activities have previously been undertaken on the areas being abandoned. This also makes provision for the Consolidation of the Mining Rights to allow for the expansion of the mining operations with the new opencast pit operations.</p>	-	<p><b>Listing Notice 1, Activity 21D:</b> Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment.</p>	-	-

## Aim and Motivation of the Project

### Economic Benefit:

Regulation 23 of the MPRDA states in Section 1(a), that subject to subsection 4, the Minister must grant a mining right if the mineral can be mined optimally in accordance with the Mining Work Programme. The mine has been awarded a Mining Right by the Department of Mineral Resources (DMR; now DMRE) and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

Wonderstone is currently in full production on Portion 44 of the farm Gestoptefontein 349 IO which is the Converted Mining Right (CMR) area. The applicant intends to extend mining to Portion 15 of the farm Gestoptefontein 349 IO that is adjacent to the current mining area and falls in the New Order Mining Right (NOMR) area. All the required infrastructure, with the exception of the Low Grade Stockpile and PCD is already in place therefore mining can start immediately. The remaining extent of the outcrop will be mined according to a schedule. The project will result in an additional 18 years life of mine. The project also allows for the consolidation of the two (2) Mining Rights and abandonment of areas not to be used.

### Giving effect to Waste Reduction:

The reworking of the mineral waste gives effect to the Waste Management Hierarchy as presented in the National Waste Management Strategy, November 2011 and also the Strategy of 2020. This 2011 Strategy states the following:

- A challenge experienced is the lack of a policy and regulatory environment that does not actively promote the Waste Management Hierarchy.
- The report states that while the elimination of waste in its entirety may not be feasible, it is possible through the systematic application of the Waste Management Hierarchy to reach a point within the next few decades where re-use, recycling, recovery and treatment overtake landfills as preferred options for waste management.
- The first goal presented in this strategy as a strategic goal is to “promote waste minimisation, reuse, recycling and the recovering of waste” by focusing on implementing the Waste Management Hierarchy, and with the ultimate aim of diverting waste from landfill.

The following is an abstract of Section 2.3 of the National Waste Management Strategy.

The Waste Management Hierarchy in the National Waste Management Strategy is summarised as follows:

- Waste avoidance and reduction;
- Re-use;
- Recycling;
- Recovery; and
- Treatment and disposal.

The foundation of the hierarchy, and the first choice of measures in waste management, is avoidance and reduction. This step aims for goods to be designed in a manner that minimises their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.

The next stage of the hierarchy is re-using waste. Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties.

After re-use comes the recycling of waste, which involves separating articles from the waste stream and processing them as products or raw materials.

These first four stages of the waste management hierarchy are the foundation of cradle-to-cradle waste management. This approach seeks to re-use or recycle a product when it reaches the end of its life span. In this way, it becomes input for new products and materials. This cycle repeats itself until as small a portion as possible of the original product eventually enters the next level of the waste management hierarchy: recovery.

As a last resort, waste enters the lowest level of the hierarchy to be treated and/or disposed of, depending on the safest manner for its final disposal.

Taking this strategy further, is the current National Waste Management Strategy of 2020. This strategy also focusses on the Circular Economy. A circular economy redefines economic growth by moving away from a take-make-waste industrial model to one that decouples economic activity from the environment and supports a just transition to renewable energy sources. The three key principles of a circular economy are: design out waste and pollution, keep products and materials in use and regenerate natural systems. The two (2) strategic entry points of the waste sector into waste minimisation and the circular economy is waste prevention and waste as a resource, as briefly explained below.

- ☞ Waste Prevention (as highlighted in the 2011 National Waste Management Strategy) – this emphasises avoiding and reducing waste before substances, materials and products are discarded.
- ☞ Waste as a Resource (key focus in the draft Strategy) – this focuses on stimulating a secondary resources economy based on recycling and recovery of materials and energy from waste i.e. interventions that take place after a product or material has become waste. Circularity can deliver substantial material savings throughout value chains and production processes, generate extra value, transformation of industry towards climate-neutrality, long-term competitiveness and unlock economic opportunities. In terms of the waste management hierarchy practices, recycling of waste for reuse and recovery of materials is prioritised over recovery of energy from waste. The main economic driver lies in exploiting the full potential value of waste.

The WST Project specifically considers the opportunity to undertake ongoing rehabilitation to allow for the reduction of waste disposal on surface and also to achieve final land use objectives. In addition to this, by undertaking sourcing at source, this will also reduce the volumes of waste which may require long term or permanent disposal.

#### **Giving effect to Marketing Needs:**

Wonderstone (Pyrophyllite) can be used in its natural form and cut into blocks, it can be shaped into ceramic products and used in powder form.

Resistance to the destructive influences of weathering and corrosive agents, superior workability, strength and other useful qualities, are distinct in the commercial exploitation of this mineral.

Some of the market types, where pyrophyllite is currently incorporated in, include the synthetic diamond industry through High Pressure High Temperature (HPHT) technology, Chemical Vapour Deposition (CVD)-, as well as the ceramics industry.

The synthetic diamond industry currently has an annual growth rate (CAGR) of ~7%. The main market drivers include jewellery and the electronics industries. Initially, HPHT technology is expected to hold market share of 73% up to 2023. Cubic HPHT units are used to produce large volumes of synthetic diamonds of which pyrophyllite accounts for 8-10% of the cubic production costs. The US market has traditionally been seeking a product with balance in high density and consistency; properties that can be met by Wonderstone. China is currently the largest market competitor. The Indian and European market is limited and relatively price sensitive.

CVD production is rising and is expected to be the preferred technology for the long term.

The global technical ceramics market is ~\$68bn, growing at 10% CAGR, of which the US owns about 30% market share. According to research, the addition of pyrophyllite could reduce costs of machining by 50%. Research into the Indian- and European markets indicated limited understanding of the benefits of Wonderstone.

#### **Giving effect to sound Environmental Management and the NEMA Duty of Care Principles:**

The intention to include the Regulation 34 Audit findings in this project is for the mine to operate under one effective Environmental Management Tool. During the past Environmental Audits, it has been determined that the management measures currently stipulated are not clear and site-specific and for this reason should be updated to understand the current site conditions and provide site-specific management measures.

This will aid the operation in understanding the holistic management requirements for all approved activities on site. The update will further enhance environmental planning on site in terms of any potential future changes on site, by making management objectives and requirements clear for defined activities.

A mining operation is continuously progressing towards best operational practices, improving on production and economics of scale. With this, there is an ongoing update and progressing of Environmental Legislation and the

understanding of site conditions based on continuous surface water, groundwater, vegetation monitoring etc being undertaken.

In the process the EMPr may become outdated. By not allowing the update of the existing EMPr as part of this project, the mine will continue with its current environmental management system, with limited understanding of the impact of the operations on the environment and an opportunity to improve of environmental management measures will be lost.

### Alternatives Considered

The purpose of this project is threefold:

- ☞ Expansion of the existing mining operations to ensure a long term mining operations which contributes to the economy of this municipality;
- ☞ Amendment of conditions as identified in the 2019 Regulation 34 Amendment Process to ensure that the EMPr is applicable and practical to address the environmental impacts on the environmental setting as a result of the mining operations; and
- ☞ Consolidation of the EMPrs to have one (1) holistic EMPr for the activities which are undertaken as an integrated mining operations.

### Alternatives Considered:

Limited location alternatives are available for this project as the project are linked to the available identified resources. The following was considered:

1. In terms of the routes, mainly existing roads are utilised for accessing the proposed areas, alternatively the access roads are placed within proximity of the proposed opencast pits.
2. In terms of the proposed WRD, one (1) area with sufficient space has been identified, which was mainly disturbed by past activities, which includes sporting grounds and mine hostels. The footprint presented is a worst case of approximately 4ha, which will allow for a WRD and potential PCD. The area provided for the WRD will be assessed by the specialists to determine where within this identified area the most suitable location for the facility will be. During the initial site walk overs, the potential for graves in this area has been identified. This will have to be confirmed during the specialist investigations to determine whether buffers can be placed to protect these structures.
3. Initially two sorting stockpiles were planned along the northern perimeter of the opencast pits. These have however been removed from the project area, with the commitment that sorting will be undertaken on the footprint of the proposed WRD to reduce further disturbances in areas. These areas will only remain for the stockpiling of topsoil

The only alternative is the No-Go alternative where the status quo remains.

### Application and Consultation Process

The application for the Environmental Authorisation Process for the Integrated Environmental Impact Assessment (IEIA) was submitted to the Department of Mineral Resources and Energy (DMRE), Klerksdorp on 19 April 2022. A letter of acknowledgement from the DMRE has not as yet been received.

Notification of I&APs commenced during the week of 11 April 2022. The notification process was undertaken by means of the following:

- ☞ Newspaper advertisements;
- ☞ Site Notices;
- ☞ Direct Notifications through a Background Information Document.

In order to inform surrounding communities and adjacent landowners of the proposed project, two site notices were erected on site (on 21 April 2022) and at visible locations close to the site.

Site Notices were place at the following locations:

- ☞ Mine Entrance;

Background Information Documents were distributed via email to all parties on the database on during the week of 18 April 2022.

The formal announcement of the proposed project was done by placing an advert in the Stellander on 20 April 2022 to invite all I&APs to register on the project database.

All registered stakeholders were informed of the availability of the draft Environmental Scoping Report on 29 April 2022 for the opportunity to review this document. The notification was sent via email to all registered stakeholders. In addition to this, hard copies were submitted to:

- ☞ Local Municipality;
- ☞ DEFF
- ☞ NWREAD;
- ☞ DMRE;
- ☞ DWS;
- ☞ SAHRA (online submission)
- ☞ One hard copy on site.

The commenting period will end on **01 June 2022**.

### Outcomes of the Specialist Studies

Study Conducted	Outcomes
Soils Assessment	Based on the desktop assessment the dominant soils associated with the study area are youthful soils with intermediate suitability for agricultural potential. The low rainfall (between 401 and 600 mm per annum) and high evaporation demand (between 1801 – 2000 mm per annum) without any supplementary irrigation renders the soils more suitable for cultivation under intensive management. The current extent of the study area should be optimised for mining related activities to avoid potential disturbance of adjacent areas which may be used for cultivation. However, the recommended mitigation and management measures must be implemented accordingly. Nevertheless, this will be confirmed by the field visit in which the soil and land capability survey will cover the full extent of the study area and all potential impacts associated with the proposed development activity will be assessed in detail. Additional mitigatory recommendations will be presented in line with the mitigation hierarchy as advocated by the DEA (2013).
Hydropedological Assessment	Most of the proposed development area comprises shallow soils which do not depict signs of wetness or an indicator of lateral flows in the vadose zone. These soils include Mispah and Glenrosa soil forms. The best suited hydropedological recharge mechanism definition for these areas is responsive shallow. The hydropedological processes are deemed to have a limited contribution (if any) to the wetlands identified in the north-eastern portion of the study area due to the occurrence of shallow soils (less than 30cm at most) which contribute to surface overflow flow during the rainy season. The anticipated dominant recharge mechanism of these wetlands is anticipated to be the shallow aquifer which manifest as springs at specific geological inflection points. The Driekuispruit is mainly driven by surface runoff with contribution from groundwater processes (as reported in the hydrology report). Some portions of the smaller wetlands that feed the Driekuispruit will be mined through while other systems will largely remain unimpacted from a hydropedological point of view. Although soils associated with interflow processes were identified within some portions of the study area which potentially feed the Driekuispruit their contribution is limited and thus the impact of the proposed development on hydropedological processes supporting the Driekuispruit is likely to be low to negligible. However, this will further be confirmed once the modelling processes have been completed. The post mining scenario will likely alter the surface runoff in the greater landscape and ultimately impact on the overall water balance of the catchment. This means that quantity as well as the pattern, timing, and duration of the hydrograph would change and little to no mitigatory options are available. However, no cone of depression is foreseen since the opencast pits will not have any interaction with the groundwater. Additional mitigation measures and recommendations include: <ul style="list-style-type: none"> <li>☞ All surface development footprint areas should remain within demarcated areas as far as possible and disturbance of soil profiles to be limited to what is essential;</li> <li>☞ Water from clean water structures should be discharged back into the watercourse in an attenuated manner; and</li> <li>☞ Implementation of strict erosion control measures to limit loss of soil and sedimentation of the watercourse within the proposed project. If the above mitigatory measures are implemented, with careful construction practices, the significance of the impact can be reduced to a low significance.</li> </ul>
Freshwater Aquatic Study	During the desktop analysis, it was established that various freshwater ecosystems are situated within the footprint of the study and investigation area and will be traversed by the mining block areas (2N, 3N and 5N), stockpiling areas and access roads. The planned method of assessment for the EIA phase will include field verification and delineation of the freshwater ecosystems, defining the Present Ecological State (PES), Ecological service provisioning and Ecological Importance and Sensitivity (EIS), as well as defining and assessing the risk significance of the proposed Driekuil development on the freshwater ecosystems. Preliminary management and mitigation measures include utilising the freshwater ecosystem delineation and Zones of Regulation maps provided in this report for planning purposes, to ensure that no project components encroach on the freshwater ecosystems associated with the proposed Driekuil development.
Ecological Study	Based on the preliminary desktop assessment, the study area is located within the Grassland Biome, within the Dry Highveld Grassland Bioregion. According to Mucina & Rutherford (2006), two vegetation types are associated with the study area, namely the Vulnerable (VU) Klerksdorp Thornveld (Gh 13) and the Endangered (EN) Western Highveld Sandy Grassland (Gh 14). The study area is not located within 10 km of any IBAs or any protected areas. According to the North West Biodiversity Sector Plan (NWBSPP) (2015), the northern portion of the study area is in a CBA 1, with the remaining sections in a CBA 2. CBAs are defined as “irreplaceable” and need be maintained in the appropriate condition for their category, to reach biodiversity targets. The Mining and Biodiversity Guidelines (2013)

	<p>identifies that most of the study area is located in an areas considered to be of High Biodiversity Importance, with a small northern section considered of “Highest Biodiversity Importance”, posing a “high” and “highest risk” for new mining operations. A small section in the southeast of the study area falls within an area considered to be of Moderate Biodiversity Importance.</p> <p>The National Web-Based Environmental Screening Tool assigned the majority of the study area is considered to have a very high sensitivity for the terrestrial biodiversity theme, with a small section southwest of the study area considered to have a low sensitivity. The triggered sensitivity features for the very high sensitivity include a CBA1, ESA1, ESA2, critically endangered ecosystem, and focus areas for land-based protected areas expansion and South African Protected Areas. For the plant species theme, majority of the study area is considered to have a medium sensitivity, a small section (less than 5%) is considered to have a low sensitivity. The triggered sensitive species includes Sensitive Species 1261 (VU). For the animal species theme, the entire study area is considered to have a low sensitivity and no faunal SCC were triggered.</p> <p>From a terrestrial desktop assessment point of view, the study area is considered to range from moderate to high sensitivity. The full biodiversity assessment in the EIA phase will, however, confirm/negate these sensitivities as identified by the relevant desktop datasets based on the detailed field assessment. Sections 4 to 5 provide preliminary impacts, management measures and legal implications pertaining to the proposed mining development based. More information will be provided during the EIA phase. Sensitive habitat types as well as detailed lists of floral and faunal SCC, or species protected under the TNCO (12 of 1983) or NEMBA:TOPS (2007) will be provided in the full biodiversity assessment reports. A comprehensive li</p> <p>List of the risks to the receiving floral and faunal environment will be identified, and additional, relevant mitigatory recommendations will be presented in line with the mitigation hierarchy, as advocated by the DMR et al. (2013), in order to ensure informed decision making and improved sustainable development in the study area.</p>
<p>Hydrological Assessment</p>	<p>The proposed project is located in the upper Harts River catchment, within quaternary catchment C31C, in the Vaal WMA. The Driekuilspruit, which is a non-perennial (seasonal) stream, flows on the western side of the proposed project area and into the Klein-Harts River. The Driekuilspruit has its source approximately 7 km south-east of Ottosdal, where a number of natural pans occur along the quaternary catchment divide. The Klein-Harts River is a tributary of the Harts River, a NFEPA River according to the NFEPA (2011), which flows into the Vaal River near the town of Delportshoop.</p> <p>Further to the above, two unnamed non-perennial tributaries of the Driekuilspruit occur within the vicinity of the project. The first, located approximately 120 m to the north of mining Block 6N, flowing in a westerly direction. The second, flowing in a north-westerly direction towards the existing WRD, which has been historically constructed in its flow path, preventing it from directly flowing into the Driekuilspruit. Water currently ponds on the eastern side of the WRD, seeping through the WRD, to form an artificial wetland system on the western side, directly north of the Black Quarry Dam. A number of farm dams have been constructed on the Driekuilspruit, including the mines Driekuilspruit Dam, which is used to supply the mining operation with water.</p> <p>The following is proposed to be undertaken during the EIA phase of the project:</p> <ul style="list-style-type: none"> <li>☞ Development of conceptual Stormwater Management Plans (SWMP) in accordance with the DWS BPG G1: Storm Water Management and GN R704 regulations. The primary purpose of the SWMP is to ensure that clean (non-impacted mine water) and dirty water (mine impacted water) are clearly separated in accordance with the above-mentioned guideline and regulations;</li> <li>☞ Determination of the 1:100 year floodline for the Driekuilspruit;</li> <li>☞ Update of the mines water balance to include the proposed activities;</li> <li>☞ An assessment of the potential surface water impacts and possible mitigation measures; and</li> <li>☞ Development of monitoring plans that can be used to monitor potential impacts resulting from the proposed mining activities.</li> </ul>
<p>Hydrogeological Study</p>	<p>The most significant impact of the project on the hydrogeology is the operational and long-term impacts on groundwater quality associated with mining and mine waste deposition. Surface source of contamination can be managed by implementing good housekeeping and safety measures. The extent and the impact of groundwater management measures to reduce and/or eliminate impacts associated the project must therefore be confirmed during the EIA phase of the project. With a sound groundwater management and monitoring programme, the project can be authorised. WST must however demonstrate that they have the technical and financial means to protect the aquifers during the project, as groundwater is the sole water resource to the landowners within the project area.</p>
<p>Heritage Assessment</p>	<p>The scoping study did not identify any fatal flaws to the Project from a heritage point of view. To comply with the National Heritage Resources Act (Act 25 of 1999) it is recommended that a Phase 1 HIA must be undertaken for the study area. During the HIA the potential impact on heritage resources will be determined as well as levels of significance of recorded heritage resources. The study will also provide management and mitigation measures should any significant sites be impacted upon, ensuring that all the requirements of the SAHRA are met. The study area is of insignificant to low paleontological sensitivity and according to the SAHRIS palaeontological sensitivity no further studies are required. During the Public participation and stakeholder consultation process (advertisements &amp; site notices) must reference the National Heritage Resources Act and address heritage concerns from stakeholders.</p>
<p>Visual Assessment</p>	<p>The study area has largely been transformed from natural bushveld and grassland to maize and sunflower crops. The natural bushveld sense of place has largely been converted into an agricultural landscape.</p> <p>The visibility of the current infrastructure at Wonderstone was modelled in ArcGIS using the viewshed analysis tool. The existing WRD is the tallest infrastructure at a height of 1 490.5 mamsl.</p>

	<p>Visual receptors identified within the study area include mostly farmhouses.</p> <p>The following will be undertaken during the EIA phase of the project for the VIA study:</p> <ul style="list-style-type: none"> <li>➤ Viewshed modelling of proposed infrastructure heights will be undertaken to determine the visibility of the project on the surrounding landscape; and</li> <li>➤ The visual impacts will be assessed in detail and mitigation measures will be proposed.</li> </ul>
Noise Assessment	<p>The preparation and provision of infra-structure for the proposed Driekuil expansion project will be the main noise sources during the construction, operational phase and the decommissioning phases of the project which may have a cumulative impact on the prevailing ambient noise level. This will however be assessed during the EIA process. The rehabilitation activities during the decommissioning phase may have a temporarily impact on the environment.</p> <p>The environmental noise survey will be conducted during the day and the night-time periods so as to determine the baseline noise levels which will be used to identify possible noise intrusion levels at the abutting noise receptors. This will assist in the management of the project in terms of noise mitigatory measures and management principles for implementation during the construction, operational and decommissioning phases of the project</p>
Air Quality Assessment	<p>A baseline assessment was undertaken which included a geographic overview and a review of available meteorological and monitoring data. In order to characterise the meteorological conditions of the site, local meteorological data was sourced from the Agricultural Research Council meteorological station outside Ottosdal, located approximately 7 km northwest of Wonderstone. Data was acquired for the period January 2017 - December 2019. It was found that winds predominantly originated from the northerly and easterly directions during all seasons of the year, with fastest winds occurring in summer and spring from the north and east.</p> <p>To understand the air quality status quo of the area, dust fallout data was obtained from Wonderstone. This monitoring was undertaken from 2013 – 2015, with no further monitoring conducted post 2015. Due to the lack of available monitoring data for the area, this dust fallout data has been included, although it is noted this must be viewed with caution given the age of the data, while fallout levels measured are extremely low, especially for a mining operation in a relatively dry environment. With this in mind, fallout levels are noted to be extremely low on the Wonderstone boundary, well below the residential standard of 600 mg/m<sup>2</sup>/day.</p>
Socio-Economic Assessment	<p>The continuation with mining activities is deemed to be in line with development priorities to support the local economy in the district and province. The mining activities are expected to have both positive and negative socio-economic impacts on the local environment. The net effect on the socio-economic environment needs to be investigated further in the Social Impact Assessment report. Negative socio-economic impacts also increase the operational risks for the mining company within the local area. The impact assessment report will focus on measures to enhance the benefits to the local community and mitigate negative socio-economic impacts.</p> <p>Based on the outcome of the baseline assessment and social screening, it is recommended that a Social Impact Assessment be compiled during the detailed phase of the Environmental Authorisation process.</p> <p>The study will provide an outline of the main anticipated socio-economic impacts and will indicate how these can be mitigated as part of a Social Management Plan.</p>

## Plan of Study for EIA

The aspects of the project that will be assessed in the EIA phase are those considered by the EAP as having the potential to result in environmental and social impacts. These include:

- Impact on groundwater resources (decant, acid mine generation, groundwater interception during mining);
- Impact on surface water resources (proximity to identified watercourses in the area);
- Impact on soil resources (erosion, loss of soil due to stripping);
- Impact on land capability (due to loss of soil);
- Impact on freshwater ecosystems (due to proximity to identified watercourses);
- Impact on noise in the area;
- Increase in dust dispersion;
- Impact on the socio-economic setting;
- Impact on land uses (such as access to the existing farm dam and windmill);
- Impact on the visual characteristics (with the expansion of mining activities); and
- Impact on heritage resources.

The various projects which will therefore be considered will be the:

- Development of roads;
- Development of low grade WRD stockpile areas and associated PCD (should this be required);
- Development of Opencast Operations;
- Development of a backfilling strategy for rehabilitation;
- Overall consolidation of the EMPr with the existing mining activities.



Specialist studies will be undertaken to determine the impact and potential flaws of the projects within the environmental setting. Note that the specialist studies will also make recommendations to the amendment of activity layouts should these be required. The following specialist studies will be undertaken:

The following specialist have been appointed for the project:

- ☞ Terrestrial Ecologist;
- ☞ Wetland Specialist;
- ☞ Air Quality Specialist;
- ☞ Soils and Land Capability Specialist;
- ☞ Hydrologist;
- ☞ Hydropedologist;
- ☞ Noise Specialist;
- ☞ Hydrogeologist; and
- ☞ Stakeholder Consultation Specialist.

The commenting period for the draft ESR will end on 01 June 2022, whereafter the final ESR will be issued to the DMRE for comment. Once the draft EIA and EMPr has been developed, in consultation with the stakeholder consultation process and the Specialist Studies, this report will also be made available to stakeholders for review.

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**mineral resources**  
Department:  
Mineral Resources  
REPUBLIC OF SOUTH AFRICA

## **FIRST DRAFT SCOPING REPORT**

### **FOR LISTED ACTIVITIES ASSOCIATED WITH MINING RIGHT AND/OR BULK SAMPLING ACTIVITIES INCLUDING TRENCHING IN CASES OF ALLUVIAL DIAMOND PROSPECTING.**

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS 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).

<b>NAME OF APPLICANT:</b>	<b>Wonderstone Limited</b>
<b>TEL NO:</b>	<b>+27 (0) 18 571 0076</b>
<b>EMAIL :</b>	<b>marisapienaar@assore.com</b>
<b>POSTAL ADDRESS:</b>	<b>P.O.Box 10, Ottosdal, 2610</b>
<b>PHYSICAL ADDRESS:</b>	<b>Wonderstone Mine Gestoptefontein Farm Ottosdal, North West Province, 2610, South Africa</b>
<b>FILE REFERENCE NUMBER SAMRAD:</b>	<b>Mining Right Reference Number: NW 30/1/2/2/398 MR</b>

## 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 valuation 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 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.

## OBJECTIVE OF THE SCOPING PROCESS

1) The objective of the scoping process is to, through a consultative process—

- identify the relevant policies and legislation relevant to the activity;
- motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
- identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
- identify the key issues to be addressed in the assessment phase;
- agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
- identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

## SCOPING REPORT

The application for the Environmental Authorisation Process for the Integrated Environmental Impact Assessment (IEIA) was submitted to the Department of Mineral Resources and Energy (DMRE), Klerksdorp on 19 April 2022. The applications were received and stamped by the DMRE. A formal letter of acknowledgement from the DMRE has not been received at the time of submission of this draft Environmental Scoping Report (ESR).

Please refer to Appendix 2 for the submitted application form and proof of submission.

### 1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

#### 1.1 Details

##### 1.1.1 Details of the Environmental Assessment Practitioner (EAP)

Table 1: Details of EAP

<b>Name</b>	Tanja Bekker
<b>Designation</b>	Environmental Assessment Practitioner
<b>Postal Address</b>	PO Box 22014, Helderkruijn, 1733
<b>Physical Address</b>	21 Gladiolus Street, Roodekrans, 1724
<b>Telephone Number</b>	+27 (0) 82 412 1799
<b>Cell Phone Number</b>	+27 (0) 82 412 1799
<b>Fax Number:</b>	+ 27 (0) 86 551 5233
<b>Email Address</b>	tanja@envirologistics.co.za

##### 1.1.2 Expertise of the EAP

The following table presents a summary of the EAP's experience:

Table 2: Experience of EAP

Name	Position	Qualification	Professional Registrations	Experience
Tanja Bekker	Principal Practitioner	M.Sc. Environmental Management (RAU; now Johannesburg University)	Registered member of the Environmental Assessment Practitioners Association of South Africa (EAPASA; Reg No. 306/2019) Registered with the South African Council for National Scientific Professions (SACNASP; Pr.Sci.Nat. Reg No. 400198/09) Member of International Association of Impact Assessors (IAIA) Member of the Environmental Law Association of South Africa (ELA)	20 Years

#### Education

- M.Sc. Environmental Management - RAU (University of Johannesburg)
- B.Sc. Geography Honours - RAU (University of Johannesburg)
- B.Sc. Earth Sciences (Geography & Geology) – RAU (University of Johannesburg)

#### Career Enhancing Courses

- ISO 14000 Lead Auditors Course (WTH Management)
- Certificate in Project Management (Pretoria University)
- Management Advance Programme (MAP 81) (Wits Business School)

#### Professional Affiliations

- Registered member of Environmental Assessment Practitioners Association of South Africa (EAPASA)
- Registered as a Professional Natural Scientist (Pr.Sci.Nat) with the South African Council for National Scientific Professions (SACNASP)
- Member of the South African affiliate of the International Association for Impact Assessment (IAIA)
- Member of the Environmental Law Association of South Africa (ELA).
- Certified ISO 14001 Environmental Management System Auditor

### Summary of the EAP’s past experience

Ms. Bekker is registered as a Professional Natural Scientist in the field of Environmental Science with the South African Council for Natural Scientific Professions (SACNASP) and is also a Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA), a legal requirement stipulated by NEMA. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include BSc. Earth Sciences (Geology and Geography), BSc. (Hons.) Geography, and MSc. Environmental Management. In addition to these tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advancement Programme at Wits Business School.

With more than 20 years' working experience in environmental management and the consulting industry and managing various Large Account Clients, she understands the South African Regulatory System, and can advise clients with due diligence on their environmental regulatory requirements and offer a solution driven service to their project life cycle. She is equipped with exceptional project management and coordination skills, which especially enhances the service she offers clients within the environmental permitting system.

Her key focus is environmental management and compliance with extensive experience in the mining industry. Project Management and Coordination of projects form a critical component of her duties, which include project planning, initiation of projects, client, authority and stakeholder consultation, specialist coordination, budget control, process control, quality control and timeframe management. Her interest lies in a client advisory capacity, being involved during due diligence investigations, pre-project development and assisting the client and engineering team in adding value to develop the project in an environmentally sustainable manner, considering client costs and liabilities, as well as considering the implication of environmental authorisation conditions and requirements on project deliverables. Her involvement in projects has spanned over the project life cycle from Due Diligence Investigations, Pre-Feasibility Investigations, Prospecting Right Applications, Mining Right Applications, Environmental Reporting and implementation and auditing of Environmental Management Plans and Authorisations.

Refer to Appendix 1 for the Curriculum Vitae of the EAP.

### *1.1.3 Details of the Applicant*

Wonderstone Limited (hereafter referred to as “WST” or “the mine”) is wholly owned by Assore Ltd (“Assore”) and has been mining a uniquely pure Pyrophyllite deposit 300km west of Johannesburg, outside Ottosdal in the North West Province, since 1937.

The mine is operated under both a New Order Mining Right (NOMR) and a Converted Mining Right (CMR) and has various Environmental Authorisations in place to allow for the legal mining and operation of the site.

Wonderstone is ISO 9001:2015 and ISO 14001:2015 certified (TUV Rheinland Certification Body).

*Table 3: Details of Applicant*

<b>Project applicant:</b>	Wonderstone Limited		
<b>Registration no (if any):</b>	NW 30/5/1/2/2/398 MR (with incorporation of certain portions of NOMR 397MR)		
<b>Trading name (if any):</b>	Wonderstone Limited		
<b>Responsible Person, (e.g. Director, CEO, etc.):</b>	General Manager - Wonderstone Limited.		
<b>Contact person:</b>	Ms Marisa Pienaar		
<b>Physical address:</b>	The mine is situated outside Ottosdal on Portions 5, 7, 9, 10, 11, 15, 20, 24 and a certain portion of Portion 44 of the farm Gestoptefontein 349 IO; Portions 1, 2, 4, 7 and the Remainder of the farm Driekuil 280 IP; situated in the magisterial district of Lichtenburg. The physical activities are undertaken on Portion 44 of the farm Gestoptefontein 349 IO.		
<b>Postal address:</b>	Private Bag X03, Northlands		
<b>Postal code:</b>	2116	Cell:	+27 (0) 82 825 3772
<b>Telephone:</b>	+27 (0) 11 770 6827	Fax:	-
<b>E-mail:</b>	marisapienaar@assore.com		

### 1.1.4 Environmental Authorisations

The mine is operating with all required environmental authorisations as indicated in the table below.

Table 4: List of Environmental Authorisations

#	Legislation	Licence	Reference	Date
1	Minerals Act	Environmental Management Programme (EMPr) and Record of Decision (ROD)	-	EMPr Dated 1997 Stamped and signed March 1998
2	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA)	Wonderstone EMPr Amendment and ROD	RDNW (KL) 6/2/2/(2975) EM	EMPr Dated 18 July 2008 (DMR Stamp of Receipt); ROD Dated 20 April 2010
3	MPRDA	Driekuil EMPr Addendum and ROD	RDNW (KL) 6/2/2/2975 Addendum	EMPr Dated 9 March 2009; ROD Dated 20 April 2010
4	MPRDA	Mining Right in terms of MPRDA on Portions 5, 7, 10, 15 and Portions A (Portion of Portion 1), 9, 25 (Portion of Portion 5) and a certain portion of Portion 44 of the farm Gestoptefontein 349 IO; Potions 2, 4, 7 (Portion of Portion 10, Remainder of Portion 1 and the Remainder of the farm Driekuil 280 IP	MR J/2008/08/22/001	1 February 2011
5	MPRDA	Conversion of Minerals Right for the conversion of an old order mining right for pyrophyllite – Gestoptefontein Portion 44.	MR J/2006/05/31/001	27 September 2012
6	National Water Act (Act No. 36 of 1998) (NWA)	Water Use Licence (WUL)	09/C31C/ABCGI/2741	11 January 2015
7	National Environmental Management (Act No. 107 of 1998) (NEMA) Section 24G	Construction of River Crossing	REC 03/2014NW	2 June 2016

## 1.2 Description of the Property

### 1.2.1 Location of the Mine

WST is located outside Ottosdal, approximately 300km west of Johannesburg in the North West Province. Wonderstone has been mining a uniquely pure Pyrophyllite deposit since 1937. The mining operation takes place on Portion 44 of the farm Gestoptefontein 349 IO and is located in the quaternary catchment C31C in the Lower Vaal Water Management Area (WMA). Please refer to the figure overleaf. The mine is located in a rural area of which agriculture and mining are the main contributors to the local Gross Domestic Product (GDP). There are no distinct topographic features within the larger region and most of the terrain is relatively flat.

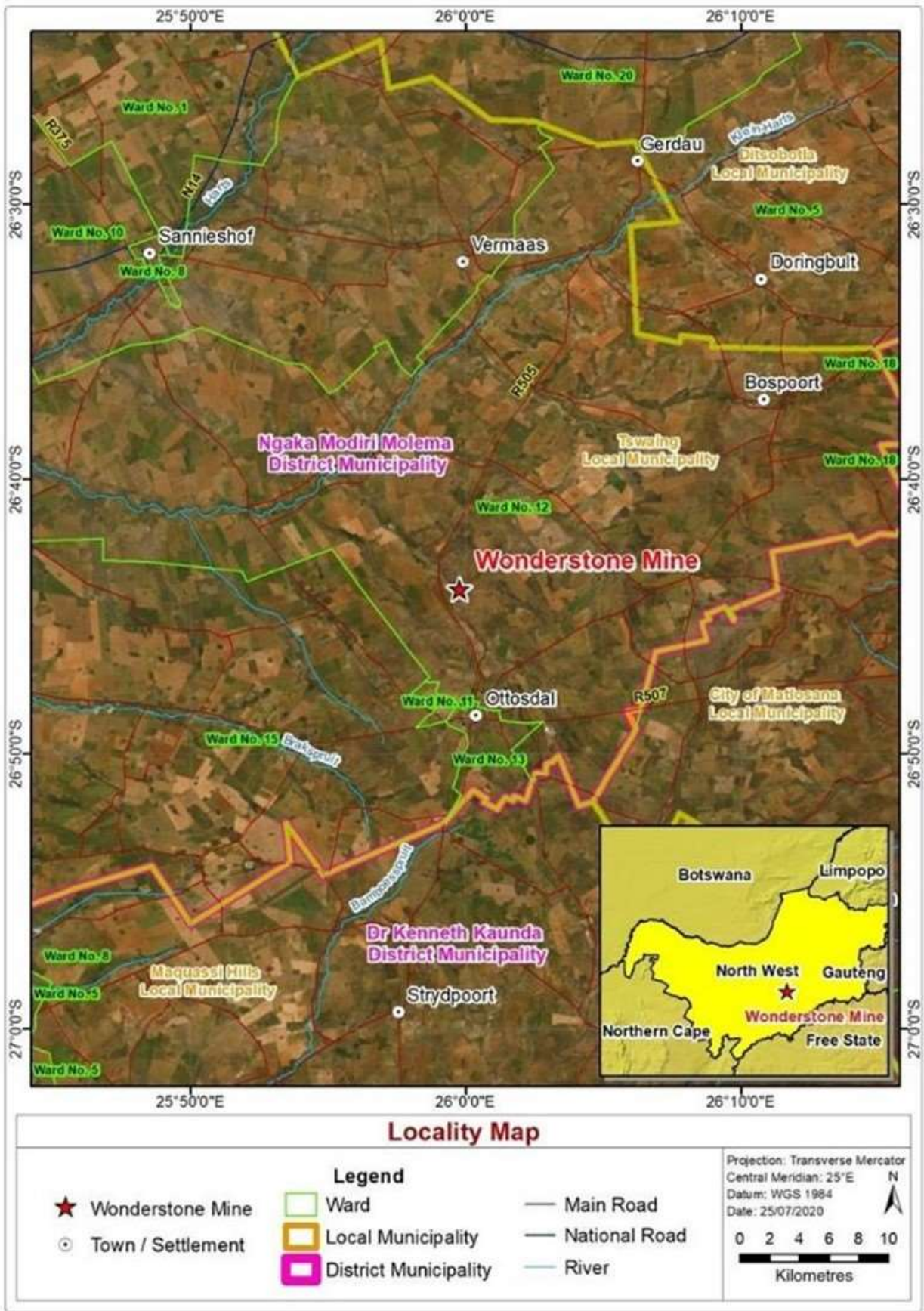


Figure 1: Local Setting



## 1.2.2 Ownership of Land and Locality Map

WST is a mining operation that is wholly owned by Assore Ltd. (“Assore”) and has been mining a uniquely pure Pyrophyllite deposit since 1935. The site is situated ±300 kilometres west of Johannesburg and approximately 10km outside Ottosdal in the North-West Province.

Wonderstone holds the mineral rights over Portions 5, 7, 9, 10, 11, remainder of Portion 15 (a portion of Portion 1), 20, 24 (a portion of Portion 5), 40 (a portion of Portion 41, now known as Portion 44) of the farm Gestoptefontein 349 IO and the remainder of Portion 1, Portions 2, 4, 7 (a portion of Portion A), and the Remainder of the Farm Driekuil 280 IP.

Up until recently, the mine has been operating under the legal entitlement, Mining Licence: ML1-97, converted to Mining Right: NW30/5/1/2/2/398MR (Registered Right dated 23 December 2014). The issued mining right authorises the extraction of Pyrophyllite for a period of 30 years over the farm Gestoptefontein 349 IO:

- ☞ Portion 44 of the farm Gestoptefontein 349 IO.
- ☞ Area measuring 135.916ha.

Mining takes place by means of open cast mining, comprising of hydraulic hammering and excavator loading with no drilling and blasting required.

In addition, WST also holds an approved New Order Mining Right (NOMR) NW30/5/1/2/2/397MR (signed 20 March 2019) over various portions of the farms Gestoptefontein 349 IO and Driekuil 280 IP:

- ☞ Portions 5, 7, 9, 10, 11, remainder of Portion 15 (a portion of Portion 1), 20, 24 (portion of Portion 5), 40 (a portion of Portion 41, now known as Portion 44) of the farm Gestoptefontein 349 IO; and
- ☞ Remainder of Portion 1, Portions 2, 4, portion 7 (a portion of portion A) and the remainder of farm Driekuil 280 IP.
- ☞ Area measuring: 4 595.4239ha

Wonderstone Ltd. (“WST” or “the mine”) is applying for the extension of their approved Converted Mining Right (398MR) (CMR) area by adding portions of the approved New Order Mining Right (397MR) (NORM) to the CMR area, with the additional inclusion of a section of Portion 8 of the farm Gestoptefontein 349 IO. At the same time, certain portions of approved areas of the NOMR will be abandoned. In addition to this, the mine will also be applying for new mining activities as an expansion to the existing WST.

For the aforementioned reasons the proposed project will involve an application, firstly in terms of Section 24 of the National Environmental Management Act, Act No. 107 of 1998 (NEMA) for the development of new activities, and secondly for the abandonment of unused surface portions, and thirdly for the amendment and consolidation of the existing Environmental Management Programme (EMPr) in terms of Regulation 34, read with Regulation 37 of the NEMA.

The following table presents the property information in question.

Table 5: Property Information

<b>Farm Name (Surface Rights):</b>	☞ Gestoptefontein 349 IO; Driekuil 280 IP
<b>Farm Name (Mineral Rights):</b>	☞ Overall Mineral Rights for Wonderstone <ul style="list-style-type: none"> <li>○ Portions 5, 7, 9, 10, 11, remainder of Portion 15 (a portion of Portion 1), 20, 24 (a portion of Portion 5), 40 (a portion of Portion 41, now known as Portion 44) of the farm Gestoptefontein 349 IO; Remainder of Portion 1, 2, 4, 7 (a portion of Portion A), and the Remainder of the farm Driekuil 280 IP</li> </ul>
<b>Magisterial district:</b>	Wonderstone Limited is located in the Tswaing Local Municipality which forms part of the Ngaka Molema District Municipality within the North West Province.
<b>Distance and direction from nearest town:</b>	Wonderstone Limited is situated on Portion 44 of the Farm Gestoptefontein 349 IO, approximately 10km north of Ottosdal on the Lichtenburg road (R505).
<b>21 digit Surveyor General Code for each farm</b>	<u>New Consolidation:</u> ☞ T0I00000000034900005

**portion**

- T010000000003490007
- T010000000003490008
- T010000000003490009
- T010000000003490010
- T010000000003490011
- T010000000003490015
- T010000000003490020
- T010000000003490024
- T010000000003490044
- T010000000002800000
- T010000000002800002
- T010000000002800004

Abandonment:

- T010000000003490005
- T010000000003490007
- T010000000003490009
- T010000000003490010
- T010000000003490011
- T010000000003490015
- T010000000003490020
- T010000000003490024
- T010000000003490044
- T010000000002800000
- T010000000002800002
- T010000000002800004

Title Deeds attached in Appendix 4.

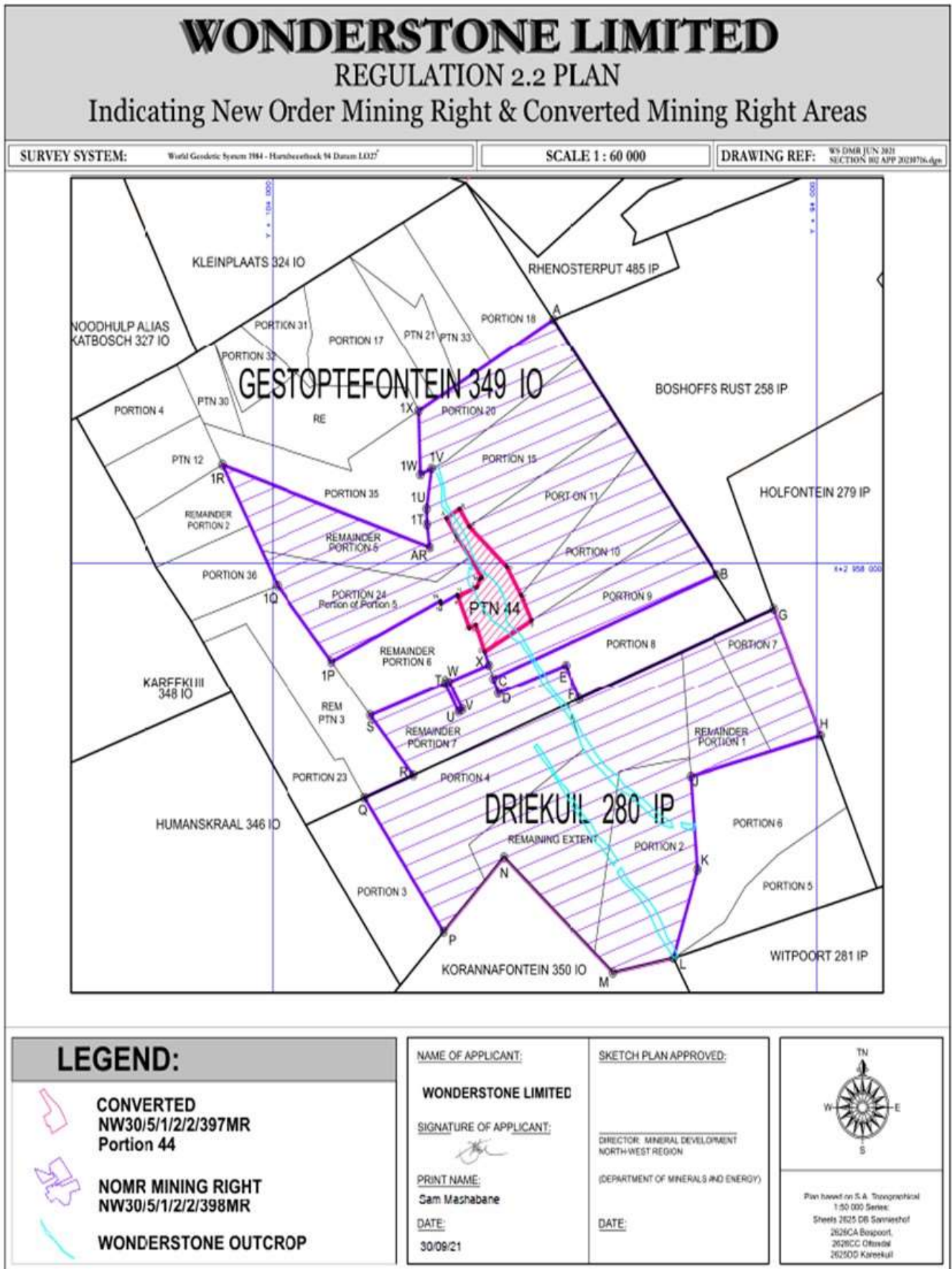


Figure 2: Illustration of the Current Mining Rights owned by WST

The following table presents the list of surface rights owners:

Table 6: Surface Rights Holders

Farm Name	Portion	Comment	Ownership as Confirmed by Wonderstone	Title Deed
<b>Current Area</b> Gestoptefontein 349 IO	RE of 5	Retain a portion of this portion	Renier Adriaan Petrus Weideman	T92404/94 (17 November 1994)
Gestoptefontein 349 IO	RE of 7	Retain a portion of this portion	Mr Jacobus Frederik (Koos) Weideman	T18088/99 18 February 1999)
Gestoptefontein 349 IO	8	Application for a section of this portion to be included into the new Mining Right.	Charles Badenhorst	T126953/2001 (9 November 2001)
Gestoptefontein 349 IO	RE of 9	Retain a portion of this portion	Charles Badenhorst	T126953/2001 (9 November 2001)
Gestoptefontein 349 IO	RE of 10	Retain a portion of this portion	Jacques Foster	T51695/97 (2 June 1997)
Gestoptefontein 349 IO	RE of 11	Retain a portion of this portion	Linda Yvonne Taljaard	T43743/96 (27 May 1996)
Gestoptefontein 349 IO	RE of 15 (a portion of Portion 1)	Retain a portion of this portion	Linda Yvonne Taljaard	T43743/1996 (27 May 1996)
Gestoptefontein 349 IO	20	Retain a portion of this portion	Willem Jacobus Scholtz	T7762/98 (29 January 1998)
Gestoptefontein 349 IO	RE of Portion 24 (portion of Portion 5)	Retain a portion of this portion	Ansie Steyn Trust (Contact Nico Steyn)	T12699/96 (19 February 1996)
Gestoptefontein 349 IO	44	Retain full portion	Wonderstone Ltd	T81675/94 (4 October 1994)
Driekuil 280IP	RE	Retain a portion of this portion	Rossouw de Toit	T106038/95 (6 December 1995)
Driekuil 280IP	2	Retain a portion of this portion	Elri van den Berg	T92063/2013 (7 November 2013)
Driekuil 280IP	4	Retain a portion of this portion	Willem Jacobus Grobbelaar	T24944/199 (9 March 1999)
<b>Proposed Abandonment Areas</b>				
Gestoptefontein 349 IO	RE of Portion 5	Abandon a portion of this portion (Area 5)	Renier Adriaan Petrus Weideman	T 92404/94 (17 November 1994)
Gestoptefontein 349 IO	RE of Portion 24 (Portion of Portion 5)	Abandon a portion of this portion (Area 5)	Ansie Steyn Trust (Contact Nico Steyn)	T12699/96 (19 February 1996)
Gestoptefontein 349 IO	RE of Portion 7	Abandon a portion of this portion (Area 4)	Jacobus Frederik Weideman	T18088/99 18 February 1999
Gestoptefontein 349 IO	RE of Portion 9	Abandon a portion of this portion (Area 1)	Charles Badenhorst	T126953/2001 (9 November 2001)
Gestoptefontein 349 IO	RE of Portion 10	Abandon a portion of this portion (Area 1)	Jacques Foster	T51695/97 (2 June 1997)
Gestoptefontein 349 IO	RE of Portion 11	Abandon a portion of this portion (Area 1)	Linda Yvonne Taljaard	T43743/96 (27 May 1996)
Gestoptefontein 349 IO	RE of Portion 15	Abandon a portion of this portion (Area 1)	Linda Yvonne Taljaard	T43743/1996 (27 May 1996)
Gestoptefontein 349 IO	RE of Portion 20	Abandon a portion of this portion (Area 1)	Willem Jacobus Scholtz	T7762/98 (29 January 1998)
Driekuil 280IP	4	Abandon a portion of this portion (Area 3)	Willem Jacobus Grobbelaar	T24944/199 (9 March 1999)
Driekuil 280IP	Remainder	Abandon a portion of this portion (Area 3)	Rossouw de Toit	T106038/95 (6 December 1995)
Driekuil 280IP	RE of Portion 1	Abandon full portion (Area 2)	Rossouw de Toit	T16397/04 25 February 2004
Driekuil 280IP	7	Abandon full portion (Area 2)	Kobus Pienaar	T7779/1962 26 April 1962
Driekuil 280IP	Remainder	Abandon a portion of this portion (Area 2)	Rossouw de Toit	T106038/95 (6 December 1995)
Driekuil 280IP	2	Abandon a portion of this portion (Area 2)	Elri van den Berg	T92063/2013 (7 November 2013)

Please refer to the following figure illustrating the areas proposed for abandonment:

Wonderstone – Driekuil Mining Expansion and Consolidation Project  
Mining Right Ref: NW30/5/1/2/2/398MR

Project Ref: 202110  
Version: Final Draft – Stakeholder Review

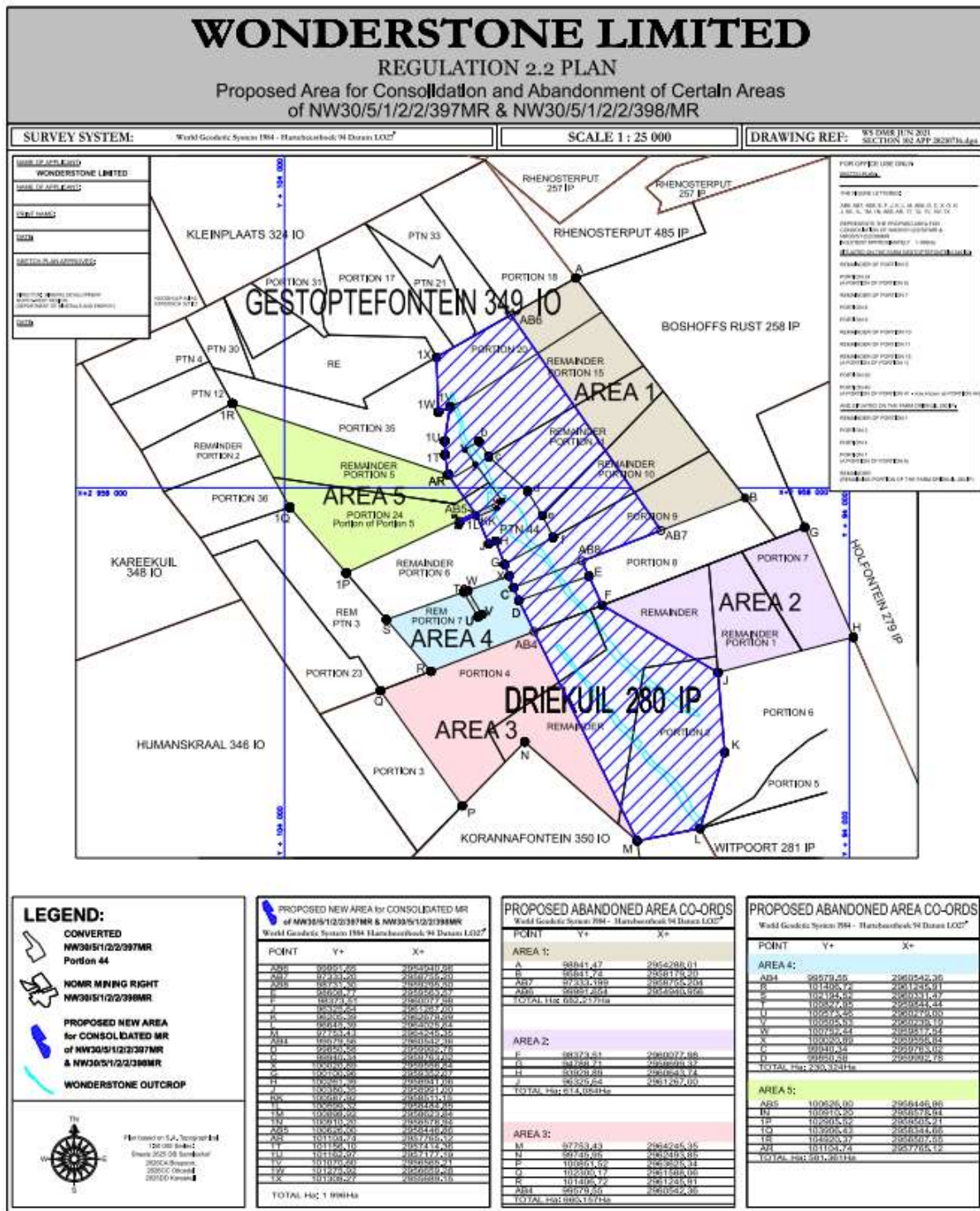


Figure 3: Proposed Abandonment Areas

### 1.3 Locality Map of Project Area

The current mining area is restricted to Portion 44 of the farm Gestoptefontein 349IO (please refer to the following figure). However, with the new Consolidated Mining Rights area, additional opencast operations will also be undertaken on Portion 15 of the farm Gestoptefontein. Various other sections of farm portions will remain part of the Consolidated Mining Rights Application for future exploration and mining activities, should this prove feasible.

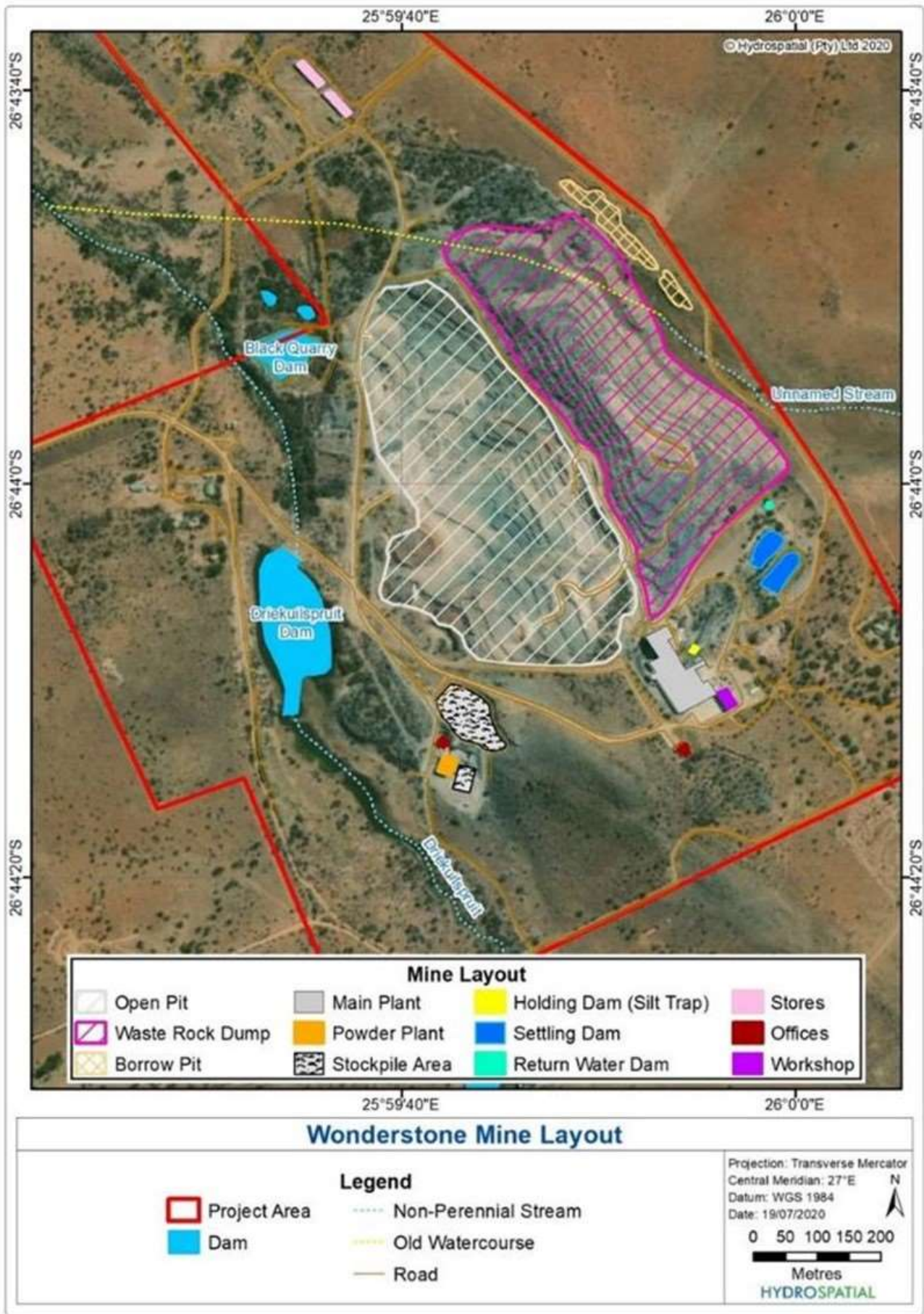


Figure 4: Current Mine Layout on Portion 44 of the farm Gestoptefontein

## 2 DESCRIPTION OF THE SCOPE OF THE PROPOSED ACTIVITY

Wonderstone Ltd (WST) is applying for the extension of the approved Converted Mining Right (398MR) (CMR) area by adding portions of the approved New Order Mining Right (397MR) (NORM) to the CMR area, with the additional inclusion of a section of Portion 8 of the farm Gestoptefontein 349 IO. At the same time certain portions of approved areas of the NORM will be abandoned. In addition to this the mine will also be applying for new mining activities as an expansion to the existing WST.

For this reason, the project will involve the application in terms of Section 24 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) for the development of new activities, as well as for the amendment and consolidation of the existing Environmental Management Programme (EMPr) in terms of Regulation 34, of the NEMA read with Regulation 37.

The project in question involves the following:

- The New Project Expansion;
- The Abandonment and Consolidation of certain Mining Rights Areas; and
- The Consolidation and Update of the mine's current EMPr's.

A description of each of the abovementioned aspects follows in the sections below.

### 2.1 New Project Expansion

The mine will continue mining from the existing Wonderstone Opencast Pit located on Portion 44 of the farm of the farm Gestoptefontein 349 IO but proposes to include an additional five (5) mining blocks. The mineral to be mined is Pyrophyllite, an aluminium silicate of the phyllosilicate family, with the chemical formula  $Al_2Si_4O_{10}(OH)_2$ .

The Pyrophyllite is mined via opencast methods with a hydraulic hammer mounted on an excavator that separates the stones' natural partings. The loose stone is then loaded onto dump trucks that transport usable (colour and cracks dependant) stone to the processing plant for further processing and the stone with varying colours and cracks to the low-grade stockpile (current Waste Rock Dump (WRD)) for possible use in future. Historically, there is little to no topsoil on Wonderstone deposits, due to the resource being a natural outcrop. In areas where there is however topsoil present, the topsoil will first be stripped to expose the Pyrophyllite. This topsoil, on completion of the mining process, will be used during the rehabilitation process. The Pyrophyllite will be mined using an excavator equipped with a hydraulic hammer that will break the stone loose, whereafter an excavator with a shovel will load the usable stone onto dump trucks that will transport the stone to the processing plant. Unusable stone will be transported to the low-grade stockpile (current WRD) for possible use in future or to a new WRD which will be located in close proximity to the proposed new mining blocks.

Mining will be done using the bench method with benches not higher than 5 meters. In addition to this, the mine will undertake ongoing rehabilitation. An example of a possible rehabilitation strategy is presented below. It should however be noted, that this could change as the customer/markets demand changes over time, which affects when mining in certain pits for certain ore grades are scheduled. The discussion below should therefore be regarded as being for illustrative purposes only.

1. The intent of the mine is to commence with mining operations on Block 2N (during years 2027/2028) and Block 3N (year 2029).
2. All the low grade ore from Block 2N (approximately 40% of all mined ore) will be placed on the proposed new WRD as the mining void will be available for backfilling. This will be dependent on the available void from the current mining Block 1N.
3. Once Block 2N is completed, backfilling and/or roll-over opencast mining will commence into this block from the year 2034 from Block 3N, Block 4N (from year 2035) and Block 5N (from year 2036).
4. Once Block 3N is completed, backfilling and/or a roll-over opencast mining from Block 4N will take place into Block 2N until filled, followed by Block 3N.
5. The WRD will therefore only receive low-grade material from the total Block 2N, with low-grade material also being placed on this facility during the first three (3) years of Block 3N and the first two

- (2) years of Block 4N. The proposed new WRD will also receive any excess material that cannot be accommodated in the open mining voids due to the bulking factor of broken material.
6. The remainder of Block 3N will be backfilled into Block 2N (however leaving a void for the first year of Block 5N’s low-grade) and Block 4N up until Block 2N is backfilled whereafter this material will be backfilled into Block 3N.
  7. Once Block 5N and 6N begins, no disposal will be required on the WRD, and all material will be placed in open voids. This will however result in voids potentially remaining in Block 4N, Block 5N and Block 6N.

Please refer to the diagram below for a conceptual illustration of how ongoing rehabilitation could take place (for illustration purposes only).

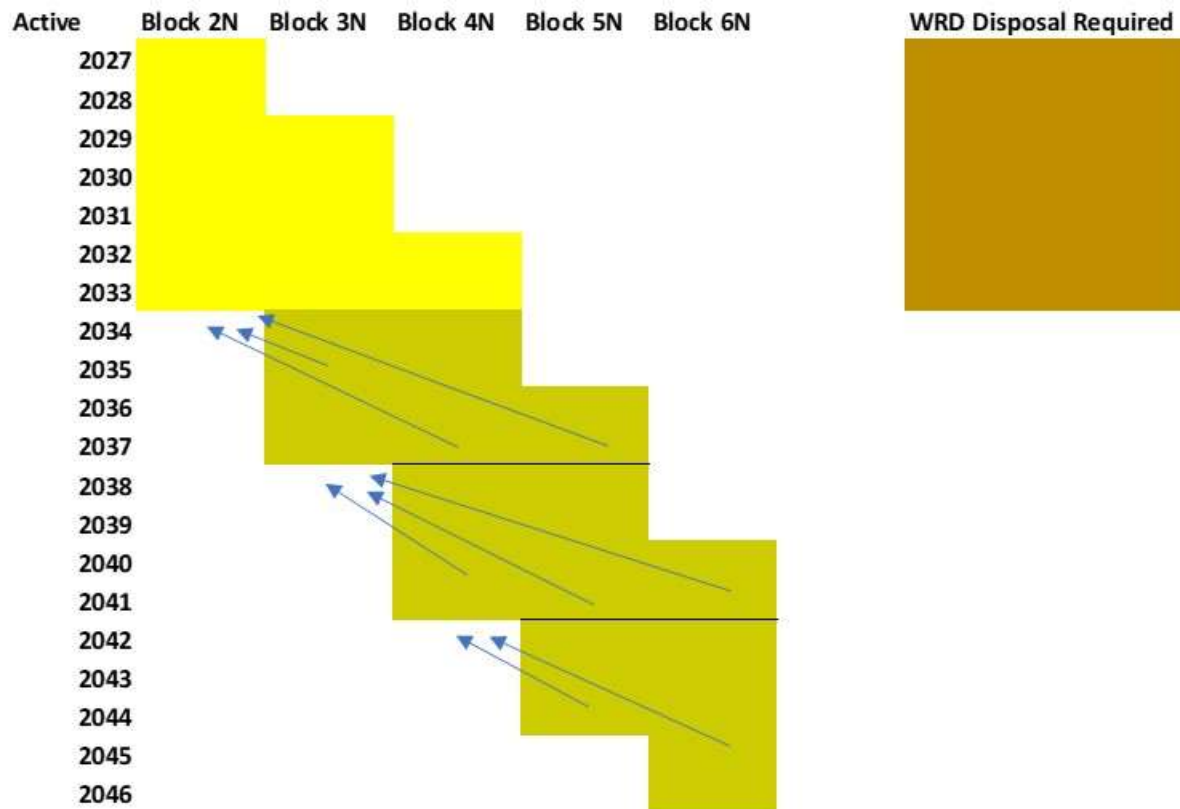


Figure 5: Schematic illustration of potential backfilling options.

One (1) WRD area is demarcated, next to the opencast pits, for the temporary storage of overburden which will be used for backfilling of the opencast pits in the future, sorting of low-grade and high-grade material and the placement of topsoil.

Existing haul roads will be used but will have to be extended to the new mining area.

No electricity is required in new areas.

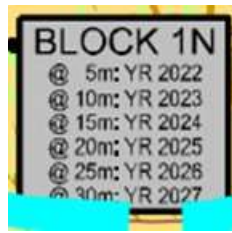
No water storage will be required, and chemical toilets will be provided where activities are undertaken.

Dust control on haul roads will be done with the mine's own water bowser and water will be extracted from Driekuilspruit Dam that is included in the mine's existing Water Use Licence (WUL). There are, however, existing boreholes that can be developed should the need arise.

The proposed project will involve:

- ☞ Topsoil Stripping – with material placed as berms around the opencast pits;
- ☞ Mining:
  - Mining of existing area (Block 1N – about 15ha in extent)





- Five (5) mining blocks (of 2.5ha, 2.1ha, 2.1ha, 2ha and 2.9ha in extent, respectively), which will be mined at different time intervals via opencast mining methods.



- Area: Combined area of approximately 12ha (considering 14ha, for inclusion of the area between Block 4N and Block 5N)
- ☞ Stockpiles:
  - Two areas for potential topsoil stockpiles;
  - A new WRD of about 4ha is currently planned, which will likely include a Pollution Control Dam (PCD). It is important to note that the existing WRD will remain operational at 13.4ha).
- ☞ Other:
  - Two roads (Eastern and Western Roads)
    - Eastern Road at 1.9km length and 6m width
    - Western Road at 1.8km length and 6m width
  - Roads will be gravel/sand – not tarred.
- ☞ Environmental reporting considerations:
  - The site is located in Quaternary Catchment C31C.
  - The majority of the existing mining activities are located in an Ecological Support Area (ESA), with the surrounding area, and area where the new activities are proposed a Critical Biodiversity Area (CBA 1) and the northern-most portion in a CBA 2.
  - A threatened, Critically Endangered Ecosystem (Western Highveld Sandy Grassland) is present in the northern-most portion of the proposed new mining operations.
  - Blocks 2N, 3N and 5N may be located within the 100m Zone of Regulation (GN704), but outside of the 1:100 year floodline.
- ☞ Sustainable mining and utilisation of mineral rights
  - The current mining operations are planned up until 2027.
  - The new plan with the project expansion will allow for mining to continue up until 2045 (additional 18 years).

The activities described above trigger the requirement for a Consolidated Environmental Authorisation in terms of Section 24F of NEMA. Please refer to the following figure for the layout of the proposed activities:



Figure 6: Proposed Expansion Project

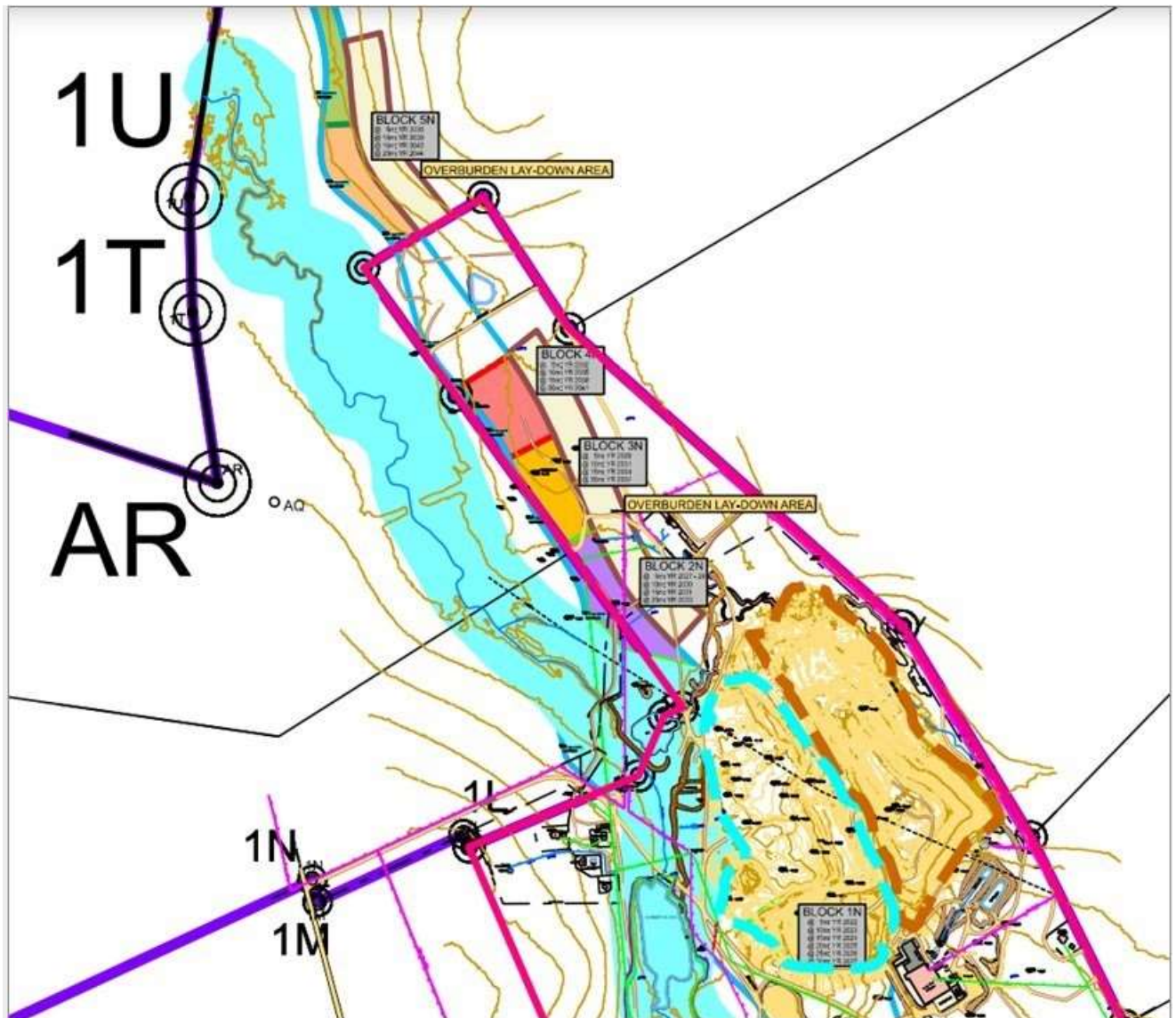


Figure 7: Proposed five (5) mining blocks

## 2.2 Abandonment and Consolidation of Mining Rights' Areas

Up until recently the mine has been operating under the legal entitlement, Mining Licence: ML1-97, converted to Mining Right: NW30/1/2/2/398MR (Registered Right dated 23 December 2014) (Converted Mining Right [CMR]). The issued mining right authorises the extraction of Pyrophyllite for a period of 30 years over the farm Gestoptefontein 349IO:

- Portion 44 of the farm Gestoptefontein 349 IO.
- Area measuring 135.916ha in extent.

Mining takes place by means of open cast mining, comprising of hydraulic hammering and excavator loading with no drilling and blasting required.

In addition, WST also holds an approved NOMR: NW30/5/1/2/2/397MR (signed 20 March 2019) over various portions of the farms Gestoptefontein 349 IO and Driekuil 280 IP:

- Portions 5, 7, 9, 10, 11, Remainder of Portion 15 (a portion of Portion 1), 20, 24 (a portion of Portion 5), and 40 (a portion of Portion 41, now known as Portion 44) of the farm Gestoptefontein 349 IO; and
- Remainder of Portion 1, Portions 2, 4, 7 (a portion of Portion A) and the Remainder of the farm Driekuil 280 IP.
- Area measuring 4 595.4239ha in extent.

The approved mining rights combined cover an area of approximately 4 731ha of which just under 30ha has been disturbed by mining activities to date. A large portion of the northern section of the WST mining area on the farm Gestoptefontein 349 IO has been rehabilitated to date.

WST would like to combine its existing mining rights into a single, consolidated right, in an attempt to ease the administrative duties and compliance requirements associated with multiple mining authorisations per site.

At the same time, the operation would like to abandon some portions of the areas currently included and authorised as part of the approved NOMR area in order to minimise its legal responsibility footprint to that of only the areas currently being mined and those to be mined as far as practically possible. The new mining area will be in the order of 2 000ha, resulting in about 2 768ha to be abandoned. This will result in a reduction of the approved Mining Rights Area of about 58%.

In addition to this, WST would like to apply for an additional area, Portion 8 of the farm Gestoptefontein 349 IO to be included in the new mining right area for the sake of continued mining.

During a pre-application meeting with the Department of Mineral Resources and Energy (DMRE) on 15 November 2021, the Department indicated that WST will be expected to submit a Section 102 of the MPRDA Amendment Application, which will allow for the consolidation of the areas of both rights into one right, and also allow for the abandonment of selected areas.

As such, WST decided to apply for the extension of the CMR (398MR) area by adding Portions of the approved NOMR (397MR) areas to the CMR area. At the same time, Portions of the approved NOMR will be abandoned.

In this regard, a Section 102 Amendment Application will be submitted to apply for the extension of the CMR area by adding Portions of the approved NOMR, and one additional portion of land (Portion 8 of the farm Gestoptefontein) to the CMR area, in addition to abandoning Portions of the approved NOMR.

The abovementioned amendment of the Mining Rights Area, which requires a Section 102 of the MPRDA process, triggers specific Listed Activities in terms of NEMA, and accordingly forms part of this Consolidated Environmental Authorisation Process.

Please refer to Figure 2 illustrating the existing CMR and NOMR Mining Rights Areas owned by the mine.

The following table presents the project areas for abandonment and to retain as Mining Rights and is supported in Figure 3.

Table 7: Property Information

<p><b>New Mining Area applied for</b></p>	<ul style="list-style-type: none"> <li>☞ Gestoptefontein 349IO               <ul style="list-style-type: none"> <li>○ A section of Portion 5</li> <li>○ A section of Portion 7</li> <li>○ A section of Portion 8</li> <li>○ A section of Portion 9</li> <li>○ A section of Portion 10</li> <li>○ A section of Portion 11</li> <li>○ Remainder of Portion 15 (a portion of Portion 1)</li> <li>○ A section of Portion 20</li> <li>○ A section of Portion 24 (portion of Portion 5)</li> <li>○ Portion 40 (A portion of portion 41, no known as Portion 44)</li> </ul> </li> <li>☞ Driekuil 280IP               <ul style="list-style-type: none"> <li>○ A section of the Remainder (RE) Portion</li> <li>○ A section of Portion 2</li> <li>☹ A section of Portion 4</li> </ul> </li> </ul>
<p><b>Abandonment Area applied for</b></p>	<ul style="list-style-type: none"> <li>☞ Gestoptefontein 349IO               <ul style="list-style-type: none"> <li>○ A section of the RE of Portion 5</li> <li>○ A section of the RE of Portion 7</li> <li>○ A section of the Re of Portion 9</li> <li>○ A section of the RE of Portion 10</li> <li>○ A section of the RE of Portion 11</li> <li>○ A section of the RE of Portion 15</li> <li>○ A section of the RE of Portion 20</li> <li>○ A section of the RE of Portion 24 (a portion of Portion 5)</li> </ul> </li> <li>☞ Driekuil 280 IP               <ul style="list-style-type: none"> <li>○ A section of the Remainder Portion</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ RE of Portion 1</li> <li>○ A section of Portion 4</li> <li>○ A section of Portion 2</li> <li>○ Portion 7</li> </ul>
<b>Application area (Ha)</b>	<ul style="list-style-type: none"> <li>☛ New Project Area: <ul style="list-style-type: none"> <li>○ Approximately 2050 ha of which approximately 30ha will be new activities.</li> </ul> </li> </ul>
<b>21 digit Surveyor General Code for each farm portion</b>	<p><u>New Consolidation:</u></p> <ul style="list-style-type: none"> <li>☛ T0I00000000034900005</li> <li>☛ T0I00000000034900007</li> <li>☛ T0I00000000034900008</li> <li>☛ T0I00000000034900009</li> <li>☛ T0I00000000034900010</li> <li>☛ T0I00000000034900011</li> <li>☛ T0I00000000034900015</li> <li>☛ T0I00000000034900020</li> <li>☛ T0I00000000034900024</li> <li>☛ T0I00000000034900044</li> <li>☛ T0I00000000028000000</li> <li>☛ T0I00000000028000002</li> <li>☛ T0I00000000028000004</li> </ul> <p><u>Abandonment:</u></p> <ul style="list-style-type: none"> <li>☛ T0I00000000034900005</li> <li>☛ T0I00000000034900007</li> <li>☛ T0I00000000034900009</li> <li>☛ T0I00000000034900010</li> <li>☛ T0I00000000034900011</li> <li>☛ T0I00000000034900015</li> <li>☛ T0I00000000034900020</li> <li>☛ T0I00000000034900024</li> <li>☛ T0I00000000034900044</li> <li>☛ T0I00000000028000000</li> <li>☛ T0I00000000028000002</li> <li>☛ T0I00000000028000004</li> </ul> <p>Title Deeds attached in Appendix 4.</p>

### 2.3 Consolidation and Update of EMPr’s ( Regulation 34 Amendment)

implementation, this Application includes the consolidation and update of the current EMPr’s in terms of Regulation 34, read with Regulation 37, of the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 as amended.

In this regard, note that Wonderstone conducted a Regulation 34 of the NEMA EIA Regulations, 2014 Environmental Audit during 2019. The audit was completed and submitted to the DMRE on 5 December 2019.

In accordance with Regulation 35 of the NEMA EIA Regulations, 2014; the DMRE provided Wonderstone with a letter of response, dated 13 February 2020 in which the Department acknowledged receipt of the Regulation 34 Environmental Audit Report and made, *inter alia*, the following stipulations:

- ☛ Acknowledged that there a non-compliances and partial compliances with certain provisions of the approved EMPr and that there are aspects which are “unachievable conditions or measures for implementation”,
- ☛ The DMRE acknowledged the observations made in terms of the WRD having been constructed on a water resource.

- Requested that the mine indicate a plan on how and when the contraventions indicated in the Audit report will be rectified.
- Requested a review on the adequacy of the Financial Provision previously submitted in the form of a bank guarantee on 29 March 2011.

Based on the outcomes of the Regulation 34 Audit, and the request issued by the DMRE, the mine has appointed external consultants to conduct the consolidation and update of the Wonderstone EMPr to address the shortcomings of the current EMPr's. In addition to this, various specialist studies have been commissioned to consider the current site conditions and to provide site specific considerations in terms of Best Practical Environmental Management Options to be implemented on site, as the management measures provided in the current EMPr's are very broad, which results in uncertainty in the implementation of specific requirements.

The consolidation of the two (2) Mining Rights as mentioned before, will necessitate the consolidation of the two (2) existing EMPr's. The intention of the consolidation and update of the EMPr's, is for the mine to operate under one effective Environmental Management Tool. During previous Environmental Audits, it has been determined that the management measures currently stipulated are not clear and site-specific and for this reason should be updated to reflect the current site conditions and provide site-specific management measures. This, as well as the consolidation of the Mining Rights, will ensure that a holistic EMPr is available on site, addressing the consolidated project. This will aid the operation in understanding the holistic management requirements for all approved activities on site. The update will further enhance environmental planning on site in terms of any potential future changes required, by making management objectives and requirements clear for defined activities.

The overall mining plan is indicated on the figure below:

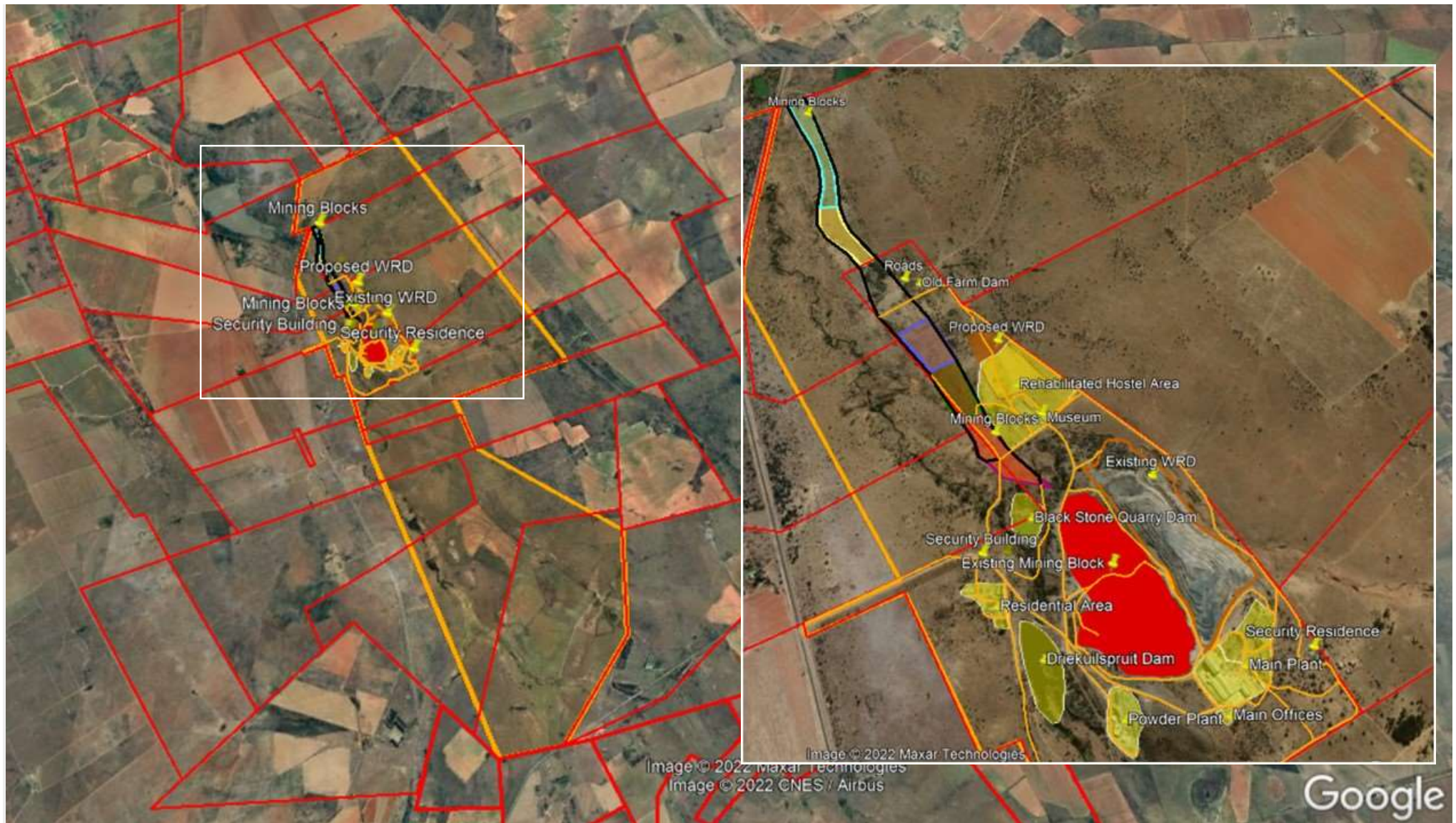


Figure 8: Consolidated Mine Plan

## **2.4 Listed Activity Location and Size (also considering other Environmental Legislation)**

### **2.4.1 National Environmental Management Act, 1998 (NEMA)**

In terms of the NEMA, there are three (3) listing notices which should be considered for this application. These listing notices were amended during April 2017 and again updated in July 2021. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full Environmental Impact Assessment (EIA) Process. Listing Notice 3 (Regulation 985) activities require a Basic Assessment Process if the area falls within certain geographic zones. The mine is located in a Critical Biodiversity Area (CBA2), with the most northern portion falling within a threatened ecosystem, and therefore Listing Notice 3 is applicable when considering infrastructure and activities planned on site.

### **2.4.2 National Heritage Resources Act, 1999 (NHRA)**

According to Regulation 38 of the NHRA, any development or other activity which will change the character of a site exceeding 5 000m<sup>2</sup> in extent requires notification to the South African Heritage Resources Agency (SAHRA). For this reason the NHRA is not applicable to this project.

### **2.4.3 National Environmental Management: Waste Act, 2008 (NEMWA)**

The NEMWA, Regulation 921, dated 29 November 2013 and as amended, makes provision for lists of waste management activities that have, or are likely to have, a detrimental effect on the environment.

The establishment of a Mine Residue Deposit (in the form of a Low Grade Stockpile) forms part of activities for which a Waste Management Licence (WML) is required.

### **2.4.4 National Water Act, 1998 (NWA)**

Chapter 4 of the NWA specifically addresses the use of water and is a tool for an authority to ensure the implementation of the principle that National Government has overall responsibility over water resource management, including the equitable allocation and beneficial use of water in the public interest, including that a person can only be entitled to use water if the use is permissible under the Act. In general, a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. Section 21 of the NWA identifies eleven (11) consumptive and non-consumptive water uses which must be authorised.

Water uses, such as for the Low Grade Stockpile and potential Pollution Control Dam (PCD) will require a Water Use Licence (WUL).

The NEMA listed activities in question and a brief location description is presented in the following table:



Table 8: Listed Activities

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m <sup>2</sup> )	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE AUTHORISATION
<b>Combined clearance:</b>	Approximately 30ha	x	<b>Listing Notice 2, Activity 15:</b> The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity.		-
<b>Opencast Mining</b>	Existing opencast pit: 15ha New Opencast blocks: 14ha	x	<p><b>Listing Notice 1, Activity 12:</b> The development of-</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs-</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p><b>Listing Notice 1, Activity 19:</b> 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</p> <p><b>Clearance included in the combined activity before.</b></p> <p><b>Listing Notice 3, Activity 10:</b> The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if applicable).</p>		<b>Section 21(c) &amp; (i) depending on specialist outcomes.</b>

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NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m <sup>2</sup> )	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE AUTHORISATION
			<p><b>Listing Notice 3, Activity 14:</b> The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p>		
<p><b>Establishment of entrance road.</b></p>	<p>Eastern Road at 1.9km length and 6m width Western Road at 1.8km length and 6m width About 2.5ha</p>	<p>x</p>	<p><b>Listing Notice 1, Activity 12:</b> The development of— (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.</p> <p><b>Listing Notice 1, Activity 19:</b> 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.</p> <p><b>Listing Notice 1, Activity 24:</b> The development of a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road — which is 1 kilometre or shorter.</p>		<p><b>Section 21(c) &amp; (i) depending on specialist outcomes.</b></p>

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m <sup>2</sup> )	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE AUTHORISATION
			<p><b>Listing Notice 3, Activity 4:</b> The development of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p><b>Listing Notice 3, Activity 12:</b> The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan.</p> <p><b>Listing Notice 3, Activity 14:</b> The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p>		
<p><b>Waste Rock Dump and PCD</b></p> <p><b>Topsoil Stockpiles</b></p>	<p>The mine is planning on establishing a new WRD, which will be below 5ha in extent. This may also include a new PCD.</p> <p>The existing WRD will remain operational at a maximum of 13.4ha.</p> <p>Two Areas of 3.4 and 3.2ha each.</p>	<p>x</p>	<p><b>Listing Notice 1, Activity 12:</b> The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs—</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p><b>Listing Notice 1, Activity 13:</b> The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more</p>	<p><b>Regulation 921, as amended by Regulation 633 dated 24 July 2015:</b></p> <p><b>Waste Management Activity, Category B, Activity 11:</b> The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).</p>	<p>Section 21(g)</p>

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			<p>(depending on the Return Water Dam requirements).</p> <p><b>Listing Notice 1, Activity 19:</b> 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.</p> <p><b>Clearance included in the combined activity before.</b></p> <p><b>Listing Notice 2, Activity 6:</b> The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. – this activity is triggered as the proposed dam would require approval in terms of a new Water Use (Section 21g) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).</p> <p><b>Listing Notice 3, Activity 14:</b> The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p>		
Abandonment of Rights and Consolidation of Rights	The operation would like to abandon some portions of the areas currently included and authorised as part of the approved NOMR area in order to minimise its legal responsibility footprint to that of only the areas to be mined as far as practically possible. The new mining area will be in the order of 2 000ha, resulting in about 2 545ha to be	-	<b>Listing Notice 1, Activity 21D:</b> Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment.	-	<b>Section 21(g)</b> <b>Section 21(c&amp;i)</b>

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	abandoned. This will result in a reduction of the approved Mining Rights Area (combined CMR and NOMR areas) of about 58%. No mining activities have previously been undertaken on the areas being abandoned. This also makes provision for the Consolidation of the Mining Rights to allow for the expansion of the mining operations with the new opencast pit operations.				
<b>Combined clearance:</b>	Approximately 20ha	x	<b>Listing Notice 2, Activity 15:</b> The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity.		-

## 2.5 Description of the Activities to be undertaken

The infrastructure and activities that will form part of the proposed project will include the following:

- ☞ Planning Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits and Authorisations)
- ☞ Construction Phase:
  - Demarcation and identification of protected species
  - Land and footprint clearance
  - Topsoil stripping and stockpiling
  - Establishment of surface infrastructure
  - Waste management
- ☞ Operational Phase:
  - Opencast Mining Operations
  - Product (Run of Mine) transportation to Plant
  - Overburden transport to Overburden Stockpiles or Low Grade Stockpile
  - Operation of Low Grade Stockpile and PCD
  - Operation of road and parking infrastructure
  - Operation of infrastructure and roads
  - Existing Plant and Powder Plant Operation
  - Water management
  - Dust suppression
  - Waste management
- ☞ Closure Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits)
  - Rehabilitation of Opencast Pits
  - Rehabilitation of Low Grade Stockpiles and PCD
  - Rehabilitation of existing Waste Rock Dump
  - Dismantling and decommissioning of infrastructure and buildings, including product stockpiles
  - Earth moving, shaping and ripping of soils
  - Cessation of Labour Contracts
  - Waste Management

## 2.6 Policy and Legislative Context

South Africa has a comprehensive environmental governance framework underpinned by an extensive array of environmental laws. The past years have evidenced the wholesale reform of South Africa's environmental legal framework under the guidance of the Constitution.

Historically, the mining industry in South Africa has not been subjected to comprehensive environmental regulation. However, in recent years, this has changed significantly and the industry is now required to comply with a multifaceted network of mining and environmental legislation. There are no shortages of policy and legal frameworks to ensure "responsible" mining in South Africa. The Minerals and Mining Policy for South Africa, 1998 affirmed that the State, as custodian of the nation's natural resources, will support mining development while maintaining and enhancing environmental awareness of the mining industry in accordance with national environmental policy, norms and standards.

The following table presents the key policy and legislative considerations as part of this application.

Table 9: Policy and Legislative Context (new Project)

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT
<p><b>1. <u>Constitution of the Republic of South Africa (Act No. 108 of 1996)</u></b></p> <p>Environmental legislation is shaped by the Bill of Rights of the Constitution of the Republic of South Africa ("<b>Constitution</b>"). Section 24 of the Constitution, known as the '<b>Environmental Right</b>', guarantees every person the right to an environment that is not harmful to their health or well-being; provides for the protection of the environment against pollution; and degradation and centres sustainable development as the cornerstone of South Africa's environmental law regime. This right is binding on the State and people, both natural and juristic.</p> <p>In fulfilment of its constitutional mandate to take reasonable legislative measures that gives effect to section 24 of the Constitution, the government has promulgated several environmental laws. These laws provide a legal framework that embodies internationally recognised legal principles.</p> <p>The principal act governing activities that affect the environment is NEMA.</p> <p><b>Applicability to this project</b></p> <p>The Regulation 34 inclusion into this process, as well as the undertaking of the various specialist studies in order to determine the impact of the proposed activities on the environment, includes the obligation by the Licence Holder to ensure that it will not result in pollution and/or ecological degradation, and the activity is ecologically sustainable while promoting justifiable economic and social development.</p>
<p><b>2. <u>National Environmental Management Act (Act No. 107 of 1998) (NEMA)</u></b></p> <p>In terms of sections 24(2) and 24D of NEMA the Minister of Environmental Affairs (now the Department of Environment, Forestry and Fisheries (DEFF)) promulgated certain activities that may not commence without an Environmental Authorisation. Activities promulgated in terms of GN 983 and GN 985 require a Basic Assessment process, while activities promulgated in terms of GN 984 require that a full Scoping and EIA process be conducted [GN 983, 984 and 985 promulgated under NEMA in Government Gazette (GG) 38282 of 4 December 2014 (as amended in 2017). The requirements for an EIA and EMPr are specified in Appendix 3 and Appendix 4 of GN 982 promulgated under NEMA in GG 38282 of 4 December 2014 (as amended in 2021) ("<b>2021 EIA Regulations</b>")].</p> <p>Section 24C(2A) of NEMA indicates that where listed activities are directly related to the extraction and primary processing of a mineral or petroleum resource the Minister of Mineral Resources (now DMRE) is the Competent Authority ("CA") or officials at the DMRE to whom he has delegated his authority, being the Regional Managers.</p> <p><b>Applicability to this project</b></p> <p>Various Listed activities are triggered by this project. For this reason an Integrated Environmental Impact Assessment (EIA) Application was submitted to the DMRE on 19 April 2022.</p> <p>Section 28 of the NEMA places a duty of care on all persons to prevent, limit or remediate any pollution or degradation of the environment. This duty of care should be adhered to at all times during construction, operation and decommissioning of a project. Section 28 applies to all activities taking place, and is not solely focused on the listed activities being applied for, but is also considered in updated the current EMPr's and consolidating these to provide a holistic approach towards Environmental Management.</p>
<p><b>3. <u>EIA Regulations (2014-2021) (2021 EIA Regulations)</u></b></p> <p>Chapter 6 of the 2021 EIA Regulations provides for the requirements for Public participation Processes (PPP), which must be carried out as part of the DMRE Application process. In terms of Regulations 21 and 23, the outcome of the PPP must be reported in this report submitted to the CA. The PPP "<i>must give all potential or registered interested and affected parties, including the competent authority a period of at least 30 days to submit comments on each of the EMPr, scoping report and environmental impact assessment report, and where applicable the closure plan, as well as the report contemplated in regulation 32, if such reports or plans are submitted at different times</i>" (Regulation 40 (1)).</p> <p>The PPP must also:</p>

- provide access to all information that reasonably has or may have the potential to influence any decision regarding an application;
- involve consultation with the CA, every state department that administers a law relating to the environment relevant to the application, all relevant organs of state and all potential, or where relevant, and registered Interested & Affected Parties (I&APs); and
- provide opportunity for I&APs to comment on reports and plans prior to submission of an application but must be provided with an opportunity to comment on such reports once an application has been submitted to the CA.

The process must include:

- notification of the application to all I&APs, as stipulated in Regulation 41;
- registration of all I&APs, as required in Regulations 42 and 43; and
- a record of comments and responses and records of meetings of and with I&APs, as outlined in Regulation 44.

Regulation 39 of the 2021 EIA Regulations requires that:

*"(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.*

*(2) Sub regulation (1) does not apply in respect of—*

*(a) linear activities;*

*(b) activities constituting, or activities directly related to prospecting or exploration of a mineral and petroleum resource or extraction and primary processing of a mineral or petroleum resource; and*

*(c) strategic integrated projects as contemplated in the Infrastructure Development Act, 2014."*

**Applicability to this project**

An integrated PPP will be undertaken for this project to make provision for the consultation process during the DMRE Application process and application for amendment of the Wonderstone WUL.

The property where the current operations are undertaken (Portion 44 of the farm Gestoptefontein 349 IO) is owned by Wonderstone Ltd.

The historic Black Rock Quarry extends beyond Portion 44, into the Remainder of Portion 24. This landowner will be directly consulted as part of this project to determine specific measures which must be considered in the environmental management measures.

The expansion of the CMR Mining Rights Area is planned on various privately owned land (see Table 6) who will be consulted as part of the project.

**4. NEMA Listed Activities (GN 544 and GN 545) of 2010**

In terms of sections 24(2) and 24D of NEMA the Minister of Environmental Affairs (now the DEFF) promulgated certain activities that may not commence without an Environmental Authorisation. Activities promulgated in terms of GN 544 and GN 546 require a Basic Assessment process, while activities promulgated in terms of GN 545 require that a full Scoping and EIA process be conducted (promulgated under NEMA in GG 33411, as amended in 2013).

**Applicability to this project**

The Licence Holder obtained an Environmental Approval on a Section 24G Rectification Process for the unlawful construction of a stream crossing with spillway over the Driekuilspruit (Environmental Authorisation Ref. REC 03/2014NW, dated 2 June 2016). The Environmental Authorisation was issued for Listing Notice No. 544 of 18 June 2010 for:

- The construction of infrastructure or structures covering 50m<sup>3</sup> or more where such construction occurs within 32m of a watercourse, measured from the edge of a watercourse [Listed activity 11(xi)];
- The infilling or deposit of any material of more than 5m<sup>3</sup> into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rocks from a watercourse [Listed activity 18(i)].



## **5. NEMA Listed Activities (GN 386 and GN 387) of 2006**

In terms of sections 24(2) and 24D of NEMA the Minister of Environmental Affairs (now the DEFF) promulgated certain activities that may not commence without an Environmental Authorisation. Activities promulgated in terms of GN 386 require a Basic Assessment process, while activities promulgated in terms of GN 387 require that a full Scoping and EIA process be conducted (promulgated under NEMA in GG 28753 dated April 2006).

### ***Applicability to this project***

None

## **6. Environmental Authorisations associated with all other approved activities on site**

### **EMPr, 2009 (as part of the New Order Mining Right 397MR)**

The EMPr, 2009 makes provision for the following activities:

- ☞ Access Roads;
- ☞ Opencast Mining;
- ☞ Waste Rock Dump (the use of the existing site at Wonderstone Mine);
- ☞ Waste Rock material can be crushed, milled for sale as specified powders or pressed components;
- ☞ Backfilling is an approved activity – the EMPr states that when a certain quarry has been backfilled or waste rock dump constructed, a certain amount of overburden material and topsoil would be placed on the areas.
- ☞ Rehabilitation of the new topographical landscape will be undertaken in such a way that it would blend in with the surrounding landscape and allow normal surface drainage to continue. Rehabilitation in such a way that the new landscape features would be stable and would not pose any safety hazard to human and animal anymore.
- ☞ The EMPr stated that the existing mining area can be expanded. Only small portions of land would be affected by the mining operation, namely 130ha in relation to the total mining right application area of 4 595.4ha.  
[Note: With the new project proposed as part of this application, providing an additional 30ha of disturbance, the overall disturbed area will not exceed the initial planned 130ha, with roughly only 80ha of overall disturbance planned.]

## **7. Environmental Authorisations associated with all other approved activities on site**

### **Original EMPr, 2010 (as part of the Converted Mining Right 398MR)**

The DMRE approved the 1997 EMPr in March 1998, subsequent to this, the EMPr was amended to allow for the conversion of Mineral Rights and was approved by the DMR on 14 April 2010. This approved EMPr included the following infrastructure:

- ☞ Main Offices;
- ☞ Club House;
- ☞ Museum;
- ☞ Opencast mining of the hill;
- ☞ Open pit to be backfilled in a roll-over method;
- ☞ Groundwater abstraction for water supply – Boreholes 3, 10 and 15;
- ☞ The office block, 19 houses and change houses all have septic tanks with French drain systems and gardens to irrigate with the sewage effluent;
- ☞ An average 8.6m<sup>3</sup>/month of water is abstracted from the Driekuil Dam for dust suppression only. The Driekuil Dam is an instream storage dam in the Driekuilspruit created by an earth wall.
- ☞ Construction of a Dam;
- ☞ Main Waste Rock Dump (WRD));
- ☞ Small WRD to the south of the Processing Plant;
- ☞ Waste rock material is disposed of at an existing designated site. Large percentages of the material mined is unsuitable for processing into solid product. This material can however be crushed, milled for sale as specified powders or pressed components;

- ☞ Domestic waste disposal;
- ☞ Various roads are discussed in the EMPr:
  - Fire breaks along the fence (as indicated on Plans 1-5)
  - Haul road at the Powder Plant;
  - Access roads to the office terrain;
  - Access roads to the hostel and married quarters;
  - Access roads to the mining area.
- ☞ Sewage system comprising of septic tanks and an effluent tank:
  - Main:
    - Sewage Plant present which consists of a septic tank with a French drain system.
    - This facility also allows for water from the wash bay to flow through.
    - An oil separator is present that separates the oil from the water before the water flow into the French drain. The used oil is stored in a holding tank, from where the used oil is collected by a licensed company.
  - Hostel Area:
    - Various other septic tanks are present to service the quarters, compound and school. The effluent from these tanks is diverted to the central treated effluent tank (capacity of 12 000, to allow for a workforce of approximately 180 people). The treated effluent tank is situated north-west of the married quarters.
    - From the effluent tank water is pumped to the concrete lined settling dams (two of the four settling dams are in use).
  - Senior Residential Area:
    - Each house has an individual septic tank and French drain.
  - Main Plant:
    - New septic tank and French drain.
- ☞ Two (2) Settling Dams, lined with wall crete for the sewage system;
- ☞ Married quarter compound and school (currently rehabilitated);
- ☞ Residential area;
- ☞ Plant Settling Dams (x2);
- ☞ Steel Holding Tank;
- ☞ Reservoirs;
- ☞ Workshop at the Main Plant;
- ☞ Tank and Gas Storage area;
- ☞ Eskom Power supply;
- ☞ Large blocks of Pyrophyllite are transferred from the quarry to a holding area (ROM Stockpile);
- ☞ Old Plant and New Plant (Main Plant);
- ☞ Powder Plant. Dust control is done with a bag filter dust extractor;
- ☞ Cut off trenches at the new plant.
- ☞ Figure 1 of the EMPr, 1997 also indicates the presence of the Driekuilspruit and the Black Rock Quarry.
- ☞ In certain cases buildings are demolished. The inert concrete, rubble or waste rock shall be introduced into backfilling and compacting of quarries (Section 2.2.3.1 of the 2008 Amendment EMPr, approved 2010).

#### **8. National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMAQA)**

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) NEMAQA was promulgated to ensure the protection and regulation of air quality and provide measures that will prevent pollution and sustainability. Under NEMAQA, the Minister of Environmental Affairs (now DEFF) must identify substances in ambient air which present a threat to health, well-being or the environment and establish national standards for ambient air quality, including the permissible quantity or concentration of each substance in ambient air.

The following regulations promulgated under NEMAQA were considered for the project:

- ☛ Listed Activities and Associated Minimum Emission Standards, published under GN 893 in GG 37054 of 22 November 2013, which lists activities that could result in atmospheric emissions requiring an Atmospheric Emissions Licence before being undertaken. Examples of such activities include:
  - the use of combustion installations;
  - storage of petroleum products;
  - slag processes;
  - carbonisation and coal gasification;
  - mineral processing and
  - disposal of hazardous and general waste by way of incineration.
- ☛ National Dust Control Regulations, published under GN827 in GG 36974 of 1 November 2013, which provide that an acceptable dust fallout rate for a non-residential area is considered more than 600mg/m<sup>2</sup>/day but less than 1 200mg/m<sup>2</sup>/day (30-day average), with maximum allowable two exceedances per year, provided these exceedances do not take place in consecutive months. Where the dust fallout rate is exceeded, a dust fall monitoring programme, as prescribed in terms of the Regulations, must include:
  - the establishment of a network of dust monitoring points using method ASTM D1739:1970 (or an equivalent standard), sufficient in number to: establish the contribution to dust fallout in residential and non-residential areas near the premises, monitor identified or likely sensitive receptor locations, and establish the baseline dust fall for the district; and
- ☛ A schedule for submitting to the air quality officer dust fallout monitoring reports annually or at more frequent intervals if so requested by the air quality officer.

#### ***Applicability to this project***

The priority pollutants, as defined by the NEMAQA, are sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), PM10 and PM2.5, carbon monoxide (CO), benzene (C<sub>6</sub>H<sub>6</sub>), lead (Pb) and ozone (O<sub>3</sub>). On 01 November 2013 the legislated standards for dust fallout were promulgated in the form of the NEMAQA National Dust Control Regulations (GN 827, November 2013). These newly promulgated regulations are based on the SANS guidelines and present acceptable/allowable dust fallout rates for both residential and non-residential areas. Within the National Dust Control Regulations, conditions are provided for Dust Management Plans, as follows:

- ☛ Any person who has exceeded the standards must, within 3 months after submission of the monitoring report, develop and submit a dust management plan, as contemplated in the National Dust Control regulations, to the Air Quality Officer (AQO) for approval;
- ☛ The dust management plan must be implemented within a month of the date of approval; and
- ☛ An implementation progress report must be submitted to the AQO at agreed time intervals.

Importantly, Draft National Dust Control Regulations have been released for public comment in GN 517 of 2018. These regulations stipulate that the latest ASTM method (2010) must be applied to dust fallout monitoring in South Africa. This requirement has a number of implications, with key items including:

- ☛ Permission to exclude exceedances caused by non-anthropogenic sources;
- ☛ The latest ASTM requires samplers be installed with a wind shield, which has been proven to increase the accuracy of capturing dust fallout;
- ☛ All mining operations must implement a Dust Fallout (DFO) programme;
- ☛ Sample analysis must now also include soluble content of samples, no longer only limited to the insoluble content of samples, as is the case with the current regulations;
- ☛ Submission of dust fallout monitoring reports on a monthly basis to the relevant AQO;
- ☛ Current fallout levels compared to historic results for at least the previous four years (where available);
- ☛ All mining operations must implement a dust management plan; and
- ☛ Provide proof of the implementation of the dust management plan in the monthly monitoring reports.

#### **9. National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) and related Legislation**

In line with the Convention on Biological Diversity, the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) aims to legally provide for biodiversity conservation, sustainable use and equitable access and benefit sharing. NEMBA creates a basic legal framework for the formation of a national biodiversity strategy and action plan and identification of biodiversity hotspots and bio-regions, which may then be given legal recognition. It imposes obligations on landowners (state or private) regarding alien invasive species. It requires that provision is made by a site developer to remove any aliens which have been introduced to the site or are present on the site.

The NEMBA also provides for listing of threatened or protected ecosystems, in one of four categories: ‘Critically Endangered (CR)’, ‘Endangered (EN)’, ‘Vulnerable (VU)’ and ‘Protected’. Threatened ecosystems are listed to reduce the rate of ecosystem and species extinction, by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value.

#### National List of Ecosystems that are Threatened and in need of Protection (2011)

The NEMBA provides for the listing of threatened or protected ecosystems in one of four categories: ‘Critically Endangered (CR)’, ‘Endangered (EN)’, ‘Vulnerable (VU)’ and ‘Protected’. Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems.

According to the National List of Threatened Terrestrial Ecosystems database (2011), the most northern portion of the project area is situated within any listed Threatened Ecosystems. Two threatened ecosystems are however located in close proximity, to Wonderstone namely Western Highveld Sandy Grassland (CR) to the west and Vaal-Vet Sandy Grassland (EN) to the north and east respectively.

#### Threatened or Protected Species Regulations (2015)

The NEMBA provides for listing of Threatened or Protected Species (TOPS). If a species is listed as threatened, it must be further classified as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). In addition to these categories, protected species are defined as “any species which is of such high conservation value or national importance that it requires national protection”. Species listed in this category may include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities, referred to as Restricted Activities, are regulated on listed species using permits by a special set of regulations published under the Act. Restricted activities regulated under the Act are keeping, moving, having in possession, importing and exporting, and selling. Certain TOPS-listed species have an increased probability of occurrence.

#### National Forests Act (Act No. 84 of 1998)

An updated list of protected tree species was published under section 12(1) (d) of the National Forests Act (Act No. 84 of 1998) on 6 December 2019. In terms of section 15(1) of this Act, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. No indigenous forests have as yet been identified in the project area. One protected tree species in terms of the National Forests Act (Act No. 84 of 1998), namely *Vachellia erioloba* was recorded within the project area and will be confirmed during the specialist studies.

#### National Environmental Management: Protected Areas Act (NEMPAA; Act No. 57 of 2003)

The NEMPAA was promulgated in order to provide for (among other things) the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national Register of Protected Areas, and for the management of those areas in accordance with national norms and standards.

#### *South African Protected Areas Database (SAPAD, 2020) and South African Conservation Areas Database (SACAD, 2020)*

The primary function of protected areas is to ensure the conservation of habitats, environmental processes and species occurring within these ecosystems. The SAPAD and SACAD are Geographic Information System (GIS) inventories of all Protected and Conservation areas in South Africa. The Protected and Conservation Areas (PACA) database also includes data on privately owned protected areas. This Register comprises of all data required for the Register of Protected Areas (legally declared) as well as data on Conservation Areas (areas responsibly managed for biodiversity conservation but not legally declared as Protected Areas). According to the most recently published SAPAD (2019) and SACAD (2019) databases, the project area is not located within any protected areas or formal conservation areas, and no protected or conservation area are located in the vicinity. Barberspan Nature Reserve, a Ramsar site of international importance, is located 40km to the northwest and various private nature reserves, namely Uitspan, Goedgevonden, Voorspoed and Tiekie Private Nature Reserves are located between 45km and 55km to the southwest.

#### *The National Protected Areas Expansion Strategy (NPAES; 2010)*

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy (NPAES, 2008). According to the NPAES database (2010), the project area is not located within an NPAES Focus Area, and no NPAES Focus Areas are located in the region, with the closest such areas, the Vaal Grasslands NPAES Focus Area, situated 45km to the east, south and southeast.

#### Important Bird and Biodiversity Areas (IBA; 2015)

Various sites within the country have been identified as important for maintaining viable populations of endemic, range restricted and threatened bird species. The primary aim of the IBA programme is to ensure the long-term conservation of important avifaunal habitats. They also provide essential benefits to people, such as food, materials, water, climate regulation and flood attenuation, as well as opportunities for recreation and spiritual fulfilment. According to BirdLife South Africa, one-third of the 112 IBAs located within South Africa are under threat by invasive alien vegetation, habitat modification/ degradation and agricultural expansion (Marnewick et al., 2015). Further to this, 52% of IBAs fall outside formally Protected Areas, further complicating avian habitat conservation.

Based on the current delineation of IBAs in South Africa, the project area is not located within any identified IBAs. Barberspan and Leeupan (SA026) is the closest IBA, located approximately 42km to the northwest of the project area.

#### ***Applicability to this project***

#### Alien and Invasive Species Regulations (2020)

The NEMBA Alien and Invasive Species Regulations (2020) aim to:

- ☛ Prevent the unauthorised introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur;
- ☛ Manage and control alien and invasive species, to prevent or minimise harm to the environment and biodiversity; and
- ☛ Eradicate alien and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Alien and invasive species categories according to the Alien and Invasive Species Regulations (2020) are as follows:

- ☛ Category 1a: Invasive species requiring compulsory control. Plants are to be removed and destroyed. Any Category 1a listed plants must be combatted or eradicated.
- ☛ Category 1b: Invasive species that require control by means of an invasive species management programme.
- ☛ Category 2: Invasive species that require a permit to carry out a restricted activity within an area, as specified in the permit. If an invasive species management programme has been developed, a person must control the listed invasive species in accordance with such a programme.
- ☛ Category 3: Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purpose of the regulation be considered to be a Category 1b Listed Invasive Species. If an invasive species management programme has been developed, a person must control the listed invasive species in accordance with such a programme.

The NEMBA Alien and Invasive Species Lists (2020) include national lists of invasive species to be read together with the Alien and Invasive Species Regulations (2014). A list of alien floral species recorded in the project area, including the applicable alien and invasive species categories will be developed as part of the EIA report.

#### Transvaal Nature Conservation Ordinance (TNCO; No. 12 of 1983)

The TNCO (No. 12 of 1983) provides for the protection of Protected and Specially Protected plant species, as per Schedule 11 and 12 respectively, whereby a permit is required to pick, donate, sell, export or remove such species. Schedule 2 of the TNCO lists Protected and Specially Protected Game. Three protected floral species, namely *Pellaea calomelanos*, *Cheilanthes hirta* and *Huernia zebrina* and one protected faunal species, namely Steenbok (*Raphicerus campestris*) were recorded within the project area in the past will be confirmed during the specialist studies. This Ordinance will be repealed in as far as it relates to the North West Province when the North West Biodiversity Management Act (NWBMA; Act No. 4 of 2016) comes into force.

#### North West Biodiversity Management Act (NWBMA; Act No. 4 of 2016) and North West Biodiversity Management Amendment Act (2017)

The North West Biodiversity Management Act (NWBMA; Act No. 4 of 2016) was published on 3 January 2017 but has not yet come into force. The North West Biodiversity Management Amendment Act, 2017 was published on 25 August 2017 to effect certain textual amendments, and to insert new definitions and provisions. Schedule 2 of the NWBMA provides for lists of specially protected floral and faunal species to which certain restricted activities apply. Two (2) protected floral species in terms of this act were recorded during the 2020 survey, namely *Pellaea calomelanos* and *Cheilanthes hirta*, and one (1) protected mammal and two (2) protected bird species were also recorded in the past, namely Blesbok (*Damaliscus pygargus phillipsi*), Black-winged Kite (*Elanus caeruleus*) and White-backed Duck (*Thalassornis leuconotus*). Discussions with mine personnel also indicated historic sightings of Cape Clawless Otter (*Aonyx capensis*) spoor and regular sightings of Water Monitor (*Varanus niloticus*). This will be confirmed during the specialist studies.

#### National Biodiversity Assessment (NBA; 2018)

The most recent National Biodiversity Assessment (NBA), dated 2018, is a collaborative effort to synthesise the best available science on South Africa's biodiversity. The NBA is used to inform policy in the biodiversity sector and other sectors that rely on or impact on natural resources, such as water, agriculture, mining and human settlements. The NBA provides information to help prioritise resources for managing and conserving biodiversity and provides context and information that underpins biodiversity inputs to land use planning processes (Skowno et al., 2019).

According to the outputs of the NBA (2018) portions of the project area are located within the remaining extent of the Klerksdorp Thornveld vegetation type. These areas occur mostly along the boundaries of the project area and implies that the vegetation within these areas has not previously been transformed (through mining activities) and is therefore regarded as natural habitat comprising remnant vegetation. The ecosystem associated with vegetation type has a threat status of Least Concern (LC) and the protection level of Klerksdorp Thornveld is poor.

#### Mining and Biodiversity Guidelines (2012)

The Mining and Biodiversity Guidelines (2012) enables regulators, industry and practitioners to minimise the impact of mining on biodiversity and ecosystem services by promoting the sustainable development of mineral resources. Biodiversity priority areas (as per the guidelines), are likely to be sensitive to the impacts of mining and as such, should inform and influence spatial land use policies and plans for mining activities (DEA et al., 2013).

The Mining and Biodiversity Guidelines (2012) (Figure 36) indicates that the majority of the project area is located within an area of Moderate to High Biodiversity Importance, with a limited portion in the northern portion of the project area, indicted to be located within an area of High Biodiversity Importance.

#### North West Biodiversity Sector Plan (NW BSP; 2015)

No Protected Areas are associated with the project area. It is evident that the majority of the project area, outside of active mining areas, falls within a Critical Biodiversity Area 2 (CBA2), while the central portion is categorised as an Ecological Support Area 1 (ESA1). The CBA2 area which predominates the project area extends in a north-south direction through the surrounding habitat matrix.

CBA2 sites in the North West Province include critical patches of Endangered (EN) and Vulnerable (VU) ecosystems and endemic vegetation types (such as the Klerksdorp Thornveld vegetation type), as well as areas defined as important natural features (habitats, springs and scenic landscapes) and focus wildlife areas (areas identified as being important for maintaining faunal Species of Conservation Concern (SCC), areas supporting free-ranging red hartebeest (*Alcelaphus buselaphus*) and black-footed cat (*Felis nigripes*), vulture nesting areas and IBAs) (Schaller & Desmet, 2015). ESA1 sites in the North West Province include important habitats such as hills and ridges, biodiversity corridors, existing or proposed Protected Area development corridors and Protected Area buffers (Desmet & Schaller, 2015).

Where CBA1, CBA2 and ESA1 sites are present, the North West Department of Agriculture and Rural Development (NWREAD; 2015) specifically requires that an EMPr should address aspects such as invasive alien species control, fire management, prevention of overgrazing and any other measures relating to the effective environmental management of the CBAs and ESAs. Fire management is especially important and should be appropriately managed for the applicable vegetation type. Furthermore, the control of illegal activities, such as hunting and dumping, which may impact on biodiversity, should be prioritised in CBA and ESA areas..

### **10. National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA)**

The purpose of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA) is to: assist in regulating waste management; ensure the protection of human health; and prevent pollution and environmental degradation through sound waste management principles and guidelines. It furthermore provides for:

- ☞ national norms and standards for regulating the management of waste by all spheres of government;
- ☞ licensing and control of waste management activities;
- ☞ remediation of contaminated land;
- ☞ a national waste information system; and
- ☞ provision for compliance and enforcement.

The NEMWA defines waste broadly as "*any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be reused, recycled or recovered.*" It also regulates processing of mining residue deposits or stockpiles.

The NEMWA imposes a general duty upon waste holders to take reasonable measures to avoid waste generation and, where this is impossible, to: minimise the toxicity and quantities of waste generated; reuse, reduce, recycle and recover waste; and ensure that it is treated and disposed of in an environmentally-sound way. Failure to do so is a criminal offence, with a maximum fine of R10 million or imprisonment of up to 10 years, or both.

It is necessary to hold a Waste Management Licence (WML) for defined waste management activities.

The Department of Environmental Affairs (DEA, now DEFF) promulgated the 2013 WML Regulations, which provides that a WML is required for undertaking certain waste management activities ("**Waste Listed Activities**"). The Waste Listed Activities are separated into three categories, namely Category A, Category B and Category C. Category A and B Waste Listed Activities require a WML, for which either a Basic Assessment or an EIA process needs to be undertaken that complies with the 2014 EIA Regulations. The procedures for licensing Waste Listed Activities are stipulated in Chapter 5 of NEMWA and are not applicable to this project.

Category C activities do not require a WML but must comply with *inter alia* the Norms and Standards for Storage of Waste, 2013 (published in GN 926 of GG 37088 on 29 November 2013). Such facilities need to be registered with the DEFF 90 days before construction commences.

Classification of certain waste streams is required in terms of the Waste Classification and Management Regulations, published in GN 634 of GG 36784 on 23 August 2013, to ensure that the correct waste management standards and disposal methods are implemented.

The National Norms and Standards for the Assessment of Waste for Landfill Disposal and the National Norms and Standards for the Disposal of Waste to Landfill (published under GN 635 and GN 636, respectively in GG 36784 of 23 August 2013) provide the norms and standards for disposal of waste to landfill. This includes liner requirements and design specifications.

In 2014 the National Environmental Management: Waste Amendment Act (Act No 25 of 2014) was promulgated to include residue deposits and residue stockpiles from:

- ☞ Mineral excavation;
- ☞ Physical and chemical processing of metalliferous minerals;
- ☞ Physical and chemical processing of non-metalliferous minerals; and
- ☞ Drilling operations.

Residue deposits are defined in the MPRDA as "*any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right*". Residue stockpiles, in turn, are defined in the MPRDA as "*any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, beneficiation plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated for potential re-use, or which is disposed of, by the holder of a mining right, mining permit, production right or an old order right.*"

The Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits ("**Residue Regulations**"), published under GN 632 in GG 39020 of 24 July 2015, provide for the planning, management and reporting of residue stockpiles and residue deposits, which obligations include:

- ☞ The assessment of impacts and analyses of risks relating to the management of residue stockpiles;
- ☞ Residue deposits; characterisation of residue stockpiles and residue deposits;
- ☞ Classification of residue stockpiles and residue deposits;
- ☞ Investigation and the selection of site for residue stockpiling;
- ☞ Design of the residue stockpiles and residue deposits;
- ☞ Impact management;
- ☞ Duties of the holder of right or permit;
- ☞ Monitoring and reporting systems;
- ☞ Dust management and control; and
- ☞ Decommissioning, closure and post closure management requirements.

The Residue Regulations provide the tools for and correspond to the statutory provision relating to managing residue stockpiles and residue deposits in the manner prescribed in section 43A of the NEMWA.

**Applicability to this project:**

The new Low Grade Stockpile and overburden stockpiles will require approval in terms of the NEM:WA.

In terms of the existing WRD it should be noted that on 24 July 2015, GN 633 introduced transitional provisions that seek to regulate the transition of waste management at mines from an EMPr approved in terms of the MPRDA to a WML in terms of the NEMWA. In this regard the transitional provisions state that:

*“An environmental management programme or plan approved in terms of the Mineral and Petroleum Resources Development Act, 2002 shall be deemed to have been approved and issued in terms of the NEMWA.” (WML).*

*“The Minister responsible for mineral resources may direct any holder of a prospecting right, mining permit, mining right, exploration right, or production right, if he or she is of the opinion that the residue stockpile or residue deposit in question is likely to result in significant pollution, degradation or damage to the environment, to take such action to upgrade the environmental management programme or plan to address any deficiency in the environmental management programme or plan.*

*An environmental management programme or plan submitted in terms of the Mineral and Petroleum Resources Regulations, 2004 and which is pending when the Notice took effect, must despite the repeal of the Mineral and Petroleum Resources Regulations, 2004 be dispensed with in terms of the Mineral and Petroleum Resources Regulations, 2004 as if those regulations were not repealed.”*

In terms of the transitional arrangement the EMPr issued prior to the notice is deemed as a WML for Residue Stockpile and Deposits. The current WRD, concurrent backfilling, as well as the intended reworking thereof is therefore a lawful activity.

### **11. National Heritage Resources Act (Act No. 25 of 1999) (NHRA)**

The protection and management of South Africa’s heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999) (“**NHRA**”). The national enforcing authority for the NHRA is the South African Heritage Resources Agency (“**SAHRA**”). In terms of the NHRA, historically important features such as graves, archaeology and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection. In terms of section 38 of the NHRA, SAHRA can call for a heritage impact assessment (“**HIA**”) for certain categories of development. The activities identified in the NHRA requiring notification to SAHRA include:

Section 38 states:

*“(1) (a): The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*

*(c): Any development or other activity which will change the character of a site*

*i. exceeding 5 000 m<sup>2</sup> in extent; or*

*ii. involving three or more existing erven or subdivisions thereof; or*

*iii. involving three or more erven or divisions thereof which have been consolidated within the past 5 years; or*

*iv. the costs of which will exceed a sum in terms of regulations by SAHRA or a provincial heritage resource authority.”*

The NHRA however makes provision for the assessment of heritage impacts as part of an EIA process and, if such an assessment is deemed adequate by SAHRA, a separate application for consent under the NHRA is not required.

#### **Applicability to this project:**

Archaeological research on the Wonderstone outcrops has been carried out sporadically since the 1930s. In 2006 Wonderstone was granted permission to destroy the rock art site on the Wonderstone outcrop called Driekuil Hill in order to investigate the suitability of the underlying deposit of Wonderstone (SAHRA Permit 80/05/04/008/51). Mitigation included the removal of a 100 numbered pieces of rock art and their distribution between a site museum, currently in place on the Wonderstone Property, the Klerksdorp Museum and the Rock Art Research Institute of Wits University, Johannesburg. The above ground part of the outcrop was removed but it was decided by management not to proceed with mining. The area is fenced off and regarded as a no-go zone.

There is also the potential for graves around the proposed WRD area, which will be confirmed during the EIA specialist studies. This may impact the location of the WRD.

### **12. National Water Act (Act No. 36 of 1998) (“NWA”)**



The National Water Act (Act No. 36 of 1998) (NWA) is the primary regulatory legislation controlling and managing the use of water resources and pollution thereof. It provides for fundamental reformation of legislation relating to water resource use. The preamble to the NWA recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that water resources quality protection is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The NWA's purpose is stated in section 2 and enforced by the DWS. Section 2 of the NWA relates to the following:

- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources; and
- Meeting international obligations.

The NWA presents strategies to facilitate sound management of water resources; provides for the protection of water resources; and regulates use of water by means of Catchment Management Agencies (CMAs), Water User Associations (WUAs), Advisory Committees and International Water Management. As the NWA is founded on the principle of trusteeship, the government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and industry (including mines) can only be entitled to use water if the use is permissible under the NWA.

In terms of section 21 of the NWA, certain consumptive and non-consumptive water uses are identified and can only commence once authorised. Where a water use constitutes a Scheduled 1 Use (permissible use without an authorization requirement); permissible water use in terms of section 22 of the NWA; or is authorised in terms of a General Authorisation, a WUL is not required.

The NWA further requires that:

- a motivation in terms of section 27 be submitted as part of a Water Use Licence Application ("WULA").
- the necessary water use application forms be compiled and submitted in support of the WULA;
- the requirements of GN 704 and detail surrounding these activities will be considered in the WULA; and
- an integrated waste and water management plan be submitted in support of the IWULA.

***Past NWA Process (please refer to Appendix 17 for the supporting documentation to this section)***

Registration Certificate:

On 02 April 2003, the mine was issued with a Registration Certificate (Reference No.: 25016795) which included the storage of clean water for two dams with the following volumes – 15 600m<sup>3</sup> and 2 470m<sup>3</sup>. No further information was provided to determine which dams were referred to – it is assumed that this may be for the Driekuilspruit Dam and the Black Rock Quarry as the only clean water containing facilities on site.

WUL Application 2006 (not processed or approved):

On 27 February 2006, GCS (Pty) Ltd ("GCS") submitted a WULA (Report Reference No.: 05.05.217) to the Department of Water Affairs and Forestry (DWAF, now DWS). The following extract from the WULA is relevant: "An authorisation is required in terms of Section 21 (b) of the National Water Act of 1998 (Act 36 of 1998) for the storage of water within old quarries on the property of Wonderstone Limited." Prior to Wonderstone Limited taking over the operations of the mining area, local farmers experimented with small quarries in the area, which have been left behind without being rehabilitated. These quarries fill with rainwater during the rainy season as well as with clean runoff water from the upstream catchment. Numerous animals and birds have started to use these quarries for breeding and other purposes and the quarries currently form part of their natural habitat. These quarries have capacities of 2 045m<sup>3</sup> (Black Hole Dam) and 16 080m<sup>3</sup> (Black Stone Quarry Dam) respectively." Note that for the purposes of this report, these facilities are referred to as the Black Rock Quarry.

Feedback from GCS on 09 January 2007 noted that "We have been following the progress of the WULA at the DWAF throughout 2006, and progress has unfortunately been slow on their side. Nevertheless, I spoke to the responsible officer today, Mr. Lebogang Swaratle at the Kimberley DWAF Office. Lebogang said he went for a site visit and thus far could not identify any issues or concerns relating to the WULA. Lebogang has also compiled a Reserve Determination and sent it to DWAF Head Office for their approval. The Reserve Determination of the relevant catchment is one component of the approval process. Once Head Office has accepted the Reserve Determination, they will assess the WULA report in full. Lebogang stated that the issuing of the license is only a formality, and that the mine need not be concerned about the current delay in the processing of the application." This application was never approved by the DWS, and it is currently unknown why it was never processed.

General Authorisation Application, 2010:

Following a visit to the Site by Mr. Lebogang Swaratle from the DWS in Kimberley on 24 May 2010, Wonderstone was advised to apply for a General Authorisation in terms of Section 27 of the NWA.

In June 2010, the mine submitted the requested application to the DWS. The activities as described in the 2006 WULA were once again included in the 2010 General Authorisation application and motivation document. Kindly note that the 2010 General Authorisation application was also never approved by the DWS.

**WUL 2015:**

On 17 April 2014, Chika Groundwater Executives CC (“Chika”) attended a site meeting with the DWS the purpose of which was to discuss the 2006 WULA as well as a pre-application for the new, 2014 WULA which Chika was appointed to submit. Chika noted in the meeting that the first WULA submission was made in 2006 and since then there have been several changes to water infrastructure and consumption on the Site, such as alterations to water use volumes and reduction in the number of French drain systems. With specific reference to the Black Rock Quarry, Chika confirmed during the site visit that “there are no discharge activities into the old quarries and that the water that accumulates at the quarry is direct rainfall and water from the immediate catchment area”

On 09 May 2014, Chika submitted the new, 2014 WULA to DWS. It is pertinent to note that the old quarries were, once again, included in the WULA as a Section 21(b) of the NWA water use.

The mine has a WUL that was issued on 11 January 2015 under Reference 09/C31C/ABCGI/2741, from the DWS, in terms of Section 21 of the National Water Act, 36 of 1998. The WUL includes:

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

It is peculiar to note that the quarries as applied for (in both the 2006 and 2014 WULAs) were excluded from the 2015 WUL. Additionally, the Waste Rock Dump was included as a Section 21(g) of the NWA water use.

**Subsequent Registrations**

On 22 February 2016, the Mine was issued with a new Registration Certificate (Reference No.: 25049661). Both the quarries were mentioned in the Registration Certificate as Section 21(b) of the NWA water uses; however, their status was shown as “deleted”. It is uncertain why the status is shown as deleted. ELG submitted an enquiry to the DWS to ascertain the correct interpretation of the Registration Certificate. To date, no response from the DWS has been received.

On 19 February 2019, after the 2015 WUL underwent an administrative amendment process to address various inconsistencies and other issues in the original license document, the Mine was issued with yet another Registration Certificate (Reference No.: 25049661). Any reference to the quarries were excluded from this Certificate.

***Applicability to this project***

**Existing Lawful Water Uses (ELWU)**

ELWU – allows people or organisations who were using raw water for commercial purposes before the NWA came into effect in 1998 to carry on using that water until such time as they are called upon to apply for a licence under compulsory licensing. Such users must have registered the use and must apply for verification of their water use when asked to by the DWS. Verification confirms how much water may be used lawfully. In terms of Section 32 of the NWA, an ELWU is defined as a water use which has taken place at any time during a period of two years immediately before the commencement date of the NWA and which was authorised by or under any law which was in force immediately before the commencement date of the NWA;

- ☞ is a stream flow reduction activity contemplated in Section 36(1) of the NWA; or
- ☞ is a controlled activity contemplated in Section 37(1) of the NWA; or
- ☞ which has been declared an ELWU in terms of Section 33 of the NWA.

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The DWS published a Draft Verification of Water Uses Guideline (“the Guideline”) which is an invaluable tool in interpreting the NWA’s intention with an ELWU. The Guideline explains that the ELWU “...is a temporary measure to allow people or organisations who were lawfully using water before the National Water Act came into force in 1998 to continue to use water until such time as licences or general authorisations can be issued to all water users”.

The continuation of an ELWU is very dependent on what was happening in the two years prior to the implementation of the relevant section of the NWA. As a result, the validation and verification processes assess two time periods:

- The “qualifying period” defined as two years before the enactment of the NWA (please refer to the following figures); and
- the “current period”.

Wonderstone – Driekuil Mining Expansion and Consolidation Project  
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Project Ref: 202110  
Version: Final Draft – Stakeholder Review

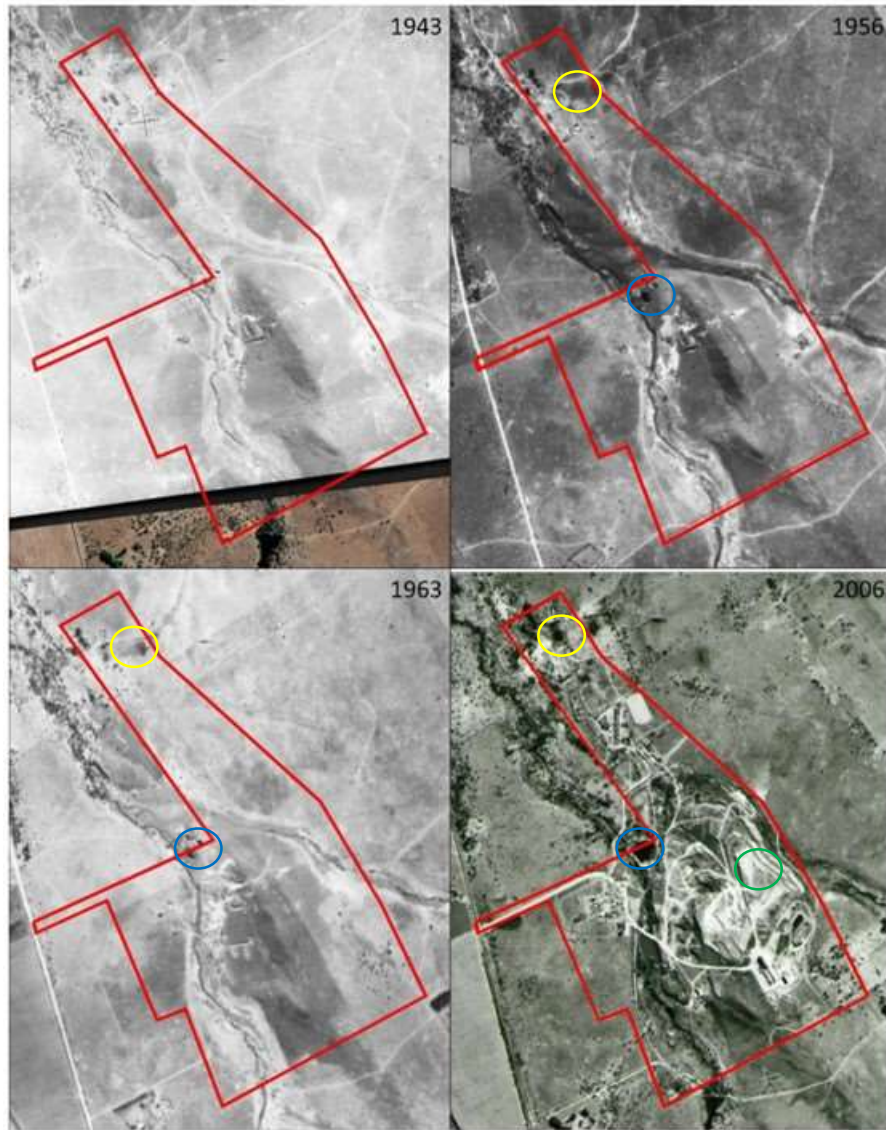


Figure 9: Historical aerial imagery from 1944, 1956 and 1963, compared with that of 2006

Wonderstone – Driekuil Mining Expansion and Consolidation Project  
Mining Right Ref: NW30/5/1/2/2/398MR

Project Ref: 202110  
Version: Final Draft – Stakeholder Review

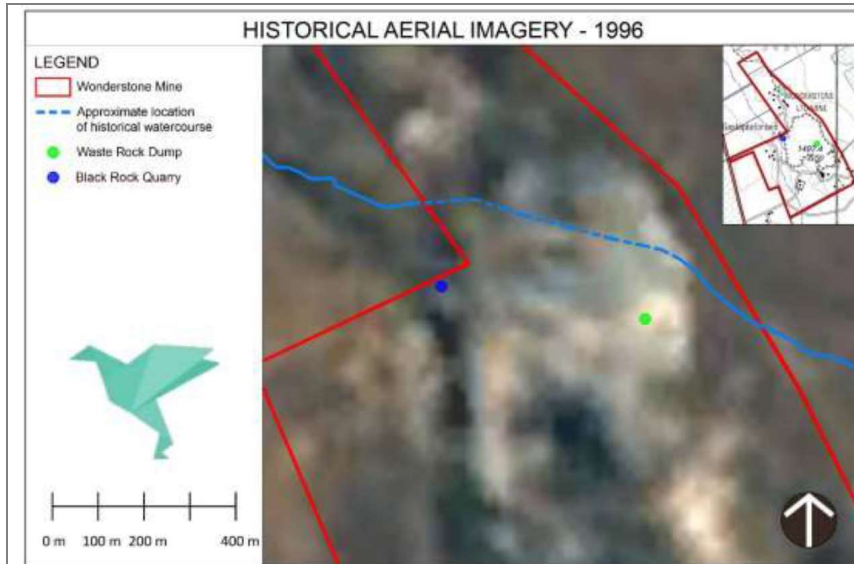


Figure 10: Historical Aerial Imagery – 1996

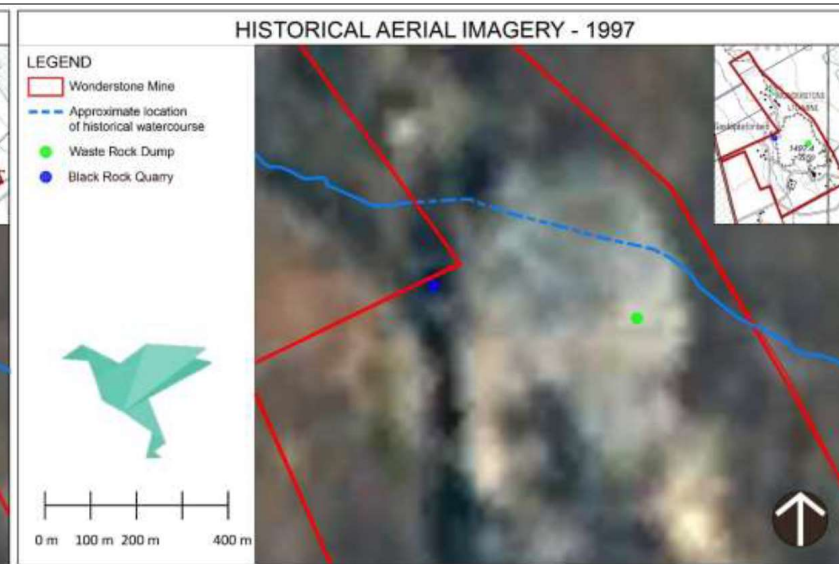


Figure 11: Historical Aerial Imagery – 1997

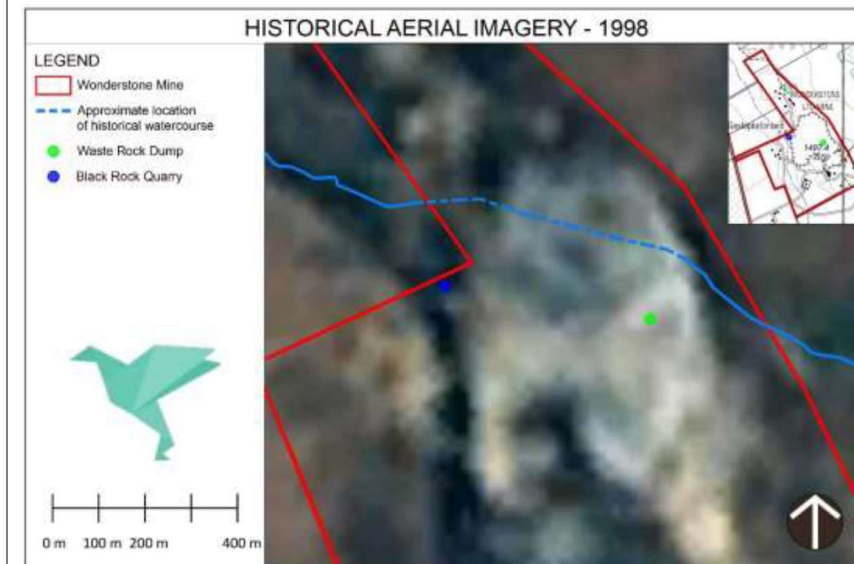


Figure 12: Historical Aerial Imagery – 1998

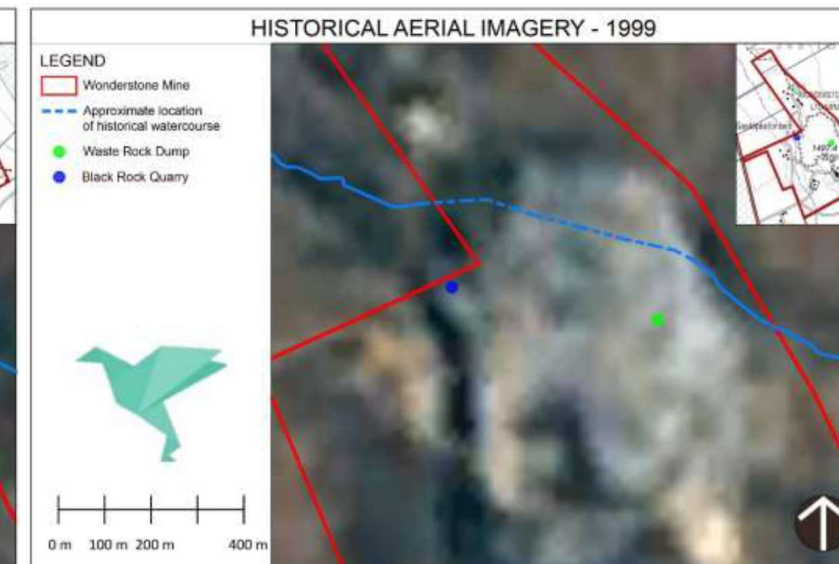


Figure 13: Historical Aerial Imagery – 1999

Figure 9 clearly indicate the presence of the Old Farm Dam, still used by the landowners for livestock watering, since 1956 (see yellow circle). These images also illustrates the presence of the Black Stone Quarry Dam since 1963.

Although the quality of the aerial imagery from 1996 to 1999 is very poor (refer to Figures 10-13 above), the encroachment of the current WRD on the non-perennial tributary can clearly be seen during these timeframes, and already existing since 1975 (**Error! Reference source not found.**).

The Guideline stipulates two (s) conditions for an ELWU, namely –

- ☞ lawful use of the water during the two-year “qualifying period” according to any laws that were in place at that time; and
- ☞ compliance with the requirements of the NWA, which includes registration, the payment of water resource management charges, and applying for verification of the extent of the ELWU (when called upon to do so).

The first legal requirement that existing water users were asked to fulfil under the NWA was to register their water use. The call for Existing Lawful Water Users to register their commercial water use was made in the GG on 12 November 1999, in terms of Section 26(1)(c) of the NWA. Existing Lawful Water Users were asked to register their water use as it actually took place, on the day of registration. It was also made clear that the verification of the extent of existing lawful water use would be based on the information provided with registration, and that the onus was on water users to provide correct information.

Note that the Mine was part of a registration process as described above in 2003, 2016 and 2019. In this regard, the following must be noted:

- ☞ it is unclear which exact water uses were registered in 2003;
- ☞ the 2016 registration made mention of the Black Rock Quarry as a Section 21(b) of the NWA water use;
- ☞ however, the Black Rock Quarry was deleted in the 2019 registration; and
- ☞ none of these registration opportunities was the WRD encroachment included and registered, although this facility was approved as a Section 21(g) water use in the 2015 WUL;
- ☞ none of these registration opportunities was used for the Old Farm Dam, located on the Wonderstone owned land (Portion 44), but used by the surrounding landowners.

GN704 Exemption:

GN 704 was promulgated in terms of section 26(1) of the NWA and specifically aimed at the protection of water resources associated with mining related activities. It provides minimum requirements which need to be adhered to for the protection of the water resources on a mine. GN 704 regulates the use of water, management of dirty and clean water infrastructure and related activities at mines. This includes minimum requirements for infrastructure that hold dirty water. A mine can apply for exemptions from these requirements and could be granted approval should sufficient management measures be put in place to ensure the protection of the environment. Regulation 4 of GN 704 places some restrictions in terms of the locality of certain infrastructure which could have an impact on water resources.

In terms of GN704 exemptions, the GN 704 Regulations relate to both existing and new water use activities and each section should be read and interpreted individually. It is recommended that exemption be applied for in terms of the GN 704 Regulations based on the historic nature of the activities.

WULA Amendment Requirement:

The Wonderstone WUL will need to be consequently amended in terms of section 50 of the NWA, 1998, to make provision for water uses previously omitted from the WUL, 2015. New WUL activities that will be included in the amendment process are set out below. The WUL also requires certain corrections and amendments to the conditions, which will be included in the WUL Amendment Application and updates to the monitoring programme to be site specific to site water conditions. Considerations for the WULA include:

- ☞ Verify water uses in terms of Section 35 of the NWA, by including these in the new WUL - Section 21(c) & (i) for the WRD and Section 21(b) and (c) & (i) for the Black Rock Quarry;
- ☞ Correction of coordinates;
- ☞ Inclusion of Section 21(b) water uses – various JoJo tanks;
- ☞ Inclusion of historic gravel roads, crossing non-perennial streams as Section 21(c & i) water uses;
- ☞ Inclusion of historic WRDs observed during site investigations;
- ☞ Application of GN704 exemption.

New Water Use Requirements:

New Water Uses may include:

- ☞ Section 21(g) for the disposal of waste such as the Low Grade Stockpiles and Overburden Stockpile, as well as the PCD.;
- ☞ Depending on the outcomes of the specialist studies Section 21(c&i) water uses may also be triggered depending on the proximity of water resources in the area.

### **13. Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)**

Since 2004, the MPRDA has been the principal piece of legislation that regulates the South African mineral and petroleum sector.

The MPRDA was enacted with the objectives of promoting local and rural development, ensuring equal access to minerals, and eradicating discriminatory practices in the industry, while still guaranteeing security of tenure to participants in the industry and increasing the industry's international competitiveness.

Recent amendments to NEMA and the MPRDA have been published with the objective to align NEMA and the MPRDA authorisation processes as well as to provide for cooperative governance between the DMRE and the DEFF.

The governing provisions in respect of EMPr's were removed from the MPRDA and incorporated into Sections 24N, 24O, 24P, 24Q, 24R and 24S of NEMA.

The project does not entail any additional authorisations for mining rights in terms of the MPRDA. The surface infrastructure will be located within the approved mining area within the DCM as the surface right owners. For the purposes of this project, the mine will also submit an updated Mining Work Programme.

#### ***Applicability to this Project***

The approved EMPr's, 2009 and 2010 will be consolidated and updated into a new EMPr which will support the Integrated Environmental Authorisation. For this reason the project, will involve the application in terms of Section 24 of the NEMA, for the development of new activities and secondly for the amendment and consolidation of the exiting EMPr in terms of Regulation 34, read with Regulation 37.

### **14. Conservation of Agricultural Resources Act, No 43 of 1998 ("CARA")**

In terms of CARA, landowners are legally responsible for the control of weeds and alien vegetation. The Act makes provision for three categories of Alien and Invasive Plant Species:

- ☞ Category 1a: must immediately be removed and destroyed;
- ☞ Category 1b: need to be immediately be removed and contained;
- ☞ Category 2: require a permit to retain the species on site and it must be ensured that they do not spread. All category 2 plants in riparian zones need to be removed; and
- ☞ Category 3: require a permit to retain these species. All category 3 plants in the riparian zone need to be removed.

CARA is also clear in terms of the conservation of soil and states that degradation of the agricultural potential is illegal. It furthermore requires the protection of land against soil erosion and the prevention of water logging and associated salinisation.

#### ***Applicability to this project***

The surface of the new project expansion is associated with some open natural land present surrounding the mining area, which are used for grazing. Wonderstone will take cognisance to the requirements of CARA where applicable.

### **15. NEMA Financial Provisioning Regulations, 2015, as amended**

The NEMA Financial Provisioning Regulations published under GN 1147 under GG 39425 of 20 November 2015 ("FP Regulations"), set out the requirements for the development of a closure and rehabilitation plan; and the financial provision for rehabilitation and closure.

#### ***Applicability to this project***

The mine is currently in the process of updating the Financial Provision.

## 16. Other Legislation, Policy & Guidelines

Other legislation and associated regulations (where applicable) considered as part of the application process include:

- ☞ The National Development Plan 2030.
- ☞ National Veld and Forest Fire Act, 101 of 1998.
- ☞ Hazardous Substance Act, No 15 of 1973.
- ☞ Mine Health and Safety Act, No 29 of 1996.
- ☞ DMRE Consultation Guidelines.
- ☞ Spatial Planning and Land Use Management Act, No 16 of 2013.

## 17. Provincial and Municipal Bylaws

The North West Province, as well as the Ngaka Modiri Molema District Municipality and the Tswaing Local Municipality have developed local bylaws and various policies relating to waste disposal, water, economic development, air quality etc. The following provincial and Municipal Bylaws are applicable to Wonderstone:

- ☞ Ngaka Modiri Molema District Municipality Integrated Development Plan (IDP) (2019-2020). The following key points are stated in the IDP:
  - Ngaka Modiri Molema District Municipality as a Water Service Authority is also affected by the scourge of water scarcity confronting many parts of South Africa water crises in many parts of the country.
  - Economic growth at municipal level is essential for the attainment of economic development, the reduction of poverty and improved accessibility. Fostering such growth requires an in-depth understanding of the economic landscape within which each respective municipality operates. Mining contributes about 42 percent of the economic activities in the area in terms of Rand Value.
  - Ngaka Modiri Molema District Municipality is well-endowed with natural resources; therefore, environmental conservation is of high importance to the municipality. Purpose of this environmental analysis is, therefore, to ensure that environmental assets which require protection are considered, and that the approach used for Environmental Management puts people and their needs at the forefront of its concerns, and serves their physical, psychological, developmental, cultural and social interests.
  - Ngaka Modiri Molema District Municipality is rich of heritage, culture, natural sites; namely specific to the Wonderstone Mine:
    - Driekuil Hill is one of at least 12 sites, all on outcrops of Pyrophyllite, or 'Wonderstone', that include Gestoptefontein Mountain and Gestoptefontein Hill, regarded collectively as the largest and most significant Khoi-San rock art sites in the former Western Transvaal (now North West Province). Two types of markings are identified on Driekuil Hill based on Josephine Flood's distribution between 'referential art' (pecked and incised images of anthropomorphs, zoomorphs, aprons, skins and other objects) and 'gestural art' (grooves, pits, hammered areas, clusters of pecks and cut marks) that may have been made as part of ceremonies.
    - Gestoptefontein Mountain which is a rock art sites are part of a much larger complex of marked outcrops in a landscape that oral traditions imbue with significance
    - Gestoptefontein Hills which has Khoi-San rock art sites.
- ☞ The 2021/2022 IDP states the following:
  - The strategic approach therefore would be to optimize the limited resources and expanding the impact it would have on the strategic priorities identified during the stake holder engagement process of developing the IDP.

### ***Applicability to this project***

Wonderstone is committed to ensure that the protection of water, ecological and heritage resources receive the highest of attention. The purpose of the project is to ensure that the current environmental setting is understood in terms of the impacts of the mining operation on the environment and to ensure that the current environmental management measures are reassessed to ensure that these are practical and effective to address potential environmental short, medium and long term risks. This process also includes the expansion of mining activities, to further contribute to the economic employment opportunities in this municipality.



### 3 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

#### 3.1 Motivation for the Proposed Project

##### Economic Benefit:

Regulation 23 of the MPRDA states in Section 1(a), that subject to subsection 4, the Minister must grant a mining right if the mineral can be mined optimally in accordance with the Mining Work Programme. The mine has been awarded a Mining Right by the Department of Mineral Resources (DMR; now DMRE) and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

Wonderstone is currently in full production on Portion 44 of the farm Gestoptefontein 349 IO which is the Converted Mining Right (CMR) area. The applicant intends to extend mining to Portion 15 of the farm Gestoptefontein 349 IO that is adjacent to the current mining area and falls in the New Order Mining Right (NOMR) area. All the required infrastructure, with the exception of the Low Grade Stockpile and PCD is already in place therefore mining can start immediately. The remaining extent of the outcrop will be mined according to a schedule. The project will result in an additional 18 years life of mine. The project also allows for the consolidation of the two (2) Mining Rights and abandonment of areas not to be used.

##### Giving effect to Waste Reduction:

The reworking of the mineral waste gives effect to the Waste Management Hierarchy as presented in the National Waste Management Strategy, November 2011 and also the Strategy of 2020. This 2011 Strategy states the following:

- A challenge experienced is the lack of a policy and regulatory environment that does not actively promote the Waste Management Hierarchy.
- The report states that while the elimination of waste in its entirety may not be feasible, it is possible through the systematic application of the Waste Management Hierarchy to reach a point within the next few decades where re-use, recycling, recovery and treatment overtake landfills as preferred options for waste management.
- The first goal presented in this strategy as a strategic goal is to “promote waste minimisation, reuse, recycling and the recovering of waste” by focusing on implementing the Waste Management Hierarchy, and with the ultimate aim of diverting waste from landfill.

The following is an abstract of Section 2.3 of the National Waste Management Strategy.

The Waste Management Hierarchy in the National Waste Management Strategy is summarised as follows:

- Waste avoidance and reduction;
- Re-use;
- Recycling;
- Recovery; and
- Treatment and disposal.

The foundation of the hierarchy, and the first choice of measures in waste management, is avoidance and reduction. This step aims for goods to be designed in a manner that minimises their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.

The next stage of the hierarchy is re-using waste. Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties.

After re-use comes the recycling of waste, which involves separating articles from the waste stream and processing them as products or raw materials.

These first four stages of the waste management hierarchy are the foundation of cradle-to-cradle waste management. This approach seeks to re-use or recycle a product when it reaches the end of its life span. In this way, it becomes input for new products and materials. This cycle repeats itself until as small a portion as possible of the original product eventually enters the next level of the waste management hierarchy: recovery.

As a last resort, waste enters the lowest level of the hierarchy to be treated and/or disposed of, depending on the safest manner for its final disposal.

Taking this strategy further, is the current National Waste Management Strategy of 2020. This strategy also focusses on the Circular Economy. A circular economy redefines economic growth by moving away from a take-make-waste industrial model to one that decouples economic activity from the environment and supports a just transition to renewable energy sources. The three key principles of a circular economy are: design out waste and pollution, keep products and materials in use and regenerate natural systems. The two (2) strategic entry points of the waste sector into waste minimisation and the circular economy is waste prevention and waste as a resource, as briefly explained below.

- Waste Prevention (as highlighted in the 2011 National Waste Management Strategy) – this emphasises avoiding and reducing waste before substances, materials and products are discarded.
- Waste as a Resource (key focus in the draft Strategy) – this focuses on stimulating a secondary resources economy based on recycling and recovery of materials and energy from waste i.e. interventions that take place after a product or material has become waste. Circularity can deliver substantial material savings throughout value chains and production processes, generate extra value, transformation of industry towards climate-neutrality, long-term competitiveness and unlock economic opportunities. In terms of the waste management hierarchy practices, recycling of waste for reuse and recovery of materials is prioritised over recovery of energy from waste. The main economic driver lies in exploiting the full potential value of waste.

The WST Project specifically considers the opportunity to undertake ongoing rehabilitation to allow for the reduction of waste disposal on surface and also to achieve final land use objectives. In addition to this, by undertaking sourcing at source, this will also reduce the volumes of waste which may require long term or permanent disposal.

#### **Giving effect to Marketing Needs:**

Wonderstone (Pyrophyllite) can be used in its natural form and cut into blocks, it can be shaped into ceramic products and used in powder form.

Resistance to the destructive influences of weathering and corrosive agents, superior workability, strength and other useful qualities, are distinct in the commercial exploitation of this mineral.

Some of the market types, where pyrophyllite is currently incorporated in, include the synthetic diamond industry through High Pressure High Temperature (HPHT) technology, Chemical Vapour Deposition (CVD)-, as well as the ceramics industry.

The synthetic diamond industry currently has an annual growth rate (CAGR) of ~7%. The main market drivers include jewellery and the electronics industries. Initially, HPHT technology is expected to hold market share of 73% up to 2023. Cubic HPHT units are used to produce large volumes of synthetic diamonds of which pyrophyllite accounts for 8-10% of the cubic production costs. The US market has traditionally been seeking a product with balance in high density and consistency; properties that can be met by Wonderstone. China is currently the largest market competitor. The Indian and European market is limited and relatively price sensitive.

CVD production is rising and is expected to be the preferred technology for the long term.

The global technical ceramics market is ~\$68bn, growing at 10% CAGR, of which the US owns about 30% market share. According to research, the addition of pyrophyllite could reduce costs of machining by 50%. Research into the Indian and European markets indicated limited understanding of the benefits of Wonderstone.

#### **Giving effect to sound Environmental Management and the NEMA Duty of Care Principles:**

The intention to include the Regulation 34 Audit findings in this project is for the mine to operate under one effective Environmental Management Tool. During the past Environmental Audits, it has been determined that the

management measures currently stipulated are not clear and site-specific and for this reason should be updated to understand the current site conditions and provide site-specific management measures.

This will aid the operation in understanding the holistic management requirements for all approved activities on site. The update will further enhance environmental planning on site in terms of any potential future changes on site, by making management objectives and requirements clear for defined activities.

A mining operation is continuously progressing towards best operational practices, improving on production and economics of scale. With this, there is an ongoing update and progressing of Environmental Legislation and the understanding of site conditions based on continuous surface water, groundwater, vegetation monitoring etc being undertaken.

In the process the EMPr may become outdated. By not allowing the update of the existing EMPr as part of this project, the mine will continue with its current environmental management system, with limited understanding of the impact of the operations on the environment and an opportunity to improve of environmental management measures will be lost.

### **3.2 Period for which the Environmental Authorisation is required**

The 397MR is valid until 19 March 2049 according to the 2022 Mining Work Programme. According to the Mining Work Programme, the life of mine (LoM) plan was compiled in 2018 using Datamine Studio 5D Planner software. The mine design was based on the measured resource category. The mined-out boundary strings were used to deplete the current reserve model. An average future production rate similar to that of the past FY of ~160 000 tpa of Wonderstone is expected.

Based on the current reserves only, Wonderstone Mine has a LoM far in excess beyond the current Mining Right term. Inferred Resources will be upgraded as exploration progress to ensure the steady state target is maintained. The new LoM allows for an additional 18 years of mining operation.

### **3.3 Description of the process followed to identify Alternatives for the Overall Preferred Site, Activities and Technology Alternative**

No location alternatives were investigated for this project as the project is linked to the existing available resource locations and available surface areas. The only alternative is the No-Go alternative where the status quo remains.

The key motivations for this project are therefore: 1. Economic benefit of optimally mining available resources; and 2. Updating the existing EMPr to address gaps identified during the Regulation 34 Audit (2019).

The project is also presented to all Registered Stakeholders. Comments received during the review period will further guide the EAP and Project Team in terms of potential concerns regarding the current layout. Lastly, specialist were involved during the compilation of this ESR to determine whether any specific restrictions are in place for the current layout of the proposed project. This is presented in Section 1.8.10.

### **3.4 The option of not implementing the activity**

Should the project not be approved (No-Go alternative) the following key positive impacts will not be achieved:

- ☞ Regulation 23 of the MPRDA states in Section 1(a), that subject to subsection 4, the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The mine has been awarded a Mining Right by the DMR (now DMRE) and therefore has an obligation to give effect to the following:
  - The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally;
  - Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a

- mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right; and
  - WST is actively investigating opportunities for the continued and sustainable mining of reserves and for the purposes of this project, has identified the sources for further mining.
- ☞ The project will allow for improved supply of material required to optimally operate the mine.
- ☞ No additional infrastructure development will be required, with the existing plant infrastructure sufficient for this project.
- ☞ Should the project not be approved the WST will lose the opportunity to update its existing EMPr to address various gaps identified during the 2019 Regulation 34 Audit. The mine will also lose the opportunity to utilise a Mining Rights area, not currently mined, this will result in the loss of opportunity for future and long term employment and providing market needs.

## 4 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

This section includes the details of the Public Participation Process undertaken to date. The Comments and Responses Section has the following objectives:

1. To provide a formal and integrated record of all the issues raised by Interested and Affected Parties (I&APs) to date and the responses provided by the EIA Study Team.
2. To provide a mechanism that allows all parties participating in the process (including the environmental authorities) to verify whether the issues raised have been considered and where appropriate, adequately addressed by EIA Study Team.

Issues which are raised will be recorded through a variety of mechanisms. These include:

- ☞ Comments sheets received by fax, and/or e-mail;
- ☞ Comments sent to the public participation office via e-mails;
- ☞ Comments received telephonically; and
- ☞ Comments received during the announcement phase when adjacent landowners were visited.

The PPP during the draft Environmental Scoping Report of the project consisted of the following activities:

- ☞ Communication with regulatory authorities and municipal authorities;
- ☞ Communication with surrounding landowners;
- ☞ The identification and engagement with the general public;
- ☞ Placement of notifications and advertisements in local newspapers;
- ☞ Placement of posters and notifications on site and in close proximity to the site;
- ☞ The PPP will be an ongoing activity and will only be concluded once the decision for the Environmental Authorisation has been issued. All I&APs will be informed as to the final decision taken by the Department.

### 4.1 Stakeholder Identification

The current Stakeholder Database on the mine was utilised as a basis for the development of the consultation register for this project. In addition, relevant government departments, municipalities and affected ward councillors were contacted to inform them of the proposed project and to obtain their issues and comments in this regard. The following stakeholders were consulted as part of the project:

- ☞ DWS (Kimberley);
- ☞ DMRE (Klerksdorp);
- ☞ NW READ;
- ☞ DEFF;
- ☞ SAHRA;
- ☞ Local Municipality;
- ☞ Districts Municipality;
- ☞ Surrounding Landowners; and

- Other Identified Stakeholders.

## 4.2 Stakeholder Identification and Notification

Notification of I&APs commenced during the week of 20 April 2022. The notification process was undertaken by means of the following:

- Newspaper advertisements;
- Site Notices;
- Direct Notifications through a Background Information Document.

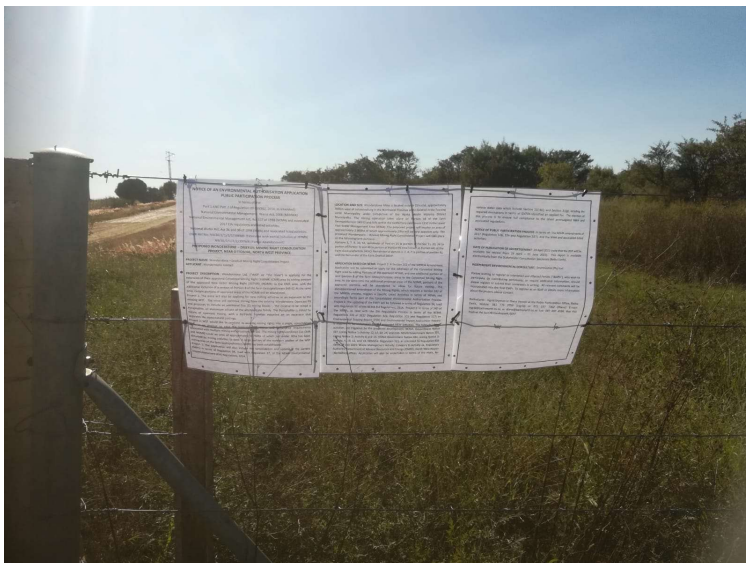
Please refer to **Error! Reference source not found.** for copies of these notifications. Proof of email submissions can be requested from the EAP.

### 4.2.1 Site Notices

In order to inform surrounding communities and adjacent landowners of the proposed project, two site notices were erected on site (on 21 April 2022) and at visible locations close to the site.

Site Notices were placed at the following locations:

- Mine Entrance;



**Main Entrance**

*Figure 14: Proof of Site Notices*

### 4.2.2 Background Information Documents

Background Information Documents were distributed via email to all parties on the database on during the week of 20 April 2022. Please refer to Appendix 5 for a copy of this document.

### 4.2.3 Advertisements

The formal announcement of the proposed project was done by placing an advert in the *Stellander* 20 April 2022 to invite all I&APs to register on the project database. The objective of this newspaper advertisement was to:

- Inform I&APs of the proposed project;
- Inform I&APs of the Environmental Impact Assessment procedure and the way in which I&APs could lodge any objections to the proposed development and provide comments; and
- Invite I&APs to become involved in the proposed project by registering as I&APs.

Please refer to Appendix 5 for a copy of the advert.

### 4.3 Document Review

All registered stakeholders were informed of the availability of the draft Environmental Scoping Report on 29 April 2022. The review period will run from 29 April – 01 June 2022 for all stakeholders to review this document. The notification was sent via email to all registered stakeholders. In addition to this, hard copies were submitted to:

- ☞ Local Municipality;
- ☞ Districts Municipality;
- ☞ DWS (Kimberley);
- ☞ DMRE (Klerksdorp);
- ☞ NWREAD;
- ☞ DEFF;
- ☞ SAHRA;
- ☞ One hard copy on site.

No comments outside of those presented in the draft reports were received.

### 4.4 Summary of Issues raised by the I&APs

To date the following comments have been received.

Table 10: Stakeholder Comments received

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	DATE AND HOW ISSUE WAS RAISED	COMMENTATOR	RESPONSE
1	I would like to know if there is a possibility for me to be shown the area that a new Mine is supposed to be at. I am not good with reading a map, I would like to see the area before filling in the form that you sent to me.	24 April 2022	Ms Salamina Kedumetse Moleleki. Ward 11 Councillor	<p>Thank you for your e-mail. As part of the first phase of this new EIA application, the draft scoping report will be submitted on 29 April 2022 to all stakeholders for review. The report will be made available for a 30-day review period. This scoping report will provide more details as to what the application entails and what is proposed, together with all the maps and affected areas.</p> <p>We will then again contact you during this phase, and once you have reviewed the information in the scoping report. The activities proposed is for the existing Wonderstone mine. They would like to expand on the existing areas.</p> <p>We also contacted the directly affected Ward Councillor (Ward 12) Mr Simane Michael Williams. Thus, to confirm, Ward 11 is an adjacent ward to the proposed area. Hope the above can assist, we will then also send you the report on Friday 29 April 2022.</p>

## 5 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE ALTERNATIVES

The following section presents the summary of the current Environmental Conditions.

### 5.1 Rainfall

The Hydrological Study will be undertaken by HydroSpatial, and the Air Quality Impact Assessment by VJ Air Modelling Services. Please refer to Appendix 10 for the Hydrological Desktop Assessment and Appendix 16 for the Air Quality Desktop Assessment.

#### 5.1.1 Monthly Rainfall

Monthly rainfall data for the area was obtained from the South African Weather Service (SAWS) station Ottosdal (Pol) (Figure 15), as well as rainfall measured at the mine.

The Ottosdal (Pol) station has a MAP of 564mm, whilst the Wonderstone gauge has an MAP of 524mm. Rainfall for the area is highest over the summer months of October to April, with December to February being the wettest months. Rainfall is lowest over the months of May to September, with June to August being the driest months.

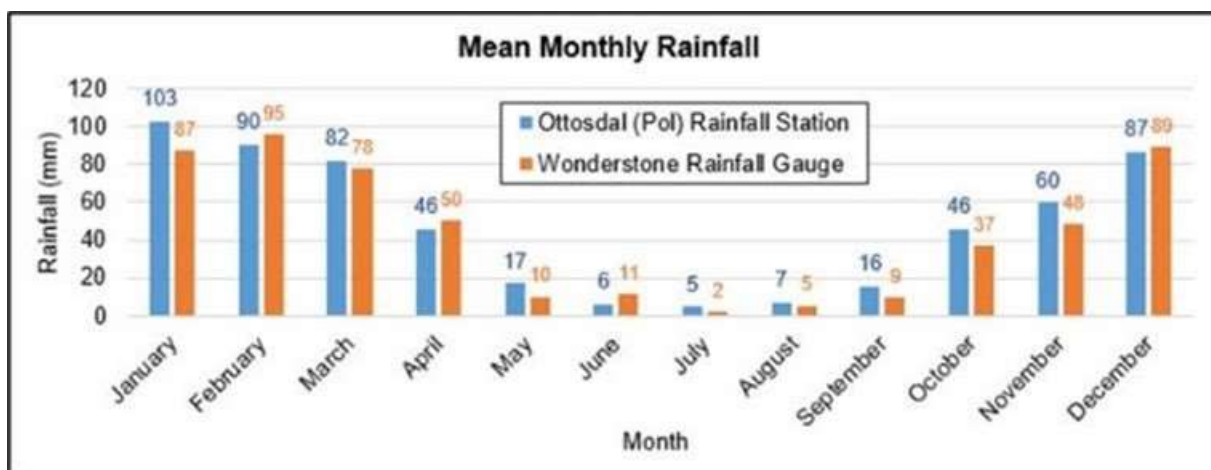


Figure 15: Mean monthly rainfall

#### 5.1.2 Annual Rainfall

The annual rainfall totals for the area over the past 40 years is indicated in the following figure. Rainfall has generally been below average at the mine over the past 10 years, with 2015, 2016 and 2018 being particularly dry years. Above average rainfall occurred during 2014, 2017 and 2019, with 2019 being a particularly wet year, receiving 731mm of rainfall.

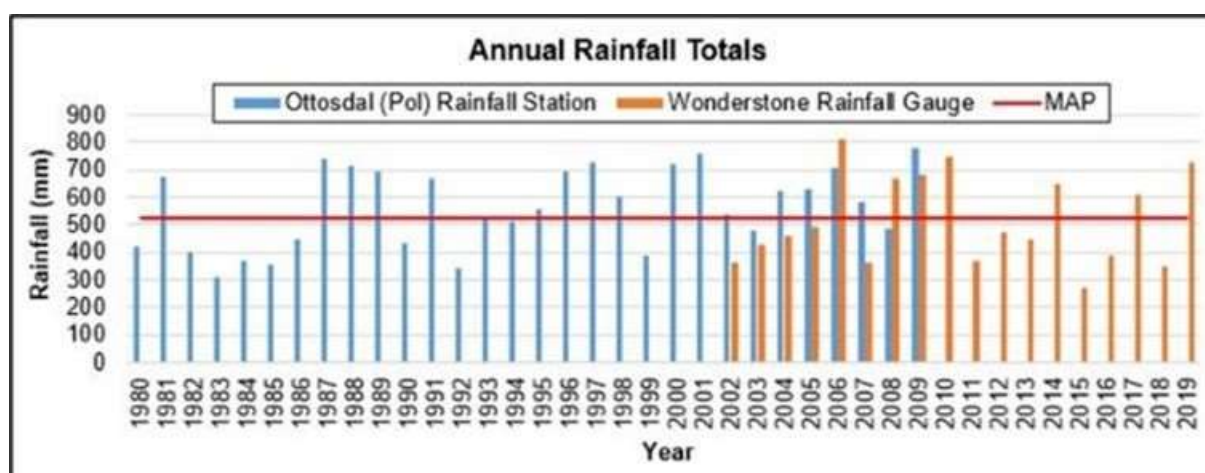


Figure 16: Annual rainfall totals

### 5.1.3 Evaporation

Monthly Symon’s Pan (S-Pan) evaporation was obtained from the WR2012 study for quaternary catchment C31C. S-Pan evaporation measurements tend to be higher than evaporation from natural open water bodies. In order to convert S-Pan measurements to open water evaporation, monthly conversion factors were used, which were obtained from the WR2012 study. The monthly evaporation for the project is indicated in the following table. The open water Mean Annual Evaporation (MAE) is 1 594mm, which is almost three times more than the MAP of the area. Evaporation is highest over the warmer months of October to March, and lowest over the cooler months of May to July.

Table 11: Mean monthly evaporation

Month	S-Pan Evaporation (mm)	Evaporation Factor	Open Water Evaporation (mm)
January	224	0.84	188
February	170	0.88	149
March	156	0.88	137
April	116	0.88	102
May	93	0.87	81
June	74	0.85	63
July	86	0.83	71
August	124	0.81	101
September	172	0.81	139
October	218	0.81	177
November	230	0.82	188
December	238	0.83	198
<b>Total</b>	<b>1 900</b>	<b>N/A</b>	<b>1 594</b>

### 5.1.4 Wind

Wind roses are useful for illustrating the prevailing meteorological conditions of an area, indicating wind speeds and directional frequency distributions. In the following wind roses, the colour of the bar indicates the wind speed while the length of the bar represents the frequency of winds blowing from a certain direction (as a percentage).

The period surface wind rose plot from the Ottosdal meteorological station is presented in the figure below. Winds recorded in the area originate predominantly from the north and east, with smaller north-easterly and north-westerly components. Wind speeds are moderate, with a number of winds exceeding 8m/s, particularly from the north and north-northeast. Calm conditions (wind speeds < 1m/s) are experienced 46.6% of the time.



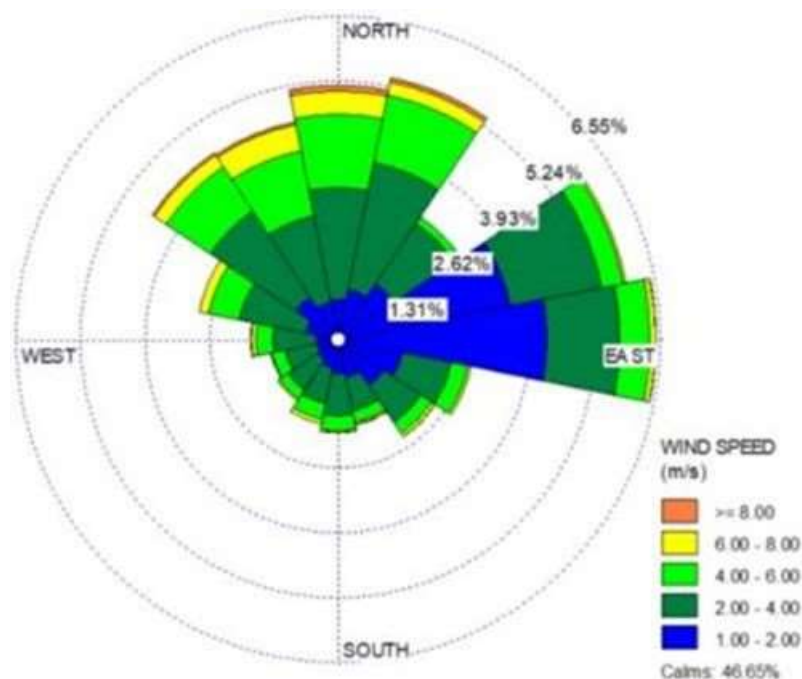


Figure 17: Ottosdal surface wind rose for the period 2017 – 2019

## 5.2 Topography

The Hydrological and Visual Impact Assessment will be undertaken by HydroSpatial. Please refer to Annexure 13 for the desktop Visual Impact Assessment.

The topography of Wonderstone Ltd area is defined as flat, lightly undulating terrain, with only prominent features the outcrops of Wonderstone that follow southeast-northwest direction. The project site is relatively flat, at an average elevation of 1,470 metres above mean sea level (mamsl), with various perennial and non-perennial drainage lines crossing the site and artificial dams that drain towards east (Klein-Hartsrivier). The topographic relief can be described as relatively gently sloping towards the west, while the topographic elevation varies between approximately 1,400 mamsl in the west of the project site to 1,570 mamsl in the far east and south east.

The modelling domain encompasses the area that varies between 1,397 mamsl to 1,566 mamsl. An analysis of topographical data did not indicate a slope of more than 1:10 over the proposed modelling area. Dispersion modelling guidance recommends the inclusion of topographical data in dispersion simulations in areas where the slope exceeds 1:10 (US EPA, 2004) (see figure below).

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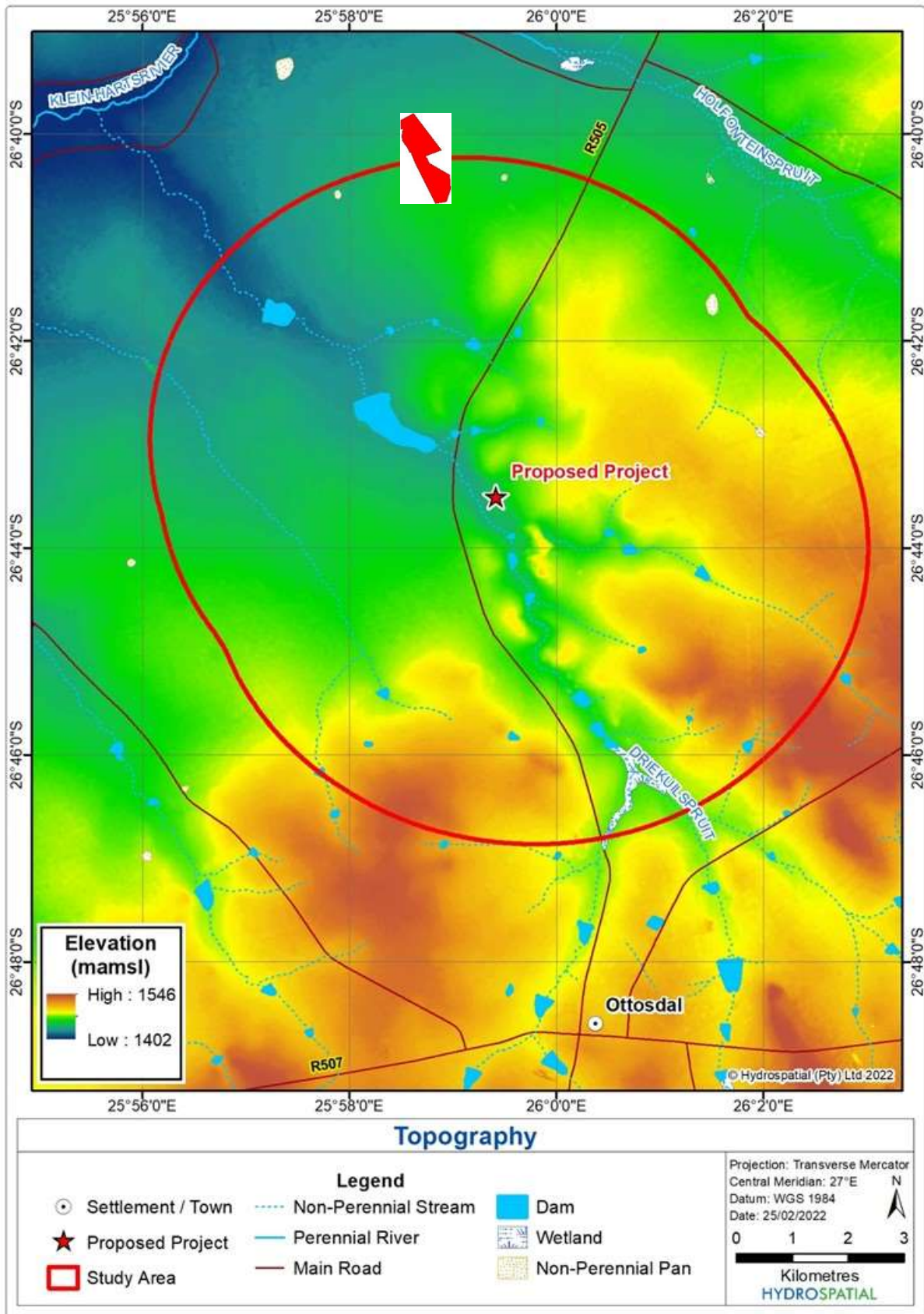


Figure 18: Topography of the study area.

## 5.3 Geology

The Hydrogeological study will be undertaken by Irene Lea Environmental and Hydrogeology (iLEH). Please refer to Appendix 11 for the Geohydrological Desktop Assessment.

### 5.3.1 Regional Geology

According to WST (2008) and Letsolo (2019), the pyrophyllite (Wonderstone) mined at the operations is hosted in a pale green acidic lava of the Syferfontein Formation of the Dominion Reef.

The pyrophyllite is metamorphosed volcanic ash interbedded with the lava. The ore is grey to black in colour and was deposited as massive fine grained body. On surface where weathering has taken place, the pyrophyllite is light grey in colour, but the colour gets darker deeper in the deposit. The ore body strikes in a north-south direction and dips at approximately 35° to the west. The thickness of the main lens of pyrophyllite is 190m and includes small inclusions of lava up to 20m thick. Geological action has tilted the deposit so that the laminations in the body dip at about 80°.

The geological setting for the sub-catchment in which the mine is situated is indicated in the following figure. The figure below indicates the extent of the host rock that comprises tuff, quartz feldspar porphyry of the Syferfontein Formation. The host rock is faulted to the west by NNW-SSE trending faults. Basement granites outcrops to the north and west.

### 5.3.2 Local geology

Exploration borehole data made available by WST to conceptualise the aquifers present suggests that the soil consists of a coarse grained volcanic ash that weathers to a clay. Alternating layers of fine and coarse volcanic ash is typically found to a depth of 50m.

This stratification is thought to reduce the vertical permeability of the rock formations underlying the operations. From depths greater than 50m, increased porosity may be encountered due to slumping structures. The felsic host rock becomes relatively homogenous from depths greater than 100m. Exploration borehole information further suggests that pyrite beds are present intermittently in the mining area.

The primary permeabilities of the pyrophyllite and lavas is low and is not expected to transmit groundwater at significant rates. Groundwater is therefore associated with fractures, faults and joints.

Exploration borehole logs however suggest that some joints are infilled by kaolin. Groundwater strikes and rest water levels measured in the exploration boreholes indicate that groundwater is associated with the limit of weathering as well as with open joints in the hard rock.

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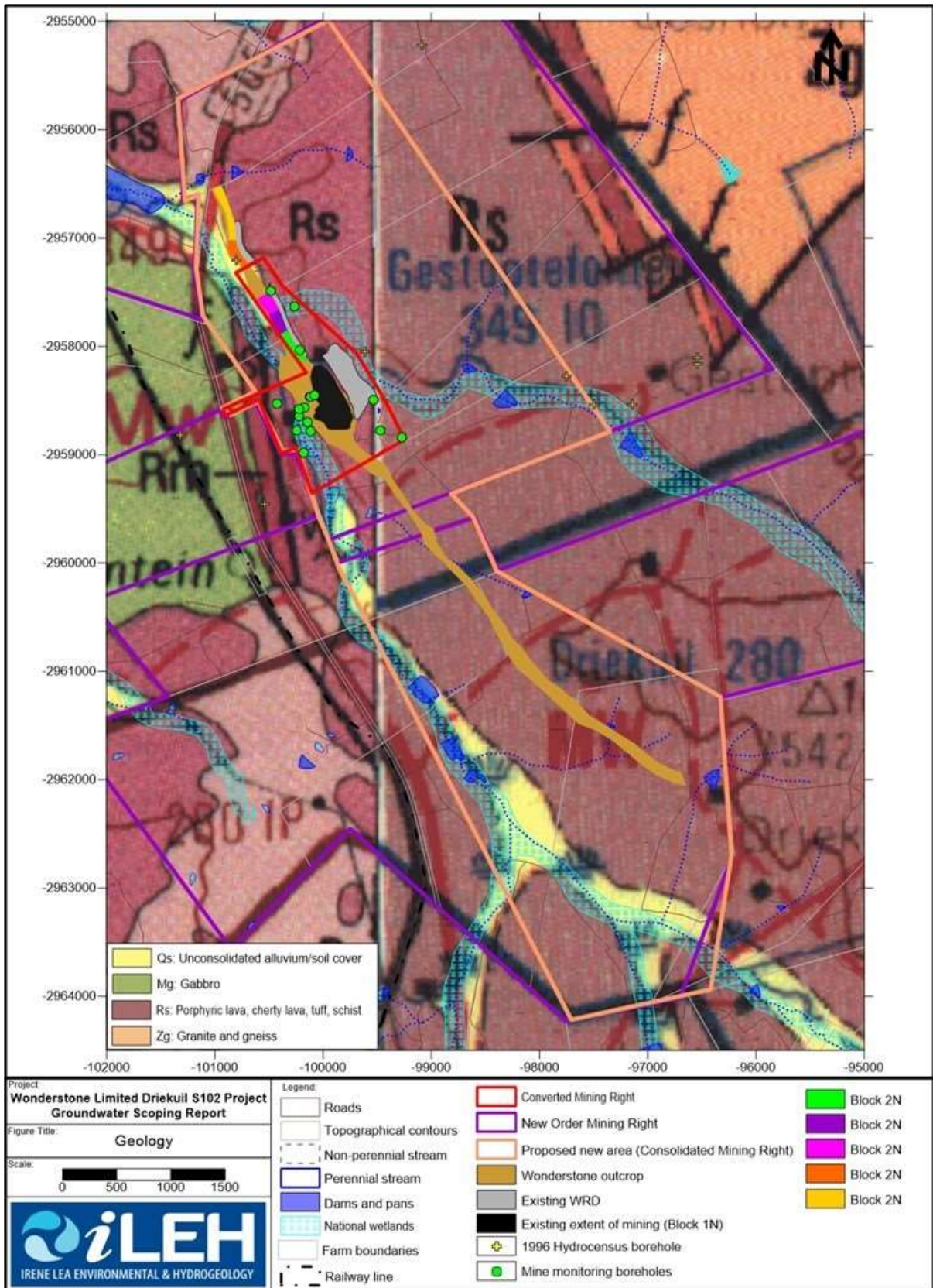


Figure 19: Geological setting

## 5.4 Soils

The Soils Assessment will be undertaken by Zimpane. Please refer to Appendix 6 for the Soil Assessment.

The land type associated with the study area is the Bc18, which is characterised by a plinthic catena with widespread eutrophic shallow red soils. Duplex and marginalitic soils are rare. The Soil and Terrain (SOTER) database indicates that the study area is dominated by Chromic Cambisols.

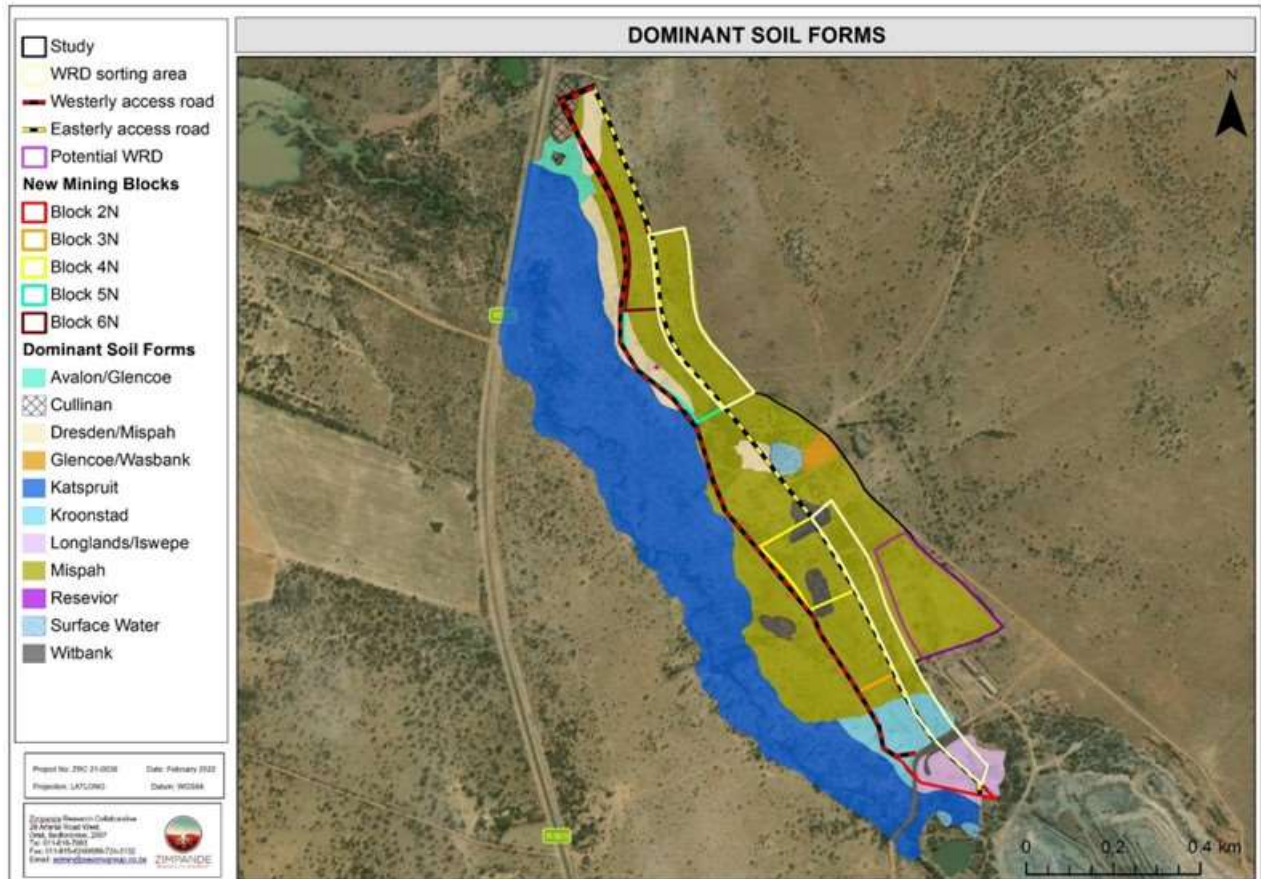


Figure 20: Dominant Soil Forms

Chromic Cambisols can be described as youthful soils, characterised by the absence of a layer of accumulated clay, humus, soluble salts, or iron and aluminium oxides. The horizon differentiation is weak. This is evident from weak, mostly brownish discolouration and/or structure formation in the soil profile. However, the B-horizon in these soils can be yellow-brown or red in colour and this is dependent on the terrain position along the hillslope. Cambisols occur in different environments and thus their morphological properties are likely to differ. Nevertheless most Cambisols:

- ☞ Are medium textured and have good structural stability;
- ☞ Have high porosity and a good water holding capacity with good internal drainage;
- ☞ Have neutral to weakly acid soil pH; and
- ☞ Satisfactory chemical fertility and active fauna. These properties mentioned above, qualifies these soils to be exploited for agricultural purposes subject to the limitations of terrain and climate conditions.

## 5.5 Land Capability

The Land Capability Assessment will be undertaken by Zimpande.

In South Africa, agricultural land capability is generally restricted by climatic conditions, particularly water availability. However, even within similar climatic zones, different soil types typically have different land use capabilities attributed to their inherent characteristics.

High potential agricultural land is defined as having the soil and terrain quality, growing season and adequate available moisture supply needed to produce sustained economically high crops yields when treated and managed according to best possible farming practices (Scotney et al., 1987). For the purpose of this assessment, land capability was inferred in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Climate Capability (measured on a scale of 1 to 8) was therefore considered in the agricultural potential

classification. The study area falls into Climate Capability Class 6 at best, with moderate to severe limitations for arable crops.

The land capability ratings associated with the study area are Arable (Class IV) capability classified as marginal arable land. This can be attributed to the slope conditions, prevailing climatic conditions associated with the study area due to low rainfall (between 401 and 600 mm per annum) and high evaporation demand (between 1801 – 2000 mm per annum) without any supplementary irrigation.

## 5.6 Hydropedology

The Hydropedological Assessment will be undertaken by Zimpane. Please refer to Appendix 7 for the Hydropedological Desktop Assessment.

Typically, there are four primary watercourse recharge mechanisms which include precipitation (rainfall), surface flow (runoff), subsurface flow (interflow) through the vadose zone of the surrounding soils, and groundwater discharge. Identified soils with the study area have been grouped into hydropedological soil types and are discussed below to understand their contribution to watercourse recharge.

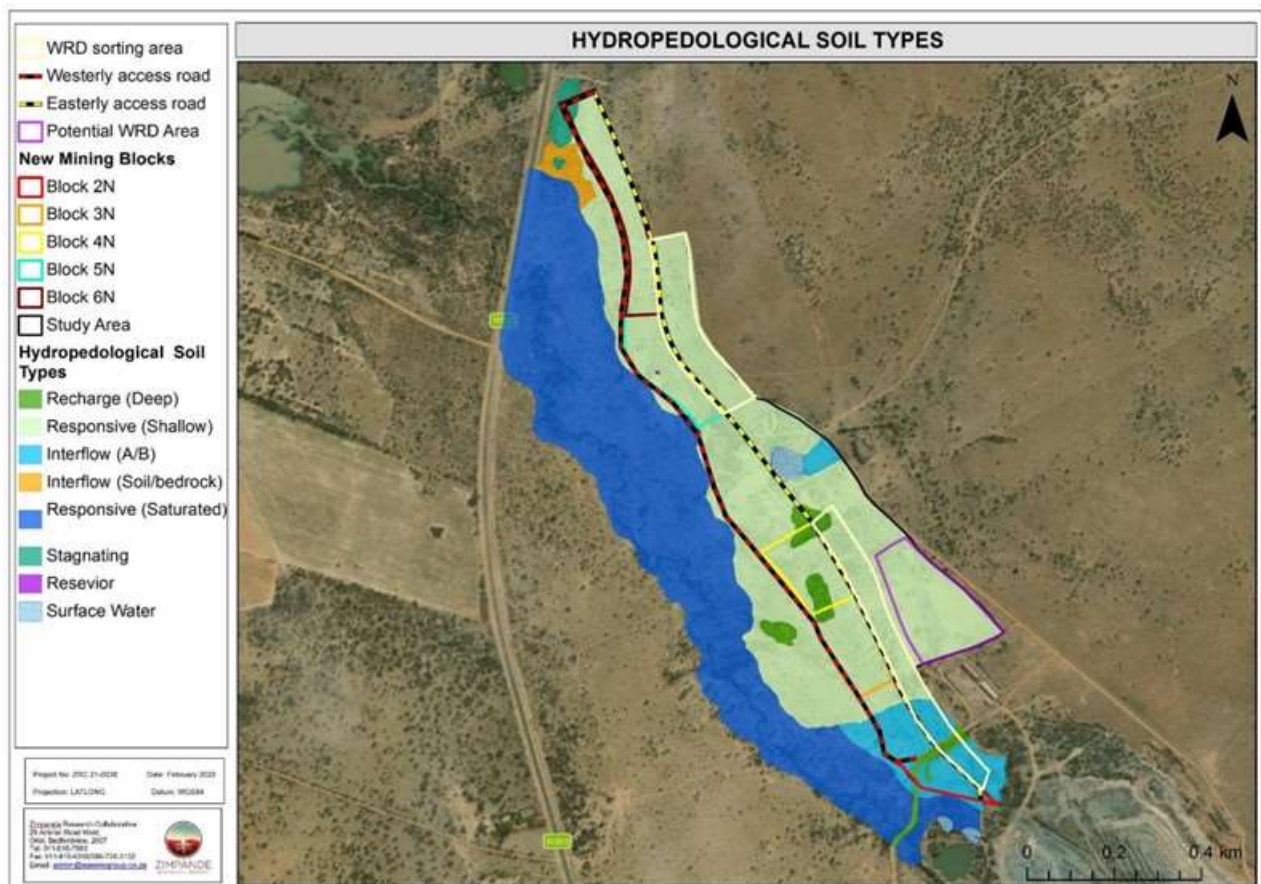


Figure 21: Map depicting hydrological soil types and delineated watercourses associated with the study area

### Morphological and Hydraulic Properties of Watercourse and Hydropedologically Important Soils Associated with the Study Area:

The catena of the watercourses resembled a lithic topo sequence. These soils are generally shallow (less than 20cm) and have a low-water storage capacity attributed to their shallow nature. These soils are shallow and comprised of loamy sand of poor structure overlying relatively impermeable hard rock/lithic horizon. Limited storage capacity results in the generation of overland flow after rain events with limited infiltration. The slope position of the soils is typically the crest and scarp. It must be noted that these are not wetland soils, however they are important for recharge of watercourses during rainfall events by means of overland flow. Thus, these soils only support freshwater resources during rainy seasons and particularly directly after rainfall events.

### Responsive (Shallow) Soils:

These soils are shallow, loamy sand of weak structure overlying relatively impermeable dark rock horizon. Limited storage capacity results in the generation of overland flow after rain events. These soils lead to a rapid runoff response time during intense rainfall events attributed to their shallow nature which inhibits infiltration. The figure below depicts Glenrosa soil form, a typical responsive shallow soil identified within the study area.



Figure 22: A depiction of responsive shallow soils

### Recharge (Deep) Soils:

Recharge soils are characterised by absence of any morphological indication of saturation and are typically associated with deep freely drained soils. The dominant hydrological pathway for these soils is vertical through and out the profile into the underlying bedrock. These soils are termed recharge soils, as they are likely to recharge groundwater, or lower lying positions in the regolith via bedrock. Figure 11 depicts Witbank soil form, a typical recharge soil identified within the study area.



Figure 23: View of the disturbed soils characterised by a lithic underlying material, draining in a vertical direction

### Interflow (A/B) Soils

Interflow soils discharge in a predominately lateral direction due to differences in the conductivity of horizons. The lateral flow occurs at the A/B horizon interface, due to the soft plinthic horizon restricting downward movement. The duration of the drainable water depends on rate of ET (evapotranspiration), extent of soils with interflow properties, position in the hillslope and slope. The interflow soils are characterised by inherently poor internal drainage due to the slowly permeable underlying soft plinthite horizon leading to lateral movement in the soil profile which allows recharge of wetlands via the vadose zone. The lighter colour of the Albic horizon further supports that lateral flow dominates (Le Roux, et al., 2015).



Figure 24: A depiction of an interflow soil in the A/B interface.

### Interflow (Soil/Bedrock) soils

These soils are characterised by hydromorphic properties particularly mottling (red, yellow, and grey colours) which signify temporal build of water on the soil/bedrock interface and slow discharge in a predominantly lateral direction. The horizons are indicative that the underlying bedrock is slowly permeable and periodic saturation in the rainy season is likely, which may lead to lateral flow at the soil bedrock interface. The drainage may be restricted by an impermeable rock layer (Le Roux, et al., 2015).



Figure 25: A depiction of an interflow soil in the soil/bedrock interface

### Responsive (Saturated) Soils:

Responsive soils include clayey Katspruit (Ka) soil form which depict prominent signs of prolonged wetness (Gleying) occurring within the permanent zone of the valley bottom wetlands (refer to Table 4) the morphological characteristics of the soils signify long periods of saturation (Le Roux, et. al., 2015) and are essentially water receptors from the surrounding catchment, since they largely occur in the lowest points in the landscape setting. The high clay content of these soils prolongs the inundation (hydroperiod) of the wetlands by reducing the rate of lateral seepage while vertical movement of water in the soils does not occur.





Figure 26: : A depiction of responsive (saturated) soils associated with the pan and valley bottom.

The following table presents the hydrological grouping of soils occurring within the study area according to Van Tol and Le Roux (2019) while Table 13 presents their respective diagnostic horizon and textural characteristics. The conceptual watercourse recharge based on the water flow paths through the soil medium are presented in Figure 17 below.

Table 12: Hydrological grouping of soils occurring within the study area according to Van Tol and Le Roux (2016)

Recharge (Deep)	Responsive (Shallow)	Interflow (A/B)	Interflow (Soil/Bedrock)	Responsive Wet
Witbank	Glenrosa	Wasbank	Avalon	Katspruit
	Mispah		Glencoe	

Table 13: List of soil forms within the study area and their contribution to watercourse recharge

Recharge Mechanism	Soil Forms	Diagnostic Horizons	Description
Interflow (A/B)	Wasbank (Wb)	-A- Orthic -B- Albic -B2-Hard Plinthic	Characterised by a bleached Albic horizon indicating soil mineral exports by the process of eluviation underlain by a semi-impermeable plinthic material.
Interflow (Soil/Bedrock)	Avalon (Av)	- A: Orthic - B1: Yellow-Brown - B2: Lithic	Characterised by a bleached Albic horizon indicating soil mineral exports by the process of eluviation, underlain by a relatively impermeable lithic underlying material. When the water level reaches the more permeable surface horizons lateral flow occurs at much faster rates at the A/B horizon interface.
Responsive (Saturated)	Katspruit (Ka)	-A: Orthic -B: Gleyed	Characterised by prominent signs of prolonged wetness (Gleying) occurring within the permanent zone of the valley bottom wetlands. The soil morphological characteristics of the soils signify long periods of saturation.
Responsive (shallow)	Glenrosa	- A -Orthic -B - Lithic	The combination of relatively impermeable bedrock and shallow soil depth implies that these soils have a low storage capacity. They will saturate quickly following a rain event and contribute mostly to overland flow.
	Mispah (Ms)	- A: Orthic - B – hard rock	
Recharge (Vertical flow)	Witbank (Wb)	Unspecified	These soils are disturbed such that the diagnostic horizon could not be identified. Vertical flow is dominant. These soils are referred to as recharge soils, as they are likely to recharge groundwater, or lower lying positions in the regolith, via the bedrock.

## 5.7 Freshwater Ecosystems

The Freshwater Ecosystem study will be undertaken by SAS. Please refer to Appendix 9 for the Freshwater Aquatic Desktop Assessment.

The study and investigation areas fall within a sub-quaternary catchment classified as an Upstream Management Area (FEPA code 4). These are subquaternary catchments in which human activities need to be managed to prevent degradation of downstream river Freshwater Ecosystem Protected Areas (FEPAs) and Fish Support Areas (FSA). Upstream Management Areas do not include management areas for wetland FEPAs which need to be determined at a finer scale.

According to the National Freshwater Ecosystem Protected Areas (NFEPA, 2011) database, there are no wetlands situated within the study area however, three natural channelled valley bottom (CVB) wetlands are situated north of the study area, within the investigation area. The wetlands range from moderately modified to seriously modified (WETCON C to Z3).

The study area is situated within the Dry Highveld Grassland Group 5 Wetland vegetation type, classified as Least Threatened according to Mbona et al. (2015).

According to the NFEPA (2011) database there are no NFEPA Rivers associated with the study and investigation area. The closest river is the Klein -Harts River which is situated approximately ±8 km north-west and downgradient of the study area.

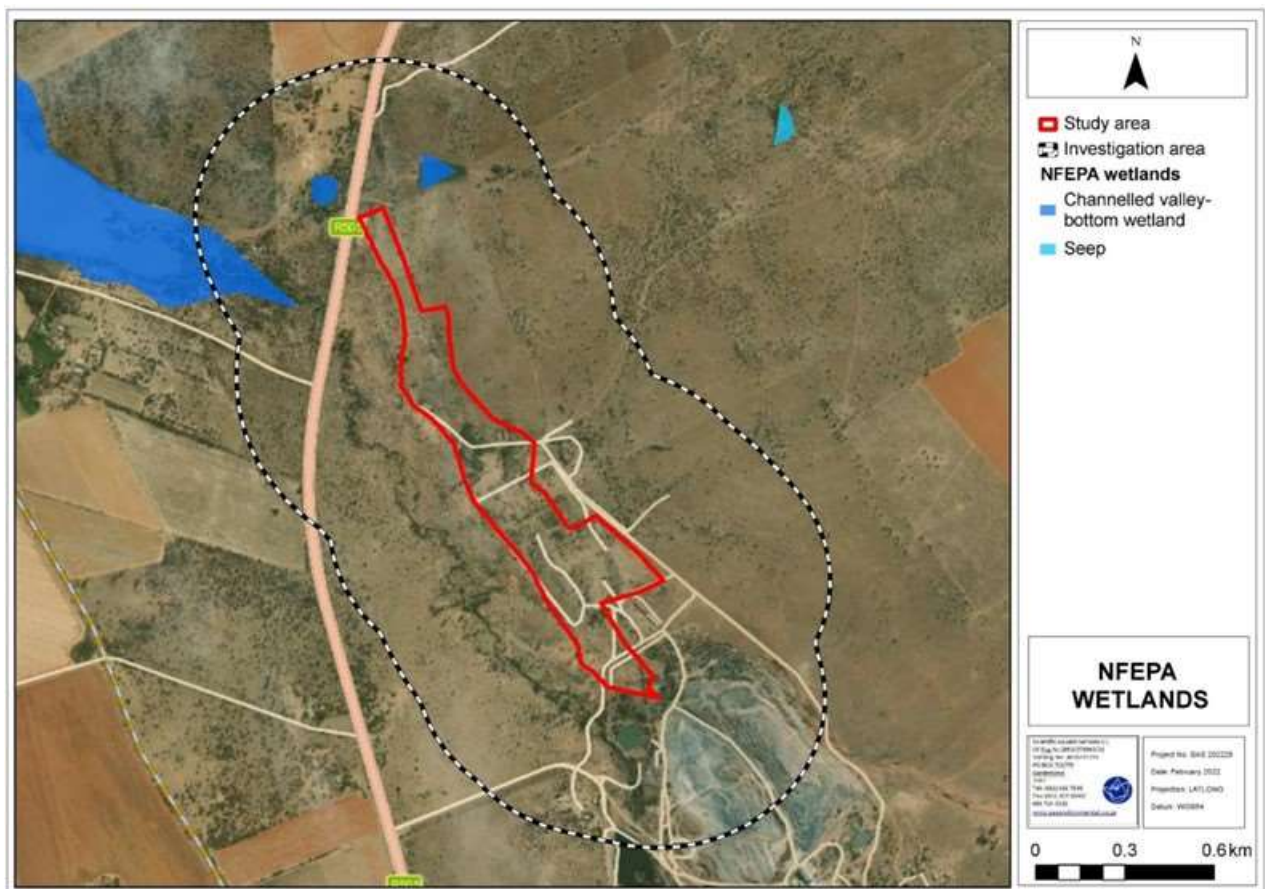


Figure 27: The wetlands associated with the study and investigation area according to the NFEPA database (2011)

Critical Biodiversity Areas (CBAs) include natural and near-natural terrestrial and aquatic features that are required to meet targets for biodiversity patterns and ecological processes. Furthermore, CBAs are areas considered important for the survival of threatened species and include valuable ecosystems such as wetlands, untransformed vegetation and ridges. Ecological Support Areas (ESAs) are natural, near natural, degraded or heavily modified areas required to be maintained in an ecologically functional state to support CBAs and/or Protected Areas. According to the North West Biodiversity Sector Plan (NW BSP, 2015) portions along the north-western and south-eastern extents of the study and investigation area falls within areas identified as an Aquatic ESA 1 whilst a small portion towards the south-east of the investigation area is situated within an area identified as an Aquatic ESA 2.

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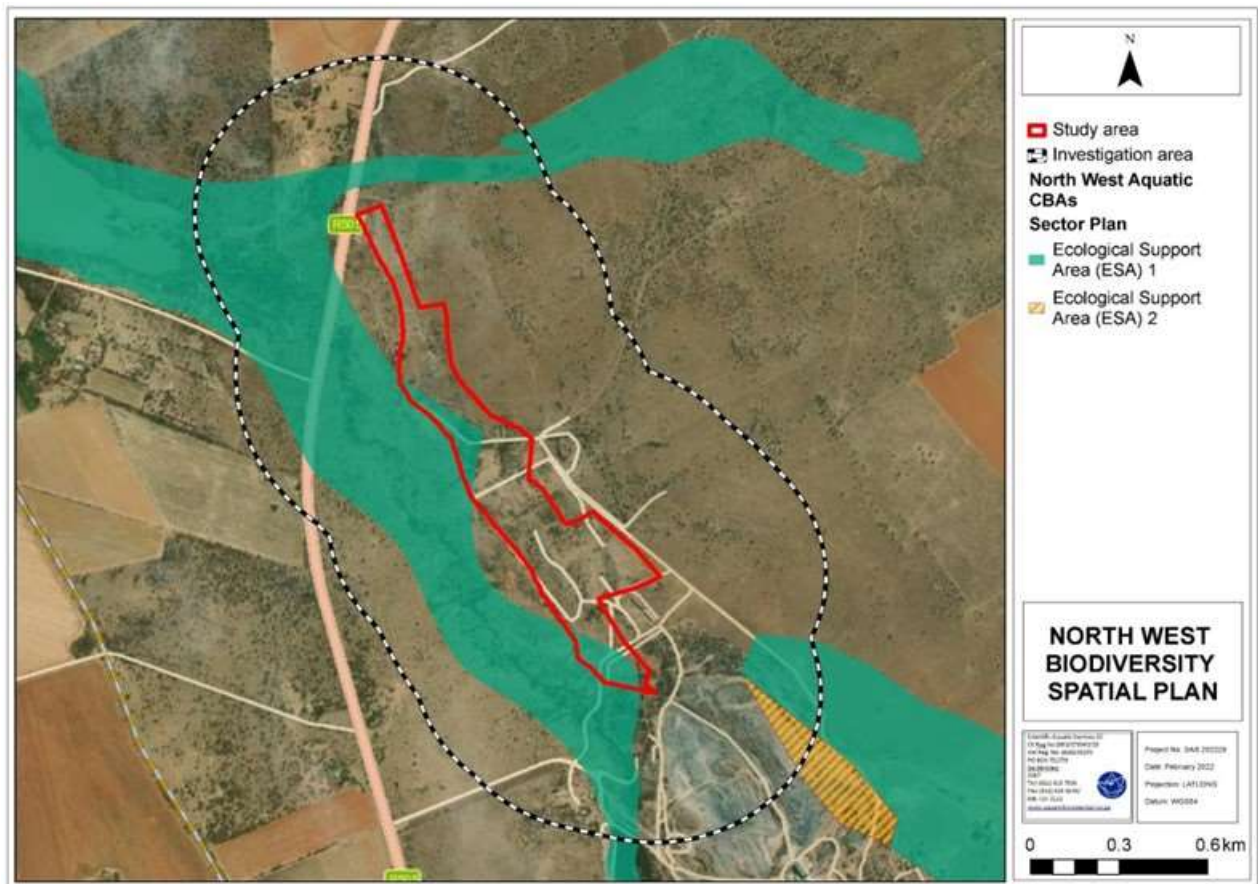


Figure 28: The Aquatic ESAs associated with the study and investigation area according to the North-West Biodiversity Spatial Plan (2015)

According to the NWBSP (2015), the large majority of the study and investigation area is classified as natural areas whilst a small portion towards the southern extent of the investigation area is classified as a settlement/ mine areas.



Figure 29: The landcover associated with the study and investigation area according to the North-West Biodiversity Spatial Plan (2015).

The National Biodiversity Assessment (NBA) 2018: South African Inventory of Inland Aquatic Ecosystems (SAIIAE) database indicates the presence of a seep wetland that traverses the study and investigation area. The seep wetland is classified to be critically endangered (ETS) and not protected (EPL). There are no rivers situated within the study and investigation area according to the NBA (2018) database and the closest river is the Klein-Harts river which corresponds with the NFEPA (2011) database. According to the NBA (2018) database, the Klein-Harts river is identified to have a ETS of critically endangered and EPL of poorly protected.

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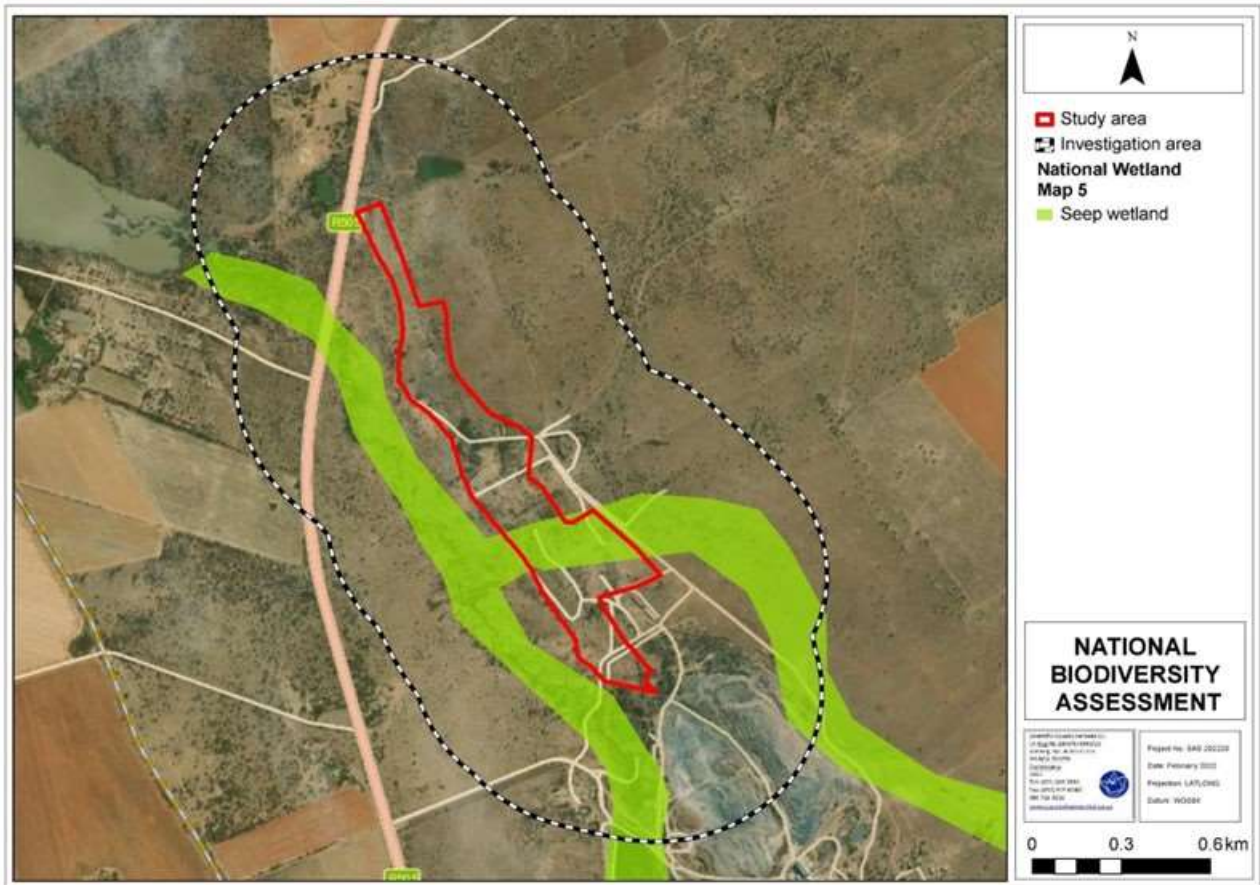


Figure 30: The wetlands associated with the study and investigation area according to the NBA (2018) database

The aquatic sensitivity of the study and investigation area is considered to have a high and very high aquatic sensitivity due to being associated with aquatic CBA's, wetlands and estuaries.

According to the Mining and Biodiversity Guidelines database (2012), the north-western portion of the study an investigation area is considered of "Highest biodiversity" importance whilst the large majority of the remaining portions of the study area is considered of "High biodiversity" importance and a small portion towards the south of the study and investigation area is considered of "Moderate biodiversity" importance.

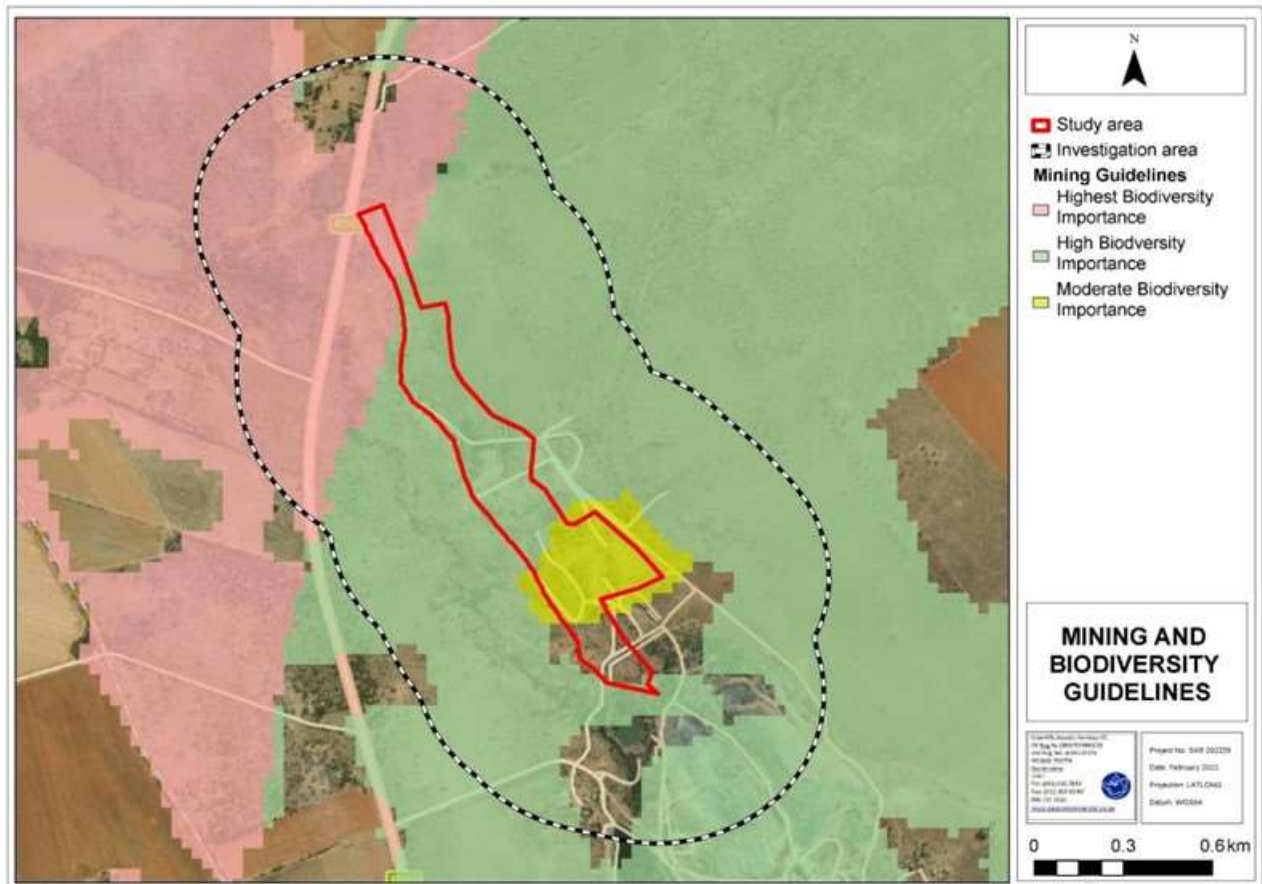


Figure 31: The biodiversity importance associated with the study and investigation area as per the Mining and Biodiversity Guidelines (2012).

The freshwater delineation undertaken using desktop methods indicated that various areas indicative of freshwater ecosystem habitat, including areas indicated by the NFEPA (2011), NBA (2018) and NWBSP (2015) databases are situated within the confines of the study and investigation area. At present, freshwater ecosystem habitat will be encroached by the mining block areas (specifically blocks 2N, 3N and 5N), stockpiling areas and both east and west access roads which is likely to directly impact these systems. In addition, it is considered plausible that areas identified to be freshwater habitat that are not directly encroached by the proposed Driekuil development components may also be affected by indirect impacts and edge effects. The presented desktop delineations can thus be used to guide the future layout and planning for the proposed Driekuil development.

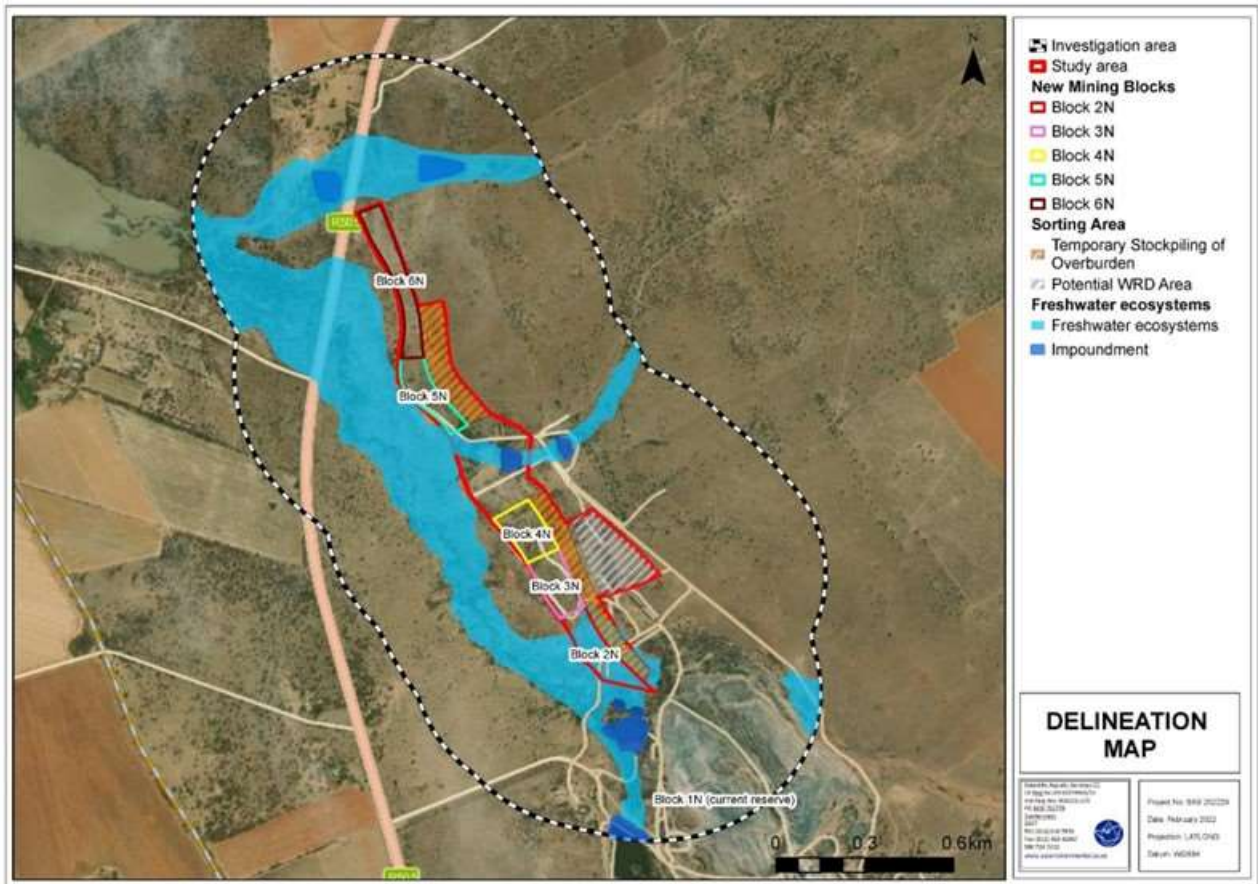


Figure 32: Freshwater ecosystem delineations (desktop methods) associated with the proposed Driekuil development on the study and investigation area

## 5.8 Ecological Footprint

The Ecological Study will be undertaken by SAS. Please refer to Appendix 8 for the Ecological Desktop Assessment.

The study area (including the study area) is situated within the Grassland Biome and within the Dry Highveld Grassland Bioregion. The study area is situated within the Klerksdorp Thornveld (Gh 13) and the Western Highveld Sandy Grassland (Gh 14) vegetation types.

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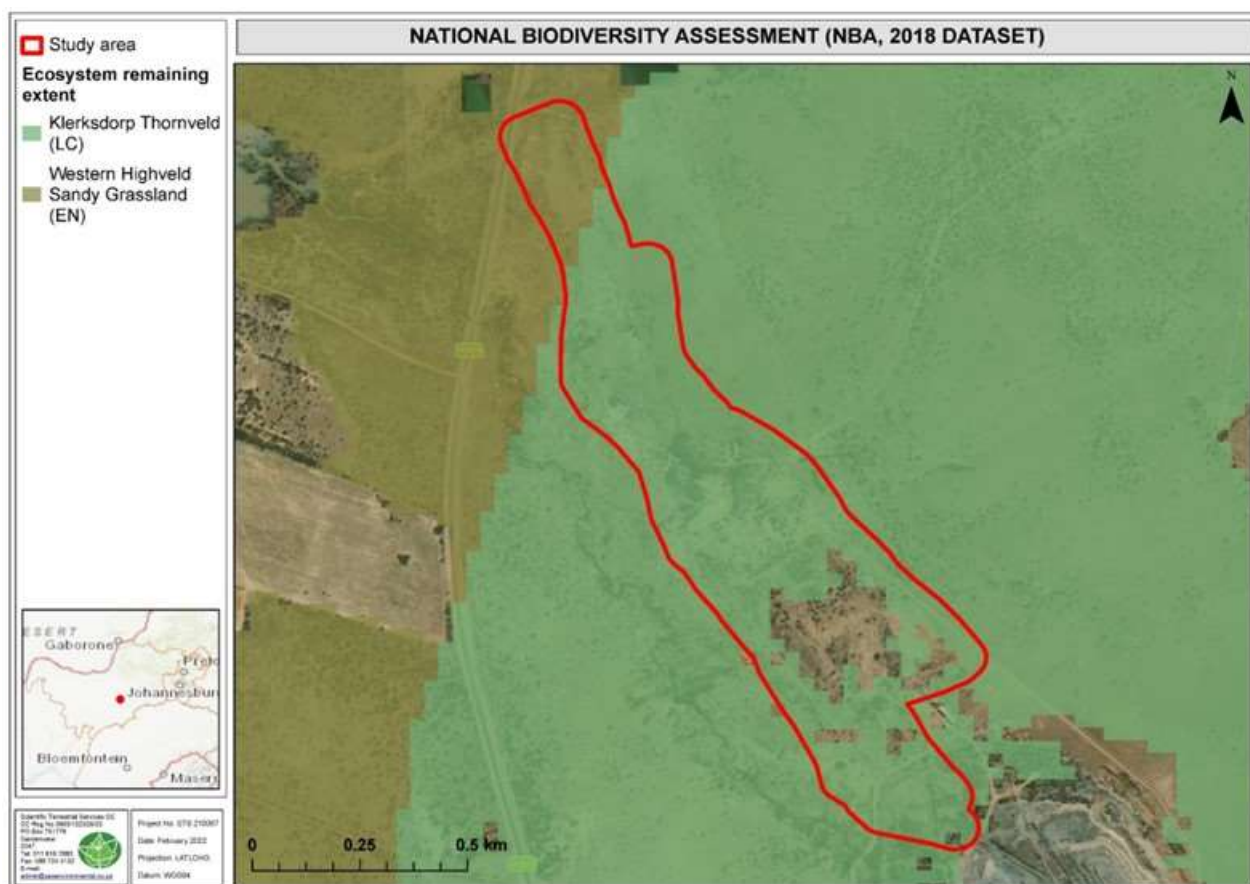


Figure 33: The remaining extent of the vegetation type associated with the study area according to the National Biodiversity Assessment (NBA, 2018)

In terms of the Conservation Status the following should be noted:

- ☞ Klerksdorp Thornveld: Vulnerable: Target 24%. Only about 2.5% conserved in the statutory Mafikeng Game Reserve, private Botsolano Game Park and Faan Meintjes Nature Reserve. Almost a third already transformed for cultivation and by urban sprawl. This vegetation unit has a high grazing capacity, and this leads to overutilisation and degradation, and subsequent invasion of *Vachellia karroo* into adjacent dry grassland. Due to the great habitat and floristic diversity and for aesthetical reasons, the landscape deserves to be conserved.
- ☞ Western Highveld Sandy Grassland: Endangered: Target 24%. Only a very small portion statutorily conserved (Barberspan Nature Reserve). More than 60% has been ploughed. Nonarable parts are on shallow aeolian soils which become easily overutilised through grazing. Erosion is very low. About 95% of this land is suitable for cultivation, but the low rainfall makes it a high-risk area for agriculture. Therefore, the natural vegetation is often restricted to nonarable bush clumps, shallow soils, aeolian sands and pans.

Distribution of the Vegetation Type:

- ☞ Klerksdorp Thornveld: North-West Province: In two sets of patches, one in the Wolmaransstad, Ottosdal and Hartbeesfontein region, and the other from the Botsolano Game Park north of Mafikeng to the vicinity of Madibogo in the south.
- ☞ Western Highveld Sandy Grassland: North-West Province: From Mafikeng to Schweizer-Reneke in the south and from Broedersput and Kameel in the west to Lichtenburg and Ottosdal in the east.

Specific landscape features:

- ☞ Klerksdorp Thornveld: Plains or slightly irregular undulating plains with open to dense *Vachellia karroo* bush clumps in dry grassland.
- ☞ Western Highveld Sandy Grassland: Flat to gently undulating plains with short, dry grassland, with some woody species occurring in bush clumps.



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The study area is located within two vegetation types, namely i) the Klerksdorp Thornveld which is Least Concern and is currently Poorly Protected, and ii) the Western Highveld Sandy Grassland which is currently Endangered and is Not Protected.

Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the NEMPAA, and compared with the biodiversity target for that ecosystem type.

The north-eastern portion of the study area is located within the Western Highveld Sandy Grassland ecosystem, according to the National Threatened Ecosystem Database (2011). The National Threatened Ecosystem Database (2011) categorised this vegetation type as Critically Endangered.

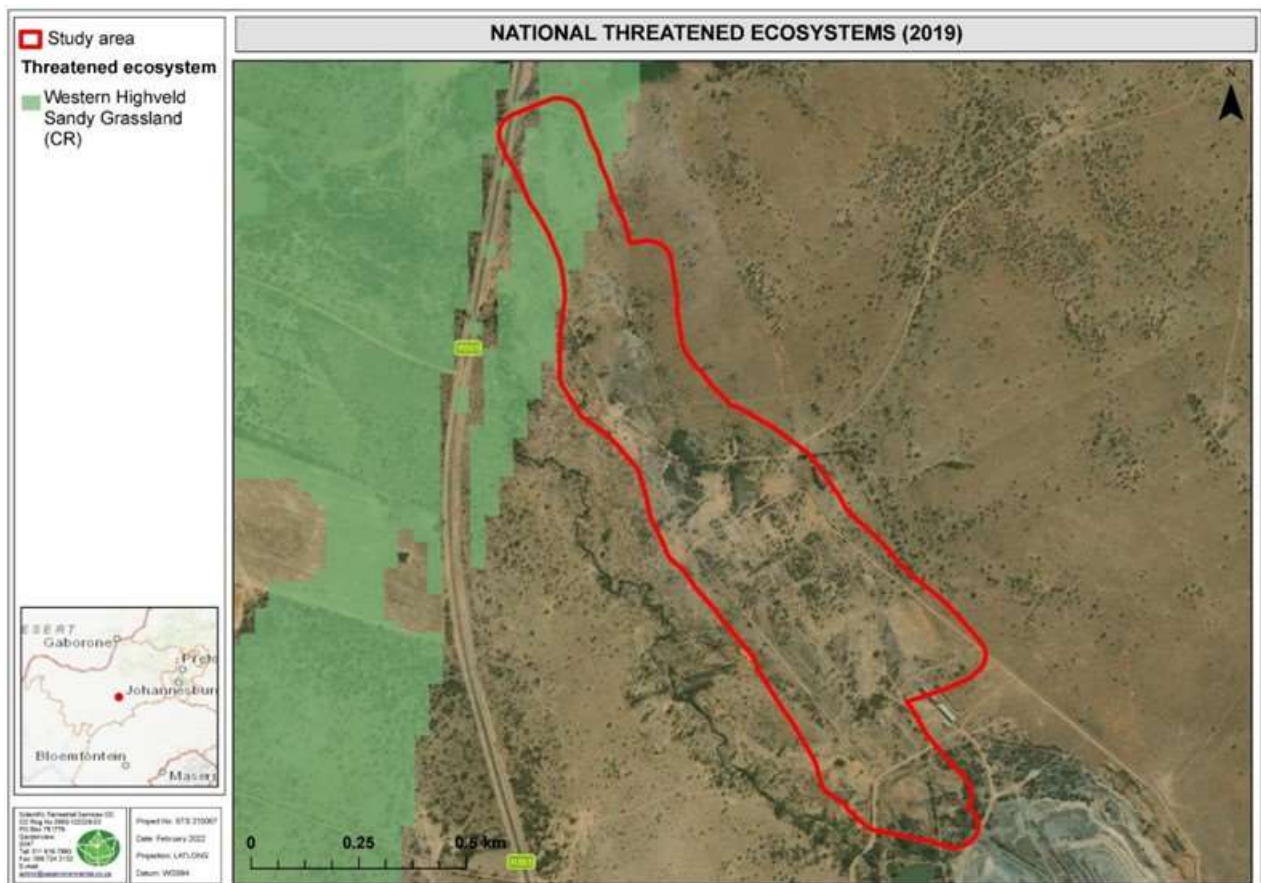


Figure 34: The study area in relation to the remaining extent of the National Threatened Ecosystems (2011)

The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011).

**Note:** The National List of Threatened Terrestrial Ecosystems published in terms of the NEMBA in 2011 remains in legal force. The data contained in NBA 2018 represents an update of the assessment of threat status for terrestrial ecosystems, but the National List of Threatened Terrestrial Ecosystems has not yet been revised

The study area is located within a Critical Biodiversity Area (CBA) 1 and 2. Land management objectives as per the NWBSP (READ, 2015a):

- ☞ CBA1 - should be maintained in a natural or near-natural state that maximises the retention of biodiversity patterns and ecological processes. CBA1 are described as i) vulnerably ecosystems that remain largely intact, the ecosystems remaining is less than the target biodiversity, thus remaining patches are of highest conservation priority and further impacts on natural habitat should be avoided. ii) irreplaceable sites which are mandatory if biodiversity targets are to be achieved. iii) critical biodiversity corridors linkages existing within the biodiversity network, in which there is limited conversion to maintain the connectivity in the

landscape. iv) important terrestrial habitats, areas identified by experts as being important for biodiversity conservation (less than 10 000 ha) and v) important terrestrial habitats: Kloofs large and medium kloof habitats which are identified as important for climate change adaptation. - CBA2 – should be maintained in a natural or near-natural state that maximises the retention of biodiversity patterns and ecological processes.

- ☞ CBA2 are characterised by the following i) ecosystems and species are fully or are largely intact or undistributed, ii) areas with intermediate irreplaceability or some flexibility in terms of meeting biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve biodiversity targets, although loss of these sites would require alternative sites to be added to the portfolio of CBAs, and iii) these are biodiversity features that are approaching but have not passes their limits of acceptable change.

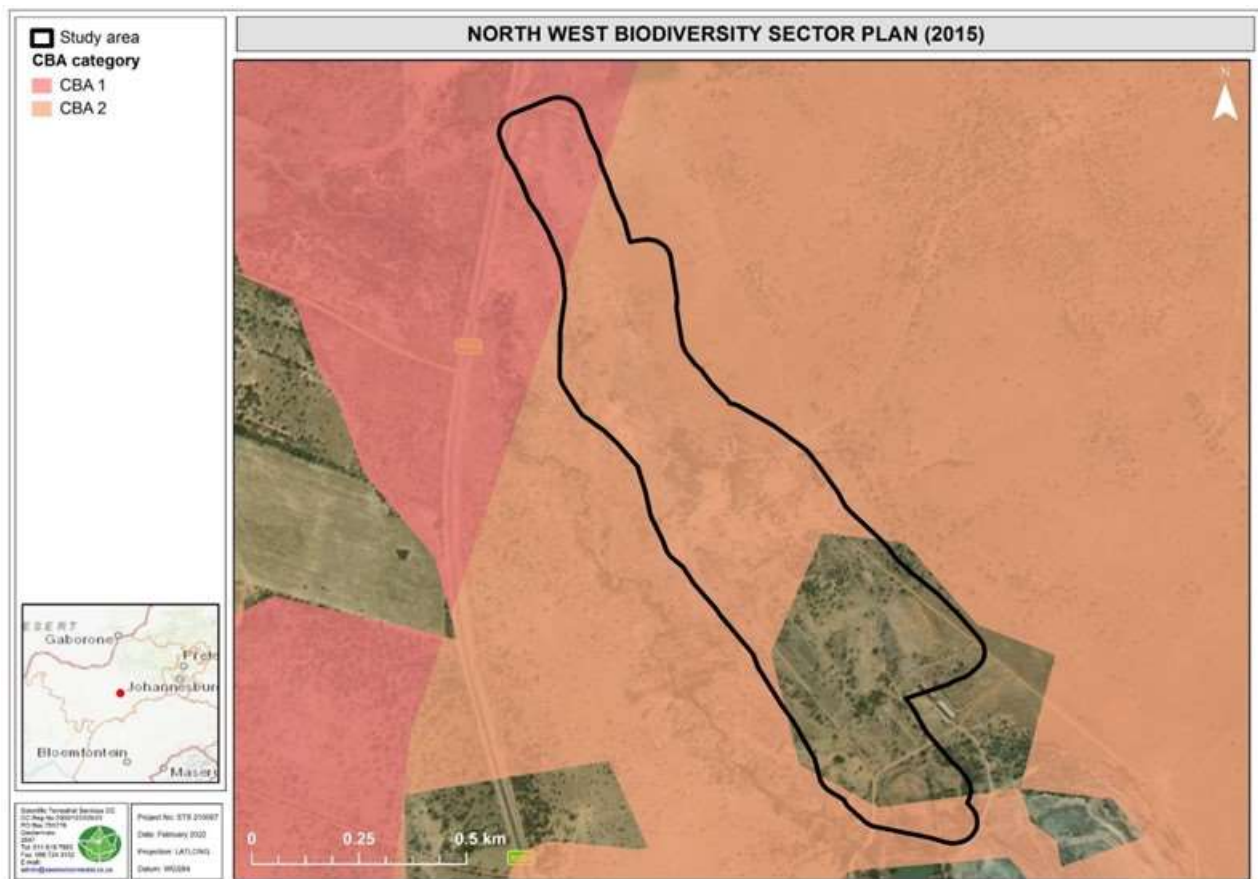


Figure 35: The study area in relation to the North West Biodiversity Sector Plan Version 2 (NW BSP, 2015).

Most of the study area is located within areas identified as High Biodiversity Importance, according to the Mining and Biodiversity Guidelines (2013). A small section in the southeast of the study area falls within an area considered to be of Moderate Biodiversity Importance and a small section in the north west of the study area is located within an area considered to be of Highest Biodiversity Importance.

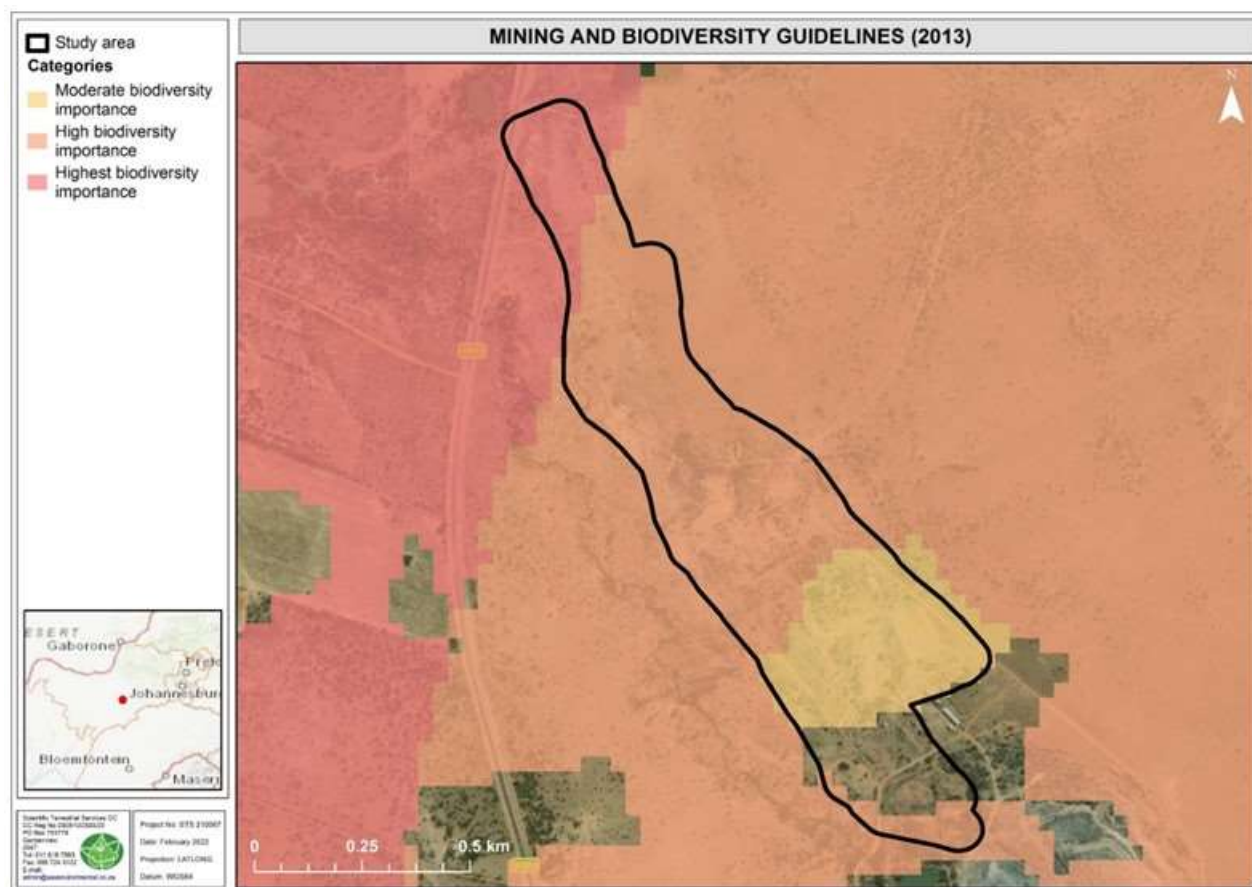


Figure 36: Importance of the study area according to the Mining and Biodiversity Guidelines

#### Areas of Highest Biodiversity Importance

- ☞ Risk for mining: Highest risk for mining.
- ☞ Implications for mining: EIA's and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licenses, and environmental authorisations. If confirmed, the risk of fatal flaws is high.

#### Areas of High Biodiversity Importance

- ☞ Risk for mining: High risk for mining.
- ☞ Implications for mining: These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, for maintaining important ecosystem services for communities or the country. An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on spatial biodiversity.

#### Areas of Moderate Biodiversity Importance

- ☞ Risk for mining: Moderate risk for mining.
- ☞ Implications for mining: EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features (e.g., threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy.

Surface Water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national water source areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage.

The study area is not within 10km of a Strategic Water Source Area.

The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The different sensitivity ratings pertaining to the plant [and animal] protocols are described below:

- Very high: habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km<sup>2</sup> are considered critical habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under critically endangered (CR), endangered (EN), or vulnerable (VU) criteria of the IUCN or species listed as critically/ extremely rare under South Africa’s national red list criteria. For each species reliant on a critical habitat, all remaining suitable habitat has been manually mapped at a fine scale.
- High: recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level.
- Medium: model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level.
- Low: areas where no species of conservation concern (SCC) are known or expected to occur.

For the terrestrial biodiversity theme, the study area is considered to have an overall very high sensitivity. The triggered sensitivity features include a terrestrial CBA1 and CBA2, Aquatic Ecological Support Area 1 (ESA1), a ESA2, a critically endangered ecosystem, and focus areas for land-based protected areas expansion and South African Protected Areas.

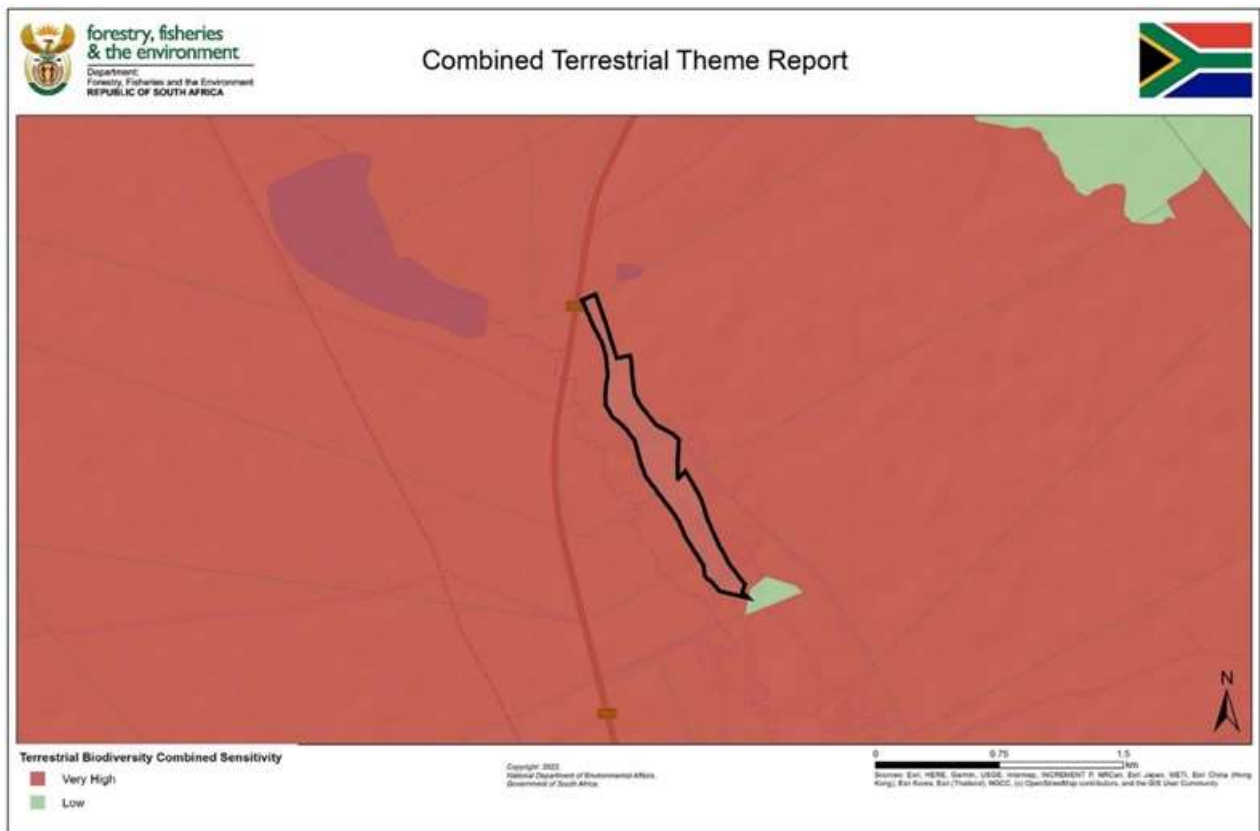


Figure 37: The combined terrestrial sensitivity assigned to the study area by the screening tool

For the plant species theme, majority of the study area is considered to have a medium sensitivity, a small section (less than 5%) is considered to have a low sensitivity. The triggered sensitive species includes Sensitive Species 1261 (VU).

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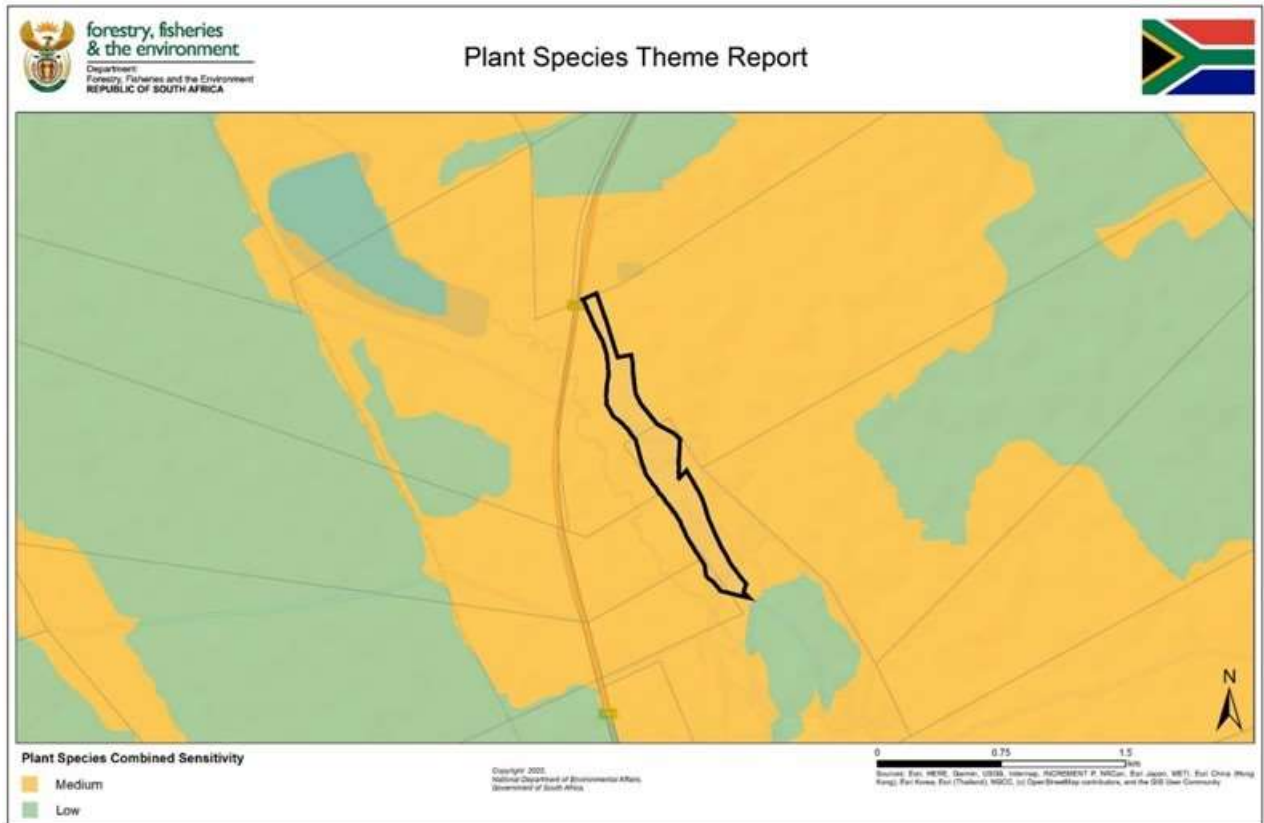


Figure 38: Plant species sensitivity assigned to the study area by the screening tool

For the animal species theme, the entire study area is considered to have a low sensitivity.



Figure 39: Animal species sensitivity assigned to the study area by the screening tool

## 5.9 Hydrological Setting

The Hydrological Study will be undertaken by HydroSpatial. Please refer to Annexure 10 for the Hydrological Desktop Assessment.

### 5.9.1 Catchments

The DWS has divided South Africa into primary, secondary, tertiary and quaternary catchments. Primary catchments are the largest defined catchments for South Africa, of which there are 22, and are assigned a letter ranging from A – X (excluding O). Secondary catchments are subdivisions of the primary catchments, and are the second largest catchments in South Africa, and are assigned the primary catchment letter within which they are located, and a number e.g. A5 (secondary catchment 5 located within primary catchment A). Similarly, tertiary catchments are subdivisions of secondary catchments, and are represented for example by A53 (tertiary catchment 3 located within secondary catchment A5). Lastly, quaternary catchments are the smallest defined catchments and are assigned the tertiary catchment number, along with a quaternary catchment letter e.g. A53D (quaternary catchment D located within tertiary catchment A53).

Further to the above, the DWS have divided South Africa into 9 Water Management Areas (WMAs). The 9 WMAs include the Limpopo, Olifants, Inkomati-Usuthu, Pongola-Mtamvuna, Vaal, Orange, Mzimvubu-Tsitsikamma, Breede-Gouritz and Berg-Olifants.

The proposed project is located in the upper Harts River catchment, within quaternary catchment C31C, in the Vaal WMA. The Driekuispruit, which is a non-perennial (seasonal) stream, flows on the western side of the proposed project area and into the Klein-Harts River. The Driekuispruit has its source approximately 7 km south-east of Ottosdal, where a number of natural pans occur along the quaternary catchment divide (Figure 40 **Error! Reference source not found.**). The Klein-Harts River is a tributary of the Harts River, a NFEPA River according to the NFEPA (2011), which flows into the Vaal River near the town of Delpoortshoop. Further to the above, two unnamed non-perennial tributaries of the Driekuispruit occur within the vicinity of the project. The first, located approximately 120 m to the north of mining Block 6N, flowing in a westerly direction. The second, flowing in a north-westerly direction towards the existing WRD, which has been historically constructed in its flow path, preventing it from directly flowing into the Driekuispruit. Water currently ponds on the eastern side of the WRD, seeping through the WRD, to form an artificial wetland system on the western side, directly north of the Black Quarry Dam. A number of farm dams have been constructed on the Driekuispruit, including the mine's Driekuispruit Dam, which is used to supply the mining operation with water.

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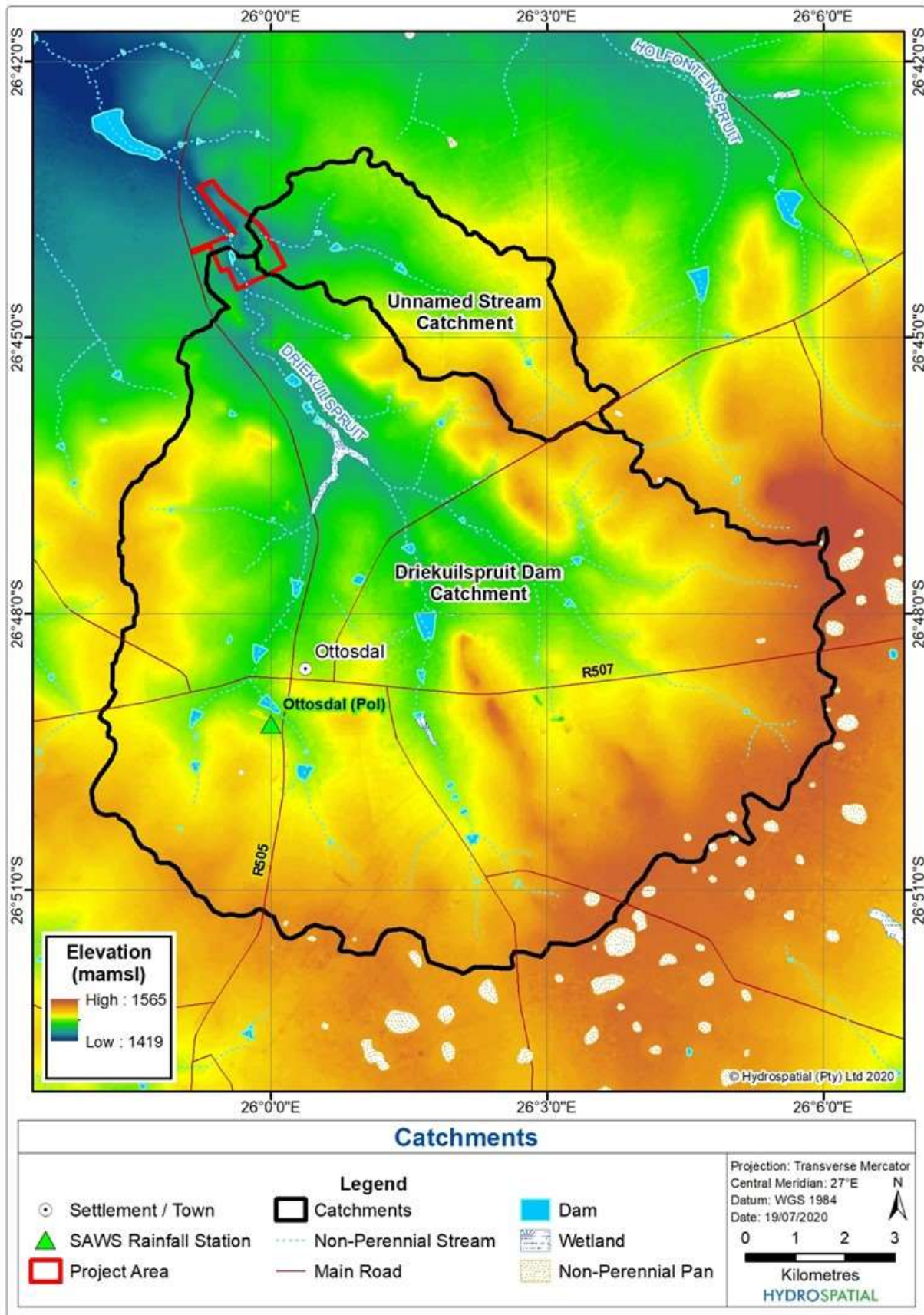


Figure 40: Catchments

## 5.9.2 Classes and Resource Quality Objectives

The NWA specifies that water resources are to be protected and managed through the classification of water resources and Resource Quality Objectives (RQOs) and the setting of the reserve. The Classes and RQOs of Water Resources for Catchments of the Lower Vaal (Government Notice No. 470, 22 April 2016) (DWS, 2016), was consulted to obtain the RQOs for quaternary catchment C31C. The present ecological status and recommended ecological category, as well as other details pertaining to quaternary catchment C31C, are indicated in the table below.

Table 14: Present ecological status and recommended ecological category

Quaternary Catchment	River	Bio-physical Node	Gross Catchment Area (km <sup>2</sup> )	Natural MAR (million m <sup>3</sup> /a)	Present Ecological Status	Recommended Ecological Category
C31C	Klein-Harts River	LA1.2	1 554	12.18	C	C

The present and recommended ecological status is a class C, representing a moderately modified system, indicating that a loss and change of natural habitat and biota has occurred, but that the basic ecosystem functions are still predominantly unchanged. The natural Mean Annual Runoff (MAR), which is the runoff under natural catchment conditions (i.e. when all man-made land uses, abstractions and return flows are removed) is 12.18 million m<sup>3</sup>/annum.

## 5.9.3 Surface Water Use

The mine abstracts water from the Driekuilspruit Dam for its operation. According to the mine's WUL (Licence No. 09/C31C/ABCGI/2741), the authorised abstraction volume is 20 000 m<sup>3</sup>/annum (m<sup>3</sup>/a). Beyond the project area, the Driekuilspruit is most likely used for irrigation and livestock watering.

## 5.9.4 Zones of Regulation

A regulated zone is a legally stipulated area around the delineated freshwater ecosystems that:

- ☞ May be considered a 'high sensitivity' area, as deemed necessary by the specialist; and/or
- ☞ Would require authorisation by the relevant authorities for any activities (both construction and operation of any development) within the identified regulatory zone as applicable to a specific type of freshwater ecosystem (e.g. wetland or riparian).

The zones of regulation were determined by Scientific Aquatic Services (SAS) according to the following legislation:

- ☞ Regulations on the Use of Water for Mining and Related Activities aimed at the Protection of Water Resources (published under Government Notice 704 (GN704) in Government Gazette 20119, 4 June 1999);
- ☞ National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA); and
- ☞ Government Notice 509 (GN509) as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).

The preliminary zones of regulation as determined in SAS (2022) are indicated on the following figure. According to SAS (2022), the zones of regulation are provided for information purposes and may potentially change dependent on the outcome of a field verification assessment.



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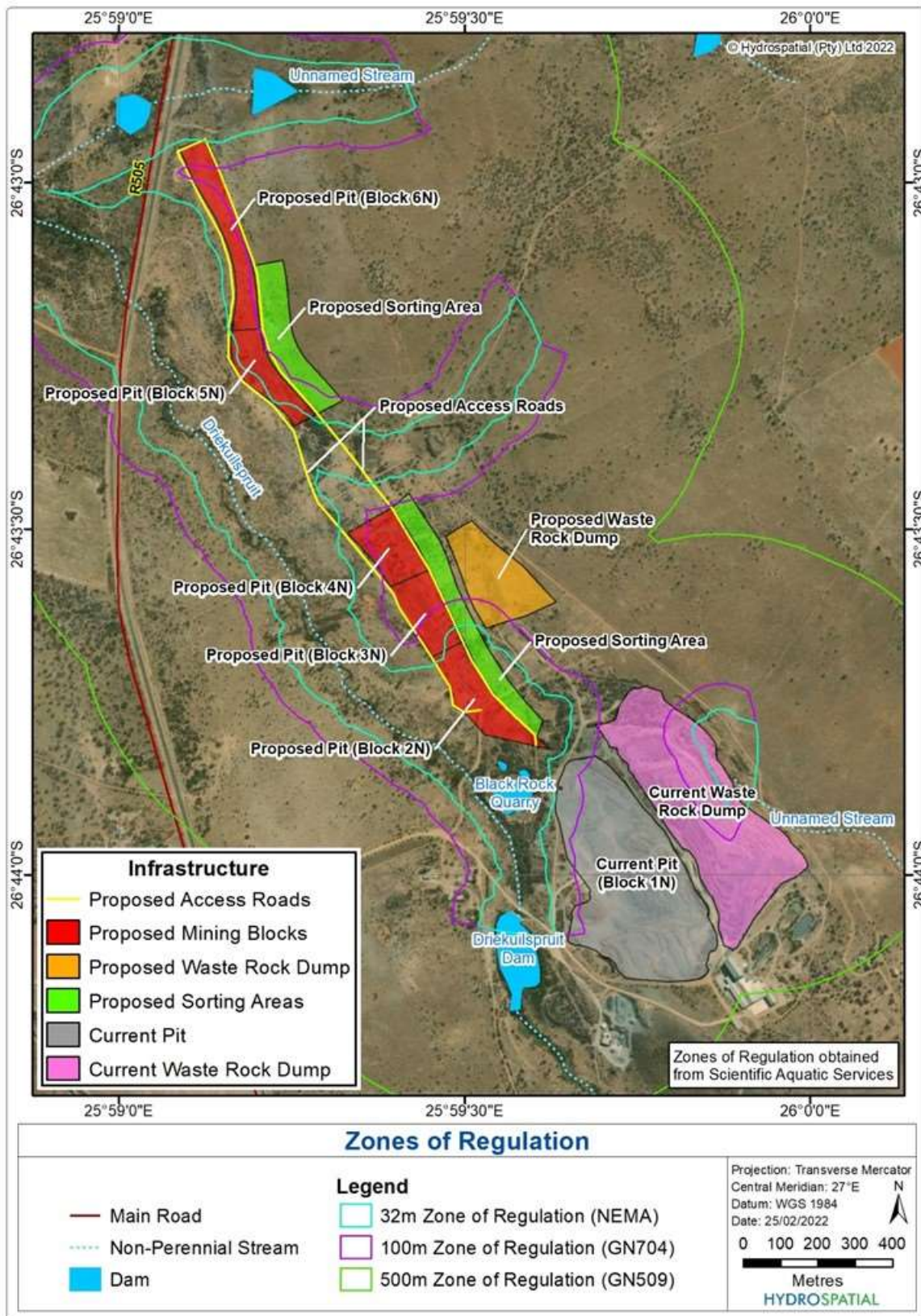


Figure 41: Zones of regulation

## 5.9.5 Surface Water Quality

The water quality at WST is monitored as part of their monitoring programme in line with the conditions specified in the mines WUL. Four (4) surface water quality samples were taken on the site visit on 2 February 2022, to assess the water quality of the Driekuilspruit in the vicinity of the proposed infrastructure.

In summary, the following are the main surface water quality findings are presented in the Hydrological Report (Appendix 6):

- ☞ The pH of the Pit water is low and acidic, ranging between 3.2 and 4.4. The pH appears to have gradually improved since backfilling began in August 2018. Metal and sulphate concentrations have been higher at the Pit in comparison to the other monitoring points;
- ☞ The salinity of the Driekuilspruit fluctuates seasonally, with generally higher salinity levels occurring during the dry season (low flow months), due to lower dilution capacity;
- ☞ Elevated metals have mostly occurred at the Pit (WSTSW7), Driekuilspruit Dam (WSTSW5) and upstream of the mine on the Driekuilspruit (WSTSW4). The occurrence of elevated metals at WSTSW4 could be potentially from the geology of the area, runoff from the upstream Idwala Pyrophyllite Mine and discharges from the Ottosdal sewage works;
- ☞ The high metal concentrations at the Pit are linked to low pH values. This is as a result of acidic conditions within the Pit water which dissolve metals; and
- ☞ There appears to be no significant difference in the water quality between WSTSW4 located upstream of the mine, and WSTSW8 located downstream.

The sampling locations, frequency of monitoring, parameters, and a summary of the water quality is provided below.

### 5.9.5.1 Monitoring Locations

Details of the sampling locations are provided in the table below. The sampling locations are indicated on the following figure.

Table 15: Water sampling locations

Sampling Point	Surface/ Groundwater	Description	Latitude*	Longitude*
SW1	Surface Water	Site visit sample taken from the Driekuilspruit at the road below Driekuilspruit Dam	-26.733807	25.992648
SW2	Surface Water	Site visit sample taken from the Driekuilspruit at the bridge	-26.731010	25.991796
SW3	Surface Water	Site visit sample taken from the Driekuilspruit at the culvert below the R505 road	-26.719800	25.983721
SW4	Surface Water	Site visit sample taken from the inflow into the Driekuilspruit from the wetland below the WRD	-26.730845	25.991937
WSTSW4	Surface Water	Driekuilspruit River upstream of mine	-26.739436	25.995356
WSTSW5	Surface Water	Driekuilspruit Dam	-26.735144	25.992931
WSTSW6	Surface Water	Black Rock Quarry	-26.731544	25.992886
WSTSW7	Surface Water	Pit	-26.732972	25.995389
WSTSW8	Surface Water	Driekuilspruit River downstream of mine	-26.729686	25.989744
WSTSW10	Surface Water	WRD upstream (2nd Paddocks)/Tributary of Driekuilspruit River	-26.732172	25.999378
WSTSW12	Surface Water	Pollution Control Dam (PCD)	-26.733242	25.999967
WSTSW13	Surface Water	Return Water Dam (RWD)	-26.733639	25.999733
WSTSW14	Surface Water	Slurry pond	-26.734247	25.999894
WSTSW15	Surface Water	Silt Trap at plant	-26.735714	25.998661
WSTSW17A	Surface Water	Natural PCD	-26.733306	25.999972
WSTSW18A	Surface Water	2nd Black Rock Quarry	-26.730872	25.993139

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Sampling Point	Surface/ Groundwater	Description	Latitude*	Longitude*
WSTSW19A	Surface Water	Ponding behind WRD	-26.729678	25.993475
WSTBH1	Groundwater	Groundwater levels monitored only	-26.736090	25.993730
WSTBH2	Groundwater	Groundwater levels monitored only	-26.734128	25.993147
WSTBH3	Groundwater	Groundwater levels monitored only	-26.737840	25.993080
WSTBH6	Groundwater	Groundwater levels monitored only	-26.736040	25.992460
WSTBH7	Groundwater	Groundwater levels monitored only	-26.729290	25.992790
WSTBH8	Groundwater	Groundwater levels monitored only	-26.733240	25.993680
WSBH9	Groundwater	Groundwater levels monitored only	-26.733250	25.993700
WBH10	Groundwater	Groundwater quality & levels monitored: supplies water to mine employees	-26.733110	25.994080
WSTBH12	Groundwater	Groundwater levels monitored only	-26.736680	26.002150
WBH13	Groundwater	Groundwater quality & levels monitored: abstraction point for process water	-26.733530	25.999590
WSTBH14	Groundwater	Groundwater levels monitored only	-26.736080	26.000150
WSTBH15	Groundwater	Groundwater levels monitored only	-26.725690	25.992310
WSTBH16	Groundwater	Groundwater levels monitored only	-26.724380	25.990080
WSTBH17	Groundwater	Groundwater levels monitored only	-26.733790	25.990610

\*Decimal degrees, geographic coordinate system, WGS 1984 datum

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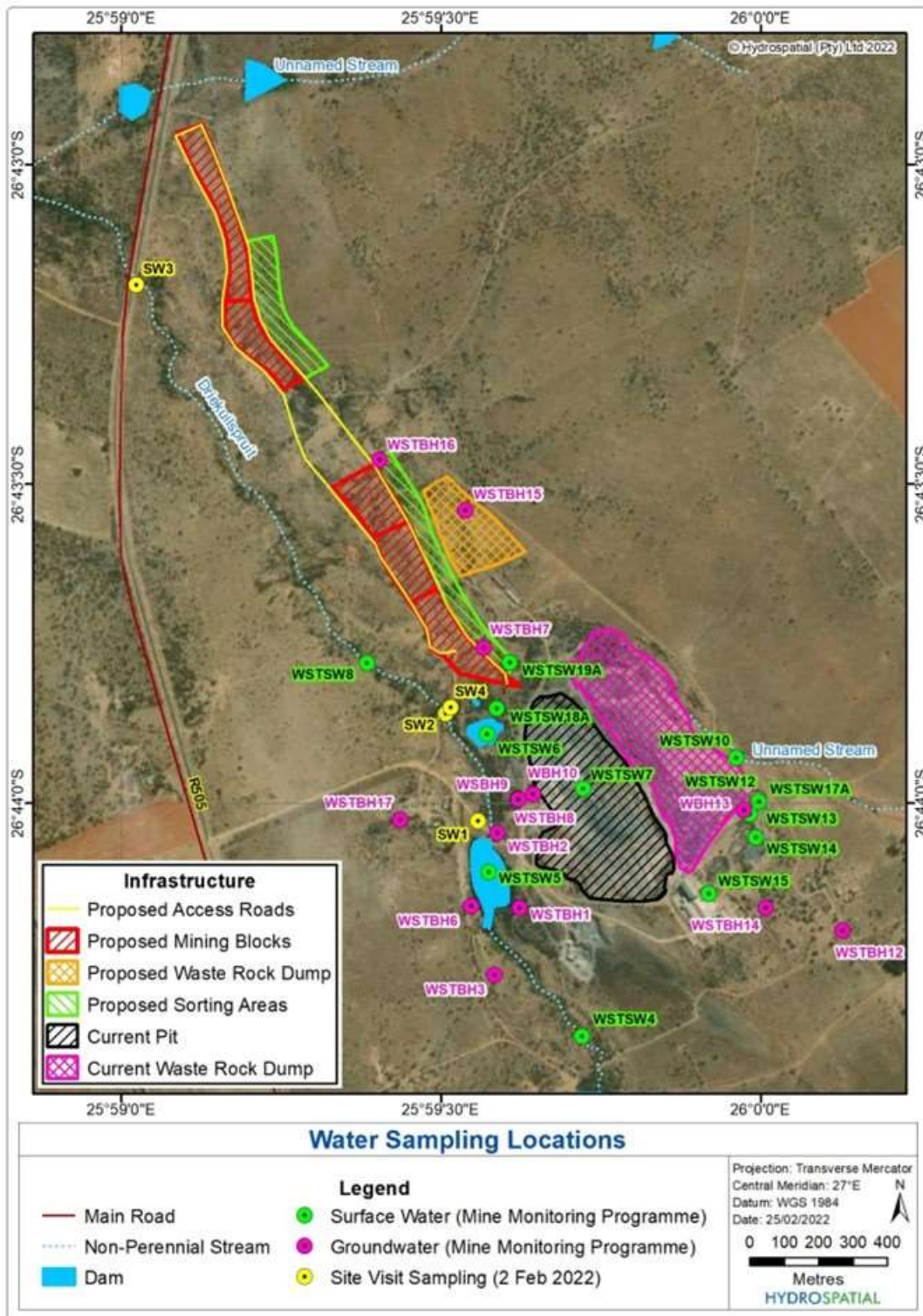


Figure 42: Water sampling locations

### 5.10 Hydrogeological Setting

The Hydrogeological Study will be undertaken by iLEH. Please refer to Appendix 11 for the Hydrogeological Desktop Assessment.

### ***5.10.1 Boreholes present***

A hydrocensus was not completed during the scoping phase of the EIA. In order to characterise private groundwater use around the WST mining area, and thus potential sensitive receptors, data from the 1997 EMP was used (WST, 1997). Discussions with WST during 2020 suggests that these boreholes are most likely still in used by surrounding farmers. No new private boreholes are known to the WST personnel.

During the 1997 hydrocensus twelve (12) private boreholes were identified. Details regarding these boreholes are presented in Table 16 and their locations are shown on Figure 44. These boreholes were drilled to depths of up to 50m and are used for agricultural and domestic purposes.

WST currently monitors seventeen (17) boreholes on a regular basis. Available details for these boreholes are presented in Figure 44. The majority of the mine's monitoring boreholes were drilled to depths of between 90 and 100m, thus deeper than the private boreholes.

### ***5.10.2 Aquifers present***

Groundwater occurrence is typically associated with two geological features in this setting. The first is groundwater seepage that collects along the zone of transition between weathered and hard rock. This is the case at WST, as recorded in the exploration borehole drilling discussed above. Groundwater level monitoring however suggests that groundwater in the shallow weathered zone is not persistent over the site. It is thought that shallow groundwater occurrence is linked to the presence of surface water bodies and wetlands. Based on the exploration borehole data made available the average depth to the limit of weathering is 20m.

The main groundwater flow in this area is associated with secondary fracturing, faulting and joints in the lavas and pyrophyllite deposits present in the mining area. The primary porosity, permeability and storage characteristics of these rocks are low. It is thought that the groundwater potential in this area is low and that zones of higher permeability is limited, especially in the surrounding host rock (WST, 1997).

Based on monitoring information, groundwater flow is in a westerly to north westerly direction towards the Driekuilspruit (iLEH, 2020).

The localised fractured aquifers in the rocks are thought to be restricted to contact zones between intrusions and the host rock as well as with joints, faults and fractures in competent lavas and pyrophyllite. Groundwater in the fractured aquifer system is drained from storage in the overlying weathered aquifer as well as through recharge of rainwater and from watercourses. This aquifer is reported to have a low groundwater potential, especially in the host rock. Flow paths may however be controlled by the orientation of fractures and faults.

### ***5.10.3 Groundwater levels and flow***

The known groundwater levels in the vicinity of the project vary from 17.2 metres below ground level (mbgl) to the south-east of the existing WRD, to 0.4mbgl near the Driekuilspruit directly north of the Driekuilspruit Dam. The general groundwater flow direction is from south-east to north-west (Digby Wells Environmental, 2020). Groundwater flow take place in a in a westerly to north-westerly direction towards the Driekuilspruit.

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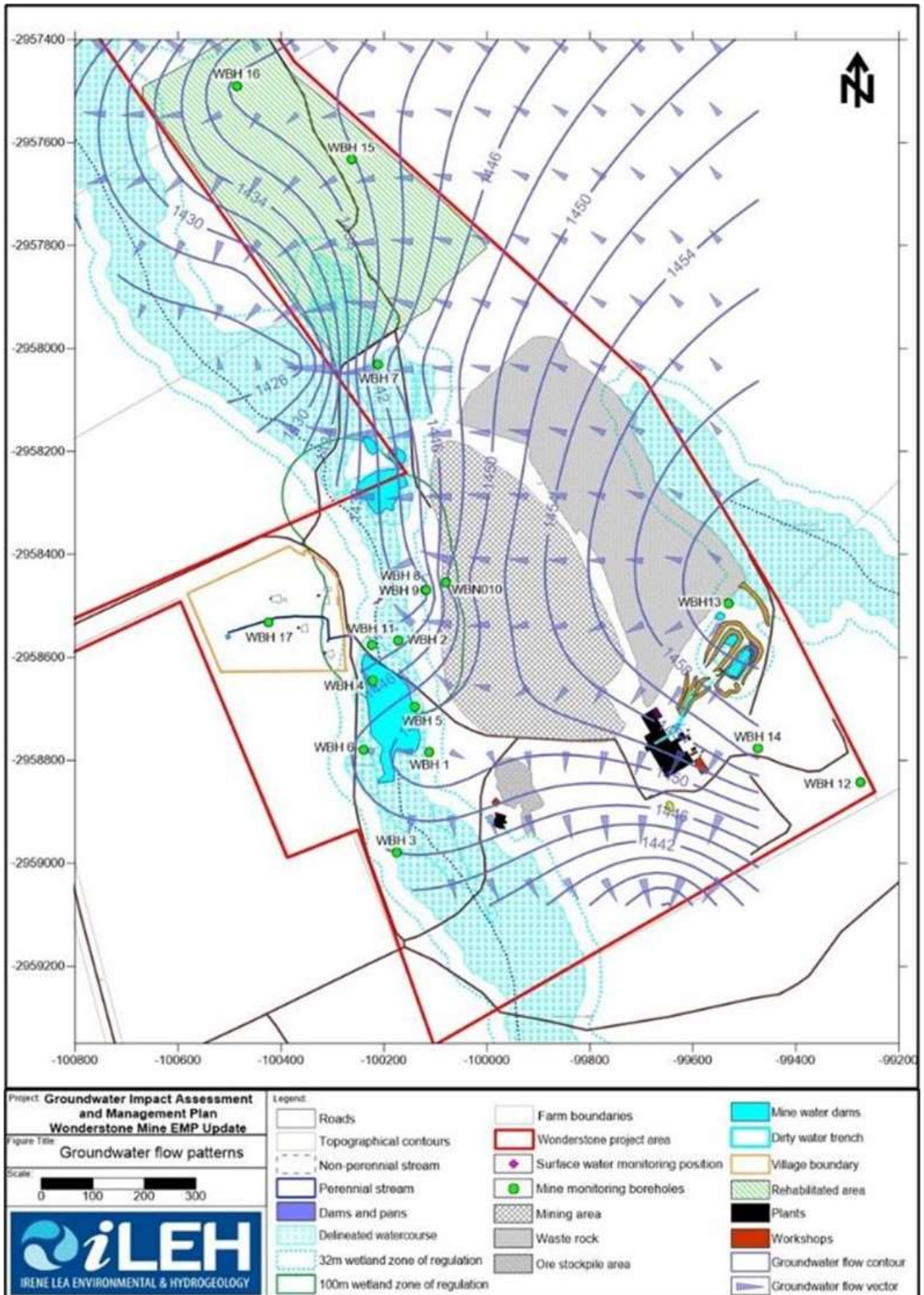


Figure 43: Groundwater level contours

#### *5.10.4 Groundwater Quality*

The groundwater quality has primarily been monitored at borehole WBH10 near the existing Pit, which was previously used to supply domestic water to the mine employees (potable water is now transported in to the mine from external sources), as well as at borehole WBH13, located directly southeast of the existing WRD, which is used to supply the plant with process water. The pH at WBH10, has consistently been below the Water Use Licence (WUL) limit of 6, whilst WBH13 has been within the limits (Digby Wells Environmental, 2020). Other parameters being monitored such as Electrical Conductivity (EC), calcium, magnesium, sodium, chloride, sulphate and nitrate have been within the WUL limits since 2016 (Digby Wells Environmental, 2020). Fluoride exceeded the WUL limit on two occasions in 2016 at WBH10, but has since been within the limit. WBH10 shows contamination from the Pit, however, the impact zone is restricted within the Pit area and does not extend to the natural environment (Digby Wells Environmental, 2020).

#### *5.10.5 Water use*

The water resources available to the mine include groundwater abstracted from two boreholes (WBN010 and WBH13), surface water pumped from the Driekuilspruit Dam and process water that recycled and reused in the plant.

The water available in the Driekuilspruit is not reliable, as the water course is non-perennial and dries up seasonally. Under these conditions, the mine relies on groundwater supply from the two boreholes. The mine's water supply boreholes WBN010 and WBH13 were drilled to depths of 110m and 22m respectively.

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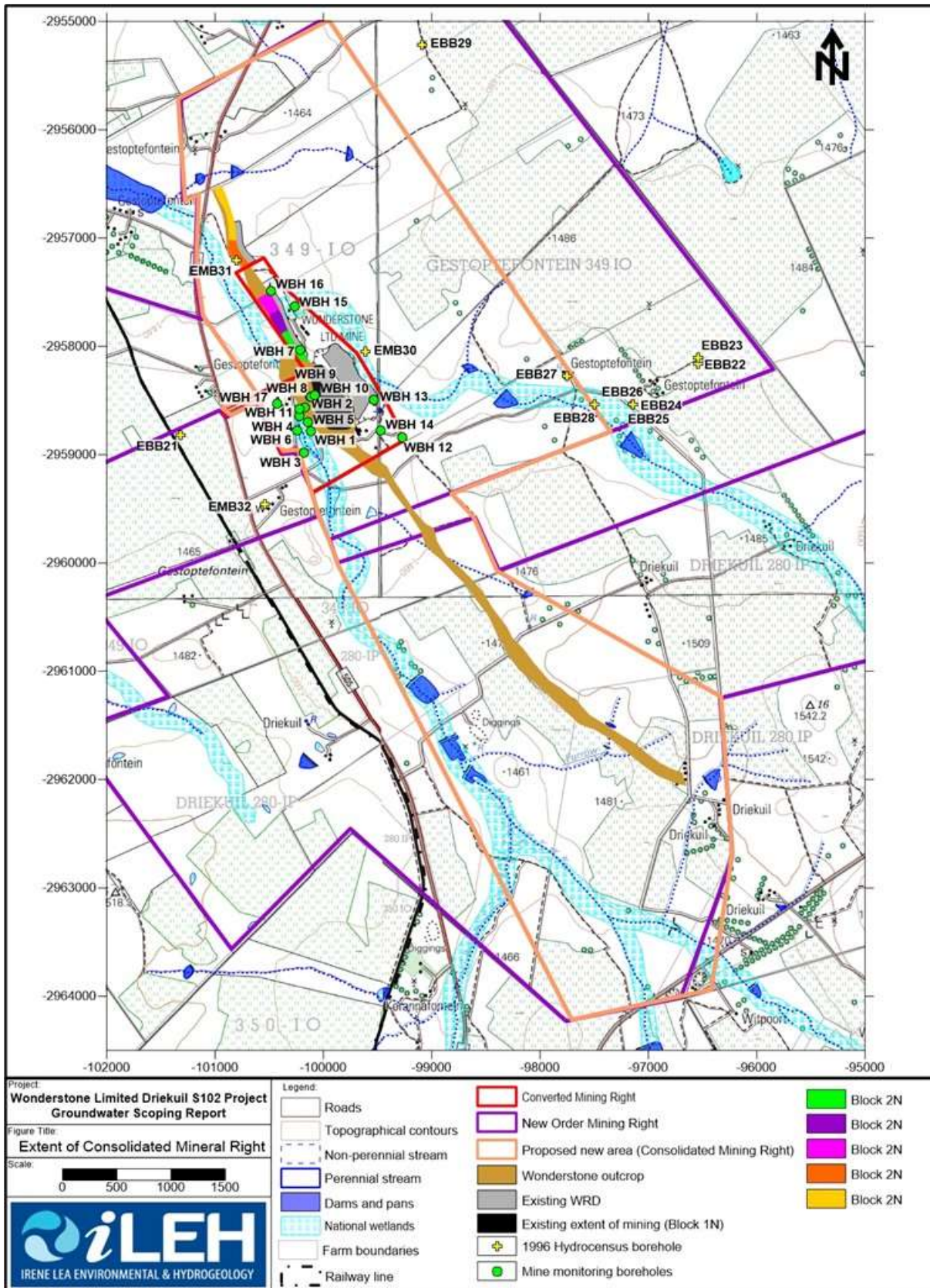


Figure 44: Map indicating borehole locations



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Table 16: 1997 EMP Hydrocensus boreholes (WST, 1997)

ID	X	X	Elevation (mamsl)	Depth	Sample No	Equipment	Use	Description
EBB20	-102495,19	-2955494,3	1442		EB1	Windpump	Domestic	Background BH, farm NW of mine, taken at house
EBB21	-101318,08	-2958818,2	1450		EB2	Powerhead	Domestic	East of railway line taken at blue tank next to tar road
EBB22	-96542,10	-2958161,4	1476	51,0	EB3	Submersible pump	Domestic	Next to reservoir
EBB23	-96542,52	-2958106,0	1476		EB4	Submersible pump	Agricultural	100m south of B22
EBB24	-97141,23	-2958536,1	1476	31,4	EB5	Submersible pump	Agricultural	Mr C Badenhorst's house
EBB25	-97141,23	-2958536,1	1475	45,9	EB6	Submersible pump	Domestic	Mr C Badenhorst's house
EBB26	-97141,23	-2958536,1	1475	36,2	EB7	Submersible pump	Domestic	Mr C Badenhorst's house
EBB27	-97748,24	-2958272,6	1475	17,4	EB8	Hand pump	Domestic	At workers compound
EBB28	-97498,42	-2958538,9	1461	36,9	EB10	Windpump	Agricultural	Small windmill in void next to reservoir, sampled from trough
EBB29	-99087,59	-2955213,4	1465		EB11	Windpump	Agricultural	Farm north of WST
EMB30	-99611,72	-2958048,9	1432		EB12	Windpump	Agricultural	WST monitoring BH NE of waste dump in neighbour's farm
EMB31	-100798,58	-2957205,0	1441		EB13	Windpump	Agricultural	WST monitoring BH Through fence near B15

Table 17: WST Current monitoring borehole information

BH ID	X-Coordinate	Y-Coordinate	Elevation (mamsl)	BH Depth (m)	Average depth to groundwater (m)
WBH 1	-100113	-2958784	1456		3,30
WBH 2	-100172	-2958567	1449	93,5	3,95
WBH 3	-100175	-2958979	1450	100,0	4,87
WBH 4	-100222	-2958646	1449		
WBH 5	-100140	-2958696	1450	2,7	
WBH 6	-100239	-2958780	1452	100,0	2,99
WBH 7	-100212	-2958031	1447	100,0	3,65
WBH 8	-100120	-2958469	1450	27,8	10,46
WBH 9	-100118	-2958469	1450		
WBN010	-100080	-2958454	1453	110,0	8,07
WBH 11	-100224	-2958576	1450		
WBH 12	-99274	-2958842	1469		11,6
WBH13	-99531	-2958496	1467	22,0	7,85
WBH 14	-99473	-2958778	1473	95,0	16,05
WBH 15	-100263	-2957633	1456	96,0	5,98
WBH 16	-100486	-2957490	1452	61,0	13,14
WBH 17	-100424	-2958532	1462		3,06

### 5.10.6 Groundwater quality

The results of the groundwater monitoring database indicate that the main opencast pit and to a lesser extent the WRD impacts most significantly on groundwater quality. Contamination originating from these areas are characterised by elevated Total Dissolved Solids (TDS), aluminium (Al), manganese (Mn), total chromium (T Cr) and copper (Cu) (iLEH).

The groundwater quality monitoring database made available by WST was used to establish groundwater quality trends for the mining area.

Groundwater sampled at the existing main opencast pit in Mining Block 1N indicates acidic conditions with pH levels below 5 units (sample WBN010 in Table 3). This suggests that opencast mining activities could result in acid mine drainage if not managed effectively.

The average concentrations for major cations and anions (Table 18) indicate that low salt concentrations prevail. All elements meet with the WST WUL conditions, with the exception of pH for boreholes WBN010 and WBH8. Both of these boreholes are situated immediately adjacent to the main quarry.

Average metal concentrations for significant metals in the WST monitoring database are presented in Table 19. Metal concentrations do not form part of the WUL requirements for the operations. WST does however include metal analysis as part of its routine monitoring programme. The average concentrations are compared to the SANS241:2015 Drinking Water Standards in Table 19. Evaluation of the information suggests that elevated total chromium concentrations in groundwater is of concern, especially in the vicinity of the existing WRD.

Monitoring results further indicate that mining activities result in an increase in aluminium concentrations in groundwater. Elevated concentrations of copper and manganese were also recorded.

Based on the evaluation of the groundwater quality monitoring database, it is concluded that aluminium, copper, manganese and potentially total chromium are indicator metals for the mining area.

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Table 18: Average groundwater quality: Major cations and anions

Element	WUL Condition	WBN010	WBH13	WBH1	WBH14	WBH16	WBH17	WBH2	WBH3	WBH6	WBH7	WBH8
Calcium (mg/l Ca)	<150	3,9	15,9	49,7	9,6	34,0	25,0	20,0	30,3	6,7	17,5	5,5
Magnesium (mg/l Mg)	<100	2,0	6,2	14,8	4,4	3,5	3,2	12,7	7,8	3,3	1,8	3,8
Sodium (mg/l Na)	<200	4,5	16,6	25,2	10,8	30,0	5,6	51,8	13,5	26,5	29,6	15,2
Potassium (mg/l K)		1,2	2,9	7,9	3,8	2,8	4,7	8,6	3,3	5,3	1,3	1,5
Total Alkalinity (mg/l CaCO <sub>3</sub> )		8,0	50,0	160,7	46,0	133,0	84,0	122,8	129,4	77,3	86,6	9,3
Chloride (mg/l Cl)	<200	8,4	24,1	46,7	16,8	29,0	16,0	66,2	13,2	19,4	14,7	32,7
Sulphate (mg/l SO <sub>4</sub> )	<400	22,4	13,9	23,2	0,2	37,0	0,2	24,6	4,3	0,1	6,4	17,7
Fluoride (mg/l F)	<1	0,51	0,11	0,10	0,10	0,30	0,50	0,18	0,24	0,23	0,78	0,10
Nitrate (mg/l NO <sub>3</sub> )	<10	1,49	3,49	1,10	0,10	0,10	0,10	0,15	0,95	0,40	0,10	0,10
Electrical Conductivity (mS/m)	<150	10,10	24,11	51,07	17,90	43,20	28,90	52,06	31,67	157,33	24,08	17,63
Total Dissolved Solids (mg/l)		68,2	149,1	286,7	134,0	270,0	200,0	286,4	162,3	157,3	135,2	100,7
pH	6 - 9,5	4,9	6,1	7,5	7,2	7,6	7,0	7,0	7,5	7,9	7,7	5,7

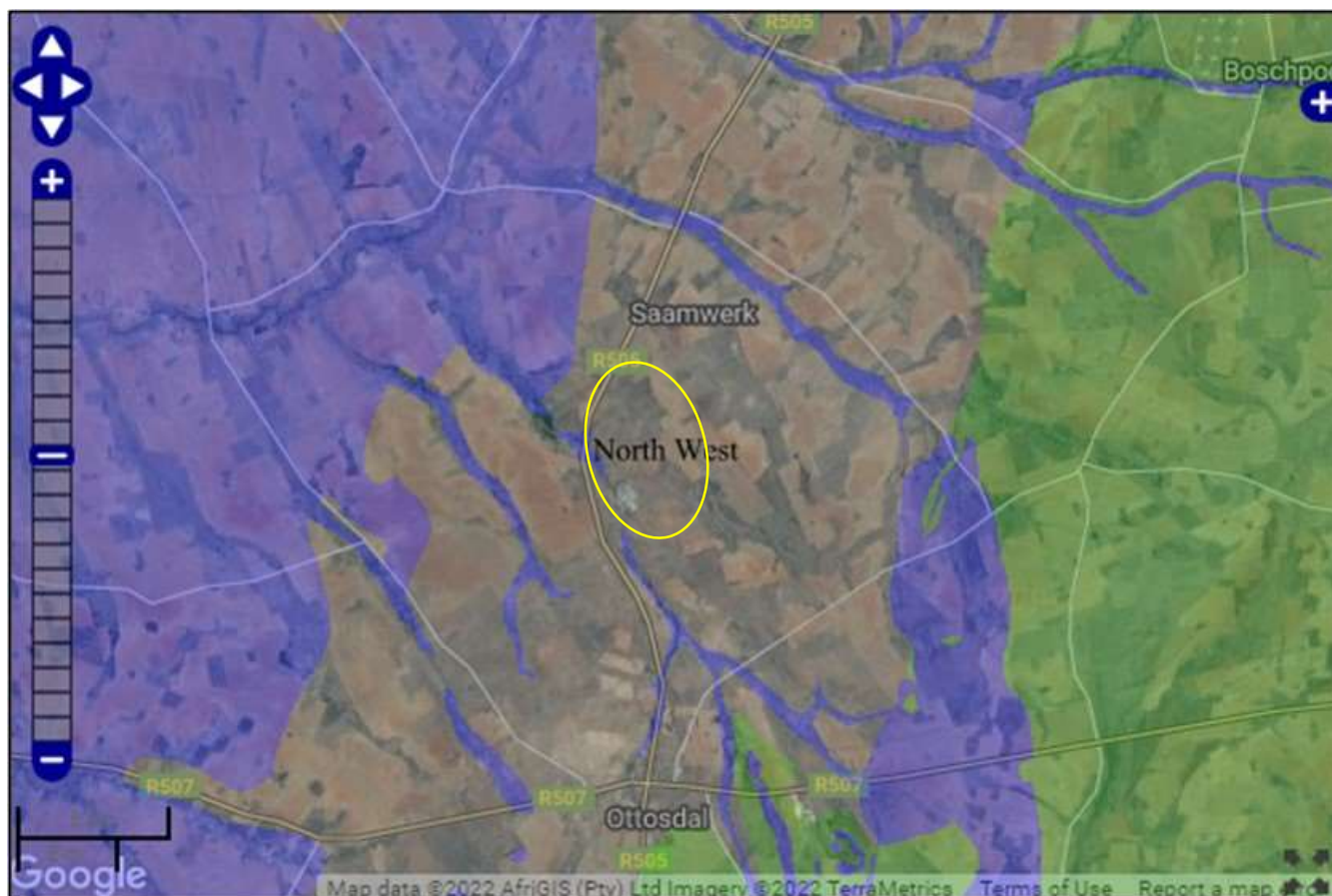
Table 19: Average groundwater quality: Significant metal concentrations

Element	SANS241:2015 Standard	WBN010	WBH13	WBH1	WBH14	WBH16	WBH17	WBH2	WBH3	WBH6	WBH7	WBH8
Aluminium (mg/l Al)	<0,3	0,50	0,03	0,02	0,05	0,04	0,04	0,18	0,02	0,20	0,01	0,02
Iron (mg/l Fe)	<2 (Chronic health)	0,09	0,08	0,11	0,24	0,37	1,80	0,32	2,42	0,96	0,22	0,15
Manganese (mg/l Mn)	<0,4 (Chronic Health)	0,18	0,03	0,57	0,04	0,60	1,10	0,45	0,62	0,51	0,20	0,90
Total Chromium (mg/l Cr)	<0,05	0,07	0,08	0,08	0,09	0,13	0,13	0,06	0,07	0,08	0,06	0,07
Copper (mg/l Cu)	<2	2,65	0,01	0,01	0,01	0,01	0,02	0,03	0,01	0,02	0,01	0,02
Zinc (mg/l Zn)	-	0,35	0,01	0,01	0,01	0,02	0,02	0,02	0,03	0,04	0,01	0,06

## 5.11 Cultural and Heritage Setting

The Cultural and Heritage Setting will be undertaken by Beyond Heritage. Please refer to Appendix 12 for the relevant study.

The study area ranges from insignificant to low palaeontological sensitivity (Figure 4.1) and no further studies will be required in the EIA phase.



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

Figure 45: Palaeontological sensitivity map of the approximate study area (yellow polygon).

### 5.11.1 Archaeological and Historical Information Available on the Study Area”

The archaeological record for the greater study area consists of the Stone Age and Iron Age.

### 5.11.1.1 Stone Age

The Stone Age is divided in the Early; Middle and Late Stone Age. It refers to the earliest people of South Africa who mainly relied on stone for their tools.

**Earlier Stone Age:** The period from  $\pm$  2.5 million yrs. -  $\pm$  250 000 yrs. ago. Acheulean stone tools are dominant. No Acheulean sites are on record near the study area, but isolated finds may be possible. However, isolated finds have little value. Therefore, the project is unlikely to disturb a site of significance. The lack of any ESA sites was confirmed during the field investigation.

**Middle Stone Age:** The Middle Stone Age includes various lithic industries in SA dating from  $\pm$  250 000 yrs. – 25 000 yrs. before present. This period is first associated with archaic Homo sapiens and later Homo sapiens. Material culture includes stone tools with prepared platforms and stone tools attached to handles.

**Later Stone Age:** The period from  $\pm$  25 000-yrs before present to the period of contact with either Iron Age farmers or European colonists. This period is associated with Homo sapiens sapiens. Material culture from this period includes: microlithic stone tools; ostrich eggshell beads and rock art. Sites located in the open are usually poorly preserved and therefore have less value than sites in caves or rock shelters.

Since there are no caves in the study area no Stone Age sites of significance are expected. The Matlase LSA site is the only known LSA site in the area and is located close to Wolmaransstad (Bergh 1999). San Rock Engravings, Stone Age Implements and Structures are found close to the impact footprint on farms such as Witpoort, Gestoptefontein, Driekuil and Korannafontein. Jeremy Hollman (2013) published a study on the rock engravings at Gestoptefontein and Driekuil at the study area.

### 5.11.1.2 The Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- ☞ The Early Iron Age: Most of the first millennium AD.
- ☞ The Middle Iron Age: 10th to 13th centuries AD.
- ☞ The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. No Sites dating to the Iron Age have been recorded for the study area. However to the north west of the study area towards Zeerust and towards Mafikeng, the area is well known for Later Iron Age stone walled settlements archaeologically referred to as Molokwane settlements (Pistorius 1992, Booyens 1998, Huffman 2007). Bergh (1999) reported on some 88 Late Iron Age sites towards Klerksdorp.

Some well-known examples are Platberg (Wells 1933) and Buisfontein/Thabeng (Maggs 1976). Another site Palmietfontein (30km north of Klerksdorp), excavated in 1975 by D.A. White. An article on this work also indicated that the area north of Klerksdorp is relatively rich in terms of Late Iron Age sites, and that the Rolong capital of Thabeng lies within this area (White 1977: 89). It is possible that sites related to the Olifantspoort facies of the Urewe Tradition, dating to around AD 1500-1700, and the Thabeng facies of the same tradition (AD 1700-1840) could possibly be found in the area (Huffman 2007). The well-known rock art site of Bosworth that also included Later Stone Age artefacts (Mason 1962) is located to the north of the study area.

### 5.11.2 Historical Information

The town of Ottosdal was established as a Dutch Reformed Church Parish on the farm Korannafontein in 1913 and named after its owner, GP Otto. Ottosdal is the only place in South Africa where the unique “Wonderstone” or Pyrophyllite, is found and mined. The annual agricultural show in Ottosdal is one of the oldest in the Province (<http://www.tourismnorthwest.co.za/ottosdal>).

The Town of Ottosdal is also home to a Garden of Remembrance that contains graves of soldiers killed during the Anglo-Boer War as well as an old Farmhouse, built in 1910 and that now houses a unique African collection. Lastly the Old Water Mill in town was built in 1860 and has been declared a national monument (<http://www.tourismnorthwest.co.za/ottosdal>).

### 5.11.2.1 Anglo-Boer War

During the Second Boer War (1899-1902), there were many battles in the area and the Klerksdorp area also housed a large concentration camp. The most famous battle in the Klerksdorp area is the Battle of Ysterspruit. The Boer General, Koos de la Rey, achieved a great victory and this battle is one of the most celebrated of the general's career. It was this battle in which the Boer soldiers pioneered the art of firing from horseback.

On April 11, 1920, Rooiwal, near Klerksdorp, saw the battle of Rooiwal, the last major engagement of the war, where a Boer charge was beaten off by entrenched British troops. Just under a thousand graves of the victims of the concentration camps, namely Boer women and children can still be visited today in the old cemetery just outside of Klerksdorp.

Sites relating to the Anglo Boer War have been recorded and indicated by Meyer (1971), Breytenbach (1978), Van den Berg (1996) as well as Scheepers-Strydom (1970) for the greater study area. A British Fort as well as trenches and Cemeteries dating from the Anglo-Boer War, 1899 to 1902, are located close to the town of Ottosdal on the farms Gestoptefontein and Driekuil.

### 5.11.3 Graves and Burial sites

Graves and cemeteries are widely distributed across the landscape and can be expected anywhere. Cemeteries occur on Boschpoort. 21 km to the northeast of the study area. The Driekuil cemetery is indicated on the eGGSA database and includes 53 graves 17 km to the south. Graves have been identified to the south-western corner of the proposed WRD (see Figure 54).

### 5.11.4 Cultural Landscape

The general area is mostly cultivated, and forms part of an agricultural landscape characterised by wide scale cultivation with a recent mining component. The proposed project is in line with the current land use in the immediate surrounds.

## 5.12 Air Quality

The Air Quality Study will be undertaken by VJA. Please refer to Appendix 14 for the Air Quality Desktop Assessment

### 5.12.1 Existing Sources of Emissions near the Project Site

Regional Road R505 and network of gravel and unpaved roads, active mining site (opencast), small town and low-income rural settlement that uses wood, coal and paraffin for heating and cooking purposes are located in the vicinity of the existing and proposed site. These land-use activities contribute to baseline pollutant concentrations via windblown dust from mine stockpiles and dumps, vehicle tailpipe emissions and dust from vehicle entrainment, together with household fuel combustion, biomass burning, veld fires and various fugitive dust sources.

Sources of atmospheric emissions include:

- ☞ Gaseous and particulate emissions from vehicles (tailpipe emissions);
- ☞ Miscellaneous fugitive dust sources including vehicle entrainment on roads and windblown dust from open areas;
- ☞ Gaseous and particulate emissions from biomass burning/veld fires (e.g. wild-fires).
- ☞ Gaseous and particulate emissions from adjacent mining operation; and
- ☞ Gaseous and particulate emissions from household fuel burning.

Vehicle Entrainment of Dust from Paved and Unpaved Roads and Tailpipe Emissions

- ☞ The force of wheels of vehicles travelling on unpaved roadways causes the pulverisation of the surface material. Particles are lifted and dropped from the rotating wheels and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. The quantity of dust emissions from unpaved roads varies linearly with the volume of traffic, as well as the speed of the vehicles. The site that is

proposed for mine development is in the vicinity of the corridor of R505 (Lichtenburg – Wolmaransstad) and a network of unpaved, gravel local roads.

#### Household Fuel Combustion (Domestic Fuel Burning)

- ☞ Despite the intensive national electrification programme, a large number of households continue to burn fuel to meet all or a portion of their energy requirements. The main fuels with air pollution potentials used by households within the study region are coal, wood and paraffin. The distribution patterns of fuel use are linked with the former townships and informal residential areas. Pollutants released from these fuels include CO, NO<sub>2</sub>, SO<sub>2</sub>, inhalable particulates and polycyclic aromatic hydrocarbons. Particulates are the dominant pollutant emitted from the burning of wood. Smoke from wood burning contains respirable particles that are small enough in diameter to enter and deposit in the lungs. These particles comprise a mixture of inorganic and organic substances including aromatic hydrocarbon compounds, trace metals, nitrates and sulphates. Polycyclic aromatic hydrocarbons are produced as a result of incomplete combustion and are potentially carcinogenic in wood smoke (Maroni et al., 1995). The main pollutants emitted from the combustion of paraffin are NO<sub>2</sub>, particulates, carbon monoxide and polycyclic aromatic hydrocarbons.
- ☞ Domestic fuel burning shows a characteristic diurnal and seasonal signature. Periods of elevated domestic fuel burning, and hence emissions, occurs in the early morning and evening for space heating and cooking purposes. During the winter months, an increase in domestic fuel burning is recorded as the demand for space heating and cooking increases with the declining temperature. The site is located close to the low-income area of Letsopa, located south from the WST mine site (~6.8 km).

#### Biomass Burning (Veld Fires)

- ☞ A veld fire is a large-scale natural combustion process that consumes various ages, sizes, and types of plants growing outdoors in a geographical area. Consequently, veld fires are potential sources of large amounts of air pollutants that should be considered when attempting to relate emissions to air quality. The size and intensity, even the occurrence, of a veld fire depend directly on such variables as meteorological conditions, the species of vegetation involved and their moisture content, and the weight of consumable fuel per hectare (available fuel loading). Veld fires are not easily quantified due to the irregular and seasonal nature of this source, but are also considered to be an important contributor to ambient particulate concentrations, particularly during the fire-burning season.

#### Mining

- ☞ The closest mining activity to the WST project area is located on the farm Witpoort 281 IP, and this is a pyrophyllite mine belonging to Idwala Industrial Holdings. It is an open pit crude pyrophyllite operation that supplies Idwala Industrial Minerals in Benoni, Gauteng Province, that mills and micronizes the crude pyrophyllite.

### 5.12.2 Measured Ambient Air Quality

#### Particulate Matter (PM10 and PM2.5)

The identification of existing sources of emission and the characterisation of ambient pollutant concentrations is fundamental to the assessment of the potential for cumulative impacts in the region.

The North West Province currently operates Lichtenburg Ambient Air Quality Monitoring station on the premises of Boikhutso Clinic in low income settlement of Boikhutso, on the southwest outskirts of Lichtenburg town, some 62 km north-northeast of the existing Wonderstone Ltd operations (Figure 48). It was commissioned in 2009, in the low-income community with a strong reliance on domestic combustion. The station is equipped to monitor meteorological parameters, SO<sub>2</sub>, NO<sub>x</sub>, CO, O<sub>3</sub>, PM<sub>2.5</sub>, and PM<sub>10</sub>. Long term availability of air quality data from this station is limited, and the most recent (2015-2016) PM<sub>10</sub> and PM<sub>2.5</sub> daily monitoring data is presented in Figure 46.

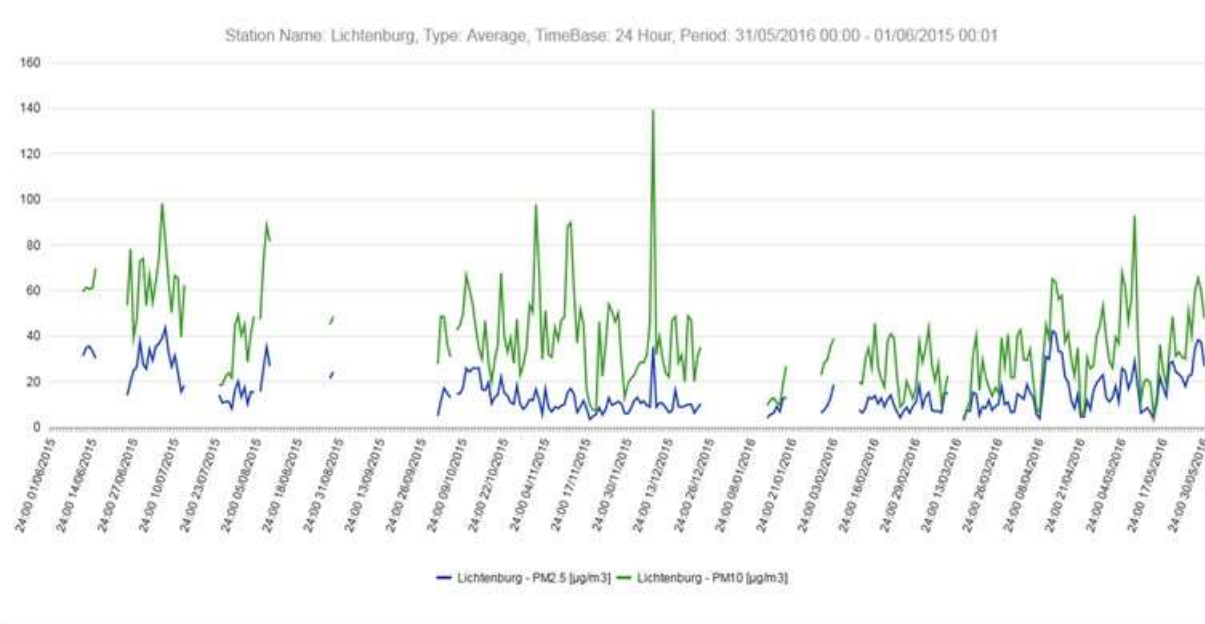


Figure 46: Daily PM<sub>10</sub> and PM<sub>2.5</sub> concentrations at Lichtenburg Air Quality Monitoring Station for the period 01 June 2015 to 31 May 2016 (<https://saaqis.environment.gov.za/>).

### 5.12.3 Dust Fallout

To assess the existing ambient air quality in the area, data was obtained from the WST. WST historically undertook dust fallout monitoring on the fenceline of the mining boundary. Monthly dust fallout monitoring was undertaken from March 2013 – September 2013, where after monitoring frequency was reduced to quarterly, with monitoring ending in June 2015. No further dust fallout monitoring has been done since June 2015.

WST had a dust fallout network consisting of eight single dust buckets (Table 20 and Figure 48) during 2013-2015 period. The measured dust fallout for the period February 2013 to June 2015 is provided in Table 21 and Figure 47. Dust fallout measured during this period was all below the NDCR for residential areas (600 mg/m<sup>2</sup>/day). Thus, all sites are within the NDCR for residential areas for the period February 2013 to June 2015.

Given the age of this dataset, the data presented below must be viewed with caution, and may not necessarily represent the current air quality situation of the area. Further, the dust fallout levels measured during this period were unrealistically low for a mining area and relatively dry environment. Multidirectional dustfall units are not in compliance with the National Dust Control Regulations, and can only be used internally as indication of dust load at the monitoring point.

National Occupational Health & Safety Consultants have been appointed by WST to establish and maintain a dustfall monitoring programme during 2013 (before the publication of GNR 827 – National Dust Control Regulations, in terms of section 53(o), read with Section 32 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA).

Table 20: Historical dustfall sites coordinates and classifications at Wonderstone Mine.

Site ID	Classification	Latitude (S)	Longitude (E)	Sampler type
NW Perimeter	Non-residential	26.73032	25.99190	Single bucket ASTM D1739 Compliant
N Perimeter	Non-residential	26.72834	25.99365	Single bucket ASTM D1739 Compliant
NE Perimeter	Non-residential	26.72871	25.99667	Single bucket ASTM D1739 Compliant



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Site ID	Classification	Latitude (S)	Longitude (E)	Sampler type
E Perimeter	Non-residential	26.73111	25.99888	Single bucket ASTM D1739 Compliant
SE Perimeter	Non-residential	26.73650	26.00005	Single bucket ASTM D1739 Compliant
S Perimeter	Non-residential	26.73911	25.99800	Single bucket ASTM D1739 Compliant
SW Perimeter	Non-residential	26.73839	25.99287	Single bucket ASTM D1739 Compliant
W Perimeter	Non-residential	26.73429	25.99221	Single bucket ASTM D1739 Compliant

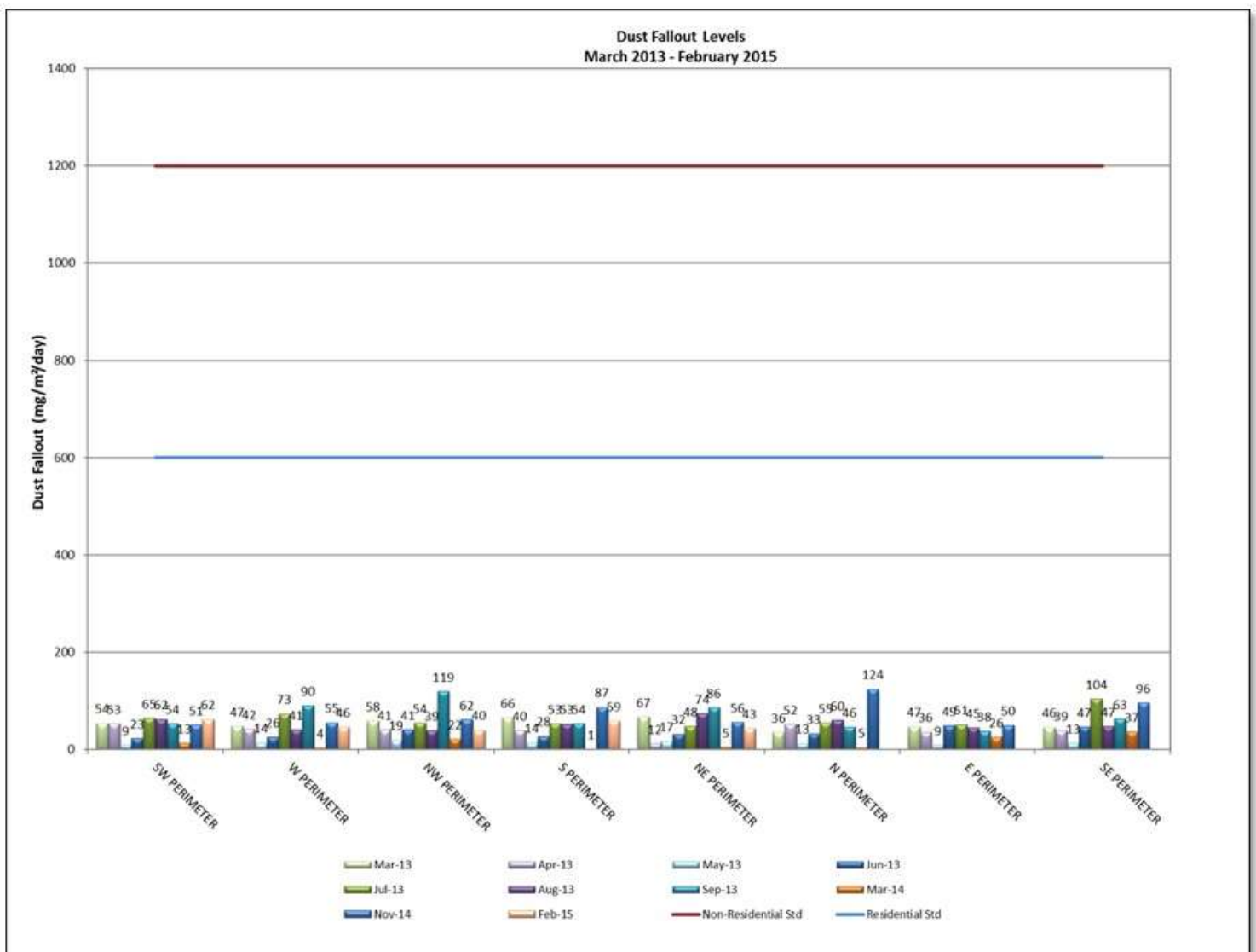


Figure 47: Dust fallout measured at Wonderstone Ltd Mine for the period March 2013 to February 2015.

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Table 21: Dustfall results and compliance for 2013 calendar year at Wonderstone Mine for March 2013 - February 2015 (NDCR: green = above residential standard, red = above non-residential standard).

Site Code	NDCR Classification	Dustfall (mg/m <sup>2</sup> /day)										Compliance (2013-2015)
		Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Mar-14	Nov-14	Feb-15	
SWP	Non-residential	54	53	9	23	65	62	54	13	51	62	Yes
WP	Non-residential	47	42	14	26	73	41	90	4	55	46	Yes
NWP	Non-residential	58	41	19	41	54	39	119	22	62	40	Yes
SP	Non-residential	66	40	14	28	53	53	54	1	87	59	Yes
NEP	Non-residential	67	12	17	32	48	74	86	5	56	43	Yes
NP	Non-residential	36	52	13	33	55	60	46	5	124	37	Yes
EP	Non-residential	47	36	9	49	51	45	38	26	50	46	Yes
SEP	Non-residential	46	39	13	47	104	47	63	37	96	77	Yes

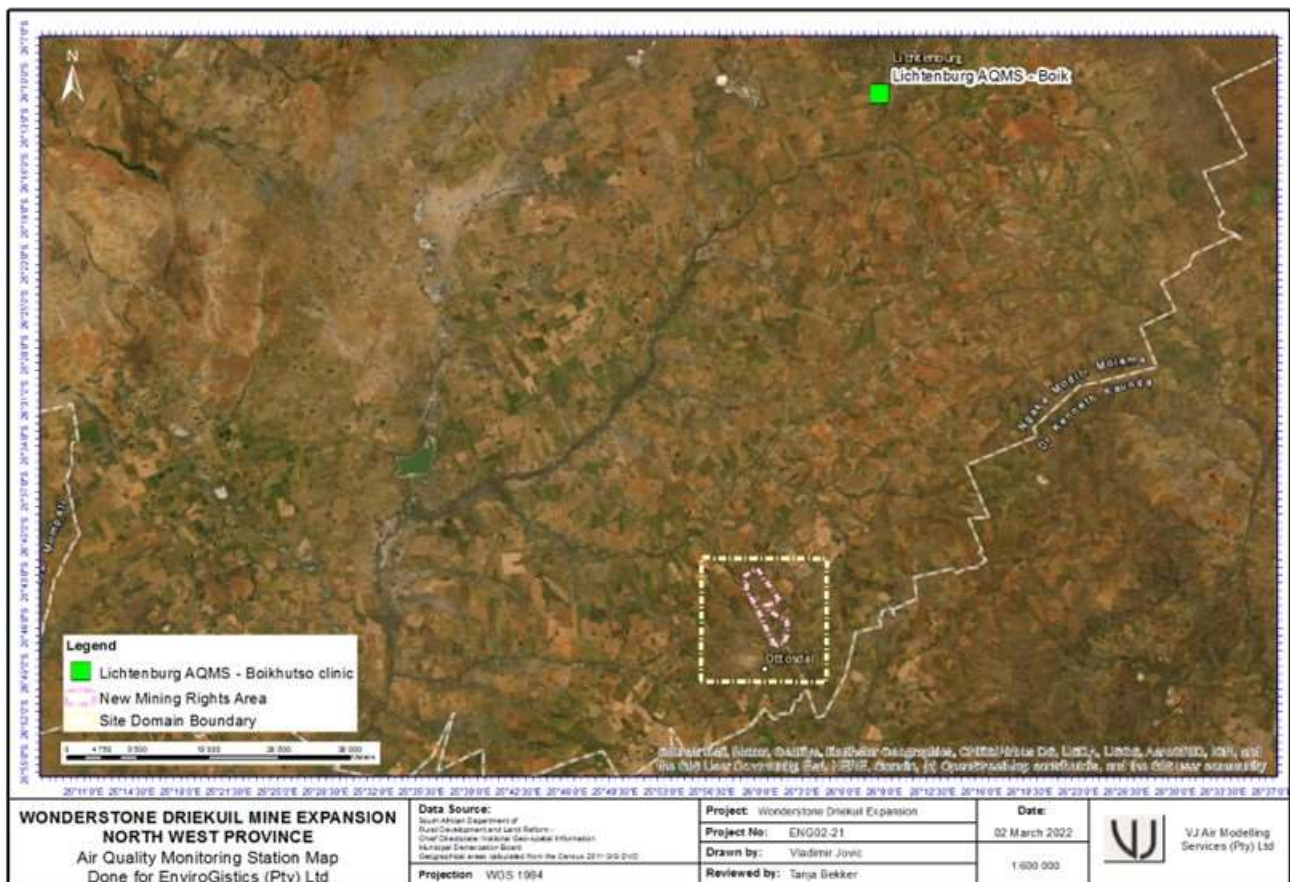


Figure 48: The closest Air Quality Monitoring Station (AQMS) in the vicinity of the WST Project area.

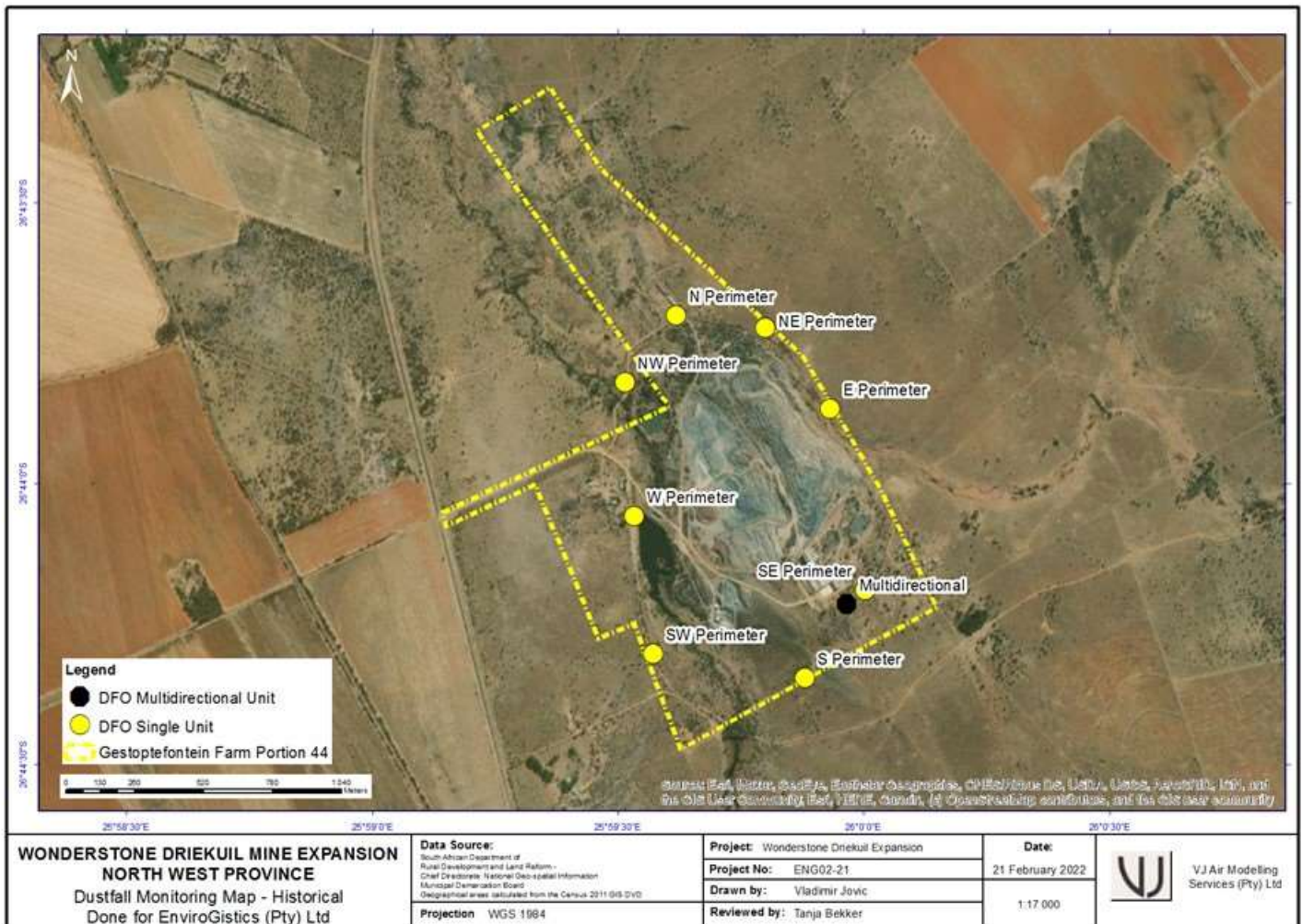


Figure 49: Historical dust fallout monitoring sites at WST.

### 5.12.4 Sensitive Receptors

The following map indicates the potential sensitive receptors:

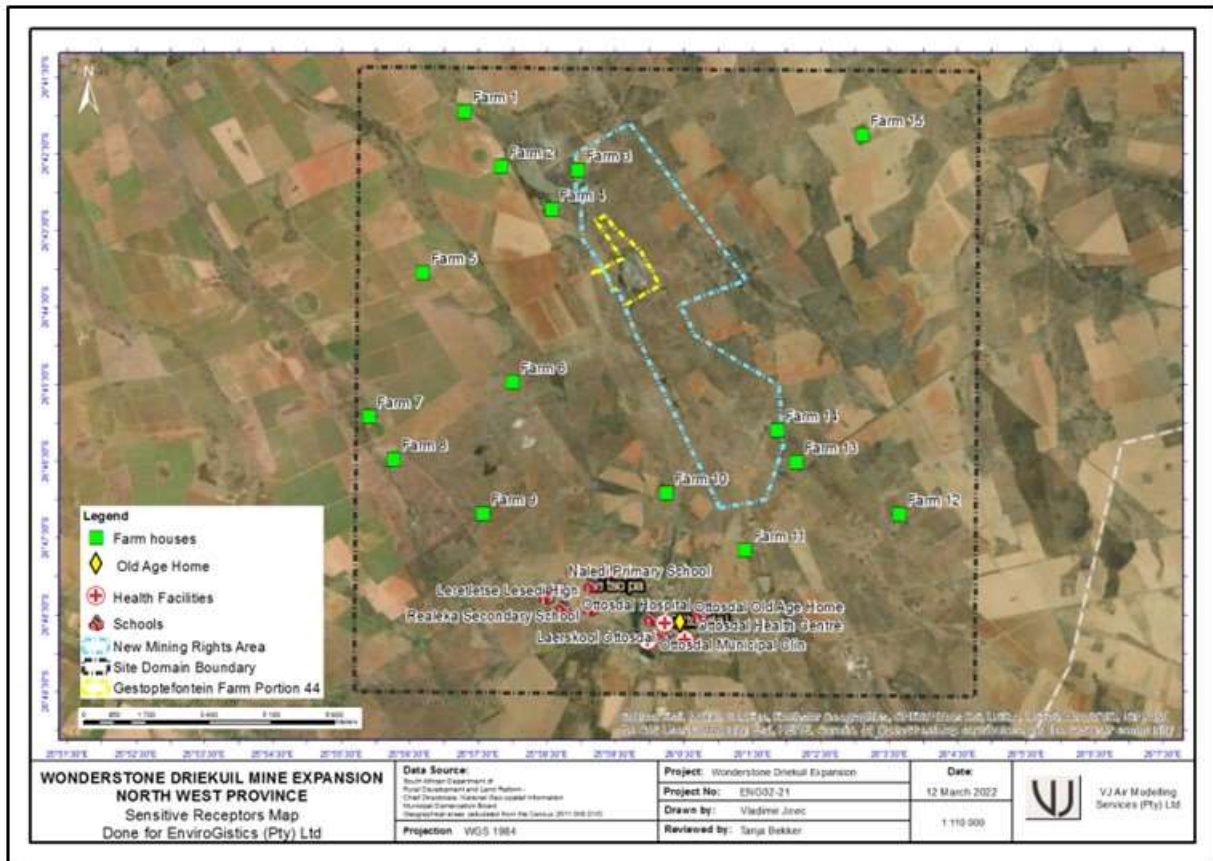


Figure 50: Sensitive receptors surrounding the WST Project area

### 5.13 Visual

The Visual Impact Assessment will be undertaken by HydroSpatial. Please refer to Appendix 13 for the Visual Impact Desktop Assessment.

Similar to topography, the land cover/use of an area plays an important role in the visibility of a project. Tall dense vegetation can conceal a project from visual receptors, while projects located in open areas consisting of grassland vegetation, are likely to be more visible to receptors.

The project area falls within the Klerksdorp Thornveld vegetation type, which is characterised by open to dense *Acacia karoo* bush clumps in dry grassland (Mucina and Rutherford, 2006). The following figure indicates the typical vegetation within the study area.



*Figure 51: Typical vegetation within the study area*

The current disturbed area at the mine consists mostly of bare areas associated with the existing opencast and WRD areas. The proposed infrastructure areas are dominated by grassland with patches of shrubland and forested areas. Cultivated land consisting mostly of maize and sunflower is the dominant land use in the surrounding area.

Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. According to Lynch (1992), sense of place is “the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own”.

The study area has largely been transformed from natural bushveld and grassland to maize and sunflower crops. The natural bushveld sense of place has largely been converted into an agricultural landscape.

The visibility of the current infrastructure at WST was modelled in ArcGIS using the viewshed analysis tool. The existing WRD is the tallest infrastructure at a height of 1 490.5 mamsl. The degree of visibility of the current infrastructure is indicated in the figure overleaf. The heights of the proposed infrastructure are not yet known; however, the visibility of the proposed infrastructure will be assessed once known during the EIA phase of the project.

Visual receptors identified within the study area include mostly farmhouses and are indicated in Figure 52.

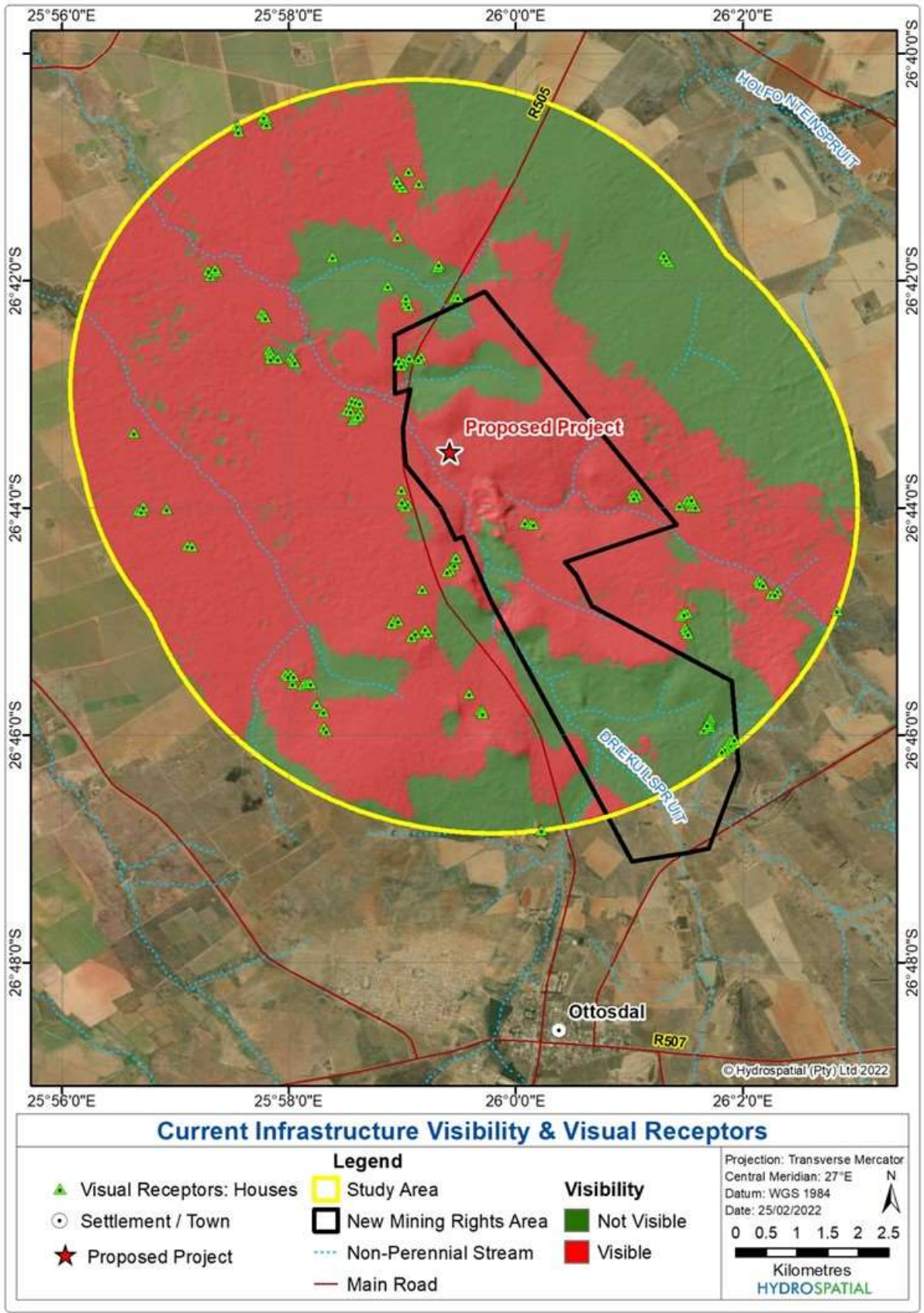


Figure 52: Current infrastructure visibility and visual receptors

## 5.14 Socio-Economic

The Socio-Economic Study will be undertaken by BathoEarth. Please refer to Appendix 16 for the Social Impact Desktop Assessment.

### 5.14.1 Ngaka Modiri Molema District Municipality

The Ngaka Modiri Molema District Municipality (NMMDM) is a Category C municipality and one of four district municipalities in the North West Province. It is situated centrally within the province and shares an international border with Botswana. It is comprised of five local municipalities: Mahikeng, Ratlou, Ramotshere Moiloa, Ditsobotla and Tswaing ([www.municipalities.co.za](http://www.municipalities.co.za)).

The main towns include Biesiesvlei, Coligny, Delareyville, Disaneng, Groot Marico, Kraaipan, Lichtenburg, Madibogo, Mahikeng, Mmabatho, Ottosdal, Ottoshoop, Sannieshof, Setlagole, and Zeerust.

The district is largely rural and is made-up of eight main towns and twenty-one townships, as well as various scattered villages. In addition, the district has 22 traditional leaders with about 90% of the district's population living in traditional authority areas. Like most of South Africa's rural communities, this district is characterised by socio-economic inequalities which result in high levels of poverty in the areas. However, the District consist of high potential agricultural land and some valuable tourism sites. Mining is further undertaken in the district.

### 5.14.2 Tswaing Local Municipality

The study area falls under the jurisdiction of the Tswaing Local Municipality (TLM), which is a Category B municipality situated in the Ngaka Modiri Molema District in the North West Province. It is one of the five local municipalities in this district, making up almost a quarter of its geographical area (TLM: IDP: 2019).

The main towns are Delareyville, Ottosdal and Sannieshof.

### 5.14.3 The local study area

Since 1937, mining of pyrophyllite has taken place on the farm Gestoptefontein near Ottosdal in the North West Province. Ottosdal is a small town situated between Hartebeesfontein and Delareyville, north west of Klerksdorp in the central North West Province of South Africa. Main routes to and from major population and economic centres, such as Pretoria and Johannesburg pass through the area to Namibia and Botswana.

Ottosdal is a farming community engaged in the cultivation of grains such as maize (mielies), sunflower and peanuts. In addition, local farmers raise cattle, sheep, pigs, dairy cows and chickens.

Ottosdal has a rich historical value with various historical sites found in the area. These include a British fort, ancient war trenches and cemeteries, a Garden of Remembrance for the soldiers killed during the Anglo-Boer War, the Old Water Mill built in 1860 that is a national monument, Khoisan rock engravings on local farms, and an Old Farm Guest House that is one of few surviving Boer mansions, built in 1907 ([www.sa-venues.com](http://www.sa-venues.com)).

The proposed project site falls within Ward 12 of the TLM near Ottosdal. Ward 13 which includes the town of Ottosdal is just south of the proposed development, with Ward 11 that includes Letsopa and the informal settlement named Iraq to the west.

The socio-demographic information for these three wards that are in close proximity to the study area will be considered in the report.

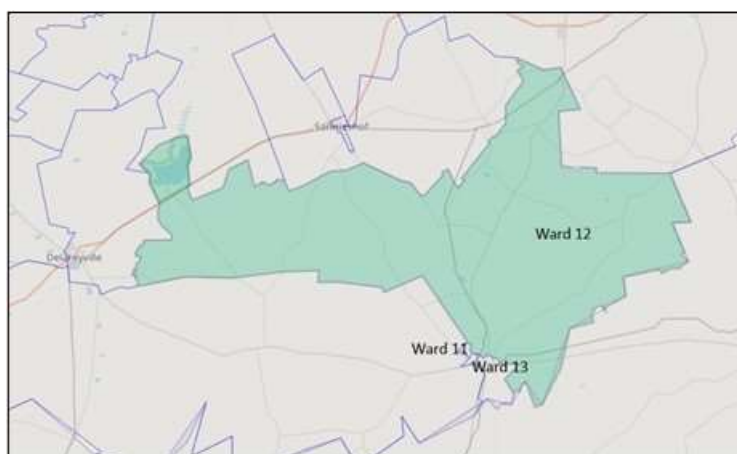


Figure 53: Ward demarcation

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

#### 5.14.4 Social Profile

##### 5.14.4.1 Population Figures

The following table provides an outline of the population figures in the local study area compared to those of the affected municipality, district and province. Ward 12, as the directly affected ward has been highlighted.

Table 22: Population figures

POPULATION FIGURES					Gender
Area	Population	People per km <sup>2</sup>	Number of Households	% Under 18 Years Age Group	
North West Province	3 748 435	35.6	1 248 765	37%	49% Female
Ngaka Modiri Molema District	889 108	31.3	269 975	37%	51% Female
TLM	129 053	21.9	35 300	41%	50%
Ward 11	9 523	2 772.4	2 247	43%	51% Female
Ward 12	10 589	8.2	2 293	42%	46% Female
Ward 13	3 866	159.8	897	41%	53% Female

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

The NMMDM IDP indicates a total population profile of 961 960 people. Based on the present age-gender structure and the present fertility, mortality and migration rates, the district’s population is projected to grow at an average annual rate of 1.6% from 946 989 in 2018 to 1.02 million in 2023 (NMMDM: IDP: 2020). There has thus been an increase in the overall population figures from 2016 and similar increases could be possible for the TLM.

The population figures indicate a study area (Ward 12) which is not as densely populated compared to the adjacent wards of Ward 11 and Ward 13. Ward 11 encompass 3.4 square kilometres and includes the highly densely populated area of Letsopa and the informal settlement of Iraq which is situated directly to the west of the town of Ottosdal. Ward 11 and Ward 12 has approximately the same number of households, although Ward 12 spans a far larger area. Ward 13 includes Ottosdal and a small section of Letsopa and is also fairly densely populated compared to Ward 12.

The residents of these wards can thus be affected by the proposed mining activities. The percentage of youth under the age of 18 years comprises large sections of the population sector within these wards. The provision of education, health and social services as well as employment creation within the municipality and especially within the area, is thus critical over the long term.



The gender ratio in the wards indicates a situation where there could be some outflow of males to other areas in search of employment. In Ward 12 this is slightly lower compared to the municipal and district statistics, which could be due to some potential for employment in the agricultural sector.

Setswana is most widely spoken in the wider study area.

#### 5.14.4.2 Population Stability

From the table below it is clear that the study area has a relative stable population with the majority of residents born in South Africa and having citizenship.

Table 23: Population Stability

POPULATION STABILITY		
Area	Born in South Africa	Citizenship
North West Province	97%	98%
Ngaka Modiri Molema District	99%	99%
TLM	99%	99%
Ward 11	99%	99%
Ward 12	9%	100%
Ward 13	95%	95%

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

#### 5.14.4.3 Education and Skills Levels

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

Table 24: Education Levels

EDUCATION LEVELS				
Area	No Schooling	Some Primary	Grade 12	Higher Education
North West Province	9%	13%	31%	5%
Ngaka Modiri Molema District	12%	16%	27%	5%
TLM	17%	21%	21%	3%
Ward 11	26%	18%	21%	2%
Ward 12	32%	24%	12%	3%
Ward 13	24%	16%	22%	3%

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

Based on information above, the percentages of those achieving matric within the municipal area and wards are more or less similar, except for Ward 12 where a far lower percentage of learners completed matric. This will be an indication of the level of skills available in the study area. Overall, the percentages of residents with no schooling remain a concern, as well as the limited number of individuals with higher educational achievements.

There are four primary schools and two secondary schools within Letsopa. Ottosdal has two primary schools, namely Laerskool Ottosdal and Natanja Primary, as well as the CVO School. There are no known schools in Ward 12. This could be due to the rural nature of the ward with no formal settlements or towns located there.

Wonderstone has been involved in the building of the Natanja Primary School in Ottosdal. The company also fund the Tertiary Education Preparatory (TEP) Programme, which aims to prepare students from rural areas, academically for university and other tertiary education programmes ([www.wonderstone.co.za](http://www.wonderstone.co.za)).

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

#### 5.14.4.4 Employment and Income

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

Table 25: Employment Profile

EMPLOYMENT AND INCOME LEVELS					
Area	Employed	Unemployed	Discouraged work-seeker	Other non-economically active	Annual Household Income below R40k
North West Province	37%	17%	6%	40%	57%
Ngaka Modiri Molema District	29%	15%	8%	48%	64%
TLM	29%	12%	8%	52%	73%
Ward 11	14%	15%	7%	64%	83%
Ward 12	41%	9%	5%	45%	88%
Ward 13	21%	15%	11%	35%	56%

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

The above indicates approximately two thirds of the population within the district that have an annual household income of below R40 000. This figure increased as the NMMDM IDP (2020) indicated that there are 640 000 (67.66%) people living in poverty, using the upper poverty line definition. It is concerning that these figures are even higher within the TLM and two of the wards within the study area.

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

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

#### 5.14.4.5 Safety, Security and Health

In 2018, NMMD had 79 clinics, 16 community health centres, 5 district hospitals, 1 regional hospital and 1 special psychiatric hospital to provide holistic care services to the district residents. In terms of accessibility of health care services there is still a challenge as some clinics do not operate on a 24-hour basis and communities find it difficult to have access to health care services when needed.

Within the TLM there are some primary health care clinics, and a hospital situated in Ottosdal, Delareyville and Sannieshof.

The District Municipality has 23 police stations servicing the entire municipal area. For the period 2008/2009 to 2018/2019 overall crime has decreased at an average annual rate of 1.20%. The town of Ottosdal has a police station that services Ottosdal and Letsopa.

According to crime statistics obtained for 2017 for the Ottosdal Police Station, the main crimes in the Ottosdal area relate to gender-based violence, burglaries and common theft. Crime levels overall were relatively low (SAPS statistics, 2017). Reports from the local hospitals and clinics indicated that most of fatalities and weekend crimes (assaults, rapes etc.) are experienced in informal settlements such as Iraq in Ottosdal. This is also due to the fact that the area does not have electricity and there are inadequate crime prevention strategies within these areas (TLM: IDP: 2019).

#### 5.14.4.6 Housing and Related Infrastructure

The infrastructure in the larger study area and within the TLM is fairly poor, with major service backlogs that cannot meet the needs of the human settlements and high poverty levels. The municipality has a Housing Sector Plan, which is currently under review. This plan has to determine the future infrastructure needs and community services including, water, sanitation, hospitals, clinics, schools and so forth.

In 2019, however, the housing backlog was estimated at 6 497 units. Letsopa has a thousand (1000) households that form part of the residents in the TLM area awaiting formal housing infrastructure. The TLM IDP indicated that the Tswaing Letsopa Ext 1,2 project in Letsopa was ready for implementation (TLM IDP: 2019).

Internal roads in the towns and settlements are in a poor condition and require ongoing maintenance. There is also limited equipment, as well as financial and human resources available to maintain these roads. The TLM IDP indicated that the Letsopa Internal Roads and Storm water Phase 3 project was in the construction phase and that the follow-on phases were at the procurement stage. Some road upgrading in Letsopa are thus planned and executed (TLM IDP: 2019).

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

Table 26: Households and housing infrastructure

HOUSEHOLDS				
Area	No of Households	Households in formal dwellings	Households in informal dwellings	Other
North West Province	1 248 765	67%	18%	15%
Ngaka Modiri Molema District	269 975	74%	11%	15%
TLM	35 300	77%	16%	5%
Ward 11	2 247	68%	29%	3%
Ward 12	2 293	90%	5%	5%
Ward 13	897	75%	23%	2%

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

#### 5.14.4.7 Basic Service Delivery

The TLM provides the basic services in its area of jurisdiction, but water and sanitation services are provided by the Ngaka Modiri Molema District Municipality in all rural villages of Tswaing.

In 2019, the area has seen various acts of violent protests due to a lack of service delivery. In addition, the TLM was officially placed under administration and workers remained without their salaries. Within Letsopa, the public library and Tswaing municipal offices were set alight and various roads were blocked for days by protestors.

##### 5.14.4.7.1 Water

Most rural water supply schemes were constructed through the Community Water Supply and Sanitation Programme through the Department of Water and Sanitation as the funding agent and the NMMDM as the implementing agent. These schemes consisted of equipped boreholes, transmission mains, storage tanks and distribution mains. Most of these schemes are currently failing to meet demands at basic level of service for the following reasons: dwindling water tables, failing infrastructure, theft, vandalism and growing demands (TLM IDP: 2019).

The NMMDM uses the local municipalities as Water Services Providers (WSPs) for the operation and maintenance of sewer treatment works and retail water reticulation systems in the urban towns of its jurisdiction. The district also uses the services of Sedibeng Water for bulk water supply (NMMDM: IDP: 2020).

Within the Ward 12, 71% of the residents received their water for household use from boreholes which correlates with the rural characteristics of the ward. Only 21% received their water from a regional service provider. In Wards 11 and 13 a different situation occurs, where 98% of the households in Ward 11 received

their water from a regional or local service provider and within Ward 13, 98% of the households received the same service. (StatsSA: Census 2011).

In 2019 already, the TLM, however, was experiencing water shortages due to dependency on underground water sources. The Municipality was then already in short supply of approximately 13Mℓ/d. During a community protest in the same year, water shortages was one of the key grievances that residents listed. These water shortages unfortunately continue in the area. In February 2022, residents had to walk far distances to queue for water at the police station until water tankers were dispatched to alleviate the shortages (TLM IDP: 2019 & <https://www.ofm.co.za/article/centralsa/313541/tankers-to-assist-with-water-provision>).

It is clear that alternative additional water sources need to be investigated as a matter of priority (TLM IDP: 2019).

#### 5.14.4.7.2 Sanitation

Within Ward 12, 39% of the households had access to flush toilet facilities, while 21% made use of the Ventilated Improved Pit (VIP) latrines. It is of concern that 29% still had no access to any sanitation facility. This is more than double the rate in the district and could be ascribed to the rural nature of the ward and the challenges faced in installing infrastructure over vast areas. The wards adjacent the proposed development, Wards 11 and 13 differ in this regard as 82% of the households in Ward 11 had access to sanitation facilities (flush toilets), and in Ward 13, the figure was at 99% ([www.statssa.gov.za](http://www.statssa.gov.za)).

Although there has been an improvement in sanitation services a number of residents at Letsopa township (Ward 11) are however still living in unsatisfactory conditions and have to face frequent sewer spillages ([www.sabc.co.za](http://www.sabc.co.za)).

It is planned to refurbish the Ottosdal Waste Water Treatment plant by the NMMDM (NMMDM IDP: 2020).

#### 5.14.4.7.3 Electricity

ESKOM is the electricity service provider to the rural areas of the TLM, as well as townships. The major towns receive their electricity via the TLM. Due to lack of resources, the streetlights and high mast lights are also poorly maintained (TLM IDP: 2019).

Regarding electricity, the TLM indicated that while 39% of households had access to electricity in 2000, the percentage rose to 77% in 2010. However, a large section of the population still has no, to very limited access, to electricity which impacts negatively on local economic development and community projects. All wards within the TLM required upgrading to electricity networks or connections as indicated as part of the IDP processes. (TLM: IDP: 2019).

A potential project was listed to be implemented in Extension 6 of Letsopa whereby 725 electricity connections will be connected (TLM IDP: 2019). The informal settlement of Iraq also required electricity connections which could assist in lessening criminal activities in this area.

#### 5.14.4.7.4 Waste Collection

In TLM only 30% of the population received a service from the municipality or private company. The majority of households rely on their own dumps. The widespread inadequacy of formal refuse removal services in the municipal area poses a health hazard to the rural communities and is particularly problematic to businesses (TLM: IDP: 2019).

#### 5.14.4.8 Local Economic Profile

The economy of the NMMDM is driven by the tertiary sector, with the community services sector being the largest and accounting for R18.2 billion or 36.5% of the total GVA in the district economy. The sector that contributes the least is the construction sector with a contribution of R 1.53 billion or 3.08% of the total GVA (NMMDM: IDP: 2020).

The strategic location of the district offers great opportunities towards the economic development and is underpinned by various development corridors that can create much needed jobs, reduce poverty and inequality. It is in relatively close proximity to the Platinum Corridor, the N18 Western Frontier Corridor and the N14 route which provides the link between Gauteng and the Northern Cape province. However, the

administration of the NMMDM has obtained adverse audit opinion in 2018/19 and disclaimer audit opinion for the past 2 years. Currently the district is under Section 137 of MFMA in terms of Financial Recovery Plan (NMMDM: IDP: 2020).

In the NMMDM, the economic sectors that has the largest number of employees is the community service sector at 33.5% of total formal employment, followed by the trade sector with 36 254 people or 17.7%. Informal employment in the district also increased from 27 000 in 2009 to an estimated 36 972 in 2019 (NMMDM: IDP: 2020).

The TLM economy is driven by dry land agriculture and mining. The local economy is highly dependent on agriculture. Delareyville is the main town within the TLM with a small CBD and industrial area. Currently there are 27 vacant stands in the industrial area, which therefore does not assist with employment provision and local economic growth. Ottosdal also has a CBD that is in need of revitalisation. The industrial area is smaller compared to Delareyville, and has 10 vacant stands. Other opportunities must be explored along the service sector and manufacturing in the medium to short term periods.

According to the North-West development plan, the TLM falls within an area that has a medium economic potential but a high socio-economic need. The economy has not been improving over the last couple of years, worsened by the decline in the agricultural sector. The LED, however seeks to achieve the following:

- Creating a conducive environment for a thriving and vibrant economy and neighbourhoods;
- Develop an employable, educated and skilled citizenry;
- Job creation and access to job opportunities; and
- Continuous and positive interactions with all key economic anchors and actors (TLM: IDP: 2019).

#### 5.14.4.9 Type of Environment Affected by the Proposed Activity

Please refer to the preceding section detailing the environmental setting in which the mine is located.

These activities may impact on the following:

- Soil resources;
- Ecological resources;
- Groundwater resources;
- Freshwater Ecosystems;
- Hydrological setting;
- Topographical setting;
- Air Quality;
- Visual setting;
- Noise setting; and
- Heritage Resources.

## 6 STATEMENT MOTIVATING THE PREFERRED SITE

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The purpose of this project is threefold:

- Expansion of the existing mining operations to ensure a long term mining operations which contributes to the economy of this municipality. This also involves the consolidation and abandonment of current Mining Rights to give effect to the Mining Works Programme;
- Amendment of conditions as identified in the 2019 Regulation 34 Amendment Process to ensure that the EMPr is applicable and practical to address the environmental impacts on the environmental setting as a result of the mining operations; and
- Consolidation of the EMPrs to have one (1) holistic EMPr for the activities which are undertaken as an integrated mining operations.

#### Alternatives Considered:

Limited location alternatives are available for this project as the project are linked to the available identified resources. The following was considered:

1. In terms of the routes, existing roads are mainly utilised for accessing the proposed mine expansion areas; alternatively the access roads will be placed within proximity of the proposed opencast pits.
2. In terms of the proposed WRD, one (1) area with sufficient space has been identified, located within an area which was mainly disturbed by past activities, which includes sporting grounds and mine hostels. The footprint presented is a worst case of approximately 4ha, which will allow for a WRD and potential PCD. The area provided for the WRD will be assessed by the specialists to determine where within this identified area the most suitable location for the facility will be. During the initial site walk overs, the potential for graves in this area has been identified. This will have to be confirmed during the specialist investigations to determine whether buffers can be placed to protect these structures.



Figure 54: Location of potential graves in relation with the proposed mining blocks and WRD.

3. Initially two (2) sorting stockpiles were planned along the northern perimeter of the opencast pits. These have however been removed from the project area, with the commitment that sorting will be undertaken on the footprint of the proposed WRD to reduce further disturbances in areas. The areas will however remain present to allow for the stockpiling of topsoil where required. Please see figure below:



Figure 55: Layout with initial Sorting Areas 1&2.



Figure 56: Layout with the exclusion of the sorting areas

4. The only alternative is the No-Go alternative where the status quo remains.

## 7 GENERAL LAND USES AND SITE SPECIFIC CONSIDERATIONS

WST has been mining in this area since the 1937s. Nhloso (2013) reported that the land use associated with the Livestock grazing is the only agricultural land use observed within the study area during the soil survey. The majority of the study area comprised of the mining pit and associated mining infrastructure including offices, processing workshop, powder plant, and other service & maintenance utilities. Whereas, the remainder of the study area comprised of rehabilitated grasslands towards the northern portion of the study area. Please refer to the following figure.





Figure 57: Photographic presentation of the dominant land uses within the area

## 7.1 Current Land Use

Mining activities have been ongoing in this area, with WST in operation since the 1937 according to the Assore website, 2022. The area towards the expansion area, is currently used as grazing land.

The landscape of the study area can be broadly divided into three main categories:

- ☞ Cultivated areas – consisting mostly of maize and sunflower crops. This is the dominant land use within the study area;
- ☞ Natural areas – consisting of natural grassland and bushveld vegetation; and
- ☞ Mining areas – Wonderstone mining area consisting of bare areas and mine infrastructure.

Nhloso (2013) reported that the land use associated with WST and the surrounding areas is mainly livestock grazing and mining related activities such as mining pit, infrastructure including offices, processing workshop, powder plant, and other service and maintenance utilities.

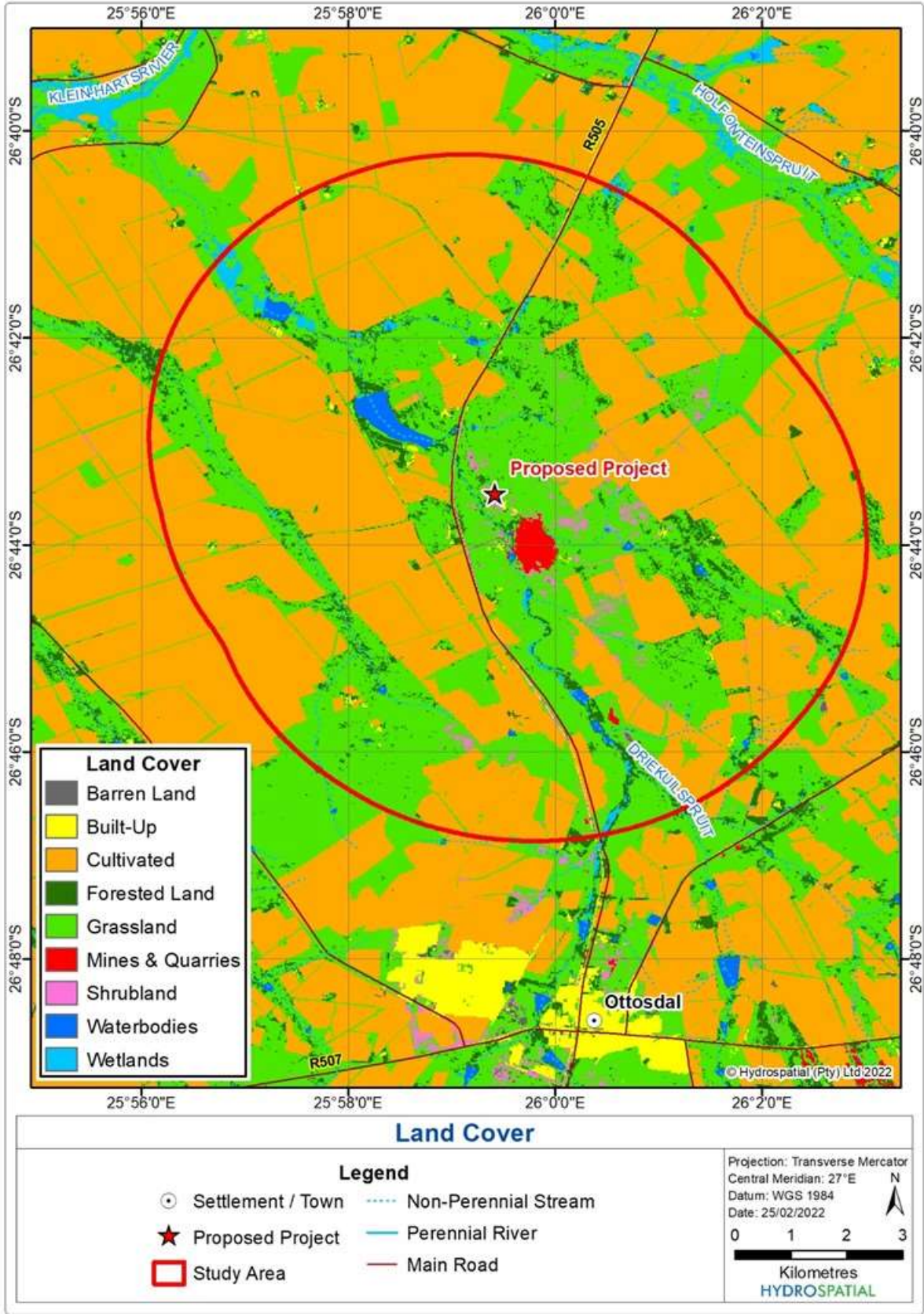


Figure 58: Land cover

## 7.2 Description of Specific Environmental Features and Infrastructure on Site

The following specific environmental features are present on site specifically of reference to the proposed project:

### Hydrological Considerations:

- The proposed project is located in the upper Harts River catchment, within quaternary catchment C31C, in the Vaal WMA.
- The Driekuilspruit, which is a non-perennial (seasonal) stream, flows on the western side of the proposed project area and into the Klein-Harts River.
- Two (2) unnamed non-perennial tributaries of the Driekuilspruit occur within the vicinity of the project. The first, located approximately 120 m to the north of mining Block 6N, flowing in a westerly direction. The second, flowing in a north-westerly direction towards the existing WRD, which has been historically constructed in its flow path, preventing it from directly flowing into the Driekuilspruit. Water currently ponds on the eastern side of the WRD, seeping through the WRD, to form an artificial wetland system on the western side, directly north of the Black Quarry Dam.
- A number of farm dams have been constructed on the Driekuilspruit, including the mines Driekuilspruit Dam, which is used to supply the mining operation with water.

### Hydrogeological Considerations:

- Groundwater flow take place in a in a westerly to north-westerly direction towards the Driekuilspruit.
- The pH at WBH10 (near the existing Opencast Pit), has consistently been below the Water Use Licence (WUL) limit of 6, whilst WBH13 has been within the limits (Digby Wells Environmental, 2020).

### Ecological Conservation Status

- Klerksdorp Thornveld: Vulnerable: Target 24%. Only about 2.5% conserved in the statutory Mafikeng Game Reserve, private Botsolano Game Park and Faan Meintjes Nature Reserve. Almost a third already transformed for cultivation and by urban sprawl. This vegetation unit has a high grazing capacity, and this leads to overutilisation and degradation, and subsequent invasion of Vachellia karroo into adjacent dry grassland. Due to the great habitat and floristic diversity and for aesthetical reasons, the landscape deserves to be conserved.
- Western Highveld Sandy Grassland: Endangered: Target 24%. Only a very small portion statutorily conserved (Barberspan Nature Reserve). More than 60% has been ploughed. Nonarable parts are on shallow aeolian soils which become easily overutilised through grazing. Erosion is very low. About 95% of this land is suitable for cultivation, but the low rainfall makes it a high-risk area for agriculture. Therefore, the natural vegetation is often restricted to nonarable bush clumps, shallow soils, aeolian sands and pans.

### Ecological Considerations:

- According to the Mining and Biodiversity Guidelines database (2012), the north-western portion of the study an investigation area is considered of “Highest biodiversity” importance whilst the large majority of the remaining portions of the study area is considered of “High biodiversity” importance and a small portion towards the south of the study and investigation area is considered of “Moderate biodiversity” importance.
- The study area is located within a CBA1 and CBA2 areas. Land management objectives as per the NWBSP (READ, 2015a):
  - CBA1 - should be maintained in a natural or near-natural state that maximises the retention of biodiversity patterns and ecological processes. CBA1 are described as i) vulnerably ecosystems that remain largely intact, the ecosystems remaining is less than the target biodiversity, thus remaining patches are of highest conservation priority and further impacts on natural habitat should be avoided. ii) irreplaceable sites which are mandatory if biodiversity targets are to be achieved. iii) critical biodiversity corridors linkages existing within the biodiversity network, in which there is limited conversion to maintain the connectivity in the landscape. iv) important

terrestrial habitats, areas identified by experts as being important for biodiversity conservation (less than 10 000 ha) and v) important terrestrial habitats: Kloofs large and medium kloof habitats which are identified as important for climate change adaptation. - CBA2 – should be maintained in a natural or near-natural state that maximises the retention of biodiversity patterns and ecological processes.

- CBA2 are characterised by the following i) ecosystems and species are fully or are largely intact or undistributed, ii) areas with intermediate irreplaceability or some flexibility in terms of meeting biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve biodiversity targets, although loss of these sites would require alternative sites to be added to the portfolio of CBAs, and iii) these are biodiversity features that are approaching but have not passes their limits of acceptable change

🌀 Freshwater Consideration:

- The study and investigation areas fall within a sub-quaternary catchment classified as an Upstream Management Area (FEPA code 4). These are sub quaternary catchments in which human activities need to be managed to prevent degradation of downstream river “Freshwater Ecosystem Protected Area’s” (FEPA’s) and Fish Support Areas (FSA). Upstream Management Areas do not include management areas for wetland FEPA’s which need to be determined at a finer scale.
- According to the NFEPA (2011) database, there are no wetlands situated within the study area however, three natural channelled valley bottom (CVB) wetlands are situated north of the study area, within the investigation area. The wetlands range from moderately modified to seriously modified (WETCON C to Z3).
- The study area is situated within the Dry Highveld Grassland Group 5 Wetland vegetation type, classified as Least Threatened according to Mbona et al. (2015).
- Critical Biodiversity Areas (CBA’s) include natural and near-natural terrestrial and aquatic features that are required to meet targets for biodiversity patterns and ecological processes. Furthermore, CBAs are area’s considered important for the survival of threatened species and include valuable ecosystems such as wetlands, untransformed vegetation and ridges. Ecological Support Areas (ESAs) are natural, near natural, degraded or heavily modified areas required to be maintained in an ecologically functional state to support CBAs and/or Protected Areas. According to the North-West Biodiversity Sector Plan (2015) portions along the north-western and south-eastern extents of the study and investigation area falls within areas identified as an ESA 1 whilst a small portion towards the south-east of the investigation area is situated within an area identified as ESA 2.
- The NBA 2018: SAIIAE database indicates the presence of a seep wetland that traverses the study and investigation area. The seep wetland is classified to be critically endangered (ETS) and not protected (EPL). There are no rivers situated within the study and investigation area according to the NBA (2018) database and the closest river is the Klein-Harts river which corresponds with the NFEPA (2011) database. According to the NBA (2018) database, the Klein-Harts river is identified to have a ETS of critically endangered and EPL of poorly protected.
- The aquatic sensitivity of the study and investigation area is considered to have a high and very high aquatic sensitivity due to being associated with aquatic CBA’s, wetlands and estuaries.

🌀 Heritage Considerations:

- Potential Graves are present within 100m of the proposed Opencast Mining Blocks and WRD. This will require further investigation during the EIA Phase.

## 8 IMPACTS IDENTIFIED

### 8.1 Methodology used in determining and ranking the Nature, Significance, Consequences, Extent, Duration and Probability of potential Environmental Impacts and Risks

In order to adequately assess and evaluate the impacts and benefits associated with the project it is necessary to use a methodology that could scientifically achieve this and to reduce the subjectivity involved in making such evaluations. For proper decision making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impacts or benefits on the surrounding natural and social environment.

This section will aim to discuss the methodology to be followed to determine, assess and describe possible impacts as a result of project implementation. Impacts will be discussed in terms of the construction, operational and decommissioning/closure phases of the project. The evaluation of impacts is conducted in terms of the criteria discussed below. The various environmental impacts and benefits of this project will be discussed in terms of the nature of the impact, as well as the status, certainty, duration, magnitude, extent, intensity, frequency and significance. The significance rating of each impact will determine whether or not mitigation will be required.

The EIA will also aim to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project;
- Assess the study area in terms of environmental criteria;
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts, and
- Successfully analyse all public issues raised to date in order to recommend appropriate mitigation measures for all social and environmental related concerns.
- Impacts and benefits are assessed before and after the application of mitigation measures.

The following section presents the criteria used to assess the potential impacts presented in the previous section.

### 8.2 Criteria of assigning significance to potential impacts

The evaluation of impacts is conducted in terms of the criteria detailed in Table 27 to Table 32. The various environmental impacts and benefits of this project are discussed in terms of impact status, extent, duration, probability, and intensity. Impact significance is regarded as the sum of the impact extent, duration, probability and intensity and a numerical rating system has been applied to evaluate impact significance. Therefore, an impact magnitude and significance rating is applied to rate each identified impact in terms of its overall magnitude and significance (Table 32).

In order to adequately assess and evaluate the impacts and benefits associated with the project, it was necessary to develop a methodology that would scientifically achieve this and to reduce the subjectivity involved in making such evaluations. To enable informed decision-making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impact or benefit on the surrounding natural and social environment.

#### 8.2.1 Impact Status

The nature or status of the impact is determined by the conditions of the environment prior to construction and operation. A discussion on the nature of the impact will include a description of what causes the effect, what will be affected and how it will be affected. The nature of the impact can be described as negative, positive or neutral.

Table 27: Status of Impact

Rating	Description	Quantitative rating
Positive	A benefit to the receiving environment.	P
Neutral	No cost or benefit to the receiving environment.	-
Negative	A cost to the receiving environment.	N

## 8.2.2 Impact Extent

The extent of an impact is considered as to whether impacts are either limited in extent or if it affects a wide area or group of people. Impact extent can be site specific (within the boundaries of the development area), local, regional or national and/or international.

Table 28: Extent of Impact

Rating	Description	Quantitative rating
Low	Site Specific; Occurs within the site boundary.	1
Medium	Local; Extends beyond the site boundary; Affects the immediate surrounding environment (i.e. up to 5 km from the Project Site boundary).	2
High	Regional; Extends far beyond the site boundary; Widespread effect (i.e. 5 km and more from the Project Site boundary).	3
Very High	National and/or international; Extends far beyond the site boundary; Widespread effect.	4

## 8.2.3 Impact Duration

The duration of the impact refers to the time scale of the impact or benefit.

Table 29: Duration of Impact

Rating	Description	Quantitative rating
Low	Short term; Quickly reversible; Less than the project lifespan; 0 – 5 years.	1
Medium	Medium term; Reversible over time; Approximate lifespan of the project; 5 – 17 years.	2
High	Long term; Permanent; Extends beyond the decommissioning phase; >17 years.	3

## 8.2.4 Impact Probability

The probability of the impact describes the likelihood of the impact actually occurring.

Table 30: Probability of Impact

Rating	Description	Quantitative rating
Improbable	Possibility of the impact materialising is negligible; Chance of occurrence <10%.	1
Probable	Possibility that the impact will materialise is likely; Chance of occurrence 10 – 49.9%.	2
Highly Probable	It is expected that the impact will occur; Chance of occurrence 50 – 90%.	3
Definite	Impact will occur regardless of any prevention measures; Chance of occurrence >90%.	4
Definite and Cumulative	Impact will occur regardless of any prevention measures; Chance of occurrence >90% and is likely to result in in cumulative impacts	5

## 8.2.5 Impact Intensity

The intensity of the impact is determined to quantify the magnitude of the impacts and benefits associated with the proposed project.

Table 31: Intensity of Impact

Rating	Description	Quantitative rating
Maximum Benefit	Where natural, cultural and / or social functions or processes are positively affected resulting in the maximum possible and permanent benefit.	+ 5
Significant Benefit	Where natural, cultural and / or social functions or processes are altered to the extent that it will result in temporary but significant benefit.	+ 4
Beneficial	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified, beneficial way.	+ 3
Minor Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally benefited.	+ 2
Negligible Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly benefited.	+ 1

Rating	Description	Quantitative rating
Neutral	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are not affected.	0
Negligible	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly affected	- 1
Minor	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally affected.	- 2
Average	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified way.	- 3
Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will temporarily cease.	- 4
Very Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will permanently cease.	- 5

### 8.2.6 Impact Significance

The impact magnitude and significance rating is utilised to rate each identified impact in terms of its overall magnitude and significance.

Table 32: Impact Magnitude and Significance Rating

Impact	Rating	Description	Quantitative rating
Positive	High	Of the highest positive order possible within the bounds of impacts that could occur.	+ 12 – 16
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. Other means of achieving this benefit are approximately equal in time, cost and effort.	+ 6 – 11
	Low	Impacts is of a low order and therefore likely to have a limited effect. Alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.	+ 1 – 5
No Impact	No Impact	Zero impact.	0
Negative	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.	- 1 – 5
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly possible. Social cultural and economic activities of communities are changed but can be continued (albeit in a different form). Modification of the project design or alternative action may be required.	- 6 – 11
	High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt.	- 12 – 16

### 8.3 Impacts and Risks identified

The following tables present the list of impacts during various project phases, and indicate the nature, extent, duration, probability and significance, as well as whether these impacts can be avoided, are reversible or will result in residual impacts.

Wonderstone – Driekuil Mining Expansion and Consolidation Project  
Mining Right Ref: NW30/5/1/2/2/398MR

Project Ref: 202110  
Version: Final Draft – Stakeholder Review

Table 33: Planning Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir – Irreversible; ST: 1-12 months; MT: 1-5 yrs; LT: 5 years and more; LOM: Life of Mine)

Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					Significance	
			St	EX	Du	Pr	Int	SbM	Mitigation Measures		St	EX	Du	Pr	Int	SaM	CbA/R/Ir
<b>Planning Phase</b>																	
Legal Requirements (Environmental Permits)	Legal Compliance	It is the responsibility of the mine to ensure that all activities are undertaken in line with the promulgated Environmental (water, biodiversity, waste, air) Legislation.	N	-4	-3	-2	-5	-14	A legal assessment of all activities must be undertaken annually to ensure that all are licensed.	P	4	3	5	5	17	CbA	
									All parties providing services to the mine (environmental, water, waste, air quality, monitoring, environmental specialist services) must be accordingly accredited to conduct such services.								
									All legally appointed personnel responsible or involved in activities on site must receive training on the requirements of the Environmental Authorisations and EMPs								
									Annual external inspections must be undertaken at the areas where waste is being removed to ensure the implementation of the Cradle to Grave principle.								
Environmental Authorisations must be available on site at all times.																	
Land Ownership	Socio-Economic	Unlawful access or access resulting in damage to private land.	N	-3	-3	-4	-4	-14	The mine should ensure that the mine plan and layout is made available to landowners.	-	-1	-2	-1	-1	-5	CbA	
									Regular meetings must be held with surface right owners to ensure that all concerns are proactively addressed.								
									All activities should remain within the approved contracts.								
Potential Grave Owners	Socio-Economic	The potential for graves in this area have been raised as a possibility during the Scoping Phase. Poor planning could result in the damage of potential structures.	N	-3	-3	-4	-4	-14	A detailed grave inventory must be developed to ensure that all graves are documented.	-	-1	-2	-1	-1	-5	CbA	
									The management of graves must be undertaken in consultation with either the SAHRA and/or the owners of the graves.								



Wonderstone – Driekuil Mining Expansion and Consolidation Project  
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Project Ref: 202110  
Version: Final Draft – Stakeholder Review

Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures										Mitigation Type	Rating Post Measures										Significance		
Activities		Potential Impacts	St	nt	Ex	ts	Du	rat	Pr	nt	Int	ns	SbM	Mitigation Measures	St	nt	Ex	ts	Du	rat	Pr	nt	Int	ns	SaM	CbA/R/Ir
														Where graves remain insitu, these must be fenced off, access for family must be available, the graves must be maintained and the necessary buffers must be maintained around these structures.												

Wonderstone – Driekuil Mining Expansion and Consolidation Project  
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Table 34: Construction Phase Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir - Irreversible)

Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures							Significance							
			St	at	EX	to	Du	rat	Pr		ch	Int	an	SbM	St	at	EX	to	Du	rat	Pr	ch	Int	an	SaM
<b>Construction Phase (Proposed Project)</b>																									
Land and Footprint Clearance	Geology	No direct impact - Activities will not be constructed over future planned mining areas.	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Topsoil Stripping and Stockpiling and Vegetation Removal	Topography	Alteration of topography. Removal of vegetation and the associated shaping of the area will lead to change in topographical characteristics of the area. The impact is not considered significant due to the fairly flat nature of the topography and the location of the activities in the immediate vicinity of the existing plant area.	N	-1	-4	-3	-2	-10		The footprint areas of all surface infrastructure must remain as small as possible within the parameters of operational and engineering requirements.	N	-1	-1	-2	-1	-5	R								
										Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing.															
										Designs of the facilities (WRD and PCD) must be undertaken by a registered Engineer.															
										Draw up a procedure clearly reflecting the method and phases of clearance of vegetation only in areas where construction will take place.															
										Removal of vegetation must be undertaken in a phased approach to limit surface exposure.															
										Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established.															
Clean and dirty water separation must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible.																									
Activities must remain outside of the 1;100 year flood lines, where this is not possible, the required approval must be obtained from the DWS and activities should further be restrained to the dry season.																									

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			St	at	EX	ts	Du	rest	Pr		ch	Int	en	SbM	St	at	EX	ts	Du	rest	Pr	ch	Int	en	SaM
											Linear infrastructure must follow for as far as practically possible the natural contours of the area.														
	Soil, Land Use and Land Capability	The removal and stockpiling of topsoil may lead to a loss of soil resource and land capability through erosion of the stockpiles and chemical and physical degradation. Construction of surface infrastructure could also increase the potential risk of soil erosion, dust emission, sedimentation, and disposal of waste on soil resources which will subsequently lead to the alteration of soil chemistry and quality.	N		-1	-4	-2	-2		-9	<p>Unnecessary disturbances of the soils can be avoided where possible to minimise loss of arable soils.</p> <p>Adhere to Soil Stripping, Soil Stockpiling and Soil Management Plan.</p> <p>Topsoil should be stockpiled on designated topsoil stockpiles, unless around linear infrastructure, where the topsoil could be stockpiled next to the linear structure.</p> <p>Where possible separate stockpiling of different soil type groups (to obtain the highest post-mining land capability).</p> <p>Should three (3) meters be exceeded for topsoil stockpiles, erosion control measures should be implemented.</p> <p>Temporary stockpiles must be protected by means of suitable geotextiles such as hessian sheeting, silt curtains, sandbags etc. to prevent contamination of runoff and sedimentation of freshwater resources in the vicinity of the surface infrastructure and should remain outside of the buffer zones.</p> <p>Stockpiles should be revegetated to establish a vegetation cover as an erosion control measure. These stockpiles should also be kept alien vegetation free at all times to prevent loss of soil quality</p> <p>Soil Stockpile Management:</p> <ul style="list-style-type: none"> <li>☛ Prior to the commencement of the proposed activities, available topsoil material should be estimated before being removed, and stockpiled for future use;</li> <li>☛ Surface and subsoil material should be stockpiled separately. This is to prevent the mixing of the fertile topsoil with the nutrient limited subsoils;</li> </ul>	N		-1	-1	-2	-1		-5	R					

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			St	at	EX	ts	Du	rs	Pr		sh	Int	SbM	St	at	EX	ts	Du	rs	Pr	sh	Int	SaM	CbA/R/Ir			
											<ul style="list-style-type: none"> <li>The duration of stockpiling must be minimised where possible;</li> <li>Ensure all stockpiles (especially topsoil) are clearly and permanently demarcated and located in defined no-go areas;</li> <li>Stockpile height should be restricted to that which can deposited without additional traversing by machinery. A Maximum height of 2-3 m is therefore proposed, and the stockpile should be treated with temporary soil stabilisation methods; such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion. Also, the use of lime to stabilise soil pH levels;</li> <li>Temporary berms can be installed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion; and</li> <li>A short-term fertilizer program should be based on the soil chemical status after levelling and should consist of a pre-seeding lime and fertilizer application, an application with the seeding process as well as a maintenance application for 2 to 3years during the rollover mining rehabilitation until the area can be declared as self-sustaining by an appropriately qualified soil scientist.</li> </ul>																
		Most of the proposed development area comprises shallow soils which do not depict signs of wetness or an indicator of lateral flows in the vadose zone. These soils include Mispah and Glenrosa soil forms. The best suited	N		-1	-3	-2	-2		-8	<p>All surface development footprint areas should remain within demarcated areas as far as possible and disturbance of soil profiles to be limited to what is essential</p> <p>Water from clean water structures should be discharged back into the watercourse in an attenuated manner</p> <p>Implementation of strict erosion control measures to limit loss of soil and sedimentation of the watercourse within the proposed project</p>	N		-1	-1	-2	-1					-5	R				

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			St	at	Ex	te	Du	ent	Pr		sh	Int	en	SbM	St	at	Ex	te	Du	ent	Pr	sh	Int	en
		<p>hydropedological recharge mechanism definition for these areas is responsive shallow. The hydropedological processes are deemed to have a limited contribution (if any) to the wetlands identified in the north-eastern portion of the study area due to the occurrence of shallow soils (less than 30cm at most) which contribute to surface overflow flow during the rainy season. The anticipated dominant recharge mechanism of these wetlands is anticipated to be the shallow aquifer which manifest as springs at specific geological inflection points. The Driekuilspruit is mainly driven by surface runoff with contribution from groundwater processes (as reported in the hydrology report). Some portions of the smaller wetlands that feed the Driekuilspruit will be mined through while other systems will largely remain unimpacted from a hydropedological point of view. Although soils associated with interflow processes were identified within some portions of the study area which potentially feed the Driekuilspruit their</p>									Opencast Pits should not be undertaken below the groundwater level.													

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			St	at	Ex	te	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	te	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir		
		<p>contribution is limited and thus the impact of the proposed development on hydrogeological processes supporting the Driekuilspruit is likely to be low to negligible. However, this will further be confirmed once the modelling processes have been completed. The post mining scenario will likely alter the surface runoff in the greater landscape and ultimately impact on the overall water balance of the catchment. This means that quantity as well as the pattern, timing, and duration of the hydrograph would change and little to no mitigatory options are available. However, no cone of depression is foreseen since the opencast pits will not have any interaction with the groundwater.</p>																										
		<p>Soil erosion due to the alteration of the landscape and the removal of vegetation.</p>	N		-1	-4	-2	-2			-9	<p>The footprint of the proposed development and construction activities should be clearly demarcated to restrict vegetation clearing activities to within the infrastructure footprint as far as practically possible</p> <p>Bare soils within the access roads should be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast.</p> <p>Ensure that all design drawings include effective erosion control measures.</p> <p>Ensure the required erosion protection measures are monitored and corrected where necessary.</p>	N		-1	-1	-2	-1									-5	R

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			St	at	EX	te	Du	er	Pr		ch	Int	er	SbM	St	at	EX	te	Du	er	Pr	ch	Int
											<p>Natural vegetation establishment (self-succesion) will be encouraged on cleared areas, and topsoil stockpiles.</p> <p>If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.</p> <p>The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succesion not establish on rehabilitated sites.</p> <p>If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low.</p> <p>The footprint of the proposed areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible.</p> <p>No construction or project related activities may be undertaken outside of the demarcated areas.</p> <p>All disturbed areas adjacent to the proposed residential development areas should be re-vegetated with an indigenous grass mix, where necessary, to re-establish a protective cover to minimise soil erosion and dust emission</p> <p>Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters.</p> <p>Vegetation clearance and commencement of construction can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low such that the soils are less prone to compaction</p> <p>Temporary erosion control measures such as berms should be used to protect the disturbed soils during</p>												

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			St	at	EX	ts	Du	rest	Pr		sh	Int	en	SbM	St	at	EX	ts	Du	rest	Pr	sh	Int	en
											the construction phase until adequate vegetation has established													
											The contractor will ensure that all activities, material and equipment storage and personnel movement take place within the designated area.													
											Soil Compaction is usually greatest when soils are moist, so soils should be stripped when moisture content is as low as possible. If they have to be moved when wet, shovel and truck should be used as bowls scrapers create excessive compaction when moving wet soils													
											Minimize compaction during the stockpile phase by keeping stockpile soil loose and limit stockpile height to 2-3 meters height, to limit internal soil compaction (Coaltech: chamber of mines, 2007);													
											Compaction should be minimised by use of appropriate equipment and replacing soils to the greatest possible thickness in single lifts													
											Heavy equipment movement over replaced soils should be minimised													
		Soil compaction	N	-1	-4	-2	-2	-9			Minimise compaction during smoothing of replaced soils by using dozers rather than graders.	N	-1	-1	-2	-1	-5	R						
											Following placement, compacted soils should be ripped to full rooting depth (at least 60 cm or 30 cm as the bare minimum seedbed) to allow penetration of plant root)													
											All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; to avoid unnecessary compaction of the surrounding soil													
											Direct surface disturbance of the identified high clay content (i.e., Calcic Vertisols and Ferric Luvisols.) soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation)													
											Compacted soils adjacent to the mining project footprints and associated infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation													



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			St	at	EX	to	Du	rest	Pr		ch	Int	SbM	St	at	EX	to	Du	rest	Pr	ch	Int	SbM	SaM
											Compaction of soil can be mitigated by ripping the footprint and introducing both organic and inorganic fertilizers.													
		Contamination resulting from spillages of hydrocarbons, heavy metals, ineffective stormwater management around stockpiles and WRD. Movement of construction vehicles off existing/demarcated roads, leading to soil compaction and potential spillage from machinery / construction vehicles	N	-1	-3	-5	-4	-13			<p>Contamination prevention measures should be addressed in the Environmental Management Programme (EMPr) for the proposed development, and this should be implemented and made available and accessible at all times to the contractors and construction crew conducting the works on site for reference</p> <p>An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent contamination</p> <p>In the event of a breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil</p> <p>Burying of any waste including rubble, domestic waste, empty containers on the site etc. should be strictly prohibited and all construction waste must be removed to an approved disposal site</p> <p>Clean and dirty water systems must be established prior to construction.</p>	N	-1	-2	-2	-1	-6		R					
		Displacement of faunal species and human/animal conflict. Due to the fact that the site is located within an existing operation mining footprint, and directly adjacent to the plant and perimeter of the existing water management facilities, the impact is not regarded to be as significant as it would have been for a green fields site.	N	-1	-2	-4	-3	-10			<p>A record of any animal fatalities should be kept on site. The reason for the fatality and action to avoid such in the future (if possible) should be stated.</p> <p>Construction and site clearance should be undertaken in a systematic approach to allow animals to relocate from the site where construction will take place.</p> <p>All employees, or contractors on site, involved in this project, should receive a detailed induction on the expectations for the protection of fauna and flora on site.</p> <p>Clearance of vegetation must be undertaken in such a manner as to provide sufficient time for animals to relocate.</p>	N	-1	-1	-3	-1	-6		R					
			N	-3	-2	-4	-4	-13			No construction or project related activities may be undertaken outside of the demarcated areas.	N	-1	-1	-2	-3	-7		R					

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			St	at	EX	te	Du	rest	Pr		sh	Int	en	SbM	St	at	EX	te	Du	rest	Pr	sh	Int	en	SaM	CbA/R/Ir				
Activities		Potential Impacts								Mitigation Measures																				
		<p>Loss of ecological connectivity and ecosystem functioning.</p> <ul style="list-style-type: none"> <li>☛ The northern portion of the study area is located within a CBA 1, and most of the remaining sections are located in a CBA 2. As such, development within these areas may impact upon the overall conservation targets of the defined CBAs;</li> <li>☛ The study area is anticipated to host provincially protected fauna and floral species listed in the TNCO(12 of 1983), NEMBA:TOPS (2007), the Screening Tool, including protected trees under the NFA. As such, the proposed mining activities threaten potentially occurring floral and faunal SCC habitat and populations. Alteration, degradation, loss, or destruction of faunal and floral habitat: <ul style="list-style-type: none"> <li>○ Vehicles may impact potential</li> </ul> </li> </ul>								<p>The construction area should, if possible, be isolated by means of a chain link fence or demarcation tape in order to prevent animals on local migrations entering the area and being killed.</p> <p>All areas should be rehabilitated once construction has been compiled.</p> <p>At all times, ensure that sound environmental management is in place during the planning phase</p> <p>The design plans should take cognisance of sensitive habitats described during the EIA phase, in line with the DFFE mitigation hierarchy. As far as feasibly possible, sensitive habitats must be excluded from the proposed mining activities. Development should be prioritised in habitats of decreased sensitivity</p> <p>Where possible, and feasible, access roads should be kept to existing roads so to reduce further fragmentation of existing natural habitat</p> <p>The construction and operational footprints must be kept as small as possible, clearly demarcated, and prioritised in habitats of low sensitivity, in order to minimise impact on the surrounding environment</p> <p>Where site clearing is necessary, it should take place in a phased manner to allow for faunal species present to move out of the footprint area;</p> <p>All soils compacted outside that of the footprint area as a result of construction and operational activities should be ripped and reprofiled to natural levels and revegetated with indigenous vegetation. Special attention should be paid to alien and invasive plant control within these areas</p> <p>Edge effects of all operational and any planned reclamation activities, such as erosion and alien plant species proliferation, which may affect adjacent natural vegetation, need to be strictly managed adjacent to the project footprint areas. Re-vegetation efforts during rehabilitation, should focus on re-planting disturbed areas with indigenous vegetation found in the study area prior to clearing</p> <p>In terms of the DFFE (2013) mitigation hierarchy, avoidance should be undertaken primarily to avoid</p>																				

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			St	at	Ex	ts	Du	rs	Pr		sh	Int	SbM	St	at	Ex	ts	Du	rs	Pr	sh	Int	SaM	CbA/R/Ir			
		<p>sensitive habitat associated with the EN Western Highveld Sandy Grassland during construction, operation, and potentially poorly implemented rehabilitation, resulting in a consequent loss of species diversity. Vehicular movement and construction activities could additionally cause increased erosion, leading to poor growth and unsuitable conditions for the establishment of indigenous floral species and, consequently, providing sub-optimal living conditions for faunal species</p>								high impacts to floral and faunal SCC. Following this, and if not completely possible (based on location of the mined resources) a search and rescue should be undertaken prior to the vegetation clearing activities. Prior to any vegetation clearing activities taking place, an authorised search and rescue plan must be implemented for floral and faunal SCC within the proposed footprint areas. From a faunal perspective, rescue efforts should focus on SCC that lack mobility and will therefore be unable to flee disturbance Search and rescue efforts should focus on smaller, less mobile faunal SCC that will not be able to move away from the disturbances. Rescue efforts should also include a walkdown of the proposed footprint areas to detect and/or mark all (potentially) occurring floral SCC. This should be overseen by a suitably qualified specialist or nominated mine personnel in order to ensure that species loss during construction activities is kept to a minimum Where faunal and floral SCC are located in the proposed footprint areas, the appropriate permits must be obtained from the relevant authorities before any further work can be conducted  Should any floral species be found within the proposed development footprint, they must be legally relocated to suitable, similar habitat in close proximity to where they were removed from, but outside the disturbance footprint																	
		<p>The disturbance of the cleared areas may allow the establishment of alien invasive vegetation. Increased prevalence of exotic invasive species: The fact that the area will</p>	N	-2	-4	-5	-1	-12	<p>Weed eradication should be implemented on site. Areas of construction must be clearly demarcated.</p>																		
									No construction or project related activities may be undertaken outside of the demarcated areas.	N	-1	-1	-2	-1	-5	R											

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			St	at	EX	ts	Du	rs	Pr		rh	Int	SbM	St	at	EX	ts	Du	rs	Pr	rh	Int	SaM	CbA/R/Ir
		be cleared for construction creates niches that can be colonised by exotic and/or invasive species. This is compounded by the fact that trucks and other heavy machinery often act as vectors for seeds of these species.																						
		Mining infrastructure and the dumping of construction and operational waste materials in the surrounding habitat will result in floral and faunal habitat changes, which is likely to push faunal species out of their current home ranges, resulting in an increased competition for space and resources within the study area and in surrounding areas	N		-2	-4	-5	-1		-12	Smaller species of invertebrates and herpetofauna are likely to be less mobile, as such should any be observed in the footprint areas during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Operational personnel are to be educated about these species and the need for their conservation. Harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own. Infrastructure design should be environmentally sound and all vehicles in a good working condition, and all possible precautions taken to prevent potential spills and /or leaks No dumping of general or hazardous waste should take place. If any spills occur, they should be immediately cleaned up, and be disposed of at a registered waste facility.	N		-1	-1	-2	-1		-5		R			
		Potential indiscriminate fires by construction personnel may lead to uncontrolled / runaway fires, impacting on floral and faunal communities of the study area and surrounds	N		-2	-4	-5	-1		-12	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	N		-1	-1	-2	-1		-5		R			
		Increased personnel on site may result in an increased risk of harvesting/overutilisation	N		-2	-4	-5	-1		-12	No harvesting of any floral or faunal species may take place	N		-1	-1	-2	-1		-5		R			

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			St	at	EX	ts	Du			ent	Pr	ch	Int	en	SaM	CbA/R/Ir
		of SCC). Moreover, increased personnel within the study area inherently brings an increased risk of harvesting activities, threatening the current faunal populations, as well as Increased risk of hunting/trapping of local faunal species; surrounds														
		Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.	N	-2	-2	-3	-2	-9	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities.  Dust suppression should be undertaken where and when dust is present.	N	-1	-1	-2	-1	-5	CbA
		Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in	N	-3	-3	-5	-5	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters.	N	-1	-1	-2	-2	-6	CbA

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		the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.									An erosion monitoring and mitigation plan should be put in place.												
	Riparian Habitat & Wetlands	Site clearing and preparation prior to commencement of any construction related activities for the proposed Driekuil development in the study area will result the potential for increased disturbance of freshwater habitat including increased runoff and erosion, disturbance and compaction of soil as well as removal of wetland vegetation. In addition, any disturbance from site clearing will result in removal of breeding and feeding habitat for faunal species. Frequent anthropogenic and noise during site clearing is also likely to disturb biota that occupy the affected and adjacent freshwater habitat. Site clearing activities will also contribute to smothering of freshwater soil and vegetation due to increased sedimentation. Should site clearing be undertaken without the implementation of the relevant mitigation	N		-3	-2	-2	-3		-10	Ensure that all project components including mining blocks, stockpile areas and access roads as well as ancillary infrastructure should be located outside of the boundaries of the freshwater ecosystems and associated zones of regulation in line with the requirements of GN 704 and GN 509 of the National Water Act, 1998 (Act No. 36 of 1998). As such, it is recommended that the layout of the proposed Driekuil development be optimised to avoid and/or minimise impacts on the freshwater ecosystems and associated buffer zones (when calculated), wherever possible. It must also be ensured that all construction phase activities must be undertaken in the dry winter season when surface flow is reduced to decrease the severity of any potential impacts expected on the freshwater ecosystems in the receiving environment Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed Driekuil development and other proposed infrastructure activities within the study area No indiscriminate disposal of waste should take place. If any spills occur, they should be immediately cleaned up, and be disposed of at a registered waste facility Upon completion of construction activities, it must be ensured that no areas remain bare and that indigenous floral species are reintroduced All soil compacted as a result of construction activities should be ripped and reprofiled to natural levels and revegetated with indigenous vegetation. Special attention should be paid to alien and invasive plant control within these areas Appropriate sanitary facilities must be provided during the construction phase and all waste must be removed to an appropriate waste facility	N		-2	-1	-1	-2		-6	CbA			

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			St	at	EX	ts	Du	ent	Pr		sh	Int	en	SbM	St	at	EX	ts	Du	ent	Pr	sh	Int	en	SaM	CbA/R/Ir	
Activities		measures, the intensity of impacts premitigation is likely to be of “moderate to high” risk significance. The impacts of site clearing are anticipated to be relatively localised however, any impacts on any of the single freshwater ecosystems will likely affect neighbouring areas further downstream as the systems are relatively well connected. Impacts on the freshwater ecosystems are considered likely to occur on a medium to long term basis. The implementation of appropriate mitigation measures during the construction and operational phase of the development are considered likely to reduce the impact significance on the affected freshwater ecosystems.																									
		The potential for construction activities associated with the creation and operation of mining block areas will permanently alter the freshwater ecosystems that fall within the footprint area of mining blocks 2N, 3N and 5N. As such, mining these blocks will involve removing the wetland soil, vegetation	N		-3	-2	-2	-3			-10																

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			St	at	EX	ts	Du	rs	Pr		sh	Int	en	SbM	St	at	EX	ts	Du	rs	Pr	sh	Int	en	SaM	CbA/R/Ir
		and most importantly altering the hydrological drivers, flow and connectivity of these freshwater ecosystems as a result of deep excavations (up to 25 m in depth) within these systems. The intensity of impacts premitigation is thus considered to be of “high” risk significance									might be required if the freshwater ecosystems are confirmed during the EIA phase of the proposed Driekuil development in which impacts cannot be effectively reduced by employing mitigation measures.															
		The freshwater ecosystems situated outside of the confines of these mining blocks, stockpiling areas and access roads whilst not anticipated to be directly affected are subject to indirect impacts such as desiccation, alteration of wetland vegetation, and smothering by dust and soil from mining and stockpile areas adjacent. The intensity of impacts is likely to be of “moderate” risk significance, premitigation	N		-2	-2	-2	-2			It is also advised that the access roads be reassessed or alternatively maintain the footprint of the existing gravel access road to reduce impacts on freshwater ecosystems															
		The creation of stockpile areas and access roads through a freshwater ecosystem considered likely to result in smothering of hydromorphic soils, contribute to soil compaction and largely alter infiltration rates and flow of water within the landscape and subsequently within the freshwater ecosystems.	N		-3	-2	-2	-3			Optimisation of the proposed Driekuil development layout to move the components, specifically the stockpiling areas outside of the freshwater ecosystems and associated buffer zones are considered the best form of mitigation to be employed															



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			St	at	EX	ts	Du	ent	Pr		ch	Int	en	SbM	St	at	EX	ts	Du	ent	Pr	ch	Int	en	SaM
		The creation of the stockpile areas and access roads will also contribute increased likelihood of dust generation, altered drainage patterns due to increased impermeable surfaces and associated runoff. The intensity of impact pre-mitigation is considered to be “moderate to high”. Whilst impacts are likely to be of a localised nature, any potential impacts are considered likely to affect neighbouring freshwater ecosystems downgradient due to the connectivity of the freshwater ecosystems in the region.																							
		It is considered likely that the development of additional clean and dirty water separation systems and associated stormwater infrastructure will occur as part of the proposed Driekuil development and may lead to loss of catchment yield from stormwater containment, altered vegetation community structure and diversity due to moisture stress and reduction in volume of water entering the freshwater environment, leading to reduced recharge. Impacts are	N		-2	-2	-2	-2			-8	The construction and operational footprints must be kept as small as possible to minimise impact on the surrounding environment and loss of catchment yield													

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			St	at	EX	ts	Du	rs	Pr		sh	Int	en	SbM	St	at	EX	ts	Du	rs	Pr	sh	Int	en	SaM
		considered likely to be of a “moderate” impact significance and may affect neighbouring areas downgradient, before the implementation of mitigation measures																							
		The operation and maintenance of the proposed Driekuil development as well as the operation of clean and dirty water separation systems may result in increased risk of pollution of surface water, increased risk of sediment transport in surface runoff from impermeable surfaces, altered vegetation community composition, increased risk of erosion and altered runoff patterns within the landscape. These impacts are considered likely to pose a “moderate” impact significance with impacts considered to occur on a localised scale, pre-mitigation	N		-2	-2	-2	-2			-8		Pollution prevention through infrastructure design in order to prevent, eliminate and/or control potential pollution of soil, groundwater and surface water as well as the implementation of a monitoring programme to detect and prevent the pollution of soil, surface and groundwater												
		The freshwater ecosystems that are not recommended to be directly affected by the stockpile areas and access roads are considered likely to be affected by indirect impacts which include smothering of vegetation by increased dust and soil and increased runoff from	N		-2	-2	-2	-2			-8		Care must be taken to ensure no restriction of flow which leads to increased velocity and turbulence of flow during runoff events within the freshwater ecosystems												

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			St	at	EX	ts	Du	rs	Pr		ch	Int	en	SbM	St	at	EX	ts	Du	rs	Pr	ch	Int	en	SaM
Activities		Potential Impacts									Mitigation Measures														
		impermeable surfaces within the catchment of these freshwater ecosystems. Impact significance is anticipated to be of “low to moderate” significance pre-mitigation																							
	Hydrology	The removal of vegetation can lead to increased surface runoff, which may in turn alter natural surface water flows and increase siltation of watercourses.	N	-3	-2	-2	-3	-10		<p>Clearance of vegetation must be limited as far as possible.</p> <p>The SWMP must be implemented as a first step during the construction phase.</p> <p>Stormwater management measures must be implemented around the pits, stockpiles and dumps.</p> <p>Water quality sampling must be implemented upstream and downstream of construction areas. Specific parameters that should be monitored include SS and turbidity. They should be kept within the baseline water quality range.</p> <p>Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide.</p> <p>Refuelling must be undertaken over hard park bundled areas that adequately capture and contain spillages.</p> <p>Machinery and vehicles should be parked on appropriately lined areas.</p> <p>Drip trays must be used under leaking machinery.</p> <p>Spillages should be reported immediately, and spill kits should be readily available at all times.</p> <p>Monitoring of the Driekuilspruit upstream and downstream of the proposed infrastructure.</p>	N	-1	-1	-1	-2	-5	CbA								
	Geohydrology	No direct impact during the construction phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heritage	Based on the current information obtained for the area at a desktop level it is anticipated that any heritage resources that occur within the proposed development area will have a Generally	N	-3	-3	-3	-4	-13		The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the	N	-1	-1	-2	3	-1	CbA								

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			St	at	Ex	te	Du	ra	Pr		ch	Int	en	SbM	St	at	Ex	te	Du	ra	Pr	ch	Int	en	SaM	CbA/R/Ir			
		Protected B (GP. B) or lower field rating and all sites should be mitigatable. Graves are of high social significance (Field rating GP A) and can be expected anywhere on the landscape.									EMP. A short summary of chance find procedures is discussed below. This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. <ul style="list-style-type: none"> <li>☞ If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.</li> <li>☞ It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.</li> <li>☞ The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.</li> <li>☞ The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP.</li> </ul> <p>The scoping study did not identify any fatal flaws to the Project from a heritage point of view. To comply with the National Heritage Resources Act (Act 25 of 1999) it is recommended that a Phase 1</p>																		

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			St	at	EX	ts	Du	rest	Pr		sh	Int	en	SbM	St	at	EX	ts	Du	rest	Pr	sh	Int	en	SaM	CbA/R/Ir																										
	Visual	Soil stripping and footprint clearance	N	-2	-2	-1	-1																																													
		Additional placement of lighting in the area.	N	-3	-2	-1	0																																													
	Air Quality	Dust-fallout	N	-2	-2	-3	-2																																													
	Noise	The area is located within the mining area. Noise impacts are not considered to be significant but can occur during excavation and construction activities.	N	-1	-2	-1	-1																																													

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Activities	Potential Impacts	St	at	EX	ts	Du	rest	Pr	ch	Int	en	SbM	Mitigation Measures	St	at	EX	ts	Du	rest	Pr	ch	Int	en	SaM	CbA/R/Ir
	Social	The continuation with mining activities is deemed to be in line with development priorities to support the local economy in the district and province. The mining activities are expected to have both positive and negative socio-economic impacts on the local environment. The net effect on the socio-economic environment needs to be investigated further in the Social Impact Assessment report. Negative socio-economic impacts also increase the operational risks for the mining company within the local area. The impact assessment report will focus on measures to enhance the benefits to the local community and mitigate negative socio-economic impacts.	N	-1	-2	-1	-1	-1	-1	-1	-5	No informal settlements will be allowed as a result of the activities.	N	-1	-1	-1	-1	-1	-1	-1	-1	-1	-4	CbA	
Establishment of Surface Infrastructure	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Topography	During the site clearance activity, the required storm water management systems and shaping of land would have been completed. The construction of the TSF will have the greatest impact on the topographic setting of the area.	-	-3	-3	-3	-2	-2	-2	-2	-11	Activities should be constructed and developed within the approved design concepts. Specifically in terms of the TSF, the design and construction should be undertaken with closure design principles.	N	-2	-2	-2	-2	-2	-1	-1	-1	-1	-7	R	
		Construction activities with surrounding exposed	N	-1	-2	-3	-4	-4	-4	-4	-10	Ensure that all design drawings include effective erosion control measures and that these are	N	-1	-1	-2	-2	-2	-2	-1	-1	-1	-5	CbA	

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			St	at	EX	ts	Du	rest	Pr		ch	Int	SbM	St	at	EX	ts	Du	rest	Pr	ch	Int	SaM	CbA/R/Ir		
	Soil, Land Use and Land Capability	soil may in turn lead to soil erosion.									implemented during the establishment of the infrastructure. Areas of construction must be clearly demarcated. No construction or project related activities may be undertaken outside of the demarcated areas. Clean and dirty water systems must be established prior to construction and must be maintained throughout the life of mine. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. Provision should be to protect the soils from hydrocarbon spills/drips by the vehicles and refuelling trucks entering and existing the site (i.e. grid system or permanently manned personnel to treat soils during periods of refuelling). Where erosion gully are formed, these will be recorded on the IsoMetrix system for immediate action.															
	Terrestrial Ecology (Fauna & Flora)	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-				
	Riparian Habitat & Hydrology	The establishment of activities in close proximity to riparian systems could lead to encroachment of activities.	N	-3	-2	-2	-3	-10		Activities should be constructed and developed within the approved design concepts. Limit vehicle/machinery activity within the active channel as well as in the riparian zone to what is absolutely essential. Disturbances to the riparian zone should be limited as far as possible. Re-fuelling of vehicles to take place outside of the riparian zone & associated buffer zones, on sealed surfaces. Hot spots for build-up of debris must be identified and debris must be regularly removed to prevent flooding and damage of infrastructure. In this regard, special mention is made of periods following high rainfall and subsequent high instream water volumes.	N	-1	-1	-1	-2	-5	CbA									

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			St	at	EX	ts	Du	Pr	Int		SbM	St	at	EX	ts	Du	Pr	Int	SaM
Activities										<p>The riparian zone must be monitored for alien vegetation encroachment and all alien vegetation/weeds must be removed according to a suitable alien vegetation control plan.</p> <p>Any erosion or gully formation must be identified on an ongoing basis and re-profiled and revegetated accordingly.</p> <p>Ongoing groundwater monitoring must be undertaken.</p>									
	Heritage	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Visual	Impact on the visual character of the site.	N	-2	-2	-4	-3	-11	<p>Activities should be restricted within the approved footprints.</p> <p><del>The TSF should be lined according to the identified designs.</del></p>	N	-2	-1	-2	-2	-7	R			
	Air Quality	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Noise	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Waste Management	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Soils	Contamination of soil resources due to hydrocarbon spills.	N	-1	-2	-4	-4	-11	<p>Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas.</p> <p>All contaminated material at the Exploration Activities must be contained in mobile sumps. The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/transported, that no spillage will occur.</p> <p>All fuels and soils must be stored in appropriate containers.</p> <p>Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.</p> <p>Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages</p>	N	-1	-2	-1	-1	-5	CbA			



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			St	at	EX	ts	Du	rest	Pr		ch	Int	SbM	St	at	EX	ts	Du	rest	Pr	ch	Int	SaM	CbA/R/Ir
Activities											<p>Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.</p> <p>A spill kit must be provided to be used in the event of a spill.</p> <p>If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.</p> <p>Safety signage must be used at designated storage areas.</p> <p>All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.</p>													
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	<p>Chemical toilets must be readily available to employees where permanent infrastructure is not available.</p> <p>Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.</p>	-	-1	-2	-1	-1	-5	CbA							
			The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	<p>Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste.</p> <p>Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.</p>	N	-1	-1	-2	-1	-5	CbA							
Riparian Habitat		Various non perennial drainage channels are present in this area. The Richmond Dam is also in close proximity to the drilling activities.								<p>Remain at all times outside of the 1:100 year flood line of the watercourses unless approved in terms of the necessary legislation.</p>	N	-1	-1	-1	-2	-5	CbA							
											<p>No waste is permitted to be disposed of within any freshwater habitat, and ensure that all waste are removed to an appropriate disposal facility.</p>													

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			St	at	EX	ts	Du	ent	Pr		ch	Int	en	SbM	St	at	EX	ts	Du	ent	Pr	ch	Int	en	SaM	CbA/R/Ir	
Activities		Potential Impacts																									
	Surface Water	Handling of Hazardous Waste within workshops and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	N	-3	-2	-2	-4	-11	<p>Ongoing Biomonitoring Monitoring should be undertaken at the upstream and downstream points of perennial point sources.</p> <p>Ongoing surface water monitoring should be undertaken at the upstream and downstream monitoring points.</p> <p>The storm water management plans should be implemented in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses.</p> <p>Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.</p> <p>Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.</p> <p>A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.</p> <p>Waste management training must be implemented on site.</p> <p>Clear signs informing staff of waste management practices must be implemented on site.</p> <p>Hazardous waste handling should only take place within banded and/or lined areas.</p> <p>Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.</p> <p>Clean spills, if occur within 24 hours.</p> <p>Documentation of removal and safe disposal must be available on site.</p> <p>The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a legally compliant manner.</p> <p>Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident.</p> <p>Regular Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.</p>	N	-1	-1	-2	-2	-6	CbA											
			Handling and Storing of Domestic Waste should have no impact on the	N/A	-1	-2	-3	-3		-9	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	N	-1	-1	-2	-1	-5	CbA									

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Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures							SbM	Mitigation Type	Rating Post Measures							Significance								
			St	at	EX	ts	Du	rest	Pr			ch	Int	en	St	at	EX	ts	Du	rest	Pr	ch	Int	en	SaM	CbA/R/Ir	
Activities		surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.									Waste management training must be implemented on site. regular inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. Waste should be disposed of by licensed companies to licenced facilities. Recycling practices must be investigated and implemented on site.																
	Groundwater	Large scale hydrocarbon spills could be present at the mining area	N		-3	-1	-4	-4		-12	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (READ, Catchment Management Agency/DWS). All equipment and machinery should be kept in good working order. A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if occur within 24 hours.	N		-2	-1	-2	-1									-6	CbA
			Handling or Hazardous Waste within workshops and general mine area.	N		-2	-2	-2	-4			-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators). Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site.	N		-1	-1	-2	-2								-6

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			St	at	EX	ts	Du	Pr	Int		SbM	St	at	EX	ts	Du	Pr	Int	SaM
Activities		Potential Impacts								Mitigation Measures									
										Hazardous waste handling should only take place within banded and/or lined areas, with a capacity of at least 110% of the volume stored.									
										Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.									
										Documentation of removal and safe disposal must be available on site.									
		Handling and Storing of Domestic Waste	N	-2	-2	-1	-2	-7		Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	N	-1	-1	-1	-2	-5	CbA		
Waste management training must be implemented on site.																			
Clear signs informing staff of waste management practices must be implemented on site.																			
All waste must be removed by licensed contractors and disposed of at a licensed landfill site.																			
As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.																			
Recycling practices must be investigated and implemented on site where practical.																			
Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the landfill site can be detected.																			
Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Table 35: Operational Phase Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir - Irreversible)

Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures					Mitigation Type	Rating Post Measures					Significance		
			Statu e	Exten + Durat ion	Prob abil ity	Inten sity	Sb M		Statu e	Exten + Durat ion	Prob abil ity	Inten sity	Sa M	CbA/R/Ir		
<b>Operational Phase (New Activities)</b>																
Geological Management	Mining Rights Area	Regulation 23 of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The mine has been awarded a Mining Right by the DMR and therefore has an obligation to give effect to the following: The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.	N	-3	-2	-4	-4	-13	Mining must be undertaken in line with the Mining Works Programme.	P	3	2	3	3	11	CbA
Topographic Management	General Infrastructure Placement and Rehabilitation	No further impacts foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	
Air Quality	Dust as a result of mining activities	The operation of the opencast pits could lead to an increase in dust dispersion.	N	-3	-2	-2	-2	-9	The dust monitoring network and dust suppression programme must be implemented and maintained throughout the operational phase of the mine.  Using water carts with boom sprayers	N	-1	-1	-2	1	-3	R

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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr
								or wet suppression systems when loading and unloading activities occur (where feasible) is recommended.								
	Excessive Dust - Windblown Emissions and Unpaved Roads	Dust emanating from active mining activities, vehicles utilising unpaved access roads and production activities may affect photosynthesis, respiration and transpiration of floral species and allow the penetration of phytotoxic gaseous pollutants. This in turn may lead to visible injuries to tree bark and leaves, a decreased productivity of grasses, changes in faunal grazing and browsing patterns, changes to invertebrate communities dependant on floral species and changes to vegetation community composition over the long term (Farmer, 1993).	N	-2	-2	-3	-2	-9	Its recommendations include reducing vehicle speed, reducing vehicle weights and limiting the amount of traffic using the roads between 10-20km/hr.  Ongoing dust suppression of unpaved access roads must be undertaken. If monitoring data indicates that wet suppression is not effective and the monitoring data indicates increasing trends beyond the approved Regulatory Limits, the mine should investigate more effective suppressant techniques - such as a chemical suppressant or dust-side.  However in terms of the use of water for	N	-2	-1	-2	-1	-6	R

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			Statu	Exten	Durat	Prob	Inten	Sb		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr	
Activities		Potential Impacts							Mitigation Measures									
									dust suppression, water abstraction from the Driekuilspruit and boreholes has the potential to result in impacts related to water stress and loss of habitat as a result. The Driekuilspruit is an ephemeral system, where surface water supply is largely seasonal and associated with both groundwater and surface rainfall. Groundwater assists in maintaining the permanent wet zones, while the temporary and seasonal zones are largely maintained through surface water contributions. Desiccation of the temporary and seasonal zones due to loss of water is considered possible as a result of abstraction activities if the volumes of water abstracted are not controlled. It is therefore recommended that the mine assess the value of using alternative dust suppression methods for wet									

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			Statu	Exten	Durat	Prob	Inten			Statu	Exten	Durat	Prob	Inten	Sa M	CbA/R/lr
								<p>suppression as part of ongoing Water Conservation and Demand Management.</p> <p>Ongoing dust control using extractors and filters at the relevant plants and workshops.</p> <p>Dust monitoring should be undertaken in line with the recommendations of the air quality specialist.</p> <p>Vehicles carrying loose and fine aggregate should be covered with tarpaulins or sheets at all times.</p>								
Soil, Land Use and Capability Management	Soil Erosion	<p>The majority of the study area comprises of gently sloping terrain, with a robust vegetation cover (predominantly grass), which restricts the erosion hazard, such that physical soil properties take precedence over slope gradient as a determining criterion for erosion risk for this assessment. The soil erosion impact is therefore considered to be relatively low for all the identified soils under prevailing conditions</p>	N	-1	-3	-2	-2	-8	<p>Bare (un-vegetated) soils can be regularly dampened with water to suppress dust, especially when strong winds prevail, but should not result in additional runoff.</p>	N	-1	-1	-2	-1	-2	R
		<p>Although the identified soils seemingly display relatively low susceptibility to erosion under current conditions, their susceptibility to erosion will largely increase once disturbed, i.e. if the protective vegetation cover were to be removed, for instance; which would directly expose the soils to wind and stormwater.</p>	N	-1	-3	-4	-2	-10	<p>Erosion berms should be installed to prevent the formation of erosion gullies as a result of the formation of any</p>							



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			Statu	Exten	Durat	Prob	Inten	Sb		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr
									<p>preferential surface flow paths, and the possible sedimentation of the assessed sites and surrounding watercourses.</p> <p>The recommended Storm Water Management Plan as provided for in this report or subsequent approval in terms of a WUL should be implemented on site - specifically regarding clean and dirty water management.</p> <p>Areas where visible erosion is present should be identified by means of dedicated monthly walkthroughs by a designated mine employee.</p> <p>Specific attention must be paid to erosion-prone areas such as watercourse crossings and the Driekuilspruit Dam wall, particularly after a heavy rainfall event.</p> <p>Erosion and sedimentation</p>								

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			Status	Extension	Duration	Probability	Intensity		SbM	Status	Extension	Duration	Probability	Intensity	SaM	CbA/R/IR
Activities								control measures must be implemented where required in line with the freshwater ecologist and engineering recommendations – this may include the construction of berms and the implementation of gabion structures and reno mattresses.								
								Any erosion noted must be rectified as soon as possible, by means on infilling, the application of topsoil, and stabilisation of the area through the application of hessian, jute or similar biodegradable material, particularly on steep slopes. Revegetation with a locally indigenous grass species mixture is recommended.								
	Soil Compaction	Heavy equipment and vehicular traffic during mining operations has resulted in significant soil compaction on some of the identified soils.	N	-1	-3	-2	-2	-8	Vehicular movement should be strictly restricted within the existing roads minimise compaction footprint.	N	-1	-1	-2	-1	-2	R

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			Statu	Exten	Durat	Prob	Inten	Sb		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr
									Soil compaction (where encountered) can be alleviated by lightly ripping the soils to at least 60cm below ground surface to physically loosen the soil during decommissioning, prior to rehabilitation.								
									Efforts should be made to reclaim all the associated facilities and infrastructure as soon as they are no longer in use, to prevent complex accumulated impacts. Bare or compacted soils should be ripped or scarified, graded and temporarily cordoned off to present access. Brush-packing of such areas is recommended to protect the soils, regulate topsoil temperatures, catch and protect seed, retain moisture and increase water infiltration (van Oudtshoorn, 2015). Natural revegetation and self-succession of such areas should								

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			Statu	Exten	Durat	Prob	Inten	Sb		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr
									be allowed where possible, and topsoil applied where necessary to replenish the seed bank (such as within areas where topsoil has been eroded). Should indigenous vegetation cover however not be achieved within a period of one year, seeding with a locally indigenous grass species mixture should take place.								
									This condition is included to replace the conditions regarding specifications in terms of fertilising, seeding and revegetation in the EMPr, 2010: Where indigenous vegetation cover not be achieved within a period of one year after rehabilitation, seeding with a locally indigenous grass species mixture should take place. This should be undertaken in consultation with a suitably qualified pedologist and ecologist.								

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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr
Activities		Potential Impacts							Mitigation Measures							
	Soil Contamination	<p>All the identified soils are considered to be equally predisposed to contamination, as contamination sources are generally unpredictable and typically occur as incidental spills or leaks in similar settings. The soil contamination impact is therefore largely dependent on the nature, locality, volume and/or concentration of the contaminant of concern.</p> <p>Contamination sources can include hydrocarbon spills, runoff from the beneficiation plant.</p>	N	-1	-2	-4	-4	-11	<p>A strict waste management plan should be developed to guide the construction crew and must be adhered to throughout the project.</p> <p>Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide and in terms of a maintenance plan. Maintenance records must be kept on file.</p> <p>Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages.</p> <p>Machinery and vehicles should be parked on appropriately lined areas.</p> <p>Drip trays must be used under leaking machinery.</p> <p>Spillages should be reported</p>	N	-1	-1	-2	-1	-5	R

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			Statu	Exten	Durat	Prob	Inten	Sb		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr
Activities		Potential Impacts							Mitigation Measures								
									<p>immediately, and spill kits should be readily available at all times. Vehicles and Machinery will be regularly maintained. Maintenance programmes will be established and implemented.</p> <p>Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas.</p> <p>Spill and absorption kits must be available and readily accessible at the parking and offloading areas. There should always be a spare kit available at any given time.</p> <p>If necessary, the polluted soils will be remediated and affected areas rehabilitated.</p> <p>A spill prevention and emergency spill</p>								

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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa	M
								response plan, as well as dust suppression, and fire prevention plans should also be compiled and incorporated to the safety protocols to guide the construction works. The spill prevention plan should adequately address clean-up measures, to mitigate ingress of contaminants into the soils and potential leaching of contaminants into groundwater in the event of a spill and/or a leak of potentially hazardous substances during the construction phase and throughout the lifespan of the proposed development. This should be implemented and made available and accessible to all contractors and construction crew.								
								The recommended Storm Water Management Plan as provided for in this report or								

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			Statu	Exten	Durat	Prob	Inten			Statu	Exten	Durat	Prob	Inten	Sa M	CbA/R/lr
									subsequent approval in terms of a WUL should be implemented on site - specifically regarding clean and dirty water management.							
Management of Ecology	Loss or Degradation of habitat	Loss of vegetation and associated floral and faunal habitat due to ongoing disturbances as part of operational mining activities may take place, either through clearance of vegetation in the event of future infrastructure expansion, encroachment of infrastructure beyond the approved mining footprint, or through disturbances such as dumping of waste or overburden material. Indirect impacts on vegetation and impacts to habitat availability are also likely to occur as a result of edge effects resulting from the ongoing operations and future mine closure. Such edge effects may include erosion and alien vegetation invasion or proliferation. Loss of vegetation may impact directly on priority floral species, including potential SCC, and will directly impact on faunal habitat availability and condition.	N	-2	-2	-3	-4	-11	The mining footprint areas must remain within current approved footprint area, unless environmental authorisation is obtained (if required) to expand these areas.  Disturbance to natural vegetation adjacent to the active mining areas must be avoided.  No littering or dumping of waste, discard or overburden material within natural areas beyond the active mining area may be allowed. Where such material is already present, this material must be removed to a suitable waste facility or to a designated area within the existing mine footprint area.	N	-1	-2	-3	-3	-9	R



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Activities		Potential Impacts	Statu	Exten	Durat	Prob	Inten	Sb	Mitigation Measures	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr
									<p>The Rocky Outcrop habitat unit should remain conserved and no further impacts or encroachment of mine activities may occur in this habitat unit. The existing fence should remain in place.</p> <p>Impacts and further disturbance to the watercourse habitat unit must be avoided, unless required as part of rehabilitation actions and approved storm- and surface water management interventions.</p> <p>Mine vehicles should only utilise existing access roads and indiscriminate driving beyond these roads and through natural vegetation may not be allowed.</p> <p>Should operations expand into the Open Thornveld habitat unit in future, detailed floral surveys must be undertaken within these areas</p>							

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Activities		Potential Impacts	Statu	Exten	Durat	Prob	Inten	Sb	Mitigation Measures	Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr
									<p>prior to site clearance, as these areas provide suitable habitat for potential floral SCC and TOPS-listed species to occur. Surveys should take place within the growing and flowering season of the applicable species. This is also of importance considering the Vulnerable (VU) conservation status of the corresponding Klerksdorp Thornveld vegetation type, the location of this habitat unit within a designated CBA2 site, and due to these areas comprising remnant vegetation according to the NBA (2018).</p> <p>Known ecological corridors, such as watercourses, within the project area and between the project area and adjacent properties should not be impacted further to ensure faunal movement patterns</p>								

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			Statu	Exten	Durat	Prob	Inten			Statu	Exten	Durat	Prob	Inten	Sa M	CbA/R/lr
									are not completely restricted.							
	Loss of SCC, protected or TOPS-listed species	It is important to note that no floral or faunal SCC, including threatened species, were recorded during the field assessment, although there is a possibility for such species, as well as TOPS-listed species, to occur within the project area. One nationally protected tree species was recorded within the Modified habitat unit and three provincially protected floral species were recorded within the Rocky Outcrop habitat unit. The activities outlined below may impact on known and potential floral and faunal SCC, protected and TOPS-listed species.	N	-3	-3	-2	-3	-11	All operational personnel must be educated in environmental awareness and be trained to identify floral and faunal SCC with a high probability of occurring in the project area. General biodiversity education and awareness programmes must also be implemented as part of the staff induction and site-specific training must be given to personnel when working in the vicinity of areas of identified with a high ecological sensitivity.  Further disturbance to natural vegetation adjacent to the active mining areas must be avoided, and should operations expand into the Open Thornveld habitat unit in future, detailed floral surveys must be undertaken within these areas prior to	N	-1	-3	-1	-2	-7	R

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			Statu	Exten	Durat	Prob	Inten	Sb		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr
									<p>site clearance to confirm the presence or absence of priority floral species.</p> <p>Impacts on confirmed provincially and nationally protected floral species during operations must be actively avoided by avoiding impacts and disturbances to areas identified as having increased ecological sensitivity. Note must be made of the location of the Vachellia erioloba tree located in the vicinity of the residential area.</p> <p>Where disturbances to potential floral SCC and TOPS-listed floral species, and known provincially protected floral species are unavoidable, the following permits must be obtained prior to site clearance:</p> <ul style="list-style-type: none"> <li>o Should floral SCC, nationally protected tree species in terms of the National Forests Act (Act No.</li> </ul>								

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Activities		Potential Impacts	Statu	Exten	Durat	Prob	Inten	Sb	Mitigation Measures	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr	
									84 of 1998) or TOPS-listed floral species be removed, damaged, or disturbed in any way, the required permits have to be obtained from DEFF. Should protected floral species in terms of the TNCO (No. 12 of 1983) be removed, damaged or disturbed in any way, a permit for this purpose must be obtained from the NWREAD.  Should priority floral species be impacted by mining activities, it is recommended that such species be rescued and relocated (where possible and depending on the growth form and relocation of each species), to suitable, similar habitat in the vicinity of their original locations under the supervision of a suitably qualified botanist or horticulturalist. Prior authorisation to do so must be obtained from DEFF or NWREAD,								

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Activities		Potential Impacts	Statu	Exten	Durat	Prob	Inten	Sb	Mitigation Measures	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr	
									<p>depending on the conservation status of the species. A description of the rescue and relocation process and procedure, including a map indicating the current location of priority floral species to be relocated, a map indicating where the plants will be relocated to and details of how the long-term survival of the plants once relocated will be ensured. If approved by the relevant department, the approved rescue and relocation procedure must be implemented.</p> <p>It is important to note that should the NWBMA (Act No. 4 of 2016) come into effect, that <i>Huernia zebrina</i> will no longer be provincially protected, however the two fern species recorded, <i>Pellaea calomelanos</i> and <i>Cheilanthes hirta</i> will remain protected under this Act.</p>								

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Activities		Potential Impacts	Statu	Exten	Durat	Prob	Inten	Sb	Mitigation Measures	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr
									<p>Should the NWBMA (Act No. 4 of 2016) come into effect, it is important that the mine take note of the content of this act, as it will be applicable to management of the mine’s biodiversity.</p> <p>Should any other floral species listed as being of conservation concern in the North West Province, but not recorded during the current field assessment, be encountered during any future surveys and ecological assessments, a floral specialist should be consulted and the permitting procedures as described above should be followed.</p> <p>All employees, or contractors on site, involved in this project, should receive a detailed induction on the expectations for the protection of fauna and flora on site.</p> <p>No harvesting or</p>							

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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr
Activities		Potential Impacts						Mitigation Measures						M		
								<p>collection of floral species from natural areas surrounding the project footprint should be allowed by mining personnel.</p> <p>No wild animals may under any circumstance be handled or removed by mining personnel.</p> <p>Hunting or killing of fauna is prohibited.</p> <p>Include photo of specific species of importance on a notice board for employees to be made aware.</p>								
	Erosion impacting on floral and faunal habitat	<p>Activities (i.e. excavations and vegetation clearing) within the project area have exposed soil to environmental factors including rainfall and wind. Furthermore, the use of heavy machinery or vehicles has in some places led to the compaction of disturbed and exposed soils. This increases the soil bulk density, reduces the porosity and the hydraulic conductivity thus resulting in a greater potential for erosion. Unchecked erosion can have negative implications on floral and faunal habitat, possible loss of floral SCC and alteration of community structure.</p>	N	-1	-2	-3	-2	-8	<p>Areas where visible erosion is present should be identified by means of dedicated monthly walkthroughs by a designated mine employee.</p> <p>Specific attention must be paid to erosion-prone areas such as watercourse crossings and the Driekuilspruit Dam wall, particularly after a heavy rainfall event.</p> <p>Erosion and sedimentation</p>	N	-1	-1	-2	-1	-5	R



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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa	M
								control measures must be implemented where required in line with the freshwater ecologist and engineering recommendations – this may include the construction of berms and the implementation of gabion structures and reno mattresses.								
								Any erosion noted must be rectified as soon as possible, by means on infilling, the application of topsoil, and stabilisation of the area through the application of hessian, jute or similar biodegradable material, particularly on steep slopes. Revegetation with a locally indigenous grass species mixture is recommended.								
								Bare or compacted soils should be ripped or scarified, graded and temporarily cordoned off to present access.								

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			Statu	Exten	Durat	Prob	Inten			Statu	Exten	Durat	Prob	Inten	Sa M	CbA/R/lr
								Brush-packing of such areas is recommended to protect the soils, regulate topsoil temperatures, catch and protect seed, retain moisture and increase water infiltration (van Oudtshoorn, 2015). Natural revegetation and self-succession of such areas should be allowed where possible, and topsoil applied where necessary to replenish the seed bank (such as within areas where topsoil has been eroded). Should indigenous vegetation cover however not be achieved within a period of one year, seeding with a locally indigenous grass species mixture should take place.								
	Proliferation of alien and invasive vegetation	Alien invasive species proliferation can result in the loss of floral habitat in the surrounding areas as many invasive species outcompete their indigenous counterparts. Existing alien invasive vegetation within the project area act as a source of reproductive materials, while the soil is likely to harbour existing seed banks that facilitate continued persistence of alien species. For this reason, alien and invasive species management within the project area should be an ongoing process.	N	-2	-2	-4	-2	-10	Dedicated monthly walkthroughs by a designated mine employee should be undertaken to identify priority areas for alien invasive species control, including watercourses, and to allow for early	N	-1	-1	-2	-1	-5	R

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Activities		Potential Impacts	Statu	Exten	Durat	Prob	Inten	Sb	Mitigation Measures	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr	
		A relatively high diversity of alien species was recorded within the mining area, along access roads and within areas where historical disturbances have taken place.							<p>detection of alien invasive species establishment.</p> <p>Areas where alien vegetation has been removed in previous years should be included in the monthly walkthroughs in order to identify areas where the re-emergence of coppicing of such populations.</p> <p>The eradication of NEMBA Category 1b invasive species, should be prioritised.</p> <p>The mechanical removal of incidental alien invasive species on an ad hoc basis, when noted, may continue provided that no unnecessary disturbance to natural vegetation occurs, and provided that removal is overseen by a dedicated mine employee.</p> <p>An Alien and Invasive Plant Control Plan has been developed for the mine (STS,</p>								

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Activities		Potential Impacts															
								2019b), which should be implemented. This control plan identifies the existing fenced off infrastructure are and disturbed areas within the active mining footprint as medium priority areas and the remainder of the open veld areas as low priority areas. Three control phases are identified, namely initial control, follow up control and maintenance, while mechanical, chemical and a combination of mechanical and chemical control are proposed. Further to the STS (2019) Alien and Invasive Plant Control Plan, it is recommended that mechanical methods be implemented prior to considering chemical means, due to the current low infestation levels and the risk associated with introducing chemicals into the environment. Smaller plants may									

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									<p>be uprooted by hand, while cutting/felling followed by cut stump treatment could be used for larger plants. For larger, dense stands of aliens, chemical control measures may however have to be implemented.</p> <p>It is important that the eradication of <i>Stoebe plumosa</i>, a species that will negatively affect the grazing capacity in post-closure land use if allowed to proliferate, be included in the control plan. Mechanical control methods include the digging up of whole plants by chopping the root about 10cm below the soil surface with a digging implement such as a hoe.</p> <p>In eradication and control of alien invasive plant species, follow up work is essential to control seedlings and prevent coppicing.</p> <p>No listed invasive</p>							

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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr
								species should be utilised in landscaping of office and residential gardens to reduce the risk of these species spreading into natural areas (currently a combination of indigenous and alien species are present in landscaped gardens).  Include photo of specific species of importance on a notice board for employees to be made aware.								
	Bush Encroachment	The project area and surrounding region has been significantly affected by indigenous bush encroachment, with the main encroaching woody species being <i>Vachellia karroo</i> , together with <i>Senegalia caffra</i> , <i>Vachellia hebeclada</i> , and the shrubs <i>Asparagus larycinus</i> and <i>Stoebe plumosa</i> . The initial cause of this encroachment may be partially attributed to historical grazing activities, which was, in addition to small-scale quarrying, also the only pre-mining land use within the project area (EMPr, 2010). Continued bush encroachment within the project area and surrounding region takes place due to anthropogenic disturbances and current land management practices. Bush encroachment may lead to numerous further impacts, including depletion of soil moisture, prevention of the establishment of other species, displacement of indigenous vegetation, reduction in wildlife habitat and ecosystem diversity, and suppression of the production of palatable forage for wildlife and livestock which may lead to an overall	N	-2	-3	-4	-2	-11	Dedicated monthly walkthroughs by a designated mine employee should be undertaken to identify priority areas for bush encroachment control, with specific mention of the Open Thornveld habitat unit.  Where dense, impenetrable stands of encroacher species are noted, with specific mention of <i>Vachellia karroo</i> , these are to be selectively thinned by cutting/	N	-2	-3	-3	-1	-9	R

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Activities		<p>reduction in grazing and wildlife carrying capacity. Should bush encroachment be allowed to continue unabated within the project area, it may impact on achieving the proposed end land use of grazing as a result of reduced carrying and grazing capacity. Proliferation of woody species was noted to be a concern within the Open Thornveld and Watercourse habitat units. Specific activities which could lead to bush encroachment include:</p> <ul style="list-style-type: none"> <li>• Over- and underutilisation of grasses, which influences basal cover, growth vigour and inter-species competition.</li> <li>• Lack of grazing by livestock during periods of high rainfall, when additional grazing land is not required by neighbouring farmers.</li> <li>• Incorrect stocking rates of livestock and game, within the open thornveld areas and the current game camp.</li> <li>• Lack of an appropriate fire regime - burning is required to maintain the grass vigour as it kills off the dead sward and moribund material and allows for new growth to emerge.</li> <li>• Lack of fire or trampling damage to young woody plants.</li> <li>• Lack of browsers.</li> <li>• Disturbances to natural vegetation structure as a result of general mining operations may encourage emergence of woody species and seedling establishment.</li> <li>• Loss of soil fertility due to erosion.</li> </ul>							<p>felling to reduce competition with grasses and follow up cut stump treatment. Cut material can be made available for firewood or used in brush-packing of bare or eroded soils.</p> <p>An appropriate fire regime should be developed and implemented for the mine, preferably in association and consultation with surrounding land owners. Should this not be feasible, a high number of cattle should be allowed to graze the open thornveld within the project area over a short time period, annually and prior to the onset of winter, to lessen the volume of moribund grass, which pose the risk of leading to uncontrolled fires, and to stimulate graminoid growth. It is important that overgrazing is prevented should this option be considered (Umfaan, 2006).</p>								

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Activities		Potential Impacts						Mitigation Measures							
								In developing a fire management plan, the following should be carefully considered: <ul style="list-style-type: none"> <li>o Best practice principles, methods and procedures;</li> <li>o The season of burning;</li> <li>o The type of fire;</li> <li>o Frequency of burning;</li> <li>o Percentage of land area to be burned at a time;</li> <li>o The presence of fire breaks;</li> <li>o Training of staff;</li> <li>o Procurement of firefighting equipment;</li> <li>o Site preparation, i.e. removal of alien species that could contribute a high fuel load;</li> <li>o Potential impacts on small animals;</li> <li>o After fire management; and</li> <li>o Approval from the surrounding land owners and the relevant authorities.</li> </ul> Another control method that may be investigated is the introduction of browsers such as goats to control							



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									woody species, however the various advantages and disadvantages of this method should be carefully considered.  Stocking rates of livestock and game, within both the open veld and game camp areas must be appropriate to avoid both over- and underutilisation of grasses.								
	Excessive Dust	Dust emanating from active mining activities, vehicles utilising unpaved access roads and production activities may affect photosynthesis, respiration and transpiration of floral species and allow the penetration of phytotoxic gaseous pollutants. This in turn may lead to visible injuries to tree bark and leaves, a decreased productivity of grasses, changes in faunal grazing and browsing patterns, changes to invertebrate communities dependant on floral species and changes to vegetation community composition over the long term (Farmer, 1993).	N	-2	-2	-3	-2	-9	Ongoing dust suppression of unpaved access roads must be undertaken.  Ongoing dust control using extractors and filters at the relevant plants and workshops.  Dust monitoring should be undertaken in line with the recommendations of the air quality specialist.	N	-1	-1	-2	-1	-5	R	
	Displacement of Fauna due to Disturbances	Disturbance to faunal communities will continue to occur during the operational and closure phases of the project, with a postulated increase during the closure phase as the area of influence increases arising from the implementation of rehabilitation and closure plans (removal of	N	-1	-3	-3	-3	-10	No wild animals may under any circumstance be handled or be interfered with by workers or	N	-1	-1	-2	-1	-5	R	

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Activities		<p>infrastructure, etc). Elevated levels of disturbance will likely result in local faunal species moving away from the area and a subsequent localised decline in biodiversity (as certain species are more sensitive to disturbances). Fauna occurring in adjacent habitats, outside of the direct impact zone, may also be negatively affected by activities that may alter or impede movement corridors. In the case of the project area, faunal communities have been exposed to varying degrees of disturbance through continued mining activities, and as such species persisting within the area likely show elevated tolerance to these disturbances.</p> <p>During the field assessment, areas with elevated noise and habitat disturbances were associated with the main pit, internal roads entering/exiting the main pit, powder plant, waste rock dump and to a lesser extent, the main plant and offices</p>						<p>personnel.</p> <p>Hunting/ killing of fauna is prohibited.</p> <p>No dumping of waste may take place outside of the project area, as this may impede faunal movement or reduce or alter faunal habitat availability.</p> <p>Movement through areas of high ecological sensitivity must be regulated.</p> <p>Ensure the corridors between important faunal habitats are not impeded and remain intact to facilitate faunal dispersal.</p> <p>Biodiversity education and awareness programmes must be implemented. This programme should form part of the staff induction in which topics such as vigilant driving techniques, the necessary procedures for working in close proximity to</p>								

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	Animal fatalities	Accidental death of animals on the roads.	N	-2	-3	-2	-5	-10	<p>sensitive habitats. Furthermore, site-specific training must be given to personnel when working in the vicinity of areas of identified with a high ecological sensitivity.</p> <p>Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings.</p> <p>A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes.</p> <p>A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads.</p> <p>Vehicles may only travel on demarcated roads on site.</p>	N	-1	-3	-1	-3	-1	R
	Habitat Fragmentation	Habitat transformation and fragmentation, coupled with increased human presence and associated impacts (persecution, hunting, trapping and intensification of land management) have had a negative impact on some faunal	N	-1	-3	-3	-3	-10	Known ecological corridors, such as watercourses, within the project area and between	P	2	1	3	3	9	R

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Activities		Potential Impacts							Mitigation Measures							
		<p>species composition (particularly true for large ungulates and carnivores, with their presence in most cases largely restricted to conservation (informal and formal) areas)) while others mammal species benefit from agriculture and various disturbance regimes (Power &amp; Olivier, 2019).</p> <p>The non-perennial Driekuilspruit (and unnamed tributary) and Driekuilspruit and Black Quarry Dams provide important habitat for aquatic and semi-aquatic fauna extending through the project area and into the surrounding landscape matrix (with more intact systems). These systems also act as important longitudinal corridors, facilitating dispersal through the fragmented landscape for terrestrial and semi-aquatic species, especially important in semi-arid landscapes (Seymour &amp; Simmons, 2008). The standing water within this system will attract avian, amphibian and water dependant reptile and mammal species. In many cases, as is also likely with the project area, development of areas surrounding watercourses often displaces wildlife into these corridors. The effective conservation of these habitats is vital for the conservation of biodiversity as well as the provision of ecosystem goods and services. The role of these systems in supporting faunal species is particularly important in areas where human activities have increased the fragmentation of natural habitats. Several small impoundments are located in proximity to the project area and may be utilised opportunistically by faunal species.</p>						the project area and adjacent properties should not be impacted further to ensure faunal movement patterns are not completely restricted.								
Hydrological and Storm Water Management	Opencast Pit Development	Loss of runoff and water quantity to downstream users.	N	-2	-2	-2	-2	-8	Runoff from upslope undisturbed areas must be diverted around dirty areas	P	2	3	3	3	11	R
	Opencast Pit Development	Impact on water quality of the Driekuilspruit.	N	-3	-3	-2	-3	-11	Implementation of a closed SWMP.	P	2	3	3	3	11	R
	Opencast Pit Development	Loss of runoff and water quantity to downstream users.	N	-2	-2	-2	-2	-8	Runoff from upslope undisturbed areas	P	2	3	3	3	11	R

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			Statu	Exten	Durat	Prob	Inten			Statu	Exten	Durat	Prob	Inten	Sa M	CbA/R/lr
									must be diverted around dirty areas							
	Use of heavy machinery, trucks and vehicles during the operational phase.	Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality.	N	-2	-2	-2	-3	-9	<p>Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide and in terms of a maintenance plan. Maintenance records must be kept on file.</p> <p>Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages.</p> <p>Machinery and vehicles should be parked on appropriately lined areas.</p> <p>Drip trays must be used under leaking machinery.</p> <p>Spillages should be reported immediately, and spill kits should be readily available at all times. Vehicles and Machinery will be regularly maintained. Maintenance</p>	N	-1	-1	-2	-1	-5	CbA

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Activities		Potential Impacts						Mitigation Measures							
								<p>programmes will be established and implemented.</p> <p>Spill and absorption kits must be available and readily accessible at the parking and offloading areas. There should always be a spare kit available at any given time.</p> <p>If necessary, the polluted soils will be remediated and affected areas rehabilitated.</p> <p>A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled and incorporated to the safety protocols to guide the construction works. The spill prevention plan should adequately address clean-up measures, to mitigate ingress of contaminants into the soils and potential leaching of contaminants into groundwater in the</p>							

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			Status	Extent	Duration	Probability	Intensity		SbM	Status	Extent	Duration	Probability	Intensity	SaM	CbA/R/Ir
								event of a spill and/or a leak of potentially hazardous substances during the construction phase and throughout the lifespan of the proposed development. This should be implemented and made available and accessible to all contractors and construction crew.								
								Contaminated soils must be placed in skips, with a lid or in a covered area.								
								Contaminated soils may only be removed by a licenced Waste Management Company and should be disposed of at a licenced facility.								
	Use of heavy machinery, trucks and vehicles during the operational phase.	Erosion along roads leading to increased siltation and sedimentation of downslope watercourses impacting on water quality.	N	-2	-2	-2	-3	-9	Berms placed at appropriate spacings across the roads to divert runoff off the roads. Regular inspections and maintenance of roads.	N	-1	-1	-2	-1	-5	CbA
								Separation of clean and dirty water								

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								areas to be maintained to prevent the risk of any contaminated runoff entering the surrounding watercourses.								
								Lined trapezoidal channels are proposed downslope of the Powder Plant. The purpose of the channels is to convey runoff to the Silt Trap, which will settle out suspended solids before overflowing into the environment.								
								Treatment of dirty water (such as silt traps) should take place prior to discharge into the receiving Driekuilspruit.								
								* The 1996 hydrocensus will be updated during the EIA phase of the project in order to confirm the locations and private groundwater uses within the NOMR. The results of the assessment will be used to prepare a final management plan to protect								
Groundwater Impact Assessment	Impact of point sources on groundwater resources.	Groundwater contamination from mining activities and mine waste rock placement - Available monitoring information suggests that existing mining activities and waste rock deposition causes groundwater contamination. If left unmanaged, these could result in adverse impacts during the operational phase, especially to sensitive receptors such as the Driekuilspruit and existing private groundwater users. The operational impact of contaminated groundwater on the salt load to the Driekuilspruit and its tributaries will be specifically assessed during the EIA phase of the project.	N	-2	-2	-2	-3	-9		N	-2	-2	-2	-3	-9	Irr during operational phase, without management measures.



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									groundwater availability. The management plan will include an assessment of the impact of groundwater abstraction by WST for use at the operations. * Hydrocensus boreholes identified will be included in the groundwater monitoring programme to be developed for the project. Both groundwater levels and quality monitoring will be undertaken in the hydrocensus boreholes. * In addition to the potential impacts on private groundwater users, recharge from the shallow aquifer to wetlands must be protected to ensure good wetland functioning. Measures will be developed during the EIA phase of the project to achieve this. * Groundwater management will focus on reducing the volume of leachate that is								

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Activities		Potential Impacts							Mitigation Measures								
									available for infiltration to the aquifers through control of stormwater runoff into the mining area and containment of dirty runoff and seepage in suitably designed facilities. No ponding will be allowed over disturbed areas. * Specific groundwater management measures will be developed to reduce the impacts of existing and planned future mine waste deposition. A number of management options will be tested to develop the preferred alternative in this regard. * The amendments to the existing groundwater monitoring programme based on the outcome of the groundwater impact assessment must be considered for implementation. The groundwater monitoring information is crucial to gauging								

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Activities		Potential Impacts							Mitigation Measures								
									the effectiveness of groundwater management measures. It is further important to establish trends with reliable information that can be used to develop mine closure strategies and apply for closure. * No mining activities should take place within the 1:100 year flood line of the Driekuilspruit and its associated water courses. * The outcome of the EIA phase hydrocensus must be used to re-assess the impact of mining on existing groundwater use and the possible exclusion zones to protect this groundwater use. * Surface water runoff must be carefully managed to prevent ponding of water over disturbed areas. * A sound groundwater monitoring programme must be implemented and maintained for the project. The								

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									monitoring programme must consider the indicator elements identified for the mining area as well as groundwater levels and on-site rainfall measurements.							
Heritage	General Infrastructure Placement and Rehabilitation	No further impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	CbA
Visual Management	General Infrastructure Placement and Rehabilitation	No further impacts foreseen. Impacts in terms of dust management is included in the relevant air quality section.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noise Management	Noise	Increased mining operations could result in an increase in noise.	N	-2	-2	-2	-3	-9	Mining operations should be limited to day time.  Complaints register should be available on site. Should complaints be lodged these should be addressed within 24 hours by providing an action plan, or intent to respond.	N	-1	-1	-2	-1	-5	CbA
Socio-Economic Management	Social	The increase in the life of mine should result in an overall improved Socio-Economic setting.	P	3	3	3	3	12	Management measures as stipulated in the EMP should be met.	P	3	3	5	4	15	CbA
Waste Management and Handling Hydrocarbon	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Soils	Contamination of soil resources due to hydrocarbon spills.	N	-1	-2	-4	-4	-11	Storage of fuels and oils, the refuelling of	N	-1	-1	-2	-1	-5	R

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spills within the Mining Area and the management of Domestic and Hazardous Waste								vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas.  All fuels and soils must be stored in appropriate containers.  Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.  Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages  Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.  A spill kit must be provided to be used in the event of a spill.							

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								<p>If a spill occurs, the contaminated soil must be removed immediately.</p> <p>Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.</p> <p>Safety signage must be used at designated storage areas.</p> <p>All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.</p> <p>A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled and</p>								

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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa	CbA/R/lr
									incorporated to the safety protocols to guide the construction works. The spill prevention plan should adequately address clean-up measures, to mitigate ingress of contaminants into the soils and potential leaching of contaminants into groundwater in the event of a spill and/or a leak of potentially hazardous substances during the construction phase and throughout the lifespan of the proposed development. This should be implemented and made available and accessible to all contractors and construction crew.							
	Ecology	No further additional impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riparian Habitat and Wetlands	Impact on the aquatic life in watercourses.	N	-2	-3	-3	-3	-11	No material may be dumped, disposed of or stockpiled within any of the watercourses in the vicinity of the mine. If any spills occur, they must be immediately cleaned up; and	N	-1	-2	-1	-1	-5	CBA

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			Statu	Exten	Durat	Prob	Inten	Sb		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/lr
									No dirty water (as defined by GN704) is to be released into the receiving environment.								
	Surface Water & Groundwater	Handling of Hazardous Waste.	N	-3	-2	-2	-4	-11	<p>Clean and Dirty water separation systems should be incorporated in terms of the approved SWMP or any approved update thereafter.</p> <p>A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.</p> <p>Waste management training must be implemented on site.</p> <p>Clear signs informing staff of waste management practices must be implemented on site.</p> <p>Clear signs informing staff of waste management practices must be implemented on site.</p>	N	-1	-1	-2	-1	-5	CbA	



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			Statu	Exten	Durat	Prob	Inten		Sb	Statu	Exten	Durat	Prob	Inten	Sa
								<p>Hazardous waste handling should only take place within bunded and/or lined areas.</p> <p>Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMRE and/or DWS).</p> <p>Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.</p> <p>Documentation of removal and safe disposal must be kept on record and in good order.</p> <p>The mine will adopt a cradle-to grave (inspection of disposal sites) approach to ensure that the waste is removed and disposed of in a legally compliant manner.</p> <p>Weekly inspections of Storm Water</p>							

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			Statu	Exten	Durat	Prob	Inten			Statu	Exten	Durat	Prob	Inten	Sa M	CbA/R/lr
									Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.							
		Handling and Storing of Domestic Waste	N	-3	-2	-2	-4	-11	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All waste must be removed by licensed contractors and disposed of at a licensed landfill site. As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented. Recycling practices must be investigated	N	-1	-1	-2	-1	-5	CbA

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			Statu	Exten	Durat	Prob	Inten	Sb	M		Statu	Exten	Durat	Prob	Inten	Sa	M	CbA/R/ir	
										and implemented on site. Records and manifests of waste disposal should be kept on file and in good order. Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the landfill site can be detected.									
	Air Quality	No direct impact	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	
	Heritage	No direct impact	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	
	Noise	No direct impact	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	
	Visual	No direct impact	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	
	Social	No direct impact	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	

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Table 36: Decommissioning Phase Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir - Irreversible)

Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures						Significance							
			St	at	Ex	te	Du	rat		Pr	ch	Int	en	SbM	Mitigation Measures	St	at	Ex	te	Du	rat	Pr	ch
<b>Decommissioning and Closure Phase (All Activities)</b>																							
Legal Requirements (Environmental Permits)	Legal Compliance	Unlawful activities could lead to NWA Directives and Section 24G Rectification fines.	N	-4	-3	-2	-5	-14	<p>A legal assessment of all activities must be undertaken annually to ensure that all are licensed.</p> <p>A detailed closure plan must be developed and submitted to the relevant departments for approval.</p> <p>All legally appointed personnel responsible or involved in activities on site must receive training on the requirements of the Environmental Authorisations and EMPs</p> <p>Quarterly decommissioning must be undertaken, on the lawful implementation of the Environmental Authorisation</p> <p>Environmental Authorisations must be available on site at all times.</p> <p>The legal register must be updated to indicate all updated activities.</p>	P	4	3	5	5	17	CbA							
-	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-								
Natural flow of land management	Topography	Removal of infrastructure may impact on the topography.	N	-2	-3	-4	-4	-13	<p>Linear Infrastructure constructed by the mine will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with</p>	P	3	3	4	4	14	CbA							

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			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir			
											<p>the Integrated Development Plan of the area ant eh local authorities.</p> <p>Ensure the entire site remains fenced for the duration of rehabilitation.</p> <p>Retain security access control to the site for the duration of rehabilitation.</p> <p>All product stockpile to be removed from site.</p> <p>All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage and resale value have however not been incorporated into the closure cost estimate as per the legislative requirements)</p> <p>All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR).</p> <p>All surface infrastructure would be demolished and removed to a depth of 500mm. Any infrastructure below 500mm will be sealed, made safe and left in situ.</p>																		

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			St	at	Ex	fa	Du	Pr	ch		Int	en	SbM	St	at	Ex	fa	Du	Pr	ch	Int	en	SaM	CbA/R/Ir		
											<p>All fences erected around the infrastructure be dismantled and either disposed of at a permitted disposal site or sold off as scrap (provided that these structures will no longer be required by the post mining land owner). Fences erected to cordon off dangerous excavations will remain in place and will be maintained as and when required.</p> <p>Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.</p>															
Soil, Land Use and Capability Management	Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the contamination of soils.	N	-1	-2	-4	-4			-11	<p>Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas.</p> <p>Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.</p> <p>Any emulsion or other contaminants should be collected and the soils remediated immediately.</p> <p>Undertake a Contaminated Land Assessment around areas used for diesel storage and supply to determine</p>	-	-1	-2	-1	-1							-5	-		

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			St	at	Ex	fa	Du	rat			Pr	ch	Int	en	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir
										whether remediation of the areas are required.																
		Contamination of soils as a result of a lack of sanitary services	N		-1	-2	-4	-4	-11	Chemical toilets must be readily available to contractors.  Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-		-1	-2	-1	-1						-5	-			
		Loss of soils due to decommissioning activities present on site.	N		-1	-2	-4	-4	-11	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas.  Soil compaction (where encountered) can be alleviated by lightly ripping the soils to at least 45 cm below ground surface to physically loosen the soil during decommissioning, prior to rehabilitation.  It is highly recommended that the wetland areas and associated buffer zones (as associated with the identified Katspruit/Kroonstad soil forms) be preserved and rehabilitated accordingly.  Efforts should be made to reclaim all the associated facilities and infrastructure as soon as they are no longer in use, to prevent complex accumulated impacts.  Inert uncontaminated	N		-1	-2	-1	-1								-5	CbA	

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Activities		Potential Impacts	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SbM	Mitigation Measures	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir									
														<p>building rubble should be removed to an authorised disposal site, or alternatively reused within the study area e.g. on road surfaces were permitted by the landowner(s).</p> <p>Schedule construction works such that there are no unprecedented delays, such that the soil exposure duration is reduced to absolute minimum.</p> <p>Vegetation clearance and earthworks should be preferably scheduled during the dry (low rainfall) season when chances of runoff and water erosion are minimal, and soil moisture content is also minimal, in order to avoid excessive soil erosion through stormwater runoff.</p> <p>Avoid clearing the vegetation cover all at once; the study area can be divided into subsections that will be progressively cleared only when required according to the construction schedule.</p> <p>Vegetation clearance and construction activities should preferably commence on the up-gradient section and gradually progress down-gradient, such that the undeveloped portion can continuously serve as a natural erosion control, sediment retention, and</p>																					



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			St	at	Ex	fa	Du	Pr	ch		Int	en	SbM	St	at	Ex	fa	Du	Pr	ch	Int	en	SaM	CbA/R/Ir
											stormwater attenuation mechanism.  Implement a strict penalty fine system for rule breaking with regard to vehicular movement.  Maintain clean and dirty water systems and undertake regular monitoring and maintenance thereof.													
Dust Management	Excessive Dust - Rehabilitation Activities	Use of bulldozers for levelling of topsoil during rehabilitation can also contribute significantly to dust emissions.	N	-2	-2	-3	-2	-9		Its recommendations include reducing vehicle speed, reducing vehicle weights and limiting the amount of traffic using the roads between 10-20km/hr.  Ongoing dust suppression of unpaved access roads must be undertaken. If monitoring data indicates that wet suppression is not effective and the monitoring data indicates increasing trends beyond the approved Regulatory Limits, the mine should investigate more effective suppressant techniques - such as a chemical suppressant or dust-a side.  Avoid the operation of bulldozers at areas exposed to the wind during dry, windy conditions.  Designate and maintain the routes that bulldozers travel between work areas.  Visual monitoring of dust	N	-2	-1	-1	-1	-5	CbA							

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			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir	
											conditions in the vicinity of bulldozer operations, so that activities can be ceased or modified when elevated dust levels occur.																
Ecological Management	Loss or Degradation of habitat	<p>Loss of vegetation and associated floral and faunal habitat due to ongoing disturbances as part of operational mining activities may take place, either through clearance of vegetation in the event of future infrastructure expansion, encroachment of infrastructure beyond the approved mining footprint, or through disturbances such as dumping of waste or overburden material. Indirect impacts on vegetation and impacts to habitat availability are also likely to occur as a result of edge effects resulting from the ongoing operations and future mine closure. Such edge effects may include erosion and alien vegetation invasion or proliferation. Loss of vegetation may impact directly on priority floral species, including potential SCC, and will directly impact on faunal habitat availability and condition.</p> <p>The following potential activities may impact on loss and degradation of habitat:</p> <p>Closure Phase</p> <ul style="list-style-type: none"> <li>• Removal of infrastructure beyond the existing areas of disturbance.</li> <li>• Removal of mine</li> </ul>	N		-2	-3	-4	-4	-13	<p>All rehabilitation activities must remain within current approved footprint area, unless environmental authorisation is obtained (if required) to expand these areas.</p> <p>Disturbance to natural vegetation adjacent to the active mining areas must be avoided.</p> <p>No littering or dumping of waste, discard or overburden material within natural areas beyond the active mining area may be allowed. Where such material is already present, this material must be removed to a suitable waste facility or to a designated area within the existing mine footprint area.</p> <p>The Rocky Outcrop habitat unit should remain conserved and no further impacts or encroachment of mine activities may occur in this habitat unit. The existing fence should remain in place.</p> <p>Impacts and further disturbance to the watercourse habitat unit must be avoided, unless required as part of rehabilitation actions and approved storm- and surface</p>																	

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			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir	
		<p>infrastructure and decommissioning activities within or in proximity to areas of increased ecological sensitivity, resulting in impacts on these habitats due to edge effects.</p> <ul style="list-style-type: none"> <li>Vehicle movement beyond the existing areas of disturbance.</li> <li>Ineffective rehabilitation of exposed and impacted areas and failure to implement progressive backfilling, rehabilitation and revegetation according to an approved rehabilitation plan.</li> </ul>									<p>water management interventions.</p> <p>Mine vehicles should only utilise existing access roads and indiscriminate driving beyond these roads and through natural vegetation may not be allowed.</p> <p>Known ecological corridors, such as watercourses, within the project area and between the project area and adjacent properties should not be impacted further to ensure faunal movement patterns are not completely restricted.</p>																
	Loss of SCC, protected or TOPS-listed species	<p>It is important to note that no floral or faunal SCC, including threatened species, were recorded during the field assessment, although there is a possibility for such species, as well as TOPS-listed species, to occur within the project area. One nationally protected tree species was recorded within the Modified habitat unit and three provincially protected floral species were recorded within the Rocky Outcrop habitat unit.</p> <p>The activities outlined below may impact on known and potential floral and faunal SCC, protected and TOPS-listed species.</p> <p>Closure Phase</p> <ul style="list-style-type: none"> <li>Removal of infrastructure beyond the existing areas of disturbance.</li> <li>Removal of mine</li> </ul>	N		-3	-3	-2		-3		-11	<p>All personnel must be educated in environmental awareness and be trained to identify floral and faunal SCC with a high probability of occurring in the project area. General biodiversity education and awareness programmes must also be implemented as part of the staff induction and site-specific training must be given to personnel when working in the vicinity of areas of identified with a high ecological sensitivity.</p> <p>Further disturbance to natural vegetation adjacent to the active mining areas must be avoided, and should operations expand into the Open Thornveld habitat unit in future, detailed floral surveys must be undertaken within these areas prior to</p>	N		-1	-3		-1		-2						-7	CbA

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Activities		Potential Impacts	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SbM	Mitigation Measures	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir
		<p>infrastructure and decommissioning activities within or in proximity to areas of increased ecological sensitivity, resulting in impacts on these habitats due to edge effects.</p> <ul style="list-style-type: none"> <li>• Vehicle movement beyond the existing areas of disturbance and within areas known to provide habitat for protected floral species and other potential priority floral and faunal species.</li> <li>• Illegal harvesting of known and potential floral SCC, protected floral species, medicinal species and floral species with a limited representation within the project area.</li> <li>• Increased human presence resulting in negative faunal interactions with humans (poaching, trapping and potential collection of priority faunal species).</li> </ul>												<p>site clearance to confirm the presence or absence of priority floral species.</p> <p>Impacts on confirmed provincially and nationally protected floral species during operations must be actively avoided by avoiding impacts and disturbances to areas identified as having increased ecological sensitivity. Note must be made of the location of the Vachellia erioloba tree located in the vicinity of the residential area.</p> <p>Where disturbances to potential floral SCC and TOPS-listed floral species, and known provincially protected floral species are unavoidable, the following permits must be obtained prior to site clearance:</p> <ul style="list-style-type: none"> <li>o Should floral SCC, nationally protected tree species in terms of the National Forests Act (Act No. 84 of 1998) or TOPS-listed floral species be removed, damaged, or disturbed in any way, the required permits have to be obtained from DEFF.</li> <li>o Should protected floral species in terms of the TNCO (No. 12 of 1983) be removed, damaged or disturbed in any way, a permit for this purpose must be obtained from the NWREAD.</li> </ul> <p>Should priority floral species</p>												

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Activities		Potential Impacts	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SbM	Mitigation Measures	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir
														<p>be impacted by mining activities, it is recommended that such species be rescued and relocated (where possible and depending on the growth form and relocation of each species), to suitable, similar habitat in the vicinity of their original locations under the supervision of a suitably qualified botanist or horticulturalist. Prior authorisation to do so must be obtained from DEFF or NWREAD, depending on the conservation status of the species. A description of the rescue and relocation process and procedure, including a map indicating the current location of priority floral species to be relocated, a map indicating where the plants will be relocated to and details of how the long-term survival of the plants once relocated will be ensured. If approved by the relevant department, the approved rescue and relocation procedure must be implemented.</p> <p>It is important to note that should the NWBMA (Act No. 4 of 2016) come into effect, that <i>Huernia zebrina</i> will no longer be provincially protected, however the two fern species recorded, <i>Pellaea calomelanos</i> and <i>Cheilanthes hirta</i> will remain protected under this Act.</p>												

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Activities		Potential Impacts	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SbM	Mitigation Measures	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir									
														<p>Should the NWBMA (Act No. 4 of 2016) come into effect, it is important that the mine take note of the content of this act, as it will be applicable to management of the mine’s biodiversity.</p> <p>Should any other floral species listed as being of conservation concern in the North West Province, but not recorded during the current field assessment, be encountered during any future surveys and ecological assessments, a floral specialist should be consulted and the permitting procedures as described above should be followed.</p> <p>No harvesting or collection of floral species from natural areas surrounding the project footprint should be allowed by mining personnel.</p> <p>No wild animals may under any circumstance be handled or removed by mining personnel.</p> <p>Hunting or killing of fauna is prohibited.</p>																					
	Erosion impacting on floral and faunal habitat	Activities (i.e. excavations and vegetation clearing) within the project area have exposed soil to environmental factors including rainfall and wind. Furthermore, the use of heavy machinery or vehicles has in some places led to the	N		-2	-3	-3	-3					-11	<p>Areas where visible erosion is present should be identified by means of dedicated monthly walkthroughs by a designated mine employee.</p> <p>Specific attention must be paid to erosion-prone areas</p>	N		-1	-2	-2	-2					-7	CbA									

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Activities		Potential Impacts	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SbM	Mitigation Measures	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir
		<p>compaction of disturbed and exposed soils. This increases the soil bulk density, reduces the porosity and the hydraulic conductivity thus resulting in a greater potential for erosion. Unchecked erosion can have negative implications on floral and faunal habitat, possible loss of floral SCC and alteration of community structure. Erosion can result from the following activities:</p> <p>Closure Phase</p> <ul style="list-style-type: none"> <li>• Loss of vegetation cover and exposure of soils during infrastructure removal and decommissioning activities.</li> <li>• Movement of heavy machinery, vehicles and removal of infrastructure resulting in compaction of soils, vegetation loss and habitat degradation.</li> <li>• Ineffective rehabilitation of exposed and impacted areas.</li> <li>• Ineffective rectification of erosion.</li> <li>• Ineffective rehabilitation and revegetation according to an approved rehabilitation plan.</li> </ul>												<p>such as watercourse crossings and the Driekuilspruit Dam wall, particularly after a heavy rainfall event.</p> <p>Erosion and sedimentation control measures must be implemented where required in line with the freshwater ecologist and engineering recommendations – this may include the construction of berms and the implementation of gabion structures and reno mattresses.</p> <p>Any erosion noted must be rectified as soon as possible, by means on infilling, the application of topsoil, and stabilisation of the area through the application of hessian, jute or similar biodegradable material, particularly on steep slopes. Revegetation with a locally indigenous grass species mixture is recommended.</p> <p>Bare or compacted soils should be ripped or scarified, graded and temporarily cordoned off to present access. Brush-packing of such areas is recommended to protect the soils, regulate topsoil temperatures, catch and protect seed, retain moisture and increase water infiltration (van Oudtshoorn, 2015). Natural revegetation and self-succession of such</p>												

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			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM
											areas should be allowed where possible, and topsoil applied where necessary to replenish the seed bank (such as within areas where topsoil has been eroded). Should indigenous vegetation cover however not be achieved within a period of one year, seeding with a locally indigenous grass species mixture should take place.														
	Proliferation of alien and invasive vegetation	<p>Alien invasive species proliferation can result in the loss of floral habitat in the surrounding areas as many invasive species outcompete their indigenous counterparts. Existing alien invasive vegetation within the project area act as a source of reproductive materials, while the soil is likely to harbour existing seed banks that facilitate continued persistence of alien species. For this reason, alien and invasive species management within the project area should be an ongoing process.</p> <p>A relatively high diversity of alien species was recorded within the mining area, along access roads and within areas where historical disturbances have taken place.</p>	N	-2	-3	-4	-3	-12		<p>Dedicated monthly walkthroughs by a designated mine employee should be undertaken to identify priority areas for alien invasive species control, including watercourses, and to allow for early detection of alien invasive species establishment. Areas where alien vegetation has been removed in previous years should be included in the monthly walkthroughs in order to identify areas where the re-emergence of coppicing of such populations.</p> <p>The eradication of NEMBA Category 1b invasive species, should be prioritised.</p> <p>The mechanical removal of incidental alien invasive species on an ad hoc basis, when noted, may continue provided that no unnecessary disturbance to natural vegetation occurs, and provided that removal is</p>	N	-1	-2	-3	-2	-8	CbA								



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			St	at	Ex	fa	Du	rat	Pr			ch	Int	en	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir			
											<p>overseen by a dedicated mine employee.</p> <p>An Alien and Invasive Plant Control Plan should be continued for implementation during the decommissioning phase.</p> <p>It is important that the eradication of Stoebe plumosa, a species that will negatively affect the grazing capacity in post-closure land use if allowed to proliferate, be included in the control plan. Mechanical control methods include the digging up of whole plants by chopping the root about 10cm below the soil surface with a digging implement such as a hoe.</p> <p>In eradication and control of alien invasive plant species, follow up work is essential to control seedlings and prevent coppicing.</p> <p>No listed invasive species should be utilised in landscaping of office and residential gardens to reduce the risk of these species spreading into natural areas (currently a combination of indigenous and alien species are present in landscaped gardens).</p>																		
	Bush Encroachment	The project area and surrounding region has been significantly affected by indigenous bush encroachment, with the main	N	-3	-3	-4	-3	-13		Dedicated monthly walkthroughs by a designated mine employee should be undertaken to identify priority areas for	N	-3	-3	-3	-2	-11	CbA												

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		<p>encroaching woody species being Vachellia karroo, together with Senegalia caffra, Vachellia hebeclada, and the shrubs Asparagus larinicus and Stoebe plumosa. The initial cause of this encroachment may be partially attributed to historical grazing activities, which was, in addition to small-scale quarrying, also the only pre-mining land use within the project area (EMPr, 2010). Continued bush encroachment within the project area and surrounding region takes place due to anthropogenic disturbances and current land management practices. Bush encroachment may lead to numerous further impacts, including depletion of soil moisture, prevention of the establishment of other species, displacement of indigenous vegetation, reduction in wildlife habitat and ecosystem diversity, and suppression of the production of palatable forage for wildlife and livestock which may lead to an overall reduction in grazing and wildlife carrying capacity. Should bush encroachment be allowed to continue unabated within the project area, it may impact on achieving the proposed end land use of grazing as a result of reduced carrying and grazing capacity. Proliferation of woody species was noted</p>								<p>bush encroachment control, with specific mention of the Open Thornveld habitat unit.</p> <p>Where dense, impenetrable stands of encroacher species are noted, with specific mention of Vachellia karroo, these are to be selectively thinned by cutting/ felling to reduce competition with grasses and follow up cut stump treatment. Cut material can be made available for firewood or used in brush-packing of bare or eroded soils.</p> <p>An appropriate fire regime should be developed and implemented for the mine, preferably in association and consultation with surrounding land owners. Should this not be feasible, a high number of cattle should be allowed to graze the open thornveld within the project area over a short time period, annually and prior to the onset of winter, to lessen the volume of moribund grass, which pose the risk of leading to uncontrolled fires, and to stimulate graminoid growth. It is important that overgrazing is prevented should this option be considered (Umfaan, 2006).</p> <p>In developing a fire management plan, the following should be carefully considered:</p> <ul style="list-style-type: none"> <li>o Best practice principles,</li> </ul>																		

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		to be a concern within the Open Thornveld and Watercourse habitat units. Specific activities which could lead to bush encroachment include: <ul style="list-style-type: none"> <li>• Failure to undertaken ongoing management of woody species density.</li> <li>• Ongoing bush encroachment during closure and decommissioning due to ongoing changes to vegetation structure and the presence of seed banks of the applicable encroacher species.</li> </ul>												methods and procedures; <ul style="list-style-type: none"> <li>o The season of burning;</li> <li>o The type of fire;</li> <li>o Frequency of burning;</li> <li>o Percentage of land area to be burned at a time;</li> <li>o The presence of fire breaks;</li> <li>o Training of staff;</li> <li>o Procurement of firefighting equipment;</li> <li>o Site preparation, i.e. removal of alien species that could contribute a high fuel load;</li> <li>o Potential impacts on small animals;</li> <li>o After fire management; and</li> <li>o Approval from the surrounding land owners and the relevant authorities.</li> </ul> <p>Another control method that may be investigated is the introduction of browsers such as goats to control woody species, however the various advantages and disadvantages of this method should be carefully considered.</p> <p>Stocking rates of livestock and game, within both the open veld and game camp areas must be appropriate to avoid both over- and underutilisation of grasses.</p>																	
	Excessive Dust	Dust emanating from active mining activities, vehicles utilising unpaved access roads and production activities may affect photosynthesis, respiration	N		-2	-2	-3	-2					-9	Ongoing dust suppression of unpaved access roads must be undertaken.  Ongoing dust control using extractors and filters at the	N		-1	-1	-2	-1					-5	CbA					

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		and transpiration of floral species and allow the penetration of phytotoxic gaseous pollutants. This in turn may lead to visible injuries to tree bark and leaves, a decreased productivity of grasses, changes in faunal grazing and browsing patterns, changes to invertebrate communities dependant on floral species and changes to vegetation community composition over the long term (Farmer, 1993).								relevant plants and workshops.  Dust monitoring should be undertaken in line with the recommendations of the air quality specialist.											
	Displacement of Fauna due to Disturbances	Disturbance to faunal communities will continue to occur during the operational and closure phases of the project, with a postulated increase during the closure phase as the area of influence increases arising from the implementation of rehabilitation and closure plans (removal of infrastructure, etc). Elevated levels of disturbance will likely result in local faunal species moving away from the area and a subsequent localised decline in biodiversity (as certain species are more sensitive to disturbances). Fauna occurring in adjacent habitats, outside of the direct impact zone, may also be negatively affected by activities that may alter or impede movement corridors. In the case of the project area, faunal communities have been exposed to varying degrees of disturbance	N		-1	-3	-2	-1	-7	No wild animals may under any circumstance be handled or be interfered with by workers or personnel.  Hunting/ killing of fauna is prohibited.  No dumping of waste may take place outside of the project area, as this may impede faunal movement or reduce or alter faunal habitat availability.  Movement through areas of high ecological sensitivity must be regulated.  Ensure the corridors between important faunal habitats are not impeded and remain intact to facilitate faunal dispersal.  Biodiversity education and awareness programmes must be implemented. This programme should form part of the staff induction in	N		-1	-1	-2	-1				-5	CbA

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		<p>through continued mining activities, and as such species persisting within the area likely show elevated tolerance to these disturbances.</p> <p>During the field assessment, areas with elevated noise and habitat disturbances were associated with the main pit, internal roads entering/exiting the main pit, powder plant, waste rock dump and to a lesser extent, the main plant and offices</p>									<p>which topics such as vigilant driving techniques, the necessary procedures for working in close proximity to sensitive habitats. Furthermore, site-specific training must be given to personnel when working in the vicinity of areas of identified with a high ecological sensitivity.</p>													
	Improvement to Habitat conditions through rehabilitation	<p>Removal and demolition of certain historic infrastructure such as the old hostel areas, the married quarters, old settling dams, soccer fields, old stores and certain access roads have taken place and vegetation has been allowed to naturally re-establish within these areas. Grass cover by indigenous species was noted to be well established within these areas during the field assessment, although a high abundance of ruderal weeds as well as dense stands of Vachellia karroo were also present. Other areas where rehabilitation has also taken place include the area south of the Driekuilspruit Dam, the Driekuilspruit Dam wall and the historic waste disposal site. Adequate vegetation cover was also noted within the aforementioned areas.</p> <p>Rehabilitation of areas during</p>	P		1	1	2	2	6	<p>A Rehabilitation Management Plan has been developed by iLEH (2019). Implementation of the measures contained in this plan should commence as soon as possible and with final closure in mind. The rehabilitation objectives outlined are as follows (iLEH, 2019):</p> <ul style="list-style-type: none"> <li>o Existing watercourses must be taken into consideration during rehabilitation.</li> <li>o The newly created topography should contribute to and blend in with the natural surrounding environment to ensure self-sustaining, stable systems with alternative utilisation potential.</li> <li>o Rehabilitation designs must be developed so that the least possible amount of material has to be shifted so as not to affect the structure of topsoil and overburden material to be used.</li> </ul>	P	2	4	3	4	13	CbA							

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		the operational and mine closure phases of the project will result in positive ecological impacts, provided that rehabilitation takes place to high standard. Where possible self-succession of vegetation within disturbed areas and bare soils available for rehabilitation should be allowed, provided that these areas are covered with topsoil. Should indigenous vegetation cover however not be achieved within a period of one year, seeding with a locally indigenous grass species mixture should take place. Current areas that require rehabilitation are the various borrow pits within the project area and the demolished pollution control dam.												<ul style="list-style-type: none"> <li>o Concurrent rehabilitation will be undertaken of the opencast pits during the current phase of mining. This will be achieved by the roll-over method of rehabilitation during which mined-out blocks are progressively backfilled with overburden material, shaped and topsoiled.</li> <li>o Careful selection of indigenous plant species, adapted to the climatic conditions, will be used to ensure a low cost, low maintenance and speedy recovery of disturbed areas. Where possible, self-seeding will be encouraged from the natural seedbed in the topsoil.</li> <li>o Soil amelioration will only be undertaken to the extent that would bring disturbed soils into equilibrium with the natural environment and not to reach agricultural levels.</li> <li>o Available material will be used as a cover layer, even if amelioration is required, to avoid further destruction of land by creating borrow pits.</li> <li>o All saleable material will be sold upon closure of the operations. Low grade material that cannot be sold, will be rehabilitated in situ.</li> <li>o The mining area will be divided into rehabilitation units as part of the development of the Final Closure Plan. A detailed rehabilitation plan will be</li> </ul>												

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														<p>developed for each unit, including a terrain analysis, soil and vegetation survey and designs of earthworks and cross sections through each area. A summary of the volumes of material to be shifted at each unit will be provided.</p> <p>o A general plan of the area will be prepared at an appropriate scale and indicating the surface topography to accurate interval spacings.</p> <p>It should be noted that the rehabilitation plan will be updated annually and for this reason the conditions provided for this impact should consider the latest approved rehabilitation measures as approved by the Competent Authority.</p> <p>In addition to the above, the following is recommended: It is proposed that rehabilitation trials be designed and established within different areas on the mine to determine the success of self-seeding within the mining areas, soil or growing medium amelioration requirements and also to determine the most suitable available site-specific rehabilitation practices and grass species mixtures in instances where topsoil availability is limited and no seed bank is present (such as eroded areas) and in</p>												

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										<p>instances where self-succession is not successful and indigenous vegetation cover is not achieved within a period of one year.</p> <p>Ongoing, progressive rehabilitation of mining infrastructure, disturbed areas and bare and exposed soils must be undertaken in line with an approved rehabilitation management plan, with the proposed end land use (grazing) and closure requirements in mind. Dedicated monthly walkthroughs by a designated mine employee should be undertaken to identify available areas for operational phase rehabilitation.</p> <p>Self-succession of vegetation within disturbed areas and bare soils available for rehabilitation should be allowed where possible, and topsoil (or another suitable, possibly ameliorated, growing medium) applied where necessary to replenish the seed bank (such as within eroded areas).</p> <p>Should self-succession not be successful, grass species for use in revegetation must include locally indigenous grass species that are well-adapted to local climatic conditions and that can provide functional use, such as grazing material as part of</p>																		



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										<p>the predefined post-mining land use.</p> <p>The addition of topsoil should take place where proposed stormwater and watercourse interventions such as berms are constructed, and within areas where the waste rock dump is proposed to be partially removed. Hessian, jute or similar biodegradable material to stabilise soils may be required on steep slopes. Should indigenous vegetation cover however not be achieved within a period of one year, seeding with a locally indigenous grass species mixture should take place.</p> <p>Areas to be rehabilitated should ideally be at slopes that do not have gradients greater than 1:3 in order to encourage successful establishment of vegetation.</p> <p>No wild animals may under any circumstance be handled or be interfered with by workers or personnel.</p>																	
	Riparian Habitat	Impact on wetlands and riparian habitats due to decommissioning activities	N	-3	-2	-2	-3	-10		Loss of catchment yield may occur as a result of rainfall within the designated dirty water areas which will be captured in the pollution control facilities of the mine dirty water system. To reduce the significance of the impact, a clean water diversion system may remain in place in order to direct	N	-1	-1	-1	-2	-5	CbA										

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											<p>clean water around the rehabilitated dirty water areas, and release into the adjacent freshwater resources in a controlled manner in order to avoid the creation of preferential flow paths, and mimic natural conditions as far as possible.</p> <p>Upon closure all haul and access roads which are no longer required, as well as all unnecessary mining infrastructure (including temporary structures) should be removed to minimise the impacts on the aquatic resources of the area beyond the life of mine. Compacted soils should be ripped and revegetated with indigenous vegetation to prevent erosion, sheet runoff, and discourage the establishment of alien floral species post-closure.</p> <p>Remain at all times outside of the 1:100 year flood line of the watercourses where not authorised.</p> <p>Rehabilitation of affected freshwater resources must ensure that riparian structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger drainage systems at pre-mining levels</p> <p>Ongoing Biodiversity</p>																		

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			St	at	Ex	fa	Du	Pr	ch		Int	SbM	St	at	Ex	fa	Du	Pr	ch	Int	SaM
										Monitoring should be undertaken at the upstream and downstream points.  Ongoing surface water monitoring should be undertaken at the upstream and downstream monitoring points.  The storm water management plans should be retained in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses.											
Wetland and Riparian Ecology Management	Rehabilitation of disturbed areas, which will include *Movement of machinery and soils *Remaining stockpiles and infrastructure such as WRD, dirty water dams, etc.; *Poorly implemented rehabilitation measures.	Removal and decommissioning of surface infrastructure, which will result in *Decommissioning of surface infrastructure; *Movement of vehicles and machinery; *Removal of waste and other materials; *Dumping of materials; *Compaction of soils.	N	-1	-1	-2	-1	-5		Strict supervision of all operational and decommissioning activities to ensure that edge effects are minimised and that activities remain within the approved footprint.  All areas affected by operational or decommissioning activities must be rehabilitated upon closure of the mine. All contaminated soils must be removed and disposed of at an appropriate facility. Affected areas must be reshaped to be free draining and reseeded with indigenous grasses which are specifically adapted to the climatic conditions of the area.  No indiscriminate driving of vehicles within wetland areas.	P	2	3	3	3	11	CBA				

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														<p>Only authorised personnel and vehicles to be permitted within wetland areas.</p> <p>No disposal of decommissioned surface infrastructure or mined materials within wetlands or within the study area. All waste to be removed to an appropriate waste facility.</p> <p>All areas of disturbance to be reprofiled, suitably rehabilitated and revegetated with suitable area specific indigenous species.</p> <p>Strict implementation of the Alien and Invasive Plant Control Plan (STS, 2019).</p> <p>All activities to be overseen by the site ECO, who should ensure compliance to the EMPr.</p> <p>Strict monitoring throughout the life of mine and post-closure is required in order to ensure the health and functioning of watercourses is retained and monitoring data must be proactively utilised to identify any possible pollutants entering the system.</p> <p>The decommissioning footprint must be clearly demarcated and no related activities, including the movement of vehicles, must</p>																					

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														<p>be permitted to occur outside of the footprint area.</p> <p>All related waste and rubble must be removed from site and disposed of according to relevant SABS standards. No waste must be permitted to enter watercourses.</p> <p>Edge effects such as dust pollution and erosion must be monitored and managed as recommended during the operational and closure phases.</p> <p>All areas affected by the Wonderstone WRD and stockpiling during the operational phase of the mine must be rehabilitated.</p> <p>Rehabilitation must ensure that watercourse structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger drainage systems at pre-mining levels.</p> <p>All areas must be re-sloped and an appropriate layer of topsoil reapplied where necessary and reseeded with indigenous plants which are specifically adapted to the climatic conditions of the area.</p> <p>It is critical that ongoing monitoring of alien vegetation is maintained post-closure, as proliferation of alien vegetation in the</p>																						

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														demolition areas is expected.												
														Ongoing biomonitoring of the watercourses must take place throughout the operational and closure phases of the mine and must continue into the post closure phase for a period of at least ten years to define latent impacts that need to be mitigated.												
	Rehabilitation of disturbed areas, which will include *Movement of machinery and soils *Remaining stockpiles and infrastructure such as WRD, dirty water dams, etc.; *Poorly implemented rehabilitation measures.	*Loss of wetland habitat and integrity; *Disturbance of wetland habitat; *Proliferation of alien and invasive plant species; *Onset of erosion and sedimentation and the creation of preferential flow paths; *Impaired water quality.	N		-1	-3	-2		-1				-7	No indiscriminate driving of vehicles within wetland areas.  Only authorised personnel and vehicles to be permitted within wetland areas.  Strict monitoring for erosion and incision. Any areas of erosion or incision identified to be immediately rehabilitated.  All areas of disturbance to be reprofiled, suitably rehabilitated and revegetated with suitable area specific indigenous species.  Ongoing wetland and aquatic biomonitoring into the post-closure phase for a period of at least 10 years following closure.  Strict implementation of the Alien and Invasive Plant Control Plan (STS, 2019).  All activities to be overseen by the site ECO, who should	P		2	3	3	3				11	CBA	

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										ensure compliance to the EMPr.													
Hydrological and Storm Water Management	Closure and rehabilitation of the pit, WRD and other disturbed areas	The topography of the project area has largely been disturbed by the Pit and WRD. These areas are bare and exposed to erosion. The Pit water has shown poor water quality, which has the potential to contaminate the Driekuilspruit.	N	-3	-3	-3	-3	-3	-12	<p>The Pit water quality is showing an improving trend since backfilling commenced in August 2018. It is recommended that this continues, and that the Pit is capped and vegetated at closure.</p> <p>It is further recommended that exposed areas such as the WRD, should be vegetated to prevent erosion.</p> <p>The topography of the disturbed areas should be free draining and vegetated at closure.</p> <p>A SWMP that is sustainable for the long term, must be designed for the mine closer to closure.</p>	N	-2	-2	-2	-2	-2	-8	CBA					
Hydrogeological Impacts	Point source management	Post-mining impact on groundwater quality of no rehabilitation	N	-3	-3	-4	-5	-15	<p>Complete all rehabilitation to a satisfactory level, focussing specifically on maintaining dirty water and runoff in designated areas. These include the main quarry, the WRD and the mine dirty water dams. Effective rehabilitation of these areas must aim to reduce the rate of recharge of rainwater as far as possible. No ponding must be allowed over rehabilitated areas.</p> <p>If the impacts of mining and mine waste deposition are not carefully planned and</p>	N	-3	-3	-4	-5	-15	CBA							
		Deterioration of groundwater quality in the groundwater component to watercourse baseflow if no rehabilitation takes place	N	-3	-3	-4	-4	-14		N	-3	-3	-4	-4	-14								
		Post-mining impact on groundwater quality of reducing the rate of recharge from the WRD and main quarry	N	-2	-3	-3	-3	-11		N	-2	-3	-2	-3	-10								
		Deterioration of groundwater quality in the groundwater component to watercourse baseflow if the rate of recharge from the	N	-2	-3	-2	-3	-10		N	-2	-3	-2	-3	-10								

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			St	at	Ex	fa	Du	rat			Pr	ch	Int	en	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir	
		WRD and main quarry is reduced								managed during the construction phase, significantly adverse impacts on groundwater quality is anticipated in the long-term post closure, especially if the cumulative impact of mining is considered. Measures will be developed during the EIA phase of mining to minimise any long-term impacts identified. The long-term impact of contaminated groundwater on the salt load to the Driekuilspruit and its tributaries will be specifically assessed during the EIA phase of the project.																	
		Post-mining impact on groundwater quality of reducing the rate of recharge from the WRD and main quarry as well as reducing the footprint area of the WRD	N	-2	-3	-3	-2		-10			N	-1	-3	-1	-1							-6				
		Deterioration of groundwater quality in the groundwater component to watercourse baseflow if the rate of recharge from the WRD and main quarry and the footprint area of the WRD is reduced	N	-2	-3	-2	-1		-8		The risk of decant is more likely associated with uncontained surface runoff than with groundwater seepage. The impact of uncontrolled surface runoff from the mining area or ponding of unmanaged surface runoff over disturbed areas will be assessed during the EIA phase.  Plan for and budget to continue with the groundwater monitoring period for a minimum of two years after mine closure. The continued need for groundwater monitoring will depend on the outcome of the final mine closure groundwater impact assessment.  • All rehabilitation must be completed during the	N	-1	-3	-1	-1										-6	



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Name of Activity Activities	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type Mitigation Measures	Rating Post Measures							Significance										
			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir		
											decommissioning phase. In terms of groundwater, the rehabilitation must focus on containing dirty water and leachate, preventing the ingress of clean runoff and rainfall to the mining area and avoid ponding over rehabilitated areas. <ul style="list-style-type: none"> <li>The groundwater monitoring programme proposed below must be maintained for a period of at least two years after mine closure in both mine monitoring and private boreholes. Details regarding the proposed monitoring programme are presented below. This information must be used to confirm the impact of rehabilitation at mine closure.</li> <li>At the end of the two-year monitoring programme, the post-closure groundwater impact assessment must be re-evaluated and adjusted, as necessary, based on the results of the monitoring programme.</li> <li>Once the monitoring data and the re-assessment of post-closure groundwater impacts are available, WST must discuss these with the authorities and determine the need of additional monitoring through consultation.</li> <li>All seepage from the quarry must be contained inside the footprint area of the quarry to avoid decant into the catchment.</li> </ul>																	

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Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures							Significance								
			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir
											<ul style="list-style-type: none"> <li>All seepage from the WRD must be contained in toe paddocks that meet the requirements of GN704.</li> </ul>															
Heritage Resources Management	Heritage	No direct impact	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Visual Management	Visual	Fugitive dust emissions as a result of infrastructure removal and associated exposed/bare areas may have an impact in terms of air quality and visual characteristics.	N	-2	-2	-4	-3	-11			The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity. Establish and implement a dust suppression plan in consultation with the environmental control officer and an air quality specialist as part of the contractor's responsibility.	N	-2	-1	-3	1	-5									CbA
Noise Management	Limit	Noise	N	-2	-2	-4	1	-7			The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these.	N	-2	-1	-3	1	-5									CbA
Socio-Economic Management	Nuisance Management	Disruption and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts.	N	-2	-2	-4	1	-7			Local residents, with the focus on the surrounding landowners, should receive accurate information with regards to the project status, timeframes for decommissioning and other	N	-2	-1	-3	1	-5									CbA

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			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	Mitigation Measures	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM
											relevant information about issues that could influence their daily living and movement patterns.															
	Socio-Economic	Infrastructure areas could benefit the local community.	N	-3	-3	-4	-5	-15		Instead of demolition of certain areas, these areas could be sold off as commercial property for use in the local community.  All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR).	P	3	3	4	4	14		CbA								
		Loss of Employment.	N	-3	-3	-4	-5	-15		The mine should continue with the skills development programme and Social and Labour Plan commitments to empower the workforce to undertake other economically viable activities.	P	2	3	3	3	11		CbA								
	Geology	No direct impact	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Topography	No direct impact	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and decommissioning of hazardous (also fuels) substances	Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the contamination of soils.	N	-1	-2	-4	-4	-11		Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.  A contaminated land assessment should be undertaken at all areas where diesel was stored, as well as where fuel pipelines were placed.	N	-1	-2	-1	-1	-5		R								
	Ecology	No further additional impact.	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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			St	at	Ex	fa	Du	rat			Pr	ch	Int	en	St	at	Ex	fa	Du	rat	Pr
	Riparian Habitat and Wetlands	Impact on the aquatic life in watercourses.	N	-2	-3	-3	-3	-11	<p>No material may be dumped, disposed of or stockpiled within any of the watercourses in the vicinity of the mine. If any spills occur, they must be immediately cleaned up; and</p> <p>No dirty water (as defined by GN704) is to be released into the receiving environment.</p> <p>Clean and Dirty water separation systems should be maintained up until closure.</p>	N	-1	-2	-1	-1	-5	CBA					
	Surface Water & Groundwater	Handling of Hazardous Waste.	N	-3	-2	-2	-4	-11	<p>Clean and Dirty water separation systems should be incorporated in terms of the approved SWMP or any approved update thereafter.</p> <p>A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.</p> <p>Waste management training must be implemented on site.</p> <p>Clear signs informing staff of waste management practices must be implemented on site.</p> <p>Clear signs informing staff of waste management practices must be implemented on site.</p> <p>Hazardous waste handling</p>	N	-1	-1	-2	-1	-5	CbA					

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Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures							Significance												
			St	at	Ex	fa	Du	rat	Pr		ch	Int	en	SbM	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir				
											<p>should only take place within bunded and/or lined areas.</p> <p>Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMRE and/or DWS).</p> <p>Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.</p> <p>Documentation of removal and safe disposal must be kept on record and in good order.</p> <p>The mine will adopt a cradle-to grave (inspection of disposal sites) approach to ensure that the waste is removed and disposed of in a legally compliant manner.</p> <p>Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.</p> <p>All building rubble will follow the waste hierarchy and will therefore either be sold for reuse where possible and as a last option be disposed of at a licensed facility suitable for such waste.</p>																			
	Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					

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Name of Activity	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures							Significance								
Activities		Potential Impacts	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SbM	Mitigation Measures	St	at	Ex	fa	Du	rat	Pr	ch	Int	en	SaM	CbA/R/Ir
	Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
	Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
	Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
	Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-

## **8.4 The Positive and Negative Impacts that the Proposed Activity (in terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be affected**

Please note that the discussion before and below relating to impacts and management measures are not exhaustive. Additional impacts may be identified during a detailed impact assessment.

### **8.4.1 Potential Soils Impacts**

Several potential risks to the receiving environment by the proposed development have been identified and are presented in the bullets below:

- ☞ Topsoil stripping and vegetation clearing within the proposed infrastructure areas as part of site preparation prior to commencement of construction activities, leading to soil disturbances and risk of erosion of exposed soils;
- ☞ Construction of surface infrastructure increasing the potential risk of soil erosion, dust emission, sedimentation, and disposal of waste on soil resources which will subsequently lead to the alteration of soil chemistry and quality;
- ☞ Contamination resulting from spillages of hydrocarbons, heavy metals, ineffective stormwater management around stockpiles and WRD etc.; and
- ☞ Movement of construction vehicles off existing/demarcated roads, leading to soil compaction and potential spillage from machinery / construction vehicles.

The study area is dominated by Chromic Cambisols which can be characterised as soils of intermediate suitability for agricultural potential. The study area is surrounded by active mining ZRC 22-4001 March 2022 14 related activities. These activities dominate a large portion of the study area and thus has caused significant impact on the soils. The loss of topsoil is anticipated and thus may reduce the quantity of soil material available for future rehabilitation and land use potential of any land that is disturbed by the proposed project. However, the proposed project is not anticipated to cause a significant cumulative impact since this area is not under current cultivation and the extent of the area to be impacted is limited. The significance of impact is anticipated to be Medium without mitigation and Low post mitigation. However, should the outlined mitigation measures not be followed, this may impact on the intensity and the extent of the impacts on the footprint areas. In addition, soils are scarce non-renewable resources which need to be protected, conserved and managed in compliance with the CARA, 1983 (Act No. 43 of 1983). The additional work required to address this issue is described in Section 7 of this Scoping Report.

### **8.4.2 Potential Hydropedological Impacts**

Most of the proposed development area comprises shallows soils which do not depict signs of wetness or an indicator of lateral flows in the vadose zone. These soils include Mispah and Glenrosa soils forms. The best suited hydropedological recharge mechanism definition for these areas is responsive shallow.

The hydropedological processes are deemed to have a limited contribution (if any) to the wetlands identified within the study area due to the occurrence of shallow soils (less than 20cm at most) which contribute to surface overflow flow during the rainy season. The anticipated dominant recharge mechanism of these wetlands is anticipated to be the shallow aquifer which manifests as springs.

The Driekuilspruit is likely driven by surface runoff with contribution from groundwater processes (as reported in the hydrology report). Although soils associated with interflow processes were identified within some portions of the study area which potentially feed the Driekuilspruit their contribution is limited and thus the impact of the proposed development is likely to be low to negligible. However, this will further be confirmed once the modelling processes have been completed.

The post mining scenario will likely alter the surface runoff in the greater landscape and ultimately impact on the overall water balance of the catchment. This means that quantity as well as the pattern, timing, and duration of the hydrograph would change and little to no mitigatory options are available. However, no cone of depression is foreseen since the opencast pits will not have any interaction with the groundwater.

### 8.4.3 Potential Aquatic and Freshwater Ecosystem Impacts

Some direct impacts as well as the potential for indirect impacts and cumulative impacts on the freshwater environment are anticipated to occur as a result of the new mining blocks, temporary stockpiling of overburden and both easterly and westerly access roads. In order to assess these risks and the significance thereof, it is firstly necessary to confirm whether the potential freshwater ecosystems identified within the study and investigation area are freshwater ecosystems according to the definitions contained in the National Water Act, 1998 (Act No. 36 of 1998). Thereafter, the potential risk to the receiving freshwater environment can be appropriately assessed using a pre-defined impact assessment method and subsequently, a quantum of impact significance defined.

Desktop data (as presented in this report) was utilised to determine the preliminary impact significance on the various freshwater ecosystems associated with the proposed Driekuil development in the study and associated investigation area which will be further refined and assessed during the EIA phase of this project. Below is a high-level identification of the potential impacts that are anticipated to occur, followed by a recommendation of proposed mitigation measures that can be employed to reduce these impacts from occurring.

The chain of mining blocks (blocks 2N, 3N and 5N) is likely to occur in potential freshwater ecosystems situated within the study area. In addition, the temporary stockpiling of overburden material and the easterly and westerly access roads are located in areas identified as freshwater ecosystems. As a result, this may pose several potential risks to the receiving freshwater environment which have been taken into consideration. The potential risks are briefly presented below:

- ☞ Site clearing and preparation prior to commencement of any construction related activities for the proposed Driekuil development in the study area will result the potential for increased disturbance of freshwater habitat including increased runoff and erosion, disturbance and compaction of soil as well as removal of wetland vegetation. In addition, any disturbance from site clearing will result in removal of breeding and feeding habitat for faunal species. Frequent anthropogenic and noise during site clearing is also likely to disturb biota that occupy the affected and adjacent freshwater habitat. Site clearing activities will also contribute to smothering of freshwater soil and vegetation due to increased sedimentation. Should site clearing be undertaken without the implementation of the relevant mitigation measures, the intensity of impacts premitigation is likely to be of “moderate to high” risk significance. The impacts of site clearing are anticipated to be relatively localised however, any impacts on any of the single freshwater ecosystems will likely affect neighbouring areas further downstream as the systems are relatively well connected. Impacts on the freshwater ecosystems are considered likely to occur on a medium to long term basis. The implementation of appropriate mitigation measures during the construction and operational phase of the development are considered likely to reduce the impact significance on the affected freshwater ecosystems.
- ☞ The potential for construction activities associated with the creation and operation of mining block areas will permanently alter the freshwater ecosystems that fall within the footprint area of mining blocks 2N, 3N and 5N. As such, mining these blocks will involve removing the wetland soil, vegetation and most importantly altering the hydrological drivers, flow and connectivity of these freshwater ecosystems as a result of deep excavations (upto 25m in depth) within these systems. The intensity of impacts premitigation is thus considered to be of “high” risk significance;
- ☞ The freshwater ecosystems situated outside of the confines of these mining blocks, stockpiling areas and access roads whilst not anticipated to be directly affected are subject to indirect impacts such as desiccation, alteration of wetland vegetation, and smothering by dust and soil from mining and stockpile areas adjacent. The intensity of impacts is likely to be of “moderate” risk significance, premitigation;
- ☞ In addition, the creation of stockpile areas and access roads through a freshwater ecosystem considered likely to result in smothering of hydromorphic soils, contribute to soil compaction and largely alter infiltration rates and flow of water within the landscape and subsequently within the freshwater ecosystems. The creation of the stockpile areas and access roads will also contribute increased likelihood of dust generation, altered drainage patterns due to increased impermeable surfaces and associated runoff. The intensity of impact pre-mitigation is considered to be “moderate to high”. Whilst impacts are likely to be of a localised nature, any potential impacts are considered likely to affect neighbouring freshwater ecosystems downgradient due to the connectivity of the freshwater ecosystems in the region. Optimisation of the proposed Driekuil development layout to move the components, specifically the stockpiling areas outside of the freshwater ecosystems and associated buffer zones are considered the best form of mitigation to be employed;



- ☞ The freshwater ecosystems that are not recommended to be directly affected by the stockpile areas and access roads are considered likely to be affected by indirect impacts which include smothering of vegetation by increased dust and soil and increased runoff from impermeable surfaces within the catchment of these freshwater ecosystems. Impact significance is anticipated to be of “low to moderate” significance pre-mitigation;
- ☞ It is considered likely that the development of additional clean and dirty water separation systems and associated stormwater infrastructure will occur as part of the proposed Driekuil development and may lead to loss of catchment yield from stormwater containment, altered vegetation community structure and diversity due to moisture stress and reduction in volume of water entering the freshwater environment, leading to reduced recharge. Impacts are considered likely to be of a “moderate” impact significance and may affect neighbouring areas downgradient, before the implementation of mitigation measures; and
- ☞ The operation and maintenance of the proposed Driekuil development as well as the operation of clean and dirty water separation systems may result in increased risk of pollution of surface water, increased risk of sediment transport in surface runoff from impermeable surfaces, altered vegetation community composition, increased risk of erosion and altered runoff patterns within the landscape. These impacts are considered likely to pose a “moderate” impact significance with impacts considered to occur on a localised scale, pre-mitigation. Mitigation measures recommended to be undertaken to reduce the impact significance include pollution prevention through infrastructure design in order to prevent, eliminate and/or control potential pollution of soil, groundwater and surface water as well as the implementation of a monitoring programme to detect and prevent the pollution of soil, surface and groundwater.

#### 8.4.4 Potential Ecological Impacts

Several potential risks to the receiving environment by the proposed infrastructure development have been identified and are presented in the bullets below:

- ☞ Vegetation clearing and construction activities will lead to habitat destruction and disturbance within the direct footprint area and will likely lead to the loss of floral and faunal communities, consequently impacting on the terrestrial biodiversity within the study area and impacting upon the overall conservation targets of the defined CBAs;
- ☞ Vegetation clearing and construction activities may result in the loss of faunal and floral SCC within the directly impacted areas;
- ☞ The proposed opencast pits, waste rock dumps, and roads are likely to have a significant impact on the habitat within the direct footprint. Potential sensitivities associated with the habitat within the study area relate to the following:
  - The northern portion of the study area is located within a CBA 1, and most of the remaining sections are located in a CBA 2. As such, development within these areas may impact upon the overall conservation targets of the defined CBAs;
  - The study area is anticipated to host provincially protected fauna and floral species listed in the TNCO (No. 12 of 1983), NEMBA:TOPS (2007), the Screening Tool, including protected trees under the NFA. As such, the proposed mining activities threaten potentially occurring floral and faunal SCC habitat and populations. Alteration, degradation, loss, or destruction of faunal and floral habitat;
  - Vehicles may impact potential sensitive habitat associated with the EN Western Highveld Sandy Grassland during construction, operation, and potentially poorly implemented rehabilitation, resulting in a consequent loss of species diversity. Vehicular movement and construction activities could additionally cause increased erosion, leading to poor growth and unsuitable conditions for the establishment of indigenous floral species and, consequently, providing sub-optimal living conditions for faunal species;
  - Mining infrastructure and the dumping of construction and operational waste materials in the surrounding habitat will result in floral and faunal habitat changes, which is likely to push faunal species out of their current home ranges, resulting in STS 210067: Scoping Phase Report February 2022 21 an increased competition for space and resources within the study area and in surrounding areas;
  - Earthworks may lead to increased runoff and erosion resulting in a further loss of faunal and floral habitat;

- Risk of discharge of contaminated water from operational facilities may pollute receiving environment leading to altered floral and faunal habitat;
- Degradation of the surrounding watercourses and wetland habitat within the study area will result in significant loss of both floral and faunal habitat (specifically species reliant on wet environments), impacting upon species diversity and abundance;
- ☞ Potential indiscriminate fires by construction personnel may lead to uncontrolled / runaway fires, impacting on floral and faunal communities of the study area and surrounds;
- ☞ Introduction of foreign material (e.g., soil) during construction activities may lead to the further introduction of alien invader species, impacting on the floral characteristics of the study area;
- ☞ Permanent surface scarring may reduce favourable habitat for floral and faunal species;
- ☞ Increased personnel on site may result in an increased risk of harvesting/overutilisation of SCC). Moreover, increased personnel within the study area inherently brings an increased risk of harvesting activities, threatening the current faunal populations;
- ☞ Increased risk of hunting/trapping of local faunal species;
- ☞ Potential for poor rehabilitation and monitoring of sensitive habitat that will as a consequence be affected as a result of edge effects associated with mining activities, thereby leading to declines in species diversity;
- ☞ Dust generated by ineffective, or lack of, rehabilitation of exposed areas may impact on the floral characteristics of the property;
- ☞ Failure to implement an alien floral control plan may result in widespread degradation or loss of indigenous flora and fauna within the study area and possibly in surrounding areas; and
- ☞ Ineffective removal and control of alien invader species, and poor rehabilitation of exposed areas could lead to re-establishment of invasive species, impacting on floral community rehabilitation efforts.

#### 8.4.5 Potential Hydrological Impacts

The following potential impacts have been identified:

- ☞ Erosion and sedimentation of drainage lines.
- ☞ Alteration in surface water drainage patterns leading to erosion and consequent increase in Suspended Solids (SS) in surrounding watercourses.
- ☞ Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality.
- ☞ Loss of runoff and water quantity to downstream users.
- ☞ Impact on water quality of the Driekuilspruit.

#### 8.4.6 Potential Hydrogeological Impacts

##### 8.4.6.1 Impact on groundwater availability

Information from the existing mining activities (Block 1N) confirms that mining activities have not intersected the shallow or deeper groundwater tables. No mine dewatering is therefore taking place. Similar mining methods will be deployed in the new mining blocks (Block 2N – 6N). As such, the impact of mine dewatering on groundwater availability is not considered significant at this stage of the project. It is noted that WST has committed that no dewatering will take place and that all mining will cease above the groundwater level.

##### 8.4.6.2 Deterioration of groundwater quality during the operational phase

Surface and groundwater monitoring data from the Block 1N mining area confirms that there is a risk acid mine drainage associated with the mining activities. This process is driven by the presence of pyrite in the ore body. In addition, sampling of runoff collected from the existing main quarry void confirms acidic conditions and elevated salt and metal concentrations in leachate associated with the mining activities. The existing WRD is also impacting on groundwater quality, as is demonstrated by the current monitoring programme. Future placement of waste rock must therefore be carefully managed.

Based on feedback received from the hydrological specialist study undertaken for this project, it is reported that the risk of acid mine drainage is reduced with backfilling of mined out areas. WST has committed to the roll over method of mining, which includes backfilling of mined-out areas during the operational phase. The extent to

which acid mine drainage and the associated poor quality leachate will remain a threat to groundwater under these commitments will be evaluated in more detail in the EIA phase of the project.

#### 8.4.6.3 Impact on baseflow to streams

Future mining is planned north the current Block 1N mining activities, parallel to the Driekuispruit. The mining is planned within 200m of the river. The potential impact of contaminated groundwater reaching the Driekuispruit during the operational phase and post-closure will therefore be assessed during the EIA phase of the project. This impact will be evaluated in terms of the estimated groundwater contribution to the salt load on the Driekuispruit.

In addition to stream baseflow, Zimpande (2022) reports that groundwater flow in shallow aquifers play an important role in wetland functioning. Due to the presence of shallow soils in the mining area, the recharge of water to wetlands from the shallow aquifer is an important mechanism to wetland functioning. This aspect will be evaluated in more detail during the EIA phase of the project.

#### 8.4.6.4 Risk of decant

Based on the current understanding of method of mining, the risk of decant from the pit is more likely associated with uncontained surface runoff than with groundwater seepage. This is due to the fact that the groundwater table has not been intersected during current mining activities. The impact of uncontrolled surface runoff on groundwater quality will therefore be assessed during the EIA phase of the project.

WST has further committed to not mine below the groundwater table at Blocks 2N – 6N. The risk of decant from future mining areas is therefor also considered low, based on the current understanding of the project. This will be evaluated in more detail during the EIA phase of the project, especially in mining areas near watercourses.

#### 8.4.6.5 Long-term impact on groundwater quality

The long-term impact of mining and mine waste management will be evaluated during the EIA phase of the project. In order to identify the optimal groundwater management plan, a number of rehabilitation scenarios will be developed in consultation with the EAP and WST and evaluated during the impact assessment phase of the project.

#### 8.4.6.6 Residual impacts

The impact of mining activities that will not be fully rehabilitated during mine decommissioning on groundwater quality will be assessed during the EIA phase of the project. Of specific note is the impact of the existing WRD, which is likely to remain in place or only be partially rehabilitated.

#### 8.4.6.7 Potential cumulative impacts

The potential cumulative impacts of existing mining at Block 1N and the planned future mining from Blocks 2N – 6N on groundwater will be assessed. During this assessment, the rehabilitation scenarios to be developed will be considered. The outcome of the assessment will be used to develop the preferred rehabilitation strategy aimed at eliminating or minimising long-term impacts.

#### 8.4.6.8 Sensitivity map – Hydrogeology

Based on the findings of the scoping study, a sensitivity map was generated for the hydrogeology to be affected by the project. The hydrogeological sensitivity map is presented in the figure overleaf and the components thereof are summarised in the following table.

Figure 59: Sensitivity rating: Hydrogeology

Sensitivity Rating	Description	Hydrogeological component identified	Motivation
Least Concern	The proposed mining activities will not affect the current	Remainder of greater project area not affected by the ratings below.	This area excludes groundwater receptors or sensitive areas identified during scoping.

Sensitivity Rating	Description	Hydrogeological component identified	Motivation
	status. These features would be the preferred alternative for mining or infrastructure placement.		
Low	The proposed development will not have a significant effect on the inherent feature status and sensitivity.	The ore body	The current mine plan focusses on the northern section of the ore body outcrop. The full length of the ore body is however assigned a low sensitivity due to possible future mining in these areas.
Low		Hydrocensus boreholes identified in 1996 that are up gradient of the proposed mining activities	Private boreholes are considered sensitive receptors. The location, condition and groundwater use from these boreholes will be confirmed during the EIA phase. Boreholes up gradient of the mining activities are however not likely to be affected by mining activities.
High	The proposed development will negatively influence the current status of the feature.	The planned future mining Blocks 2N – 6N and the areas identified for the temporary placement of waste rock.	Based on monitoring of the existing mining at Block 1N, mining activities are likely to result in acid mine drainage and contamination of groundwater if not carefully managed. Groundwater contamination is also currently associated with the placement of waste rock.
High		Hydrocensus boreholes identified in 1996 down gradient of the proposed mining activities	Private boreholes are considered sensitive receptors. The location, condition and groundwater use from these boreholes will be confirmed during the EIA phase. Boreholes down gradient of the mining activities could be affected by mining activities and this will be confirmed in the EIA phase of the project.
Very High	The proposed development will negatively significantly influence the current status of the feature.	Hydrocensus boreholes identified in 1996 located within or immediately adjacent to the proposed mining activities	Private boreholes are considered sensitive receptors. The location, condition and groundwater use from these boreholes will be confirmed during the EIA phase. Boreholes within the mining area could be destroyed or groundwater quality may deteriorate as a result of the impact of mining and this will be confirmed in the EIA phase of the project.
Very High		Existing mining activities in Block 1N and the existing WRD.	The current mine water monitoring programme confirms that these areas are impacting on groundwater quality. If not managed with care, these existing impacts could result in unacceptable long-term deterioration in groundwater quality.

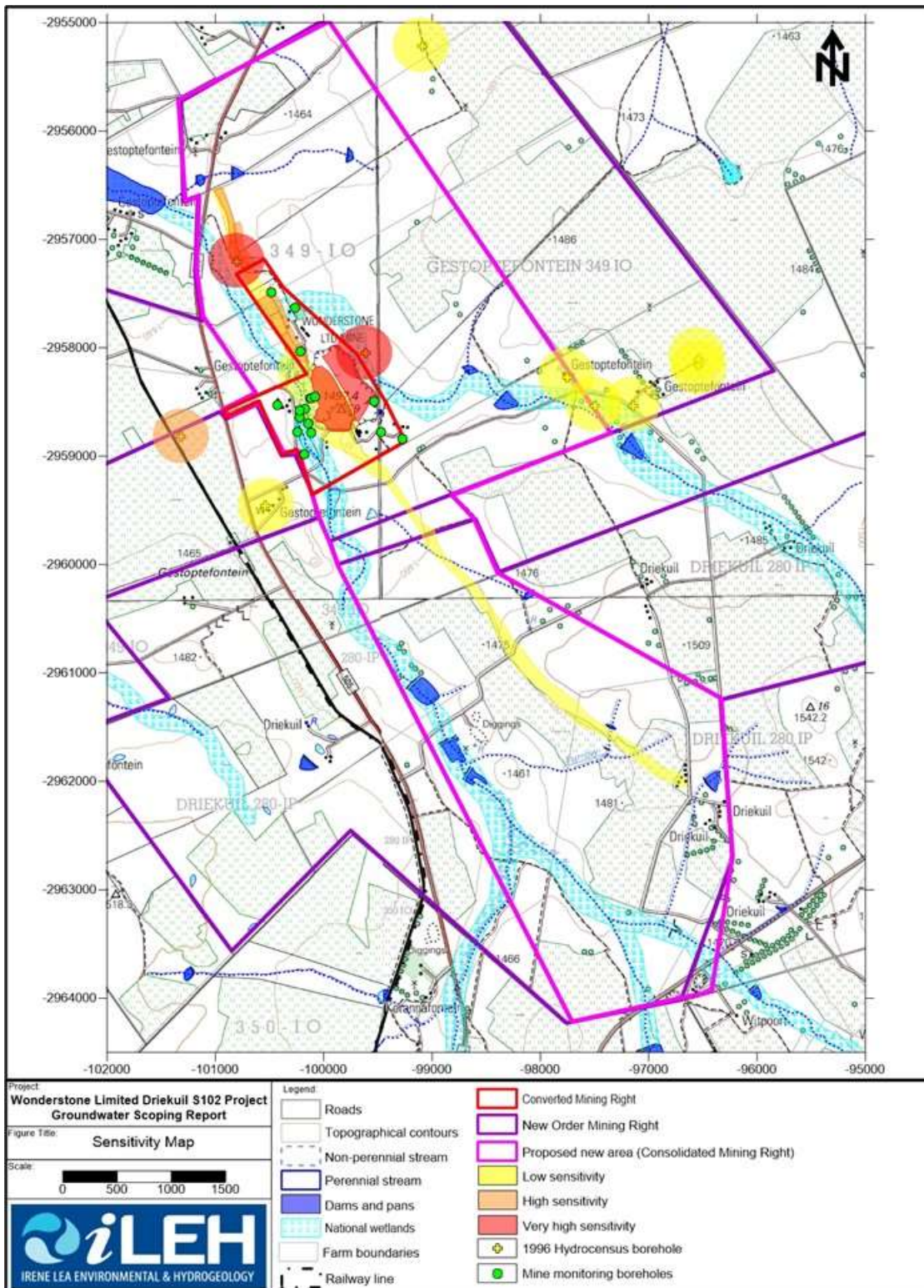


Figure 60: Hydrogeological sensitivity map

### 8.4.7 Heritage Assessment

The study area is known to contain rock engravings on the farms Gestoptefontein and Driekuil. These sites formed the basis of a PhD study (Hollman 2013). The engravings were done on Wonderstone which is a type of pyrophyllite that will be mined for this application and more sites can be expected.

Based on the current information obtained for the area at a desktop level it is anticipated that any heritage resources that occur within the proposed development area will have a Generally Protected B (GP. B) or lower field rating and all sites should be mitigatable.

To the west of the proposed WRD potential graves are present. Graves are of high social significance (Field rating GP A) and can be expected anywhere on the landscape.

#### **8.4.8 Potential Air Quality Impacts**

The following potential impacts have been identified:

- ☞ Increase in dust dispersion which may have an impact on health, as well as visual aesthetics.

#### **8.4.9 Potential Visual Impacts**

The following potential Impacts have been identified:

- ☞ Creation of a bare areas exposing mine infrastructure and the generation of dust.
- ☞ The movement of vehicles and heavy machinery during the construction phase will create a visual presence and will generate dust.
- ☞ Impact on visual receptors in the surrounding landscape and alteration of the sense of place.
- ☞ Additional lighting at night impacting on visual receptors.
- ☞ The rehabilitation of the proposed project is likely to result in less of a visual impact if the pits are backfilled and the WRD is removed.

#### **8.4.10 Potential Noise Impacts**

The preparation and provision of infrastructure for the proposed Driekuil expansion project will be the main noise sources during the construction, operational phase and the decommissioning phases of the project which may have a cumulative impact on the prevailing ambient noise level. This will however be assessed during the EIA process. The rehabilitation activities during the decommissioning phase may have a temporarily impact on the environment.

#### **8.4.11 Potential Socio-Economic Impacts**

The following impacts have been identified:

- ☞ Potential ongoing influx of people and households related to those formally employed by the mine
- ☞ Limited potential informal influx of people in the form of job seekers are anticipated
- ☞ No change foreseen in the social fabric of the community as a result of the proposed project.
- ☞ Increase in nuisance factors (noise and dust)
- ☞ Unfulfilled community expectations in terms of the employment creation and community development funds could increase the potential for civil unrest in the area
- ☞ Community safety due to mining and infrastructure development
- ☞ Continuation of traffic accident risks due to mining related traffic flow
- ☞ No additional pressure on existing health facilities and infrastructure (e.g. clinics, housing, water, electricity, roads) anticipated as no population increase is expected.
- ☞ Ongoing positive impacts on local employment and income due to the operation itself and due to supply-links with local suppliers.
- ☞ A decrease/cessation in employment and community funds could negatively impact former beneficiaries
- ☞ Potential impact on other (non-supply linked) businesses already established in the local area
- ☞ Possible social dissatisfaction with regards to no or limited job opportunities and local procurement associated with the mining activities
- ☞ Unfulfilled community expectations in terms of employment creation could result in social conflict
- ☞ Continuous tax income: Due to continued positive spin-offs on employment and income levels, it is expected that tax revenue to local, provincial and central government will continue
- ☞ Continuation in social funds for socio-economic development.

- ☞ Potential negative environmental or social impacts (external costs related to project): This could include negative impacts on groundwater, air quality, biodiversity, traffic, road infrastructure, health and community safety.
- ☞ Continued employment and possible job creation for low-income groups throughout extended life of mine
- ☞ The project can continue to contribute to economic activities in the local economy but if closure occurs the positive inputs on local economy will cease.
- ☞ Mining related land-uses are present in the area, but the expansion can have possible negative land-use impacts. Some impacts on sense of place are anticipated.
- ☞ The energy and water use needs to be considered.

## 8.5 The possible mitigation measures that could be applied and the level of risk

Various general management measures are proposed for this project, which include:

### 8.5.1 General Management Measures

The following General Management Measures should be considered:

- ☞ All Environmental Permits must be available on site;
- ☞ The required environmental and social buffers should be demarcated on site layouts;
- ☞ A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised;
- ☞ All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with environmental management measures;
- ☞ Formulate a detailed training plan as part of induction to ensure that all parties are aware of the environmental characteristics in which the mine is located and the important management commitment, and liabilities;

### 8.5.2 Potential Soils Management Measures

Management measures identified at the Scoping Phase include the following:

#### Soil Erosion and Dust Emission Management

- ☞ The footprint of the proposed development and construction activities should be clearly demarcated to restrict vegetation clearing activities to within the infrastructure footprint as far as practically possible;
- ☞ Bare soils within the access roads should be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast;
- ☞ All disturbed areas adjacent to the proposed residential development areas should be re-vegetated with an indigenous grass mix, where necessary, to re-establish a protective cover to minimise soil erosion and dust emission; and
- ☞ Temporary erosion control measures such as berms should be used to protect the disturbed soils during the construction phase until adequate vegetation has established.

#### Soil Contamination Management

- ☞ Contamination prevention measures should be addressed in the Environmental Management Programme (EMPr) for the proposed development, and this should be implemented and made available and accessible at all times to the contractors and construction crew conducting the works on site for reference;
- ☞ An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent contamination; and
- ☞ Burying of any waste including rubble, domestic waste, empty containers on the site etc. should be strictly prohibited and all construction waste must be removed to an approved disposal site.

### Soil Compaction Management

- ☞ Soil Compaction is usually greatest when soils are moist, so soils should be stripped when moisture content is as low as possible. If they have to be moved when wet, shovel and truck should be used as bowls scrapers create excessive compaction when moving wet soils;
- ☞ Minimise compaction during the stockpile phase by keeping stockpile soil loose and limit stockpile height to 2-3 meters height, to limit internal soil compaction (Coaltech: chamber of mines, 2007);
- ☞ Compaction should be minimised by use of appropriate equipment and replacing soils to the greatest possible thickness in single lifts;
- ☞ Heavy equipment movement over replaced soils should be minimised;
- ☞ Minimise compaction during smoothing of replaced soils by using dozers rather than graders;
- ☞ Following placement, compacted soils should be ripped to full rooting depth (at least 60 cm or 30 cm as the bare minimum seedbed) to allow penetration of plant root);
- ☞ All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; to avoid unnecessary compaction of the surrounding soils;
- ☞ Direct surface disturbance of the identified high clay content (i.e., Calcic Vertisols and Ferric Luvisols.) soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation);
- ☞ Compacted soils adjacent to the mining project footprints and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation; and
- ☞ Compaction of soil can be mitigated by ripping the footprint and introducing both organic and inorganic fertilisers.

### Soil stockpile management

- ☞ Prior to the commencement of the proposed activities, available topsoil material should be estimated before being removed, and stockpiled for future use;
- ☞ Surface and subsoil material should be stockpiled separately. This is to prevent the mixing of the fertile topsoil with the nutrient limited subsoils;
- ☞ The duration of stockpiling must be minimised where possible;
- ☞ Ensure all stockpiles (especially topsoil) are clearly and permanently demarcated and located in defined no-go areas;
- ☞ Stockpile height should be restricted to that which can be deposited without additional traversing by machinery. A maximum height of 2-3m is therefore proposed, and the stockpile should be treated with temporary soil stabilisation methods; such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion. Also, the use of lime to stabilise soil pH levels;
- ☞ Temporary berms can be installed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion; and
- ☞ A short-term fertiliser program should be based on the soil chemical status after levelling and should consist of a pre-seeding lime and fertiliser application, an application with the seeding process as well as a maintenance application for 2 to 3 years during the rollover mining rehabilitation until the area can be declared as self-sustaining by an appropriately qualified soil scientist.

### **8.5.3 Potential Hydropedological Management Measures**

Management measures recommended, include:

- ☞ All surface development footprint areas should remain within demarcated areas as far as possible and disturbance of soil profiles to be limited to what is essential;
- ☞ Water from clean water structures should be discharged back into the watercourse in an attenuated manner; and
- ☞ Implementation of strict erosion control measures to limit loss of soil and sedimentation of the watercourse within the proposed project.



#### 8.5.4 Potential Aquatic Freshwater Ecosystem Management Measures

The following “high-level” mitigation measures are provided to assist in minimising impacts to the receiving freshwater environment and which can be considered in the pre-development phase of the proposed Driekuil development. These measures may be refined following the field verification of the freshwater ecosystems, but are provided herein for high-level planning purposes:

- ☞ The layout and footprint of the proposed Driekuil development needs to take cognisance of the delineated freshwater ecosystems and calculated buffers and impacts must be mitigated in line with the requirements of the mitigation hierarchy (DEA et al., 2013). As such, it is advised that the Driekuil development layout be reassessed to avoid the delineated boundaries of the freshwater ecosystems with specific mention of mining block 2N and the southern stockpiling area which will directly encroach on the freshwater ecosystems. Should this not be considered feasible, following the mitigation hierarchy a suitable wetland offset might be required if the freshwater ecosystems are confirmed during the EIA phase of the proposed Driekuil development in which impacts cannot be effectively reduced by employing mitigation measures;
- ☞ It is also advised that the access roads be reassessed or alternatively maintain the footprint of the existing gravel access road to reduce impacts on freshwater ecosystems;
- ☞ The construction and operational footprints must be kept as small as possible to minimise impact on the surrounding environment and loss of catchment yield;
- ☞ Care must be taken to ensure no restriction of flow which leads to increased velocity and turbulence of flow during runoff events within the freshwater ecosystems;
- ☞ Appropriate sanitary facilities must be provided during the construction phase and all waste must be removed to an appropriate waste facility;
- ☞ All soil compacted as a result of construction activities should be ripped and reprofiled to natural levels and revegetated with indigenous vegetation. Special attention should be paid to alien and invasive plant control within these areas;
- ☞ No indiscriminate disposal of waste should take place. If any spills occur, they should be immediately cleaned up, and be disposed of at a registered waste facility; and
- ☞ Upon completion of construction activities, it must be ensured that no areas remain bare and that indigenous floral species are reintroduced.

##### Vehicle access

- ☞ Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed Driekuil development and other proposed infrastructure activities within the study area; and
- ☞ In the event of a breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil.

##### Soil

- ☞ Limit the footprint area of the construction activity to what is essential to minimise environmental damage;
- ☞ Edge-effects of activities, including erosion and alien and invasive plant control, need to be strictly managed in the disturbed areas;
- ☞ It must be ensured that all hazardous storage containers and storage areas comply with the relevant South African Bureau of Standards (SABS) to prevent leakage. All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; and
- ☞ To prevent the erosion of topsoil, management measures may include berms, soil traps, hessian curtains and storm water diversion away from areas susceptible to erosion. Stockpiles should be placed away from areas known to contain hazardous substances such as fuel and if any soils are contaminated, they should be stripped and disposed of at a registered hazardous waste disposal site.

##### Rehabilitation

- ☞ All areas affected by mining activities and ancillary infrastructure should be rehabilitated upon closure of the mining and associated infrastructure areas. Areas should be reseeded with indigenous grasses as required;

- ☞ Vegetation growth should be promoted as much as possible within the proposed development areas following construction activities to protect the soil;
- ☞ Strategies to minimise the spread of alien vegetation must be put in place;
- ☞ All areas of disturbed and compacted soils should be ripped and reprofiled; and
- ☞ All rehabilitated areas should be rehabilitated to a point where natural processes will allow the pre-development ecological functioning and biodiversity of the area to be re-instated to a relatively functional state. It is highly recommended that a nursery be developed where indigenous tree species are cultivated for use during revegetation of the area and to reintroduce biodiversity elements to the affected areas.

### 8.5.5 Potential Ecological Management Measures

The implementation of mitigation measures is important to manage the overall risk to floral and faunal diversity, habitat and SCC. The list below highlights the preliminary mitigation measures that are applicable to the proposed mining activities to suitably manage and mitigate the ecological impacts on faunal and floral communities that are associated with the proposed mining activities.

#### Habitat and Species Diversity:

- ☞ At all times, ensure that sound environmental management is in place during the planning phase;
- ☞ The design plans should take cognisance of sensitive habitats described during the EIA phase, in line with the DFFE mitigation hierarchy. As far as feasibly possible, sensitive habitats must be excluded from the proposed mining activities. Development should be prioritised in habitats of decreased sensitivity;
- ☞ Where possible, and feasible, access roads should be kept to existing roads so to reduce further fragmentation of existing natural habitat;
- ☞ The construction and operational footprints must be kept as small as possible, clearly demarcated, and prioritised in habitats of low sensitivity, in order to minimise impact on the surrounding environment;
- ☞ Where site clearing is necessary, it should take place in a phased manner to allow for faunal species present to move out of the footprint area;
- ☞ Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed;
- ☞ No harvesting of any floral or faunal species may take place; and
- ☞ Smaller species of invertebrates and herpetofauna are likely to be less mobile, as such should any be observed in the footprint areas during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Operational personnel are to be educated about these species and the need for their conservation. Harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own.

#### Species of Conservation Concern:

- ☞ In terms of the DFFE (2013) mitigation hierarchy, avoidance should be undertaken primarily to avoid high impacts to floral and faunal SCC. Following this, and if not completely possible (based on location of the mined resources) a search and rescue should be undertaken prior to the vegetation clearing activities.
- ☞ Prior to any vegetation clearing activities taking place, an authorised search and rescue plan must be implemented for floral and faunal SCC within the proposed footprint areas. From a faunal perspective, rescue efforts should focus on SCC that lack mobility and will therefore be unable to flee disturbance;
- ☞ Search and rescue efforts should focus on smaller, less mobile faunal SCC that will not be able to move away from the disturbances. Rescue efforts should also include a walkdown of the proposed footprint areas to detect and/or mark all (potentially) occurring floral SCC. This should be overseen by a suitably qualified specialist or nominated mine personnel in order to ensure that species loss during construction activities is kept to a minimum;
- ☞ Where faunal and floral SCC are located in the proposed footprint areas, the appropriate permits must be obtained from the relevant authorities before any further work can be conducted; and
- ☞ Should any floral species be found within the proposed development footprint, they must be legally relocated to suitable, similar habitat in close proximity to where they were removed from, but outside the disturbance footprint.

### General Waste Management:

- ☞ Infrastructure design should be environmentally sound and all vehicles in a good working condition, and all possible precautions taken to prevent potential spills and /or leaks; and
- ☞ No dumping of general or hazardous waste should take place. If any spills occur, they should be immediately cleaned up, and be disposed of at a registered waste facility.

### Rehabilitation and Edge Effect Control:

- ☞ All soils compacted outside that of the footprint area as a result of construction and operational activities should be ripped and reprofiled to natural levels and revegetated with indigenous vegetation. Special attention should be paid to alien and invasive plant control within these areas; and
- ☞ Edge effects of all operational and any planned reclamation activities, such as erosion and alien plant species proliferation, which may affect adjacent natural vegetation, need to be strictly managed adjacent to the project footprint areas. Re-vegetation efforts during rehabilitation, should focus on replanting disturbed areas with indigenous vegetation found in the study area prior to clearing.

## **8.5.6 Potential Hydrological Management Measures**

The following management measures have been identified:

- ☞ Clearance of vegetation must be limited as far as possible.
- ☞ The Storm Water Management Plan (SWMP) must be implemented as a first step during the construction phase;
- ☞ Stormwater management measures around the pits, stockpiles and dumps;
- ☞ Water quality sampling must be implemented upstream and downstream of construction areas. Specific parameters that should be monitored include SS and turbidity. They should be kept within the baseline water quality range; and
- ☞ Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide.
  - Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages.
  - Machinery and vehicles should be parked on appropriately lined areas.
  - Drip trays must be used under leaking machinery.
  - Spillages should be reported immediately, and spill kits should be readily available at all times.
  - Monitoring of the Driekuilspruit upstream and downstream of the proposed infrastructure.
  - Runoff from upslope undisturbed areas must be diverted around dirty areas.
  - Monitoring of the Driekuilspruit upstream and downstream of the proposed infrastructure.
  - Stormwater management measures should be in place while rehabilitation is taking place.
  - Revegetation of exposed areas.

## **8.5.7 Potential Hydrogeological Management Measures**

Based on the results of the scoping phase of the project, it is recommended that the following areas are avoided as part of the planning and design phase of the project:

- ☞ The proposed mining activities are in close proximity to the Driekuilspruit. Based on the current monitoring programme at Block 1N (existing Main Quarry), it is likely that the planned future mining activities could impact on groundwater quality entering the river as baseflow. The shallow aquifer is also thought to recharge wetlands in the area. In order to minimise these impacts, it is recommended that no mining or mine waste deposition takes place within the 1:100 year floodline of the river and its associated watercourses. Specific attention must be given to the design of surface runoff at the new mining areas, especially associated with the placement of mine waste rock. The stormwater management plan must prevent obstruction of water courses and the ponding of water over the disturbed mining areas.
- ☞ Existing private boreholes should also be protected during the project. The 1996 hydrocensus data must be confirmed and the locations of private boreholes identified must be re-evaluated against the mine plan for the project. Private boreholes that fall within the mining areas must be flagged for action. If private boreholes will be destroyed or significantly impacted during mining, negotiations must be entered into with borehole owners to explore groundwater management options.

### Management plan to protect groundwater availability

The 1996 hydrocensus will be updated during the EIA phase of the project in order to confirm the locations and private groundwater uses within the NOMR. The results of the assessment will be used to prepare a final management plan to protect groundwater availability. The management plan will include an assessment of the impact of groundwater abstraction by WST for use at the operations.

Hydrocensus boreholes identified will be included in the groundwater monitoring programme to be developed for the project. Both groundwater levels and quality monitoring will be undertaken in the hydrocensus boreholes.

In addition to the potential impacts on private groundwater users, recharge from the shallow aquifer to wetlands must be protected to ensure good wetland functioning. Measures will be developed during the EIA phase of the project to achieve this.

### Management plan to prevent contamination of groundwater

Groundwater management will focus on reducing the volume of leachate that is available for infiltration to the aquifers through control of stormwater runoff into the mining area and containment of dirty runoff and seepage in suitably designed facilities. No ponding will be allowed over disturbed areas.

Specific groundwater management measures will be developed to reduce the impacts of existing and planned future mine waste deposition. A number of management options will be tested to develop the preferred alternative in this regard.

The amendments to the existing groundwater monitoring programme based on the outcome of the groundwater impact assessment must be considered for implementation. The groundwater monitoring information is crucial to gauging the effectiveness of groundwater management measures. It is further important to establish trends with reliable information that can be used to develop mine closure strategies and apply for closure.

### Conditions for environmental authorisation

The following hydrogeological conditions for environmental authorisation should be considered:

- No mining activities should take place within the 1:100 year flood line of the Driekuilspruit and its associated water courses.
- The outcome of the EIA phase hydrocensus must be used to re-assess the impact of mining on existing groundwater use and the possible exclusion zones to protect this groundwater use.
- Surface water runoff must be carefully managed to prevent ponding of water over disturbed areas.
- A sound groundwater monitoring programme must be implemented and maintained for the project. The monitoring programme must consider the indicator elements identified for the mining area as well as groundwater levels and on-site rainfall measurements.

### Monitoring requirements

The groundwater monitoring requirements for the project are summarised in the following table. The monitoring programme design and format will be finalised during the EIA phase of the project.

Table 37: Proposed groundwater monitoring requirements

Component	Comment	Proposed monitoring requirement
Private boreholes confirmed as part of a 2022 hydrocensus	Groundwater is the sole source of water supply to landowners within the project area. Existing groundwater use must therefore be protected.	Private boreholes within the NOMR must be identified and monitored during prior to the commencement of any mining activities. Both groundwater levels and quality must be included in the monitoring programme. The monitoring frequency, list of elements for analysis and reporting requirements will be finalised during the EIA phase of the project.
WST monitoring boreholes	The current monitoring programme must be evaluated and adjusted against the outcome of the groundwater impact assessment. Should results dictate, additional monitoring boreholes must be drilled and used for early detection of adverse impacts on groundwater.	Both groundwater levels and quality must be included in the monitoring programme. The monitoring frequency, list of elements for analysis and reporting requirements will be finalised during the EIA phase of the project.

### 8.5.8 Heritage Management Measures

To comply with the National Heritage Resources Act (Act 25 of 1999) it is recommended that a Phase 1 HIA be undertaken for the study area. During the HIA the potential impact on heritage resources will be determined as well as levels of significance of recorded heritage resources. The HIA will also provide management and mitigation measures should any significant sites be impacted upon, ensuring that all the requirements of the SAHRA are met. The study area is of insignificant to low paleontological sensitivity and according to the SAHRIS palaeontological sensitivity no further studies are required. During the Public participation and stakeholder consultation process (advertisements & site notices) must reference the National Heritage Resources Act and address heritage concerns from stakeholders.

The following management measures will be considered:

- ☞ Development of a chance find procedures;
- ☞ Should graves be confirmed, the required buffers will be stipulated. Where this is not possible, the required removal/excavation permits must be considered or no-impact decisions must be reached; and
- ☞ Site of agricultural importance will be assessed in terms of its significance to determine the required management measures (permits for removal, or no permits required, or the implementation of buffers).

### 8.5.9 Potential Air Quality Management Measures

Air quality management measures may include:

- ☞ Dust suppression on access roads; and
- ☞ Monitoring of dust emissions to determine potential increases and trends over time.

### 8.5.10 Potential Visual Management Measures

The following management measures have been identified:

- ☞ Vegetation clearance should be kept to an absolute minimum;
- ☞ Exposed areas should be vegetated as soon as possible;
- ☞ Dust suppression measures should be implemented to limit the generation of dust;
- ☞ Only vehicles and heavy machinery necessary for construction activities should be used;
- ☞ Dust suppression measures should be implemented to limit the generation of dust;
- ☞ The natural landscape of the area has to some degree already been altered by mining and more so by agricultural activities. The proposed infrastructure will add to the already altered landscape;
- ☞ The proposed WRD and other infrastructure heights should be limited as far as possible;

- ☞ Infrastructure should be painted earthy colours to blend into the surrounding landscape;
- ☞ Only vehicles and heavy machinery necessary for operational activities should be used;
- ☞ Dust suppression measures should be implemented to limit the generation of dust;
- ☞ Down lighting and lighting shields should be used as far as possible; and
- ☞ Backfilling of the pits with WRD material and re-vegetating disturbed areas.

#### 8.5.11 Potential Noise Management Measures

The environmental noise survey will be conducted during the day and the night-time periods so as to determine the baseline noise levels which will be used to identify possible noise intrusion levels at the abutting noise receptors. This will assist in the management of the project in terms of noise mitigatory measures and management principles for implementation during the construction, operational and decommissioning phases of the project. Measures could include:

- ☞ Specific timeframes recommended for activities to be conducted in;
- ☞ Implementation of barriers to reduce noise, if determined necessary, such as trees; and
- ☞ Implementation of specific measures on vehicles to reduce noise emissions.

#### 8.5.12 Potential Socio-Economic Management Measures

Potential management measures include:

- ☞ Minimise any possible negative impacts through information sharing processes;
- ☞ Minimise any possible negative impacts related to informal population influx as a direct result of the proposed project in coordination with TLM e.g. through information sharing processes;
- ☞ Limit negative impacts of nuisance factors (intrusions, noise and dust);
- ☞ Pollution prevention of construction site;
- ☞ Avoid creation of unrealistic expectations; implement transparent communication processes
- ☞ Limit safety and health risks through design considerations, location of infrastructure and precautionary construction and operational management principles (in the event that new infrastructure would be required);
- ☞ Limit safety risks during transportation of personnel and material;
- ☞ Continue to involve locals in employment opportunities and procurement;
- ☞ Closure Plan to attend to this way in advance;
- ☞ Source and maximise local skills and local procurement if and where possible;
- ☞ Avoid creation of unrealistic expectations; implement transparent communication processes;
- ☞ Continued mining activities and employment creation;
- ☞ Continued mining activities and distribution of social funds;
- ☞ Environmental management of site can limit any possible negative impacts;
- ☞ Continue to involve locals in employment opportunities and procurement; and
- ☞ Environmental management of site can limit any possible negative impacts.

### 8.6 The outcome of the Site Selection Matrix, Final Site Layout Plan

As part of the ESR the project team has concluded that the two (2) stockpile areas (see Section 5.16.2.5) will no longer be required. This has therefore been removed from the project layout for the purposes of a sorting area, but will rather be utilised for topsoil placement.

The WRD footprint will still be amended, pending the designs currently being undertaken, as well as the outcomes of the specialist studies.

The presence of the graves on the western side of the WRD, north of the opencast pits, will require further investigation to determine the buffers required around these structures. This will also impact on the location of the proposed WRD and PCD.

The site layout to be assessed for the new expansion and to be included into the consolidated EMP is presented in Figure 8.

## 8.7 Motivation where no alternatives sites exist

In terms of the opencast pit development, no location alternatives are available as the placement thereof is in relation with the Wonderstone Outcrop.

Please refer to the following section where the various alternatives are being discussed.

## 9 PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

### 9.1 Description of alternatives to be considered including the option of not going ahead with the activity

The following alternatives will be considered during the specialist studies as part of the EIA process:

The purpose of this project is threefold:

- Expansion of the existing mining operations to ensure a long term mining operations which contributes to the economy of this municipality, which involves the consolidation of mining rights, as well as the abandonment of certain areas;
- Amendment of conditions as identified in the 2019 Regulation 34 Amendment Process to ensure that the EMPr is applicable and practical to address the environmental impacts on the environmental setting as a result of the mining operations; and
- Consolidation of the EMPrs to have one (1) holistic EMPr for the activities which are undertaken as an integrated mining operations.

#### Alternatives Considered:

Limited location alternatives are available for this project as the project are linked to the available identified resources. The following was considered:

1. In terms of the routes, mainly existing roads are utilised for accessing the proposed areas, alternatively the access roads are placed within proximity of the proposed opencast pits.
2. In terms of the proposed WRD, one (1) area with sufficient space has been identified, which was mainly disturbed by past activities, which includes sporting grounds and mine hostels. The footprint presented is a worst case of approximately 4ha, which will allow for a WRD and potential PCD. The area provided for the WRD will be assessed by the specialists to determine where within this identified area the most suitable location for the facility will be. During the initial site walk overs, the potential for graves in this area has been identified. This will have to be confirmed during the specialist investigations to determine whether buffers can be placed to protect these structures.
3. Initially two sorting stockpiles were planned along the northern perimeter of the opencast pits. These have however been removed from the project area, with the commitment that sorting will be undertaken on the footprint of the proposed WRD to reduce further disturbances in areas. Please see figure below:
4. The only alternative is the No-Go alternative where the status quo remains.

### 9.2 Description of the aspects to be assessed as part of the environmental impact assessment process

The aspects of the project that will be assessed in the EIA phase are those considered by the EAP as having the potential to result in environmental and social impacts. These include:

- Impact on groundwater resources (decant, acid mine generation, groundwater interception during mining);
- Impact on surface water resources (proximity to identified watercourses in the area);
- Impact on soil resources (erosion, loss of soil due to stripping);
- Impact on land capability (due to loss of soil);

- ☞ Impact on freshwater ecosystems (due to proximity to identified watercourses);
- ☞ Impact on noise in the area;
- ☞ Increase in dust dispersion;
- ☞ Impact on the socio-economic setting;
- ☞ Impact on land uses (such as access to the existing farm dam and windmill);
- ☞ Impact on the visual characteristics (with the expansion of mining activities); and
- ☞ Impact on heritage resources.

### 9.3 Description of aspects to be assessed by specialists

#### 9.3.1 Soil Study

##### 9.3.1.1 Specialist Appointed:

Zimpande (Pty) Ltd

##### 9.3.1.2 Scope of Work for EIA

The scope of work and specific outcomes in terms of the EIA Phase report are presented in the points below:

- ☞ Analysis of field results considering the various soil types;
- ☞ Data analysis will include a description of physical soil properties, including the following parameters:
- ☞ Terrain morphological unit (landscape position) description;
  - Diagnostic soil horizons and their respective sequence;
  - Texture, estimated as % clay according to the in-situ hand feel method;
  - Depth of identified soil horizons;
  - Soil form classification name(s);
  - Observed land capability limitations of the identified soil forms; and
  - Depth to saturation (water table), if encountered.
- ☞ Group uniform soil patterns into map units, according to observed limitations;
- ☞ Analyse and interpret soil analysis data to assess the contamination risk / impacts; and
- ☞ Provide recommended mitigation measures for the rollover mining process as active mining will take place concurrently with rehabilitation of affected areas, monitoring practices and management practices to implement in order to comply with the National Environmental Management Act (NEMA) 107 of 1998.

#### 9.3.2 Hydropedological Study

##### 9.3.2.1 Specialist Appointed:

Zimpande (Pty) Ltd

##### 9.3.2.2 Scope of Work for EIA

A hydropedological survey and sampling activities were conducted in August 2021 to assess the hydropedological characteristics of the landscape and associated soils within the study area. A soil sampling exercise was undertaken at selected representative points, considering the various soil types, to deduce the watercourse recharge mechanisms and identify the anticipated hydropedological impacts of the proposed development on the watercourses that will be affected by the proposed activity. Subsurface soil observations were made by means of a standard hand auger and investigation methods.

##### Identification of the representative hillslope/s

Prior to the site visit a desk-based exercise was undertaken which included the following:

- ☞ Identification of land types (Land Type Survey Staff, 1972 – 2006) within the study area; and
- ☞ Identification of dominant hillslopes (from crest to stream) of the study area using terrain analysis.



### Conceptualize hillslope hydrogeological responses

- ☞ Transect soil survey was conducted on each of the identified hillslope (Le Roux et al., 2011);
- ☞ Soil observations were made at regular intervals, not exceeding 100 m, on the transect;
- ☞ Analysis of soil was made by means of a hand augur as well as analysis of exposed profile areas which depict the diagnostic horizon sequence; and
- ☞ Soil observations were made until the layer of refusal.

Field assessment data included description of physical soil properties including the following parameters, in order to characterise the various recharge mechanisms of the investigated watercourse:

- ☞ Diagnostic soil horizon sequence;
- ☞ Landscape position in relation to the investigated watercourse (recorded on GPS); and
- ☞ Depth to saturation (water table), if encountered.

### Conceptual hillslope hydrogeological response

The occurrence, sequence, and coverage of the different hydrogeological groups on a transect was used to describe the hydrological behaviour of the hillslope (van Tol et al., 2013). This includes a graphical representation of the dominant and sub-dominant flow paths at hillslope scale prior to development (as presented in Section 5.3). This will include:

- ☞ Overland flow;
- ☞ Subsurface lateral flow;
- ☞ Bedrock flow;
- ☞ Return flow; and
- ☞ Storage mechanisms

Field assessment data was subsequently used to carry out the following assessments and investigation:

- ☞ Verify the spatial extent of the identified soil forms using a GIS software programme;
- ☞ Identify the potential impacts of the proposed development on the unsaturated flow processes, and implications to the functionality of the watercourse;
- ☞ Compile a brief report on the conceptual hydrogeological regime of the assessed watercourse based on the soil types within the study area under current conditions; and
- ☞ Recommend suitable mitigation and management measures to alleviate the identified impacts on the watercourse hydrogeological conditions.

## 9.3.3 Aquatic Freshwater Ecosystem Study

### 9.3.3.1 Specialist Appointed:

Scientific Aquatic Services CC

### 9.3.3.2 Scope of Work for EIA

The following points highlight the envisaged activities during the EIA phase of the proposed Driekuil development:

- ☞ Field verification and delineation of the potential freshwater ecosystems must be undertaken, and the field verification assessment must ensure no other freshwater ecosystems are located within the study and investigation area that may have been missed on the desktop assessment using digital satellite imagery;
- ☞ During the field verification, the classification of the freshwater ecosystems must be undertaken according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis et al., 2013);
- ☞ The Ecological Importance and Sensitivity (EIS) of the freshwater ecosystems must be determined according to the method described by Rountree and Kotze, (2013);
- ☞ The ecological service provisioning provided by the freshwater ecosystems associated with the proposed Driekuil development in the study area and associated investigation area must be assessed according to the method of Kotze et al (2020);

- ☞ The Present Ecological State (PES) of the freshwater ecosystems must be assessed according to the resource directed measures guideline as advocated by Macfarlane et al., (2008) or DWAF (2007) as applicable;
- ☞ The freshwater ecosystems within the study and associated investigation area of the Driekuil development should be mapped according to the ecological sensitivity of each hydrogeomorphic unit. In addition to the freshwater ecosystem boundaries, construction and operational phase buffers should be appropriately calculated according to the method of Macfarlane et al. (2015) and the applicable Zones of Regulation will be refined and depicted, (where applicable) dependent on the classification of the freshwater ecosystems after the field verification;
- ☞ The PES, EIS, and ecological service provision of the freshwater ecosystems should be highlighted and expected impacts on the systems must be assessed according to a pre-defined impact assessment methodology.

### 9.3.4 Ecological Study

#### 9.3.4.1 Specialist Appointed:

Scientific Aquatic Services CC

#### 9.3.4.2 Scope of Work for EIA

Specific outcomes in terms of the EIA phase report are presented in the points below:

- ☞ To identify and consider all sensitive landscapes including rocky ridges, wetlands and/or any other special features;
- ☞ The terrestrial ecological assessment will focus on:
  - Conducting a SCC assessment, including potential for species to occur within the study area;
  - Providing floral and faunal inventories of species that were encountered on site;
  - Describing the spatial significance of the proposed infrastructure development with regards to surrounding natural areas;
  - Describing floral habitats, communities and ecological state of the proposed infrastructure development as is determined on site;
  - Identifying dominant floral and faunal species for each habitat type;
  - Focus will be given to identifying areas of severe alien and invader encroachment and listing Category 1, 2 and 3 species in terms of GN No. 864 Alien and Invasive Species List, 2016: National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
  - Specific focus will also be given to establishing the presence of Red Data Listed (RDL) and protected fauna and flora as listed under the IUCN, the TNCO (Schedules 2, 11 and 12), the NFA, and the NEMBA: TOPS list of 2007);
- ☞ The reports produced will include a detailed impact assessment of all identified significant risks, including cumulative impacts on ecological assemblages in the region; and
- ☞ Recommendations on the management and mitigation measures (including opportunities and constraints) with regards to the construction and operation of the proposed activities, will be provided to manage and mitigate impacts on the terrestrial ecology of the area.

### 9.3.5 Hydrological Study

#### 9.3.5.1 Specialist Appointed:

HydroSpatial (Pty) Ltd

#### 9.3.5.2 Scope of Work for EIA

The following is proposed to be undertaken during the EIA phase of the project:

- ☞ Development of conceptual Stormwater Management Plans (SWMP) in accordance with the DWS BPG G1: Storm Water Management and GN R704 regulations. The primary purpose of the SWMP is to ensure

that clean (non-impacted mine water) and dirty water (mine impacted water) are clearly separated in accordance with the above-mentioned guideline and regulations;

- ☞ Determination of the 1:100 year floodline for the Driekuilspruit;
- ☞ Update of the mines water balance to include the proposed activities;
- ☞ An assessment of the potential surface water impacts and possible mitigation measures; and
- ☞ Development of monitoring plans that can be used to monitor potential impacts resulting from the proposed mining activities.

### 9.3.6 Hydrogeology

#### 9.3.6.1 Specialist Appointed:

Irene Leah Environmental and Hydrogeology CC (iLEH)

#### 9.3.6.2 Scope of Work for EIA

A groundwater specialist study will be undertaken as part of the impact assessment phase of the project to investigate the key potential issues identified during scoping. These key issues have been identified based on:

- ☞ The legal requirements;
- ☞ The nature of the receiving environment and the proposed activities discussed above;
- ☞ Professional experience of the hydrogeologist.

The assessment of impacts will be based on the professional judgement of the hydrogeologist, site assessments, a planned hydrocensus, sampling of rock material for leach and acid base accounting tests, conceptualisation and numerical groundwater flow and contaminant transport modelling. Assumptions, limitations and sources of information will be clearly identified. The knowledge of local people will, where possible, be incorporated into the study, especially in terms of private groundwater use. The description of the approach will include a short discussion of the appropriateness of the methods used in the hydrogeologist study. The assessment of the data will be based on accepted scientific techniques as well as professional expertise and experience.

#### Description of the Affected Environment or Baseline

A description of the affected hydrogeological environment will be provided, both at a site-specific level and for the wider region. The latter will provide an appropriate context, especially in terms of regional groundwater use. It is essential that the uniqueness or irreplaceability of the groundwater resources is understood in the context of the surrounding region at a local, regional scale. This will largely be based on the results of the proposed numerical modelling.

The study will provide a sufficiently comprehensive description of the existing hydrogeological setting to ensure that a detailed assessment of the potential impacts of the proposed development can be made. The baseline will include data collected during field surveys as well as desktop studies.

#### Assessment of abandonment areas

As part of the EIA phase of the project, the areas currently included in the NOMR which are to be abandoned will be visited to confirm whether or not mining activities have taken place. If any disturbances are identified that could impact on groundwater, a management plan will be developed for implementation.

#### Hydrocensus and rock sampling

A hydrocensus will be completed as part of the EIA phase of the project to update the 1996 hydrocensus data. The objective of the hydrocensus will be to confirm current private groundwater use in relation to the project. This information will be used to update the current understanding of the sensitive receptors for the area.

A composite rock sample will be taken for acid base accounting and leach tests in order to improve the understanding of acid mine drainage and the impact of poor quality leachate on groundwater quality.

#### Impact Identification and Assessment

Clear statements identifying the potential environmental impacts of the proposed project will be presented. This includes potential impacts of the planning, construction, operational, rehabilitation, decommissioning and closure phases of the project. The study will clearly identify the potential direct, indirect and cumulative

environmental impacts associated with the hydrogeology. The assessment of these impacts will specifically take into account any private groundwater use in the surrounding area.

Direct impacts that require a quantitative assessment will be assessed following the impact assessment methodology laid out by EnviroGistics. The significance of impacts will be assessed both without and with assumed effective mitigation and/or rehabilitation. Indirect and cumulative impacts will be described qualitatively. The study will comparatively assess environmental impacts of the proposed mining activities, groundwater abstraction for use at the mine and mine waste deposition. The study will indicate any significant adverse hydrogeological impacts which cannot be mitigated and which will jeopardise the project and/or groundwater use in a particular area. All conclusions will be thoroughly backed up by scientific evidence.

### Management Measures

The study will recommend practicable groundwater management measures or management actions that effectively minimise or eliminate negative impacts, enhance beneficial impacts, and assist mine design. If appropriate, the study will differentiate between essential mitigation measures, which must be implemented and optional mitigation measures, which are recommended (“nice-to-haves”). Unsubstantiated recommendations for further studies will be avoided.

The study will recommend appropriate monitoring and review programmes to track the efficacy of mitigation measures.

The study will indicate the environmental acceptability of the proposed project (and alternatives if applicable), i.e. whether the impacts are acceptable or not. A comparison between the “no-project” alternative and the proposed development alternative(s) will also be included.

### Terms of Reference for the Groundwater Specialist Study

This study will address aspects associated with groundwater identified in the scoping phase. The following is proposed:

- ☞ Identify, describe and map groundwater resources (aquifers) in the area that may be affected by the proposed activities and obtain a holistic understanding of the interactions between surface water and wetland resources and the aquifer(s) in the area.
- ☞ Undertake a hydrocensus within the NOMR to identify existing private groundwater use. During the hydrocensus, borehole ownership details, borehole depth, construction, abstraction rates, groundwater levels and groundwater quality will be measured and/or recorded.
- ☞ Take groundwater samples from selected hydrocensus boreholes for chemical analysis at an accredited laboratory in order to establish the baseline groundwater quality for the project site;
- ☞ Construct a conceptual model for the sub-catchment in which the project falls, which demonstrates the interaction between mining and associated activities and the aquifer(s) present.
- ☞ Construct and calibrate a groundwater flow and contaminant transport model for the sub-catchment in which the project is situated. The model will be used as a groundwater impact assessment and prediction tool.
- ☞ Identify and assess potential impacts on groundwater resources, including impacts associated with the construction, operation, decommissioning and post closure phases of the proposed project. Specific focus will be placed on residual and/or cumulative impacts on groundwater.
- ☞ Propose practicable measures to manage/rehabilitate potentially negative impacts and enhance positive impacts of the project;
- ☞ Recommend monitoring measures to ensure the correct implementation and adequacy of recommended mitigation measures;
- ☞ Make recommendations for closure planning.

## **9.3.7 Cultural and Heritage Assessment, including Paleontological Assessment**

### **9.3.7.1 Specialist Appointed:**

Beyond Heritage (Pty) Ltd

### 9.3.7.2 Scope of Work for EIA

In order to achieve the successful completion of the project, the following methodology is proposed:

- ☞ **Background Study.** This phase included:
  - This was accomplished by means of the following phases:
    - Literature search
      - A literature search was conducted utilising data from published articles on the archaeology and history of the area. The aim of this is to extract data and information on the area in question, looking at archaeological sites, historical sites and graves of the area.
    - Information collection
      - SAHRIS was consulted to collect data from CRM practitioners who undertook work in the area to provide the most comprehensive account of the history of the area where possible.
    - Public consultation
      - A full public consultation process will be facilitated by WSP. Any heritage concerns raised during this process will be addressed in the HIA.
    - Google Earth and mapping survey
      - Google Earth and 1:50 000 maps of the area were utilised to identify possible places where archaeological sites might be located.
    - Genealogical Society of South Africa
      - The database of the genealogical society was consulted to collect data on any known graves in the area.
- ☞ **Physical Surveying**
  - The field visit will aim to understand the heritage character of the study area. If heritage sites of significance are encountered these sites will then be recorded, photographed and described. GPS points of significant sites will be documented using the WGS 84 datum point.
- ☞ **Reporting and Impact Assessment**
  - Should any sites be identified during the field visit a study method for the way forward will be proposed. This will include determining the levels of heritage significance of recorded heritage resources and the impact of the proposed development on these resources. Mitigation measures and management actions will be recommended should any significant sites be impacted upon.

### 9.3.8 Air Quality Impact Study

#### 9.3.8.1 Specialist Appointed:

VJA Air Modelling Services (Pty) Ltd

#### 9.3.8.2 Scope of Work for EIA

The main purpose for conducting the Air Quality Impact Assessment (AQIA) is to identify key activities that might have significant air quality impacts during the project planning, construction and operational phases. In order to sufficiently understand the possible impact of the proposed expansion project the following activities will be undertaken:

##### Baseline Air Quality Assessment

The baseline assessment will consist of:

- ☞ A site visit to determine the footprint and layout of the existing Wonderstone mining operation and proposed expansion, as well as any significant surrounding sources of emissions;
- ☞ A description of the receiving environment, focusing on sensitive receptors;
- ☞ Assessment of the existing air quality situation in the area with the use of ambient monitoring data (historical);

Information gathering, inclusive of, but not limited to:

- ☞ Baseline climatic and air quality characterisation.
- ☞ Existing sources of emissions.
- ☞ Existing air quality monitoring data.
- ☞ A detailed list of sensitive receptors in the vicinity of the existing and proposed Wonderstone mining operation.

### Development of Emissions Inventory

A detailed, accurate source emissions inventory is extremely important to produce an accurate dispersion model. The inventory will be developed through the calculation of emissions by mass, source, time period and pollutant. These variables are calculated by using individual emission source information with their associated emission factors, and the respective operational parameters over a determined period of time. These parameters are then used to calculate the total source related emissions at the Wonderstone Mine, including:

- ☞ Calculation of emissions from the existing activities and proposed expansion project; and
- ☞ Verification of the existing emissions inventory and capturing into an electronic format.

### Dispersion Modelling

Source inventory data will be used as input for the creation of a dispersion model that demonstrates the impact of emissions associated with the existing activities and proposed expansion project to the existing situation. AERMOD modelling suite will be used to model the proposed Wonderstone expansion project. AERMOD is new generation air dispersion model designed for short-range dispersion of airborne pollutants in steady state plumes.

AERMOD system:

- ☞ Uses hourly sequential meteorological files with pre-processor to generate flow and stability regimes for each hour.
- ☞ Produce output maps of plume spread with key isopleths for visual interpretation.
- ☞ Statistical output of the model allows for direct comparisons with the latest national ambient air quality standards (NAAQS) for compliance testing.

The model will be setup to compute ambient ground level concentrations (GLC) based on both long-term (annual / chronic) and short-term (worst-case / acute) averaging periods. Model scenarios will be for cumulative impacts (no background concentrations are available to be included), such that statistical output will be compared with applicable ambient air quality standards for compliance assessment purposes. Additionally, model predictions will be compared to actual monitored data (historical).

### Air Quality Impact Assessment

An AQIA will be required as part of the EIA process to demonstrate the impacts of the proposed operations on the existing air quality situation of the area. The report will include all methodological and technical information required to support the findings, as well as focusing on the potential impacts on the sensitive receptors.

### Development of an Air Quality Management Plan

The AQIA report will also include an air quality management plan (AQMP) that details an emissions management and monitoring plan for key pollutants. Focus will be afforded to the following air pollutants:

- ☞ Particulate matter smaller than 10 microns (PM10) and 2.5 microns (PM2.5); and
- ☞ TSP (as deposited dust).

Mitigation recommendations will also be provided for those sources identified as key emitters, where emission reduction strategies should be implemented.

## 9.3.9 Visual Study

### 9.3.9.1 Specialist Appointed:

HydroSpatial (Pty) Ltd

### 9.3.9.2 Scope of Work for EIA

The following will be undertaken during the EIA phase of the project for the VIA study:

- Viewshed modelling of proposed infrastructure heights will be undertaken to determine the visibility of the project on the surrounding landscape; and
- The visual impacts will be assessed in detail and mitigation measures will be proposed.

### 9.3.10 Noise Study

#### 9.3.10.1 Specialist Appointed:

dBa Acoustics (Pty) Ltd

#### 9.3.10.2 Scope of Work for EIA

##### Legislative Requirements

The following Legislation and Standards will be used during the Noise Impact Assessment:

- Department of Environment Affairs: Noise Control Regulations, 1994 promulgated under the Environment Conservation Act, (Act No. 73 of 1989), Government Gazette No. 15423, 14 January 1994; Wonderstone Expansion Project Page 0-5 dBaAcoustics
- SANS 10328: 2008 - Methods for environmental noise impact assessments.
- SANS 10103: 2008 - The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.
- SANS 10357:2000 The calculation of sound propagation by the Concave method.
- SANS 10210 of 2004 – The determination of road traffic noise.
- Environmental, Health and Safety Guidelines for Community Noise and Mining, World Health Organisation, Geneva, 1999.

##### Impact Identification

The preparation and provision of infra-structure for the proposed Driekuil expansion project will be the main noise sources during the construction, operational phase and the decommissioning phases of the project which may have a cumulative impact on the prevailing ambient noise level. This will however be assessed during the EIA process. The rehabilitation activities during the decommissioning phase may have a temporarily impact on the environment.

##### Terms of Reference for Environmental Impact Assessment

###### *Environmental Noise study*

The environmental noise study will be conducted to determine the prevailing environmental ambient noise levels within and adjacent to the proposed project area/s. This information will be used to determine the potential noise intrusion levels at the different noise receptors in the vicinity of the project area/s.

###### *Area of Influence*

All residential properties in the vicinity of the proposed project study area.

###### *Methodology*

A site visit will be conducted to determine the prevailing ambient environmental noise levels by means of a qualitative evaluation and/or a quantitative evaluation. Calibrated instruments will be used to do the environmental noise survey. The impact assessment methodology will be used to identify the area likely to be affected. In terms of the International Finance Corporation Performance Standards the area of influence is defined as:

- the project and the client's activities and facilities that are directly owned, operated, or managed (including by contractors) and that are a component of the project;
- impacts from unplanned but predictable developments caused by the project that may occur later or at a different location;

- indirect project impacts on biodiversity or on ecosystem services upon which affected communities' livelihoods are dependent;
- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

### 9.3.11 Socio-Economic Study

#### 9.3.11.1 Specialist Appointed:

Batho Earth

#### 9.3.11.2 Scope of Work for EIA

Based on the outcome of the baseline assessment and social screening, it is recommended that a Social Impact Assessment be compiled during the detailed phase of the Environmental Authorisation process.

The study will provide an outline of the main anticipated socio-economic impacts and will indicate how these can be mitigated as part of a Social Management Plan.

#### Approach

##### *Further Literature Review*

Additional relevant additional literature would be reviewed and incorporated into the SIA.

##### *Information from Consultation Sessions and Fieldwork*

Comments, issues and concerns as raised during the consultation with the stakeholders and affected parties during the public participation process would be studied and integrated where applicable.

##### *Analysis of data compiled from parallel studies*

The Social Impact Assessment (SIA) team will study and analyse the information gathered by the biophysical studies. Information related to technical, environmental, economic and demographic aspects, land-use changes, impact on other facilities, services, and so forth will be used to develop the SIA Report.

##### *Outcome*

- On completion of the above activities, the SIA Report will be compiled and submitted. It can include inter alia:
  - A description of the anticipated social impacts and the significance of these impacts;
  - Recommendations for the enhancement of positive social impacts;
  - Recommendations for the avoidance, mitigation and management of negative social impacts;
  - Compliance/management measures to assist in limiting any possible social risks to the communities;
  - Note any possible social attitude formation;
  - Recommendations for future communication efforts and strategies with regards to the implementation of the proposed project.

### 9.3.12 The proposed method of assessing duration significance

Please refer to Section 8.1 presenting the methodology to be used in the determination of the significance of the impacts.

### 9.3.13 Proposed method of assessing the environmental aspects including the proposed method of assessing alternatives

Please refer to Section 8.1 presenting the methodology to be used in the determination of the significance of the impacts.



### *9.3.14 The stages at which the competent authority will be consulted*

The commenting authorities have been notified of the proposed project via notification letters (Background Information Documents – please refer to Appendix 5). The documents provided high level project information with a reference to the project.

Commenting authorities have received hard copies the draft ESR and will receive hard copies of the draft EIA and EMPr Report.

This final ESR and EIA/EMPr report will be submitted to the DMRE for consideration. All comments to be received during this draft report review periods will be included into the final ESR, draft EIA and EMPr and final EIA and EMPr.

All comments received from the authorities will be provided to the DMRE for considerations.

The EAP will arrange an authority meeting with the DMRE.

### *9.3.15 Particulars of the public participation process with regard to the Impact Assessment process that will be conducted*

#### 9.3.15.1 Steps to be undertaken to notify interested and affected parties

In accordance with the NEMA, GNR 982, Chapter 6, potential I&APs either have been or will be notified of the proposed project using the following means:

- ☞ Fixing a notice board in conspicuous areas around the proposed project site.

Written notice to the:

- ☞ Land owner of the site where the activity to which the application relates to;
- ☞ The current occupier of the land;
- ☞ Municipal ward councillor(s) related to the project site;
- ☞ Municipality which has jurisdiction in the area; and
- ☞ Commenting authorities.

Placing an advertisement in a local newspaper.

A stakeholder meeting will also be arranged with I&APs.

#### 9.3.15.2 Details of the engagement process to be followed

Please refer to Section 4 and Appendix 5 for more detail in this regard.

#### 9.3.15.3 Description of the information to be provided to Interested and Affected Parties

During the initial stakeholder notification process, high level project detail will be provided including location of the project, boundary of the proposed project site, farm details, land use information, legal triggers and proposed way forward.

The draft ESR will be made available to the registered I&APs for review. During the Scoping Phase the stakeholders obtained information regarding the:

- ☞ Site Plans;
- ☞ Alternatives;
- ☞ A description of activities and operations to be undertaken;
- ☞ Baseline information;
- ☞ Specialist studies to be undertaken; and
- ☞ Proposed impact assessment methods.

All comments received from stakeholders during the review periods will be included into the next phase of assessment. All comments will be submitted to the DMRE and DWS as the Commenting Authorities.

During the EIA Phase, the following information will be disclosed in the EIA Report:

- ☞ Impact assessment undertaken and results thereof;
- ☞ Management measures;
- ☞ Monitoring plans; and
- ☞ Closure objectives.

### ***9.3.16 Description of the tasks that will be undertaken during the environmental impacts assessment process***

Once the Final ESR has been submitted to and accepted by the DMRE, the proposed project will proceed into the detailed EIA Phase, which involves the detailed specialist investigations (as described in earlier sections of this report – Plan of Study).

The EAP will produce a Draft EIA Report after the completion of the required specialist studies. The Draft EIA Report will provide an assessment of all the identified key issues and associated impacts from the Scoping phase.

### ***9.3.17 Measures to avoid, reverse, mitigate, or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored***

Please refer to Sections 8.3 and 8.5 for a detailed description of the potential impacts and management measures.

## **9.4 Other Information required by the Competent Authority**

As yet, no specific information requirements have been listed by the Competent Authority.

### ***9.4.1 Compliance with the provisions of sections 24(4) (a) and (b) read with section 24(3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). The EIA report must include the:-***

#### ***9.4.2 Impact on the socio-economic conditions of any directly affected person***

The continuation with mining activities is deemed to be in line with development priorities to support the local economy in the district and province. The mining activities are expected to have both positive and negative socio-economic impacts on the local environment. The net effect on the socio-economic environment needs to be investigated further in the Social Impact Assessment report. Negative socio-economic impacts also increase the operational risks for the mining company within the local area. The impact assessment report will focus on measures to enhance the benefits to the local community and mitigate negative socio-economic impacts.

The mining activities have been taking place in this area for over 80 years. There is a good relationship with WST and the surrounding landowners. During the consultation phase landowners will be given the opportunity to comment on the project and to provide recommendations for consideration into the EIA project.

The mine layout has been structured as such, not to impact on current farm dams and water resources for livestock watering and also to allow for the safe movement of livestock on the property.

#### ***9.4.3 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act***

The study area is known to contain rock engravings on the farms Gestoptefontein and Driekuil. These sites formed the basis of a PhD study (Hollman 2013). The engravings were done on Wonderstone which is a type of pyrophyllite that will be mined for this application and more sites can be expected.

Based on the current information obtained for the area at a desktop level it is anticipated that any heritage resources that occur within the proposed development area will have a Generally Protected B (GP. B) or lower field rating and all sites should be mitigatable.

To the west of the proposed WRD potential graves are present. Graves are of high social significance (Field rating GP A) and can be expected anywhere on the landscape. A Heritage Specialist has been appointed for the purposes of this project.

The field visit will aim to understand the heritage character of the study area. If heritage sites of significance are encountered these sites will then be recorded, photographed and described. GPS points of significant sites will be documented using the WGS 84 datum point.

#### 9.4.4 Other matters required in terms of sections 24(4) (a) and (b) of the Act.

A detailed EIA process will be undertaken to:

- Consult with the various Organs of State;
- Provide the findings and recommendations from the specialist studies;
- Detailed description of the environmental likely to be significantly affected by this proposed project;
- Consult with the various stakeholders;
- Report on any Gaps identified; and
- Provide the required monitoring and management of consequences for, or impacts on the environment and the assessment of the effectiveness of the measures after their implementation.

## 10 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

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The EAP herewith confirms:

- 10.1 The correctness of the Information provided in the Reports
- 10.2 The inclusion of Comments and Inputs from Stakeholders and I&APs
- 10.3 The inclusion of Inputs and Recommendations from the Specialist Reports where relevant
- 10.4 That the Information provided by the EAP to I&APs and any Responses by the EAP to Comments and Inputs made by I&AP are correctly reflected herein

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*Signature of the Environmental Assessment Practitioner*

EnviroGistics (Pty) Ltd

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*Name of company*

*Date 26 April 2022*

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## 11 UNDERTAKING REGARDING LEVEL OF AGREEMENT

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Undertaking by the client: *(client signature to be include into the final scoping report)*

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant, and confirm that the above report comprises EIA and EMP compiled in accordance with the guideline on the Departments official website and the directive in terms of sections 29 and 39 (5) in that regard, and the applicant undertakes to execute the Environmental management plan as proposed.

\_\_\_\_\_  
Full Names and Surname

\_\_\_\_\_  
Identity Number

\_\_\_\_\_  
Designation

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## **Annexures**

*Appendix 1: EAP Curriculum Vitae*

*Appendix 2: Application Submission*

*Appendix 3: Regulation 34 Submission*

*Appendix 4: Title Deeds*

*Appendix 5: Stakeholder Consultation*

*Appendix 6: Soils and Land Capability Report*

*Appendix 7: Hydropedology Report*

*Appendix 8: Ecological Report*

*Appendix 9: Freshwater Ecosystems Report*

*Appendix 10: Hydrological Report*

*Appendix 11: Hydrogeological Report*

*Appendix 12: Heritage Report*

*Appendix 13: Visual Report*

*Appendix 14: Air Quality Report*

*Appendix 15: Noise Report*

*Appendix 16: Socio-Economic Report*

*Appendix 17: Past DMRE consultation*

Wonderstone – Driekuil Mining Expansion and Consolidation Project  
Mining Right Ref: NW30/5/1/2/2/398MR

Project Ref: 202110  
Version: Final Draft – Stakeholder Review

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## ***Annexure 1: DMR Acknowledgement of Receipt***

Wonderstone – Driekuil Mining Expansion and Consolidation Project  
Mining Right Ref: NW30/5/1/2/2/398MR

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## ***Annexure 2: Stakeholder Consultation Report***

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## ***Database***



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## ***BID***

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## ***Adverts***

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## ***Consultation***

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## ***Comments Received***

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## ***Proof of submission***

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## ***Annexure 3: Specialist Report***