mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

# SCOPING REPORT FOR THE SUBSTITUTION OF AN ENVIRONMENTAL MANAGEMENT PROGRAMME (ENVIRONMENTAL AUTHORISATION), AN APPLICATION IN TERMS OF SECTION 102 OF THE MINERAL AND PETROLEUM RESOURCE DEVELOPMENT ACT, 28 OF 2002 FOR LISTED ACTIVITIES ASSOCIATED WITH MINING RIGHT PRIVATE RAILWAY SIDING, SERVICE ROADS, RAILWAY CROSSING AND ACCESS ROAD FOR PALING MINE

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).[1]


| | |
|---|---|
| **NAME OF APPLICANT:** | **PMG MINING (PTY) LTD** |
| **TEL NO:** | **011 – 484 2622** |
| **FAX NO:** | **011 – 484 2621** |
| **POSTAL ADDRESS:** | **P.O. BOX 731637<br>FAIRLANDS<br>2030** |
| **PHYSICAL ADDRESS:** | **22 WELLINGTON RD<br>PARKTOWN<br>JOHANNESBURG<br>2123** |
| **FILE REFERENCE NUMBER SAMRAD:** | **(NC) 30/5/1/1/3/2/1/244 MR** |


[1] Section 102 Application in terms of the Mineral and Petroleum Resources Development Act, 28 of 2002.

## IMPORANT NOTICE

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

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

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

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

**It is furthermore an instruction that** the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices.) The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

## OBJECTIVE OF THE SCOPING PROCESS

1) The objective of the scoping process is to, through a consultative process:-
   a) identify the relevant policies and legislation relevant to the activity;
   b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
   c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
   d) 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;
   e) identify the key issues to be addressed in the assessment phase;
   f) 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
   g) 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

2) Contact Person and correspondence address:

**a) Details of:**

**i) The EAP who prepared the report:**

| | |
|---|---|
| Name of the Practitioner: | Roelien Oosthuizen |
| Tel No.: | 084 208 9088 |
| Fax No. : | 0 |
| e-mail address: | roosthuizen950@gmail.com |
| Physical Address: | Farm Oberon, Kimberley, 8301 |
| Postal Address: | P O Box 110823, Hadisonpark 8306 |

**ii) Expertise of the EAP:**

(1) The qualifications of the EAP:
(With evidence attached as Appendix 1)

Masters in Environmental Management (UFS)
B-Comm in Human and Industrial- Psychology (NWU)

In terms of Regulation 13 of the 2014 EIA Regulations (Government Notice R. 982) as amended by GNR326 (2021), an independent Environmental Assessment Practitioner (EAP), must be appointed by the applicant to manage the application. Wadala Mining and Consulting (Pty) Ltd. has been appointed by the Applicant as the EAP (Roelina Oosthuizen) and is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations and Section 1 of the NEMA. This includes, inter alia, the requirement that Roelina Oosthuizen is:

- Registered
- Objective and independent;
- Has expertise in conducting EIA's;
- Complies with the NEMA, the Regulations and all other applicable legislation;
- Takes into account all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with environmental impact assessments and relevant application processes) are attached as **Appendix 1** to this report.

(2) Summary of the EAP's past experience:
(Attach the EAP's curriculum vitae as Appendix 2)

Relevant past experiences in carrying out the Environmental Impact Assessment Procedures include Environmental Impact Assessments, Environmental Management Plans/Programmes/ Reports, Performance assessments, Rehabilitation progress assessments, Environmental Liability assessments, Environmental compliance monitoring, Scoping Reports, etc. See attached CV as **Appendix 2**.

**b) Description of the property:**

| | |
|---|---|
| Farm Name: | Remainder of the farm Paling No. 434 |
| Application area (Ha) | 3 278.6156 |
| Magisterial district: | Hay |
| Distance and direction from nearest town | The area is located on the farm Paling which is 20km west of Postmasburg and approximately 180km to the south of Kathu |
| 21 digit Surveyor General Code for each farm portion | C03100000000043400000 |

**c) Locality Map:**
(show nearest town, scale not smaller than 1:250 000 attached as Appendix 3)

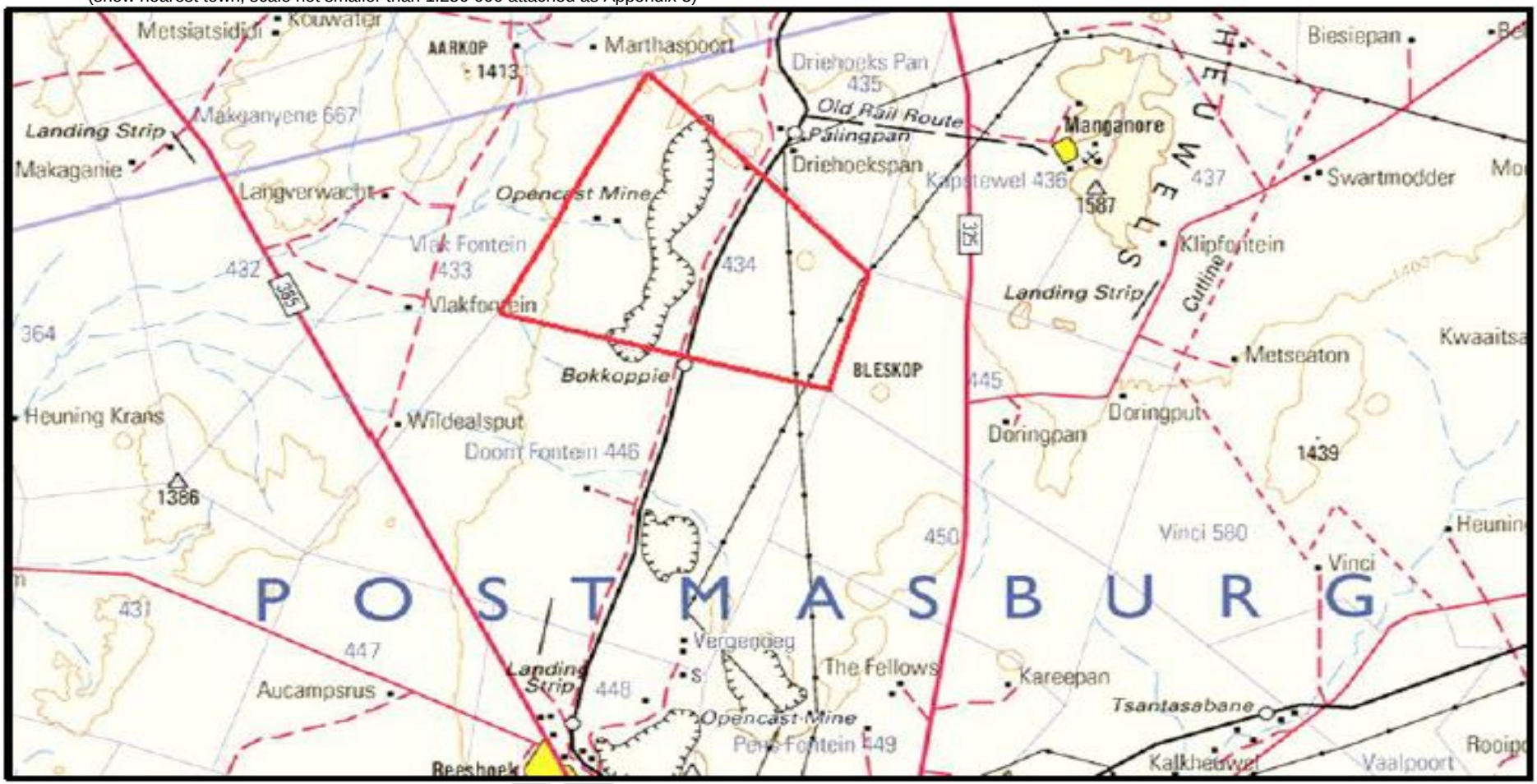


**Figure 1**. Locality Map of the mining area of PMG on the farm Paling with the existing Transnet Freight Railway (TFR) line running through the property indicated with the existing gravel road next to the Transnet Railway line.

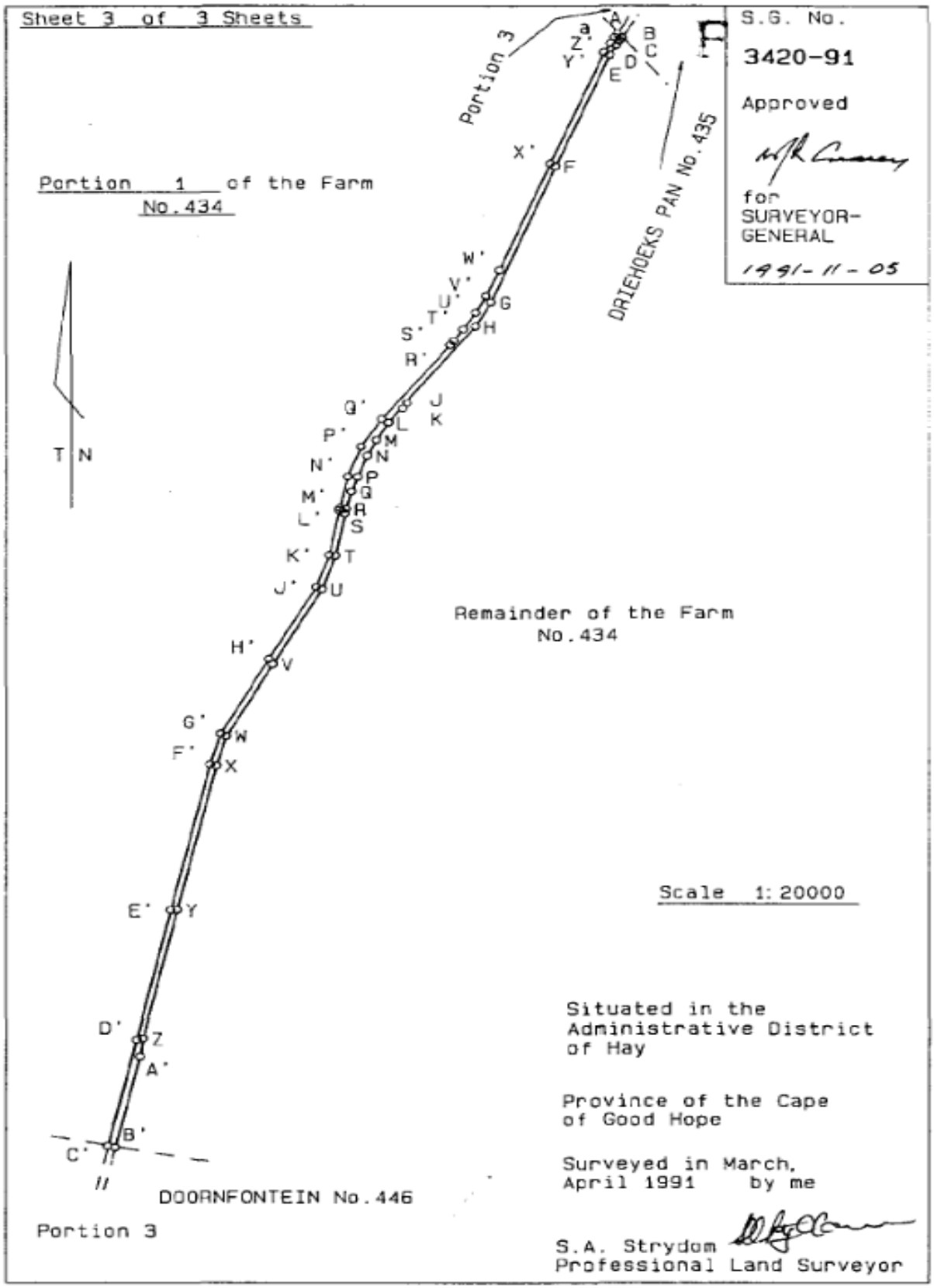


**Figure 2.** Surveyor General surveyed map of the railway line dating 1991 and indicating the Freight Railway Line (FRL) as Portion 1 of the Farm 434, Hay.

**d) Description of the scope of the proposed overall activity:**

**i) Listed and specified activities:**

(Provide a plan drawn to a scale acceptable to the competent authority but not less than 1:10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site and attach as Appendix 4)

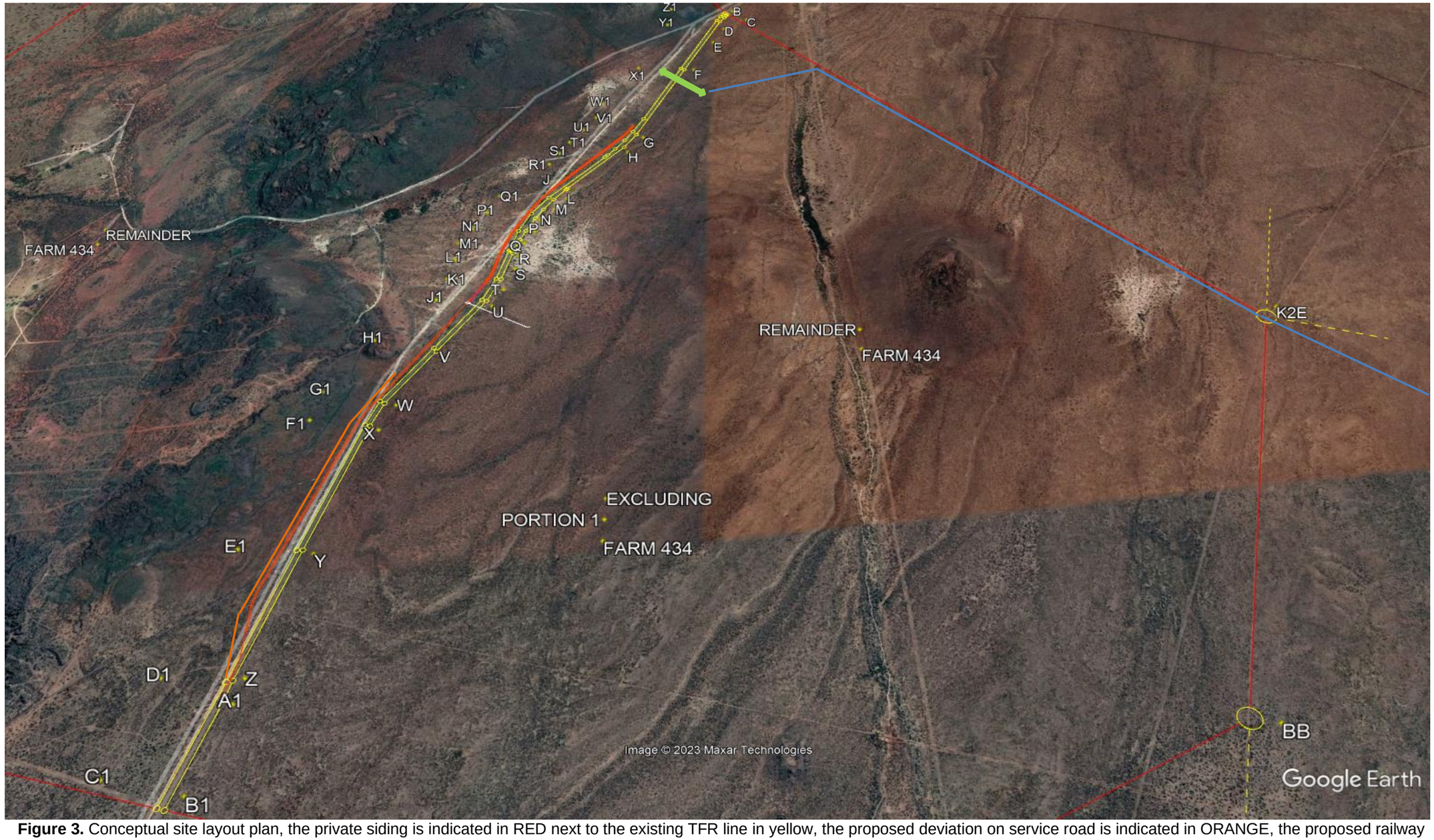


**Figure 3.** Conceptual site layout plan, the private siding is indicated in RED next to the existing TFR line in yellow, the proposed deviation on service road is indicated in ORANGE, the proposed railway crossing is indicated in green and the new access road in Blue.

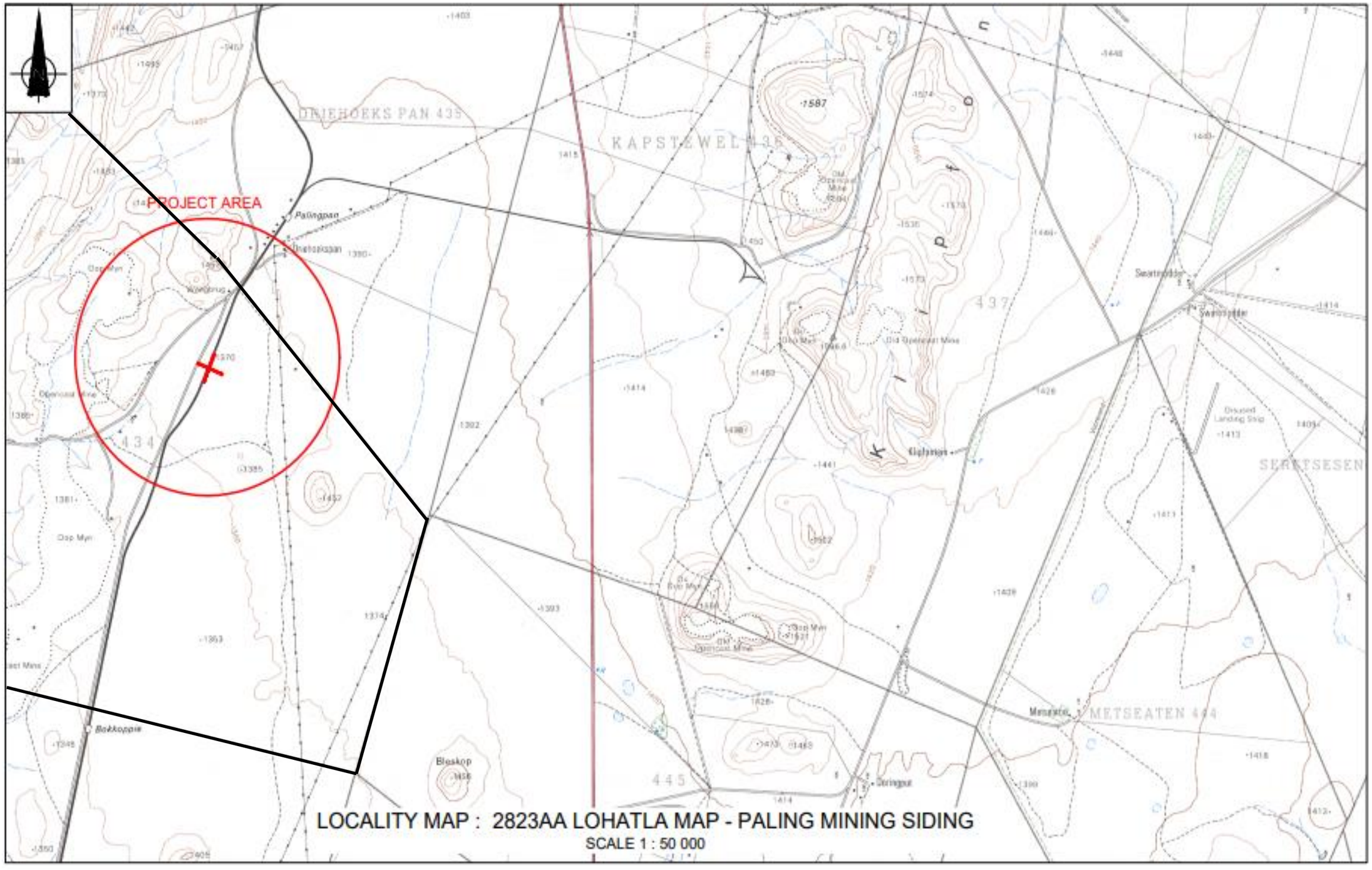


**Figure 4.** Location of new cross over on Paling the existing cross over at km 224 will be closed and a new one will be constructed at 226/2 Indicated with red cross.

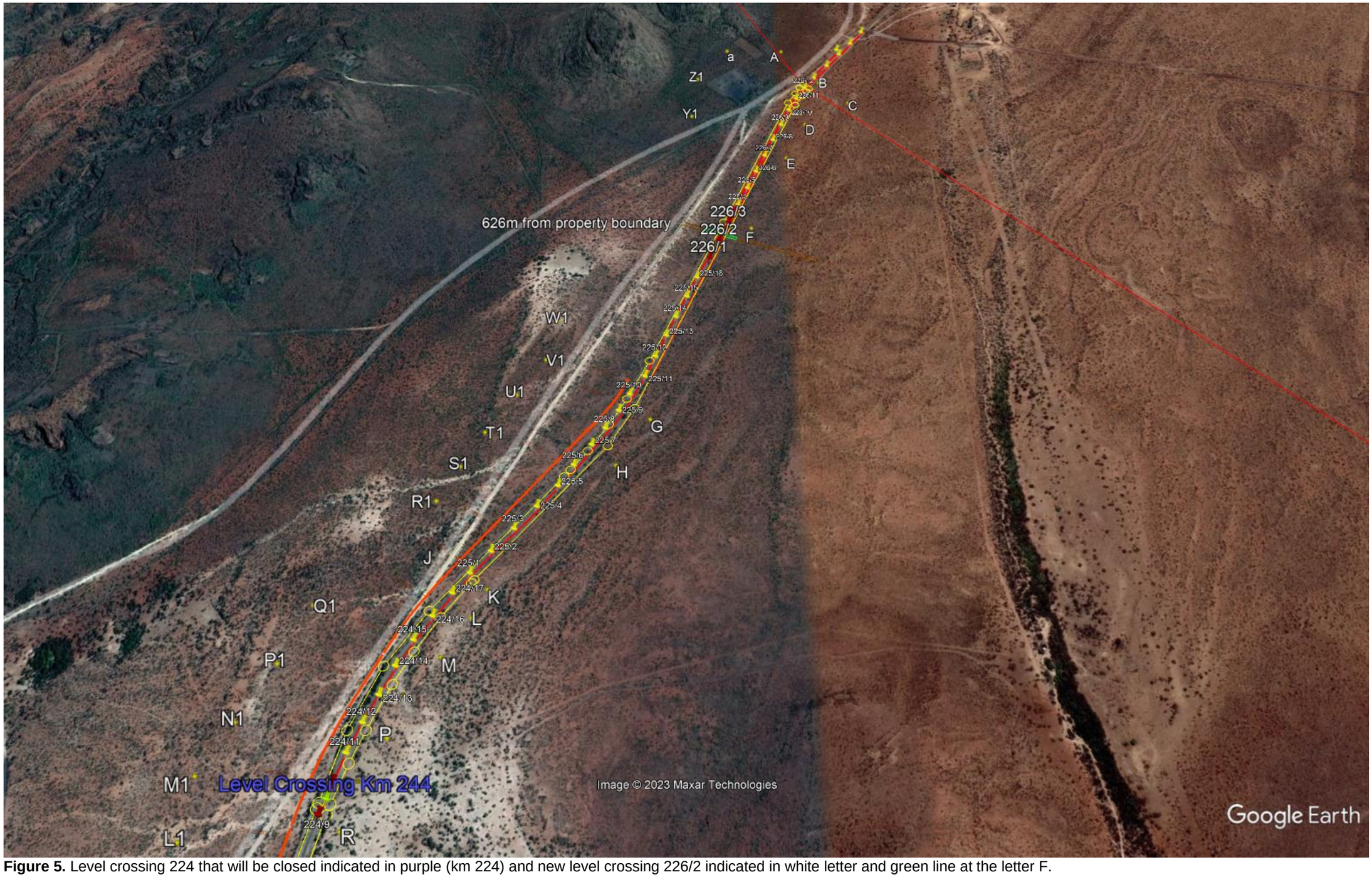


**Figure 5.** Level crossing 224 that will be closed indicated in purple (km 224) and new level crossing 226/2 indicated in white letter and green line at the letter F.

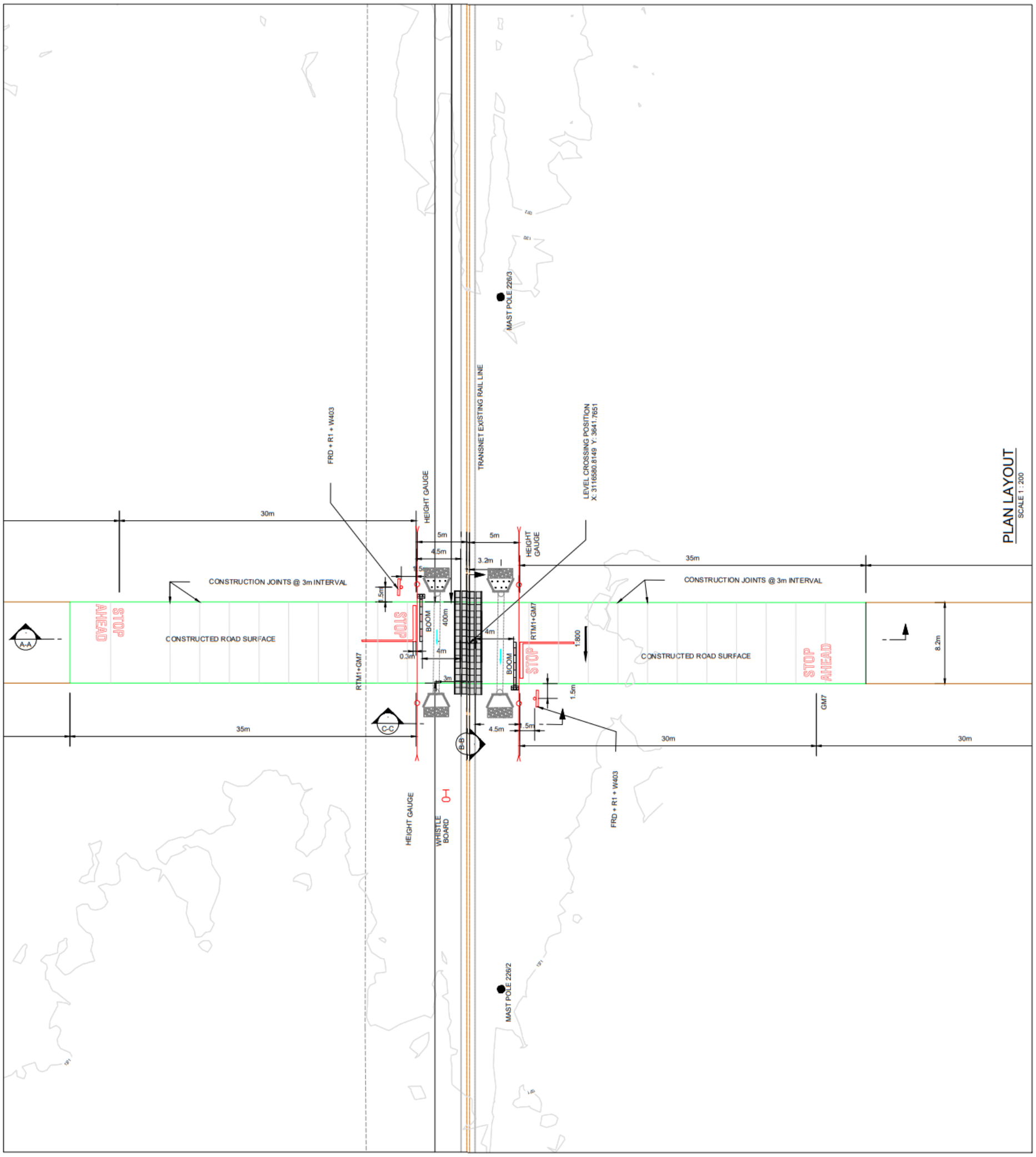


**Figure 6.** New Level Crossing Layout Plan

| NAME OF ACTIVITY<br><br>(E.g. for prospecting – drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route, etc. … etc. … etc.<br>E.g. for mining – excavations, blasing, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc. … etc. … etc.) | Aerial extent of the Activity Ha or m² | LISTED ACTIVITY<br><br>(Mark with an X where applicable or affected). | APPLICABLE LISTING NOTICE<br><br>*(GNR 544, GNR 545 or GNR 546)* | WASTE MANAGEMENT AUTHORISATION<br><br>(Indicate whether an authorisation is required in terms of the Waste Management Act).<br><br>(Mark with an X) |
|---|---|---|---|---|
| **Activity 12 of NEMA Listing Notice 2**<br>The development of railway lines, stations or shunting yards excluding -<br>i) railway lines, shunting yards and railway stations in industrial complexes or zones;<br>ii) underground railway lines in a mining area; or<br>iii) additional railway lines within the railway line reserve. | **The new development of PMG Mining Private Siding 243213 adjacent to the TFR mainline between Bokkoppie Station and Palingpan Station with a new level crossing over Erts to Postmasburg mainline existing Transnet Freight Rail (TFR)**<br><br>**Private Siding: 64065m² / 6.4065Ha**<br><br>**Level Crossing: 663m² / 0.0663Ha** | X | Listing Notice 2<br>GNR 325<br>GNR 984 | |
| **Activity 64 of NEMA Listing Notice 1**<br>The expansion of railway lines, stations, or shunting yards where there will be an increased development footprint, excluding-<br>i) railway lines, shunting yards and railway stations in industrial complexes or zones;<br>ii) underground railway lines in a mining area; or<br>iii) additional railway lines within the railway line reserve. | **The new development of PMG Mining Private Siding 243213 adjacent to the TFR mainline between Bokkoppie Station and Palingpan Station with a new level crossing over Erts to Postmasburg mainline existing Transnet Freight Rail (TFR)**<br><br>**Privaate Siding: 64065m² / 6.4065Ha**<br><br>**Level Crossing: 663m² / 0.0663Ha** | X | Listing Notice 1<br>GNR 327<br>GNR 983 | |
| **Activity 24(ii) of NEMA Listing Notice 1**<br><br>"The development of – (ii)a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters." | Additional serice road next to siding = Service Road: L 1405m x W 4.5m = 6320m²/0.632Ha (Transnet Road for emergencies)<br><br>Additional service road for private siding = 8000m x 20m (wide) = 160 000m2 (existing road which will be moved in some places to make provision for new siding buffer)<br><br>Access Road<br>The new road will ensure safe transport and hauling from the R325 to the Palingpan Manganese Mine. The new road will be built up in layers of approved material that forms a 10m gravel carriageway for a length of approximately 5km. This material will be sourced from the mine dumps and borrow pits. The design will also include a new intersection on the R325 to accommodate traffic that will use the new service road and a new railway crossing. Stormwater crossings will be placed at regular intervals to accommodate the natural water course and lay of the land. | X | Listing Notice 1<br>GNR 327<br>GNR 983 | |
| **Activity 30 of NEMA Listing Notice 1**<br><br>"Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)." | The new development of PMG Mining Private Siding 243213 adjacent to the TFR mainline between Bokkoppie Station and Palingpan Station with a new level crossing over Erts to Postmasburg mainline existing Transnet Freight Rail (TFR)<br><br>Private Siding: 64065m² / 6.4065Ha<br><br>Level Crossing: 663m² / 0.0663Ha | X | Listing Notice 1<br>GNR 327<br>GNR 983 | |

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|---|---|---|---|---|
| | Additional serice road next to siding = Service Road: L 1405m x W 4.5m = 6320m²/0.632Ha (Transnet Road for emergencies)<br><br>Additional service road for private siding = 8000m x 20m (wide) = 160 000m2 (existing road which will be moved in some places to make provision for new siding buffer)<br><br>Access Road<br>The new road will ensure safe transport and hauling from the R325 to the Palingpan Manganese Mine. The new road will be built up in layers of approved material that forms a 10m gravel carriageway for a length of approximately 5km. This material will be sourced from the mine dumps and borrow pits. The design will also include a new intersection on the R325 to accommodate traffic that will use the new service road and a new railway crossing. Stormwater crossings will be placed at regular intervals to accommodate the natural water course and lay of the land.<br><br>AREAS OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY<br><br>Sensitivity \| Feature(s)<br>Very High \| Ecological support area<br>Very High \| FEPA Subcatchments | | | |
| **Activity 15 of NEMA Listing Notice 2**<br>"The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-<br>(i) The undertaking of a linear activity; or<br>(ii) Maintenance purposes undertaken in accordance with a maintenance management plan." | **Private Siding: 64065m² / 6.4065Ha**<br><br>**Service Road: 6320m² / 0.632Ha (Transnet Road for emergencies)**<br><br>**Level Crossing: 663m² / 0.0663Ha**<br><br>**Additional service road for private siding = 8000m x 20m (wide) = 160 000m2 (existing road which will be moved in some places to make provision for new siding buffer)**<br><br>**Access Road**<br>The new road will ensure safe transport and hauling from the R325 to the Palingpan Manganese Mine. The new road will be built up in layers of approved material that forms a 10m gravel carriageway for a length of approximately 5km. This material will be sourced from the mine dumps and borrow pits. The design will also include a new intersection on the R325 to accommodate traffic that will use the new service road and a new railway crossing. Stormwater crossings will be placed at regular intervals to accommodate the natural water course and lay of the land. | X | Listing Notice 2<br>GNR 325<br>GNR 984 | |
| **Activity 27(iv) of NEMA Listing Notice 2**<br>"The development of —<br>(iv) a road catering for more than one lane of traffic in both directions;" | Service Road: 6320m² / 0.632Ha (Transnet Road for emergencies) | X | Listing Notice 2<br>GNR 325<br>GNR 984 | |

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| | Additional service road for private siding = 8000m x 20m (wide) = 160 000m2 (existing road which will be moved in some places to make provision for new siding buffer)<br><br>Access Road<br>The new road will ensure safe transport and hauling from the R325 to the Palingpan Manganese Mine. The new road will be built up in layers of approved material that forms a 10m gravel carriageway for a length of approximately 5km. This material will be sourced from the mine dumps and borrow pits. The design will also include a new intersection on the R325 to accommodate traffic that will use the new service road and a new railway crossing. Stormwater crossings will be placed at regular intervals to accommodate the natural water course and lay of the land. | | | |
| **Activity 14 of NEMA Listing Notice 1:** "The development and related operation of facilities or infrastructure for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic meters."<br><br>This will be a diesel locomotive, with the planned dangerous goods to be stored from the mining operation this listed activity had been included to make sure that the mine does not exceed the approved capacity. | **A locomotive facility will also be constructed where light maintanance will be done and diesel refuelling.**<br><br>**Fuel Storage facility** (Diesel tanks):<br><br>215m² / 0.0215Ha<br>Concrete, bricks, and steel<br><br>**Re-fuel and lube station**<br>215m² / 0.0215Ha<br><br>Pipes, concrete, bricks and steel<br><br>Diesel Lokomotive<br><br>An additional diesel tank facility of ± 10000lt will be added this will be sufficient for the first 2 years<br><br>The layout plans of this fasility is attached as Drawing 2614-100-S001 which also indicates the footprint of 132m² / 0.0132Ha | X | Listing Notice 2<br>GNR 325<br>GNR 984 | |
| **Activity 56 of NEMA Listing Notice 1**<br>The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre<br>(i) where the existing reserve is wider than 13,5 meters; or<br>(ii) where no reserve exists, where the existing road is wider<br>than 8 metres; excluding where widening or lengthening occur<br>inside urban areas. | **The access, service and additional service roads may trigger this activity.** | X | Listing Notice 1<br>GNR 327<br>GNR983 | |
| **Activity 12 of NEMA Listing Notice 3**<br>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.<br>g. Northern Cape<br>i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;<br>ii. Within critical biodiversity areas identified in bioregional plans,<br>iii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans; or<br>iv. On land, where, at the time of the coming into effect of this<br>Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning. | **The development of the private siding, the crossing as well as the access and service roads and transnet road may trigger this activity.** | X | Listing Notice 3<br>GNR 324<br>GNR 985 | |

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| **NEMWA: Category B**<br>**GNR 632: Activity 11:**<br>"The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right …" | **Proposed permanent and temporary Stockpile areas**<br><br>**Provision is made for a maximum footprint (at full production) of 8315m² / 0.8315Ha for the stockpile area at any one time.**<br><br>**Two temporary stockpiles 4048m² / 0.4048Ha** | | NEMWA: Category B<br>GNR 632: Activity 11 | X |
| **OTHER ACTIVITIES (Associated infrastructure not considered to be listed activities) but included under listed activity 17 which states** "Any activity including the operation of that activity which requires a mining right [section 22 of MPRDA], including infrastructure, structures and earthworks, directly related to the extraction of a mineral resource …"<br><br>Workshop and Wash Bay | A locomotive facility will also be constructed where light maintanance will be done and diesel refuelling.<br><br>132m² / 0.0132Ha<br>Concrete and Steel | | NOT LISTED | |

**ii) Description of the activities to be undertaken:**
(Describe methodology or technology to be employed, and for a linear activity, a description of the route of the activity.)

PMG Mining (PMG) intends to construct a new mine and private siding adjacent to the Transnet Freight Railway (TFR) mainline between Bokkoppie Station and Palingpan Station. There will also be an upgrade and deviation of the existing gravel road next to the railway line as a service road on the left hand side of the railway line and existing track on the right hand side of the railway line as a Transnet service road for emergencies.

PMG proposes to construct a new level crossing and associated infrastructure within the fenced railway servitude. An approval was granted for the closure of the current level crossing leading onto the mine property at km 224, because the level crossing is not ideally located to be developed into a suitable level crossing to fulfil the mine requirements.

PMG requires a more suitable location to develop a suitable level crossing to transport mine equipment received from both the Kathu and Postmasburg directions, direct onto the mine property across the TFR mainline.

PMG intents to start with the construction of the new mine and private siding during the latter half of 2023 as soon as all authorizations have been received.

Approval was granted for the closure of the current level crossing at km 224 by Transnet, which was not ideally located to be developed into a suitable level crossing for the mines purpose.

The mine requires a suitable new level crossing to transport their mine equipment received from both the Kathu and Postmasburg directions, onto the mine area across the TFR mainline.

The level crossing will also serve as access onto and exit point from the mine.

The level crossing will be fitted with half-mast automated booms, which will be activated by the approach of a freight train from either direction of the level crossing.

The level crossing will also be fitted with flashing lights as an additional measure to warn the drivers to be cautious when approaching the level crossing.

The level crossing is suitable to be used by pedestrians, workers on bicycles, light vehicles, construction vehicles, busses transporting workers, and later interlink tipper trailers/trucks.

Wadala Mining and Consulting Pty Ltd have been appointed by PMG Mining (Pty) Ltd to conduct a Section 102 application to revise their Environmental Management Programme (Environmental Authorization) dated 25 October 2019 to include the Private Siding 243213 and New level crossing on Erts to Postmasburg mainline on the Remainder of the farm Paling 434, Kuruman in extent 3278, 6156 ha. The Mining Right had been executed for 20 years from 20 June 2012 to 19 June 2032.

**LOCATION**
The location for the proposed level crossing is located on the Postmasburg to Hotazel mainline, between mast poles 226/2 and 226/3, at coordinates 28º 9'49.20"S latitude and 23º 2'13.39"E longitude.

**TFR (TRANS NET FREIGH RAIL) RAIL INFRASRUCTURE DETAILS**
Route: Beeshoek to Hotazel
Line type: Mainline
Number of lines: Single Line
Speed: 80km/h
Electrified: 3kV DC
Adjacent stations: Bokkoppie &Palingpan
Kilometer point: 226
Coordinates: 28º 9'49.20"S latitude and 23º 2'13.39"E

A locomotive facility will also be constructed where light maintanance will be done and diesel refuelling. The layout plans of this fasility is attached as Drawing 2614-100-S001 which also indicates the footprint of 132m² / 0.0132Ha

**The high-level Scope of work for the new Crossing**.

1. **Civil Works**
   - Site establishment by sub-contractor
     - Clear the area construction area of vegetation
     - Place mobile offices, Mess and Ablution Facilities
     - Develop laydown area for material
   - Clear and Grub Vegetation along rail line
     - Use TLB / Grader to clear the vegetation on both side of the track, and on both sides of the proposed level crossing, for 300m
     - Use TLB / Excavator to load soil / vegetation onto trucks to remove it.
   - Construct level crossing road approaches, as per haul road design, at least 30m to either side of level crossing, 8.2m wide
     - Roadbed preparation and compaction of material to required specifications
     - Construct layerworks to specifications
     - Construct wearing Coarse to specifications
     - Construct Subbase to specifications
     - Construct concrete surface for 30m
   - Install concrete drainage pipes for stormwater management
   - Construct speedbumps on either side of the road approach leading to the level crossing

2. **Platelaying and Trackwork**
   - Remove existing ballast from the track and backfill with new ballast over an area large enough to support all the level crossing blocks
   - Place the level crossing blocks in position and check that the top of each block is clear of the top of rail.

- Check that the blocks are fully supported and stable

3. **Overhead Track Equipment (OHTE)**
   - Install height gauges structures with signage on both sides of the level crossings
     - Excavate, drill hiles for Wooden Poles
     - Install 8m poles: Lightwood SANS 753 Item 9 Group B
     - Install all wiring with hardware and asseblies on Height Gauge
     - Install new level crossings height gauge signage for protection Level 5A

4. **Ancillary Works**
   - Install automated booms
   - Install flashing lights
   - Install all related safety signages

5. **Trackwork**
   - Install train detection devices on the track
   - Install drivers lights adjacent to the track
   - Install the necessary electrical supply to the train detection devices
   - Install a PLC at the level crossings to interface with the train detection devices and the automated boom gates

6. **General and Safety**
   - Due to the nature of the work what will be executed between trains, a responsible TFR Track Inspector will need to be present at all times
   - This the Track Inspector is required to monitor the works, and approve the safe passing of trains
   - Necessary protection will be provided by the contractor with regards to Flagmen, Sirens, Communication etc.
   - However, the TFR representativw will still need to be in contact with the Central Train Control Office to facilitate the train movements and coordination thereof

7. **Standards & Specifications**
   - Transnet Manual for Track Maintenance 2012
   - Transnet S410: Earthworks Specifications for Rail Formation
   - Transnet S406: Testing and supply of Aggregate and Ballast for Rail
   - Transnet darwing CEE-TMG-0036 Amendment 8 – Height gauge
   - SANS 3000-2-2-1:2021 – Level Crossing
   - SANS 1200 – Construction

**The high-level Scope of work for the Construction of the Bokkoppie Linear siding and Loading station are as follows:**

1. **Survey**
   - Survey and Stake battery limits
   - Reference Stakes

2. **Track Substructure (Earthworks)**
    - Clear and grub construction area
    - Excavate soft in-situ material
    - Excavate Hard rock material
    - Perform Blasting where Hard rock cannot be excavated
    - Prepare and test excavated material suitable for backfill material.
    - If in-situ materials are suitable for back fill materials crush in-situ materials to desired sizes and specifications.
    - Backfill bulk earth works ad compact.
    - Import “B” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)
    - Import ”A” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)
    - Import ”SB” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)
    - Import ”SSB” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)
    - Final profile and compact formation to design. (Max allowed deviation is ± 20 mm from design level)
    - Shape Cutting and embankment walls
    - Construct service road next to Final formation level.

3. **Track Superstructure (Construct Railway Line)**
    - Place rails on the side of the formation (Nominal 18-meter rails)
    - Place sleepers on the side of the formation
    - Offload ballast with Road tipper trucks on top of the formation. (Do not use side tipper trucks)
    - Level sub ballast layer (50 mm lower than final design level)
    - Compact sub ballast layer
    - Place and space concrete sleepers on sub ballast layer
    - Install rails on top of sleepers
    - Flash butt weld (18 m rails into 500 m panels)
    - Final space and square sleepers and fasten sleepers to the rails.
    - Offload top ballast either with side tipper truck or front-end loaders or if possible, with AY railway wagon (Hoppers). This must be done within 24 hours after track was fastened to prevent stresses in the newly constructed railway track.
    - Lift and align railway track to design levels. With every 500 meter still not welded.
    - Box and profile ballast

4. **Turnouts**
    - Offload ballast with Road tipper trucks on top of the formation. (Do not use side tipper trucks)
    - Level sub ballast layer (50 mm lower than final design level)
    - Compact sub ballast layer
    - Place the turnout sleepers on the formation
    - Place the straight-line steel components on the sleepers (only the one leg)
    - Align turnout and space sleepers
    - Place second stock and switch, square points blades.
    - Space sleepers and fasten
    - Continue to place remaining turnout steel components and fasten.
    - Using joggle plates fasten the rail components together
    - Offload ballast with either front-end loaders or if possible, AY rail wagons.
    - Lift and align turnout to design level
    - Box and Profile ballast
    - Thermit weld the joints within the turnout

5. **Finalising**
    - The full track must now be destressed. (The ”A” – Frame stress measurement is to test of destressing was done correctly and not to determine if destressing is required!!)
    - To destress loosen 1 km of track
    - Lift the rails with destressing rollers to ensure the rail does not have any contact with the sleepers over the full distance.
    - Vibrate the rails to release any stresses. Within the required destressing temperature ranges, IF the required destressing temperature ranges cannot be achieved Rail tensors must be used.
    - After the 1 km destressing is complete fasten the rails and weld the two (2) joint in the middle of the 500 m sections. The rail must also be fasten within the required temperature ranges or be fixed with the rail tensor until the track is fasten. The two (2) rails must have the same stress-free temperature (Maximum tolerance are 2 degrees)
    - Continue until the full track was destressed
    - No further work except boxing and profiling ballast are allowed after destressing.
    - Final record as built data sheets and survey.

e) **Policy and Legislative Context:**

| Applicable Legislation and Guidelines used to compile the report (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.) | Reference where applied | HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT (E.g In terms of the National Water Act:-Water Use License has/has not been applied for). |
|---|---|---|
| Conservation of Agricultural Resources Act (Act 43 of 1983) and Regulations (CARA) | - Section 5: Implementation of control measures for alien and invasive plant species;<br>- Section 6: Control measures.<br>- Regulation GN R1048, published on 25 May 1984, in terms of CARA | - Control measures are to be implemented upon the approval of the EMPR. |
| Constitution of South Africa (Act 108 of 1996) | - Section 24: Environmental right<br>- Section 25: Rights in Property<br>- Section 27: Water and sanitation right | - To be implemented upon the approval of the EMPR. |
| Environment Conservation Act (Act 73 of 1989) and Regulations (ECA) | - Sections 21, 22, 25, 26 and 28: EIA Regulations, including listed activities that still relate to the existing section of ECA.<br>- Section 28A: Exemptions. | - To be implemented upon the approval of the EMPR. |
| Fencing Act (Act 31 of 1963) | - Section 17: States that any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5m on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora. | - Control measures are to be implemented upon the approval of the EMPR. |
| Hazardous Substances Act (Act 15 of 1973) and Regulations read together with NEMA and NEMWA | - Definition, classification, use, operation, modification, disposal or dumping of hazardous substances. | - Noted and Considered measures are to be implemented upon the approval of the EMPR. |

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| Intergovernmental Relations Act (Act 13 of 2005) | - This Act establishes a framework for the National, Provincial and Local Governments to promote and facilitate intergovernmental relations. | |
| Mine, Health and Safety Act (Act 29 of 1996) and Regulations | - Entire Act. | - Control measures are to be implemented upon the approval of the EMPR. |
| Mineral and Petroleum Resources Development Act (Act 28 of 2002) and Regulations as amended | - Entire Act.<br>- Regulations GN R527 | - A Mining Right has been granted and this is an application for revision in terms of Section 102 to include additional listed activities. ((NC) 30/5/1/2/2/244 MR).<br>- Rights and obligations to be adhered to. |
| National Environmental Management Act (Act 107 of 1998) and Regulations as amended | - Section 2: Strategic environmental management principles, goals and objectives.<br>- Section 24: Foundation for Environmental Management frameworks.<br>- Section 24N:<br>- Section 24O:<br>- Section 28: The developer has a general duty to care for the environment and to institute such measures to demonstrate such care.<br>- Regulations GN R547, more specifically Chapters 5 and 7, where applicable (the remainder was repealed) published on 18 June 2010 in terms of NEMA (Environmental Management Framework Regulations)<br>- Regulations GN R982 to R985, published on 4 December 2014 in terms of NEMA (Listed Activities)<br>- Regulations GN R993, published on 8 December 2014 in terms of NEMA (Appeal) | - The approved Environmental Management Programme that had been approved with the Mining Right application. As a result of the document that cannot be located an application for the substitution of the environmental authorisation has commenced and is to be lodged and this document is being compiled in order to fulfil the requirements thereof. |

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| | - Regulations GN R994, published on 8 December 2014 in terms of NEMA (exemption)<br>- Regulations GN R205, published on 12 March 2015 in terms of NEMA (National appeal Amendment Regulations)<br>- Regulations GN R1147, published on 20 November 2015 in terms of NEMA (Financial Provision) | |
| National Environmental Management: Air Quality Act (Act 39 of 2004) | - Section 32: Control of dust<br>- Section 34: Control of noise<br>- Section 35: Control of offensive odours<br>- Regulation GN R551, published on 12 June 2015 (amended Categories 1 to 5 of GN 983) in terms of NEM:AQA (Atmospheric emission which have a significant detrimental effect on the environment)<br>- Regulation GN R283, published on 2 April 2015 in terms of NEM:AQA (National Atmospheric Emissions Reporting Regulations) (Group C-Mines) | - Control measures are to be implemented upon the approval of the EMPR.<br>- This is also legislated by Mine Health and Safety from DMR and is to be adhered to. |
| National Environmental Management: Biodiversity Act (Act 10 of 2004) | - Section 52 of The National Environmental Management Act: Biodiversity Act (NEMBA) (Act 10 of 2004) states that the MEC/Minister is to list ecosystems that are threatened and in need of protection.<br>- Section 53 states that the Minister may identify any process or activity in such a listed ecosystem as a threatening process.<br>- A list of threatened and protected species has been published in terms of Section 56(1) GG | - A permit application regarding protected plant species need to be lodged with DENC which is in process to be lodged.<br>- Control measures are to be implemented upon the approval of the EMPR. |

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| | 29657 GNR 151 and GNR 152, Threatened or Protected Species Regulations.<br><br>Commencement of Threatened or Protected Species Regulations 2007 : 1 June 2007<br>GNR 150/GG 29657/23-02-2007<br><br>Publication of lists of critically endangered, vulnerable and protected species GNR 151/GG 29657/23-02-2007 *<br><br>Threatened or Protected Species Regulations<br>GNR 152/GG 296547/23-02-2007 *<br>- Sections 65 – 69: These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species.<br>- Sections 71 and 73: These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.<br>- Regulation GN R151, published on 23 February 2007 (List fo Critically Endangered, Vulnerable and Protected Species, 2007) in terms of NEM: BA<br>- Regulation GN R152, published on 23 February 2007 (TOPS) in terms of NEM:BA<br>- Regulations GN R507 to 509 of 2013 and GN 599 of 2014 in terms of NEM:BA (Alien Species) | |
| The National Environmental Management Act: Protected Areas Act (NEMPAA) (Act 57 of 2003) | - Chapter 2 lists all protected areas. | - The mining operation fall within |

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| provides for the protection of ecologically viable areas that are representative of South Africa"s natural biodiversity and its landscapes and seascapes. | | <table><tr><th>Sensitivity</th><th>Feature(s)</th></tr><tr><td>Very High</td><td>Ecological support area</td></tr><tr><td>Very High</td><td>FEPA Subcatchments</td></tr></table> |
| National Environmental Management: Waste Management Act (Act 59 of 2008) | - Chapter 4: Waste management activities<br>- Regulations GN R634 published on 23 August 2013 in terms of NEM:WA (Waste Classification and Management Regulations)<br>- Regulations GN R921 published on 29 November 2013 in terms of NEM:WA (Categories A to C – Listed activities)<br>- National Norms and Standards for the Remediation of contaminated Land and Soil Quality published on 2 May 2014 in terms of NEM:WA (Contaminated land regulations)<br>- Regulations GN R634 published on 23 August 2013 in terms of NEM: WA (Waste Classification and Management Regulations)<br>- Regulations GN R632 published on 24 July 2015 in terms of NEM: WA (Planning and Management of Mineral Residue Deposits and Mineral Residue Stockpiles)<br>- Regulations GN R633 published on 24 July 2015 in terms of NEM: WA (Amendments to the waste management activities list published under GN921) | - To be implemented upon the approval of the EMPR. |
| National Forest Act (Act 84 of 1998) and Regulations | - Section 15: No person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister. | - A permit application regarding protected tree species need to be lodged with DAFF which is in process to be lodged. |

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| | | - Control measures are to be implemented upon the approval of the EMPR. |
| National Heritage Resources Act (Act 25 of 1999) and Regulations | - Section 34: No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.<br>- Section 35: No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site.<br>- Section 36: No person may, without a permit issued by SAHRA or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a forma cemetery administered by a local authority.<br>- Section 38: This section provides for HIA which are not already covered under the ECA. Where they are covered under the ECA the provincial heritage resources authorities must be notified of a proposed project and must be consulted during HIA process.<br>- Regulation GN R548 published on 2 June 2000 in terms of NHRA | - Control measures are to be implemented upon the approval of the EMPR. |
| National Water Act (Act 36 of 1998) and regulations as amended, *inter alia* Government Notice No. 704 of 1999 | - Section 4: Use of water and licensing.<br>- Section 19: Prevention and remedying the effects of pollution.<br>- Section 20: Control of emergency incidents.<br>- Section 21: Water uses | - A water use application is in the final stages of preparation and will be lodged with Department of Water and Sanitation (DWS). |

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| | In terms of Section 21 a licence is required for:<br>(a) taking water from a water resource;<br>(b) storing water;<br>(c) impeding or diverting the flow of water in a watercourse;<br>(f) Waste discharge related water use;<br>(g) disposing of waste in a manner which may detrimentally impact on a water resource;<br>(i) altering the bed, banks, course or characteristics of a watercourse;<br>(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and;<br>- Regulation GN R704, published on 4 June 1999 in terms of the National Water Act (Use of water for mining and related activities)<br>- Regulation GN R1352, published on 12 November 1999 in terms of the National Water Act (Water use to be registered)<br>- Regulation GN R139, published on 24 February 2012 in terms of the National Water Act (Safety of Dams)<br>- Regulation GN R398, published on 26 March 2004 in terms of the National Water Act (Section 21 (j))<br>- Regulation GN R399, published on 26 March 2004 in terms of the National Water Act (Section 21 (a) and (b) )<br>- Regulation GN R1198, published on 18 December 2009 in terms of the National Water Act (Section 21 ( c ) and (i) – rehabilitation of wetlands) | - Control measures are to be implemented upon the approval of the EMPR. |

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| | - Regulations GN R1199, published on 18 December 2009 in terms of the National Water Act (Section 21 ( c ) and (i) )<br>- Regulations GN R665, published on 6 September 2013 in terms of the National Water Act (Amended GN 398 and 399 – Section 21 (e), (f), (h), (g), (j)) | |
| Nature Conservation Ordinance (Ord 19 of 1974) | - Chapters 2, 3, 4 and 6: Nature reserves, miscellaneous conservation measures, protection of wild animals other than fish, protection of Flora. | - Control measures are to be implemented upon the approval of the EMPR. |
| Northern Cape Nature Conservation Act (Act 9 of 2009) | - Addresses protected species in the Northern Cape and the permit application process related thereto. | - A permit application regarding provincially protected plant species as well as for large-scale harvesting of indigenous flora need to be lodged with DENC which is in process.<br>- Control measures are to be implemented upon the approval of the EMPR. |
| Occupational Health and Safety Act (Act 85 of 1993) and Regulations | - Section 8: General duties of employers to their employees.<br>- Section 9: General duties of employers and self-employed persons to persons other than their employees. | - Control measures are to be implemented upon the approval of the EMPR. |
| Road Traffic Act (Act 93 of 1997) and Regulations | - Entire Act. | - Control measures are to be implemented upon the approval of the EMPR. |
| Water Services Amendment Act (Act 30 of 2007) | - It serves to provide the right to basic water and sanitation to the citizens of South Africa (giving effect to section 27 of the Constitution). | - Control measures are to be implemented upon the approval of the EMPR. |
| National Land Transport Act, (Act 5 of 1998) | | - To take note. |

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| Northern Cape Planning and Development Act (Act 7 of 1998) | - To control planning and development | - To be implemented upon the approval of the EMPR. |
| Spatial Planning and Land Use Management (Act 16 of 2013 (SPLUMA) and regulations | - To provide a framework for spatial planning and land use management in the Republic;<br>- To specify the relationship between the spatial planning and the land use management, amongst others<br>- Regulations GN R239 published on 23 March 2015 in terms of SPLUMA | - To be implemented upon the approval of the EMPR. |
| Subdivision of Agricultural Land Act, 70 of 1970 and regulations | - Regulations GN R373 published on 9 March 1979 in terms of Subdivision of Agricultural Land | - To take note. |
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| Basic Conditions of Employment Act (Act 3 of 1997) ) as amended | - To regulate employment aspects | - To be implemented upon the approval of the EMPR |
| Community Development (Act 3 of 1966) | - To promote community development | - To be implemented upon the approval of the EMPR |
| Development Facilitation (Act 67 of 1995) and regulations | - To provide for planning and development | - To take note. |
| Development Facilitation (GN24, PG329, 24/07/1998) | - Regulations re Northern Cape LDO's | - To take note. |
| Development Facilitation (GNR1, GG20775, 07/01/2000) | - Regulations re application rules S26, S46, S59 | - To take note. |
| Development Facilitation (GN732, GG14765, 30/04/2004) | - Determines amount, see S7(b)(ii) | - To take note. |
| Land Survey Act (Act 8 of 1997) ) and regulations, more specifically GN R1130 | - To control land surveying, beacons etc. and the like;<br>- Agriculture, land survey S10 | - To take note. |
| National Veld and Forest Fire Act (Act 101 of 1998) ) and regulations, more specifically GN R1775 | - To regulate law on veld and forest fires<br>- (Draft regulations s21) | - To be implemented upon approval of the EMPR |
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| Municipal Ordinance, 20/1974 | - To control pollution, sewers etc. | - To be implemented upon approval of the EMPR |
| Municipal Ordinance, PN955, 29/08/1975 | - Nature conservation Regulations | - To be implemented upon approval of the EMPR |
| Cape Land Use Planning Ordinance, 15/85 | - To control land use planning | - To take note. |
| Cape Land Use Planning Ordinance, PN1050, 05/12/1988 | - Land use planning Regulations | - To take note. |
| | | |

**f) Need and desirability of the proposed activities:**
(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location.)

The main benefits of the proposed Private Siding 243213 and New level crossing, on Erts to Postmasburg mainline with service roads and new access road on the Remainder of the farm Paling 434, Kuruman are:

- Direct economic benefits will be derived from wages, taxes and profits;
- Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees;
- It will contribute to the economic welfare of the surrounding community by creating working opportunities;
- It will contribute to the upliftment of living standards and the health and safety of the local community;
- Effective transportation of manganese for export.

The (then) Department of Environmental Affairs (DEA) published a Guideline on Need and Desirability (2017) in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended). The key components are listed and discussed below:

• Securing ecological sustainable development and use of natural resources; and

• Promoting justifiable economic and social development.

According to DEA's (2017) Guideline on Need and Desirability, in order to describe the need for a development, it must be determined whether it is the right time for locating the type of land use and/or activity being proposed.

To describe the desirability for a development, it must be determined, whether it is the right place for locating the type of land use and/or activity being proposed. Need and desirability can be equated to the concept of wise use of land which can be determined through asking the question: "what is the most sustainable use of land?"

PMG Mining (Pty) Ltd is the holder of a Mining Right with reference number NC244MR, executed on behalf of the Minister of Mineral Resources ("Minister") and PMG Mining (Pty) Ltd on 20 June 2012 before Mr Noel Henry Kriel, a Notary Public, under Protocol Number 122/2012, consisting of the sole and exclusive right to prospect for Iron Ore and Manganese in, on and under the Remainder of farm 434 in the magisterial district of Hay, Northern Cape Province and measuring 3278,6156 (three thousand two hundred and seventy eight comma six one five six) hectares in extent, together with all benefits and/or improvements ("Mining Right").

The Mining Right for PMG Mining on Paling was issued 20 June 2012 and will continue to be in force for a period of 20 years ending on 19 June 2032.

The Farm is also the Property of PMG Mining and it is therefore a sustainable development as the farm is also already zoned for manganese mining purposes.

The service roads and access road is on already disturbed land as there is an existing gravel road next to the railway line and a track on the other side of the railway line.

The Access road is on an existing fire break next to the fence line and it is therefore seen as an existing infrastructure that will be upgraded and that will still be viable for use as a fire break.

**g) Period for which the environmental authorisation is required:**

This development of the private siding, railway crossing, service roads and access road is to make the mining and export of the manganese ore more cost effective and best timing. The Mining Right was executed on 20 June 2012 and, unless cancelled or suspended in terms of clause 13 of the right and or section 47 of the Act (MPRDA), will continue to be in force for a period of Twenty (20) years ending on 19th June 2032. The EA will be needed to the same time.

**h) Description of the process followed to reach the proposed preferred site:**
(NB!! – This section is not about the impact assessment itself; it is about the determination of the specific site layout having taken into consideration (1) the comparison of the originally proposed site plan, the comparison of that plan with the plan of environmental features and current land uses, the issued raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout as a result.)

**(i) Details of all alternatives considered:**
With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

A project alternative is defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004). In an EIA process, project alternatives serve to determine the most effective way of meeting the objectives of that project. This is generally done through either enhancing the benefits of an activity and/or mitigating the negative impacts and risks of an activity.
According to the Department of Environmental Affairs (DEA) Criteria for Determining Alternatives in EIA Guideline (2004), there are various types or categories of alternatives, including:

- Location alternative – alternative project sites in the same geographic area;
- Process/design alternative – alternative process/design/equipment;
- Activity alternative – consideration of different means to achieve the same project objective;
- Routing alternative – consideration of different routes for linear infrastructure;
- Site layout alternative – consideration of the different options to place project infrastructure; and
- No-go alternative – the proposed project/activity does not proceed, implying that the current situation or status quo remains.

**(a) The property on which or location where it is proposed to undertake the activity:**

The registered description of the land to which the mining right application relates as well as the development of the private siding, railway crossing and service roads:

| Farm Name | Title Deed | In Extent |
|---|---|---|
| Remainder of the farm Paling No. 434 | T245/1954 | 3 278.6156 Ha |

The property on which the Mining Right was granted is determined by the geological location of the mineral resource. The current Transnet Freight railway line that runs through the Paling property had been there for many years (Since 1991). Therefore, there are no alternatives for the location of the activity, except for not proceeding with the private siding, railway crossing, service roads and access road. This will however cause the underutilisation of a national economic resource as well as the transport of a mineral of national importance.

Alternatives considered: -

Therefore, there are no alternatives for the location of the said developments.

**(b) The design or layout of the activity:**

Proposed construction of a Private Siding 243213 and new level crossing on Erts to Postmasburg mainline with service roads and new access road on the Remainder of the farm Paling 434.The construction is mandated by South African National Standards and no alternatives can therefore be considered.

The service roads and access road is on already disturbed land as there is an existing gravel road next to the railway line and a track on the other side of the railway line.

The Access Road is on an existing fire break next to the fence line and it is therefore seen as an existing disturbed area for this infrastructure that will be upgraded and that will still be viable for a fire break.

The site infrastructure will need to be strategically placed by incorporating mining project demands and environmental sensitivities identified during the Environmental Impact Assessment process. Thus, the site layout will primarily be based on proximity to the access roads, proximity to the areas earmarked for mining as well as limited additional impact on the environmental (non-perennial drainage lines and wind direction), heritage resources.

The following infrastructure will be established and will be associated with the additional development in the proposed mining operation:

PMG intents to start with the construction of the new mine and private siding during the latter half of 2023.

Approval was granted for the closure of the current level crossing at km 224, which was not ideally located to be developed into a suitable level crossing for the mines purpose.

The mine requires a suitable new level crossing to transport their mine equipment received from both the Kathu and Postmasburg directions, onto the mine area across the TFR mainline.

The level crossing will also serve as access onto and exit point from the mine.

The level crossing will be fitted with half-mast automated booms, which will be activated by the approach of a freight train from either direction of the level crossing.

The level crossing will also be fitted with flashing lights as an additional measure to warn the drivers to be cautious when approaching the level crossing.

The level crossing is suitable to be used by pedestrians, workers on bicycles, light vehicles, construction vehicles, busses transporting workers, and later interlink tipper trailers/trucks.

Alternatives considered:-

The current railway line runs through the middle of the property and is a registered servitude and is registered as Portion 1 of the farm Paling 434. The private siding therefore have only one alternative to be constructed within the boundaries of the mines property next to the existing Transnet Freight Rail between Bokkoppie and Paling stations. There is therefore no alternative in respect of the location of the private siding.

The service roads for the siding is also existing with minor deviations to stay out of the buffer of the proposed private siding. The emergency service road for Transnet also is an existing track on the other side of the TRF line and would be used for emergencies by Transnet.

In terms of power generation for the locomotive the options available was for ESKOM power or diesel driven locomotive. Given the extra infrastructure and poles that would have been necessary to be erected for electricity and the load shedding status of South Africa the choice were made to go with a diesel driven locomotive.

**(c) The technology to be used in the activity:**

In terms of power generation for the locomotive the options available was for ESKOM power or a diesel driven locomotive. Given the extra infrastructure and poles that would have been necessary to be erected for electricity and the load shedding status of South Africa the choice were made to go with a diesel driven locomotive.

In terms of the level crossing based on the outcome of the risk assessment the type of level crossing protection was reflected as a Level 3
The client however insist that they want a Level 5 type level crossing protection as specified in SANS 3000-2-2-1:2012 i.e.

- Flashing lights

- Automated Booms (Interlocked with TFR Signalling system)
- Road surface level on both sides of the track

**(d) The operational aspects of the activity:**

- **The high-level Scope of work for the new Crossing**.

1. **Civil Works**
   - Site establishment by sub-contractor
     - Clear the area construction area of vegetation.
     - Place mobile offices, Mess and Ablution Facilities
     - Develop laydown area for material.
   - Clear and Grub Vegetation along rail line
     - Use TLB / Grader to clear the vegetation on both side of the track, and on both sides of the proposed level crossing, for 300m.
     - Use TLB / Excavator to load soil / vegetation onto trucks to remove it.
   - Construct level crossing road approaches, as per haul road design, at least 30m to either side of level crossing, 8.2m wide
     - Roadbed preparation and compaction of material to required specifications.
     - Construct layerworks to specifications
     - Construct wearing Coarse to specifications.
     - Construct Subbase to specifications
     - Construct concrete surface for 30m.
   - Install concrete drainage pipes for stormwater management.
   - Construct speedbumps on either side of the road approach leading to the level crossing.

2. **Platelaying and Trackwork**
   - Remove existing ballast from the track and backfill with new ballast over an area large enough to support all the level crossing blocks.
   - Place the level crossing blocks in position and check that the top of each block is clear of the top of rail.
   - Check that the blocks are fully supported and stable.

3. **Overhead Track Equipment (OHTE)**
   - Install height gauges structures with signage on both sides of the level crossings.
     - Excavate, drill hiles for Wooden Poles
     - Install 8m poles: Lightwood SANS 753 Item 9 Group B
     - Install all wiring with hardware and assemblies on Height Gauge
     - Install new level crossings height gauge signage for protection Level 5A.

4. **Ancillary Works**
   - Install automated booms.
   - Install flashing lights.
   - Install all related safety signages.

5. **Trackwork**
   - Install train detection devices on the track.
   - Install drivers lights adjacent to the track.
   - Install the necessary electrical supply to the train detection devices.
   - Install a PLC at the level crossings to interface with the train detection devices and the automated boom gates.

6. **General and Safety**
   - Due to the nature of the work what will be executed between trains, a responsible TFR Track Inspector will need to be present at all times.
   - This the Track Inspector is required to monitor the works, and approve the safe passing of trains.
   - Necessary protection will be provided by the contractor with regards to Flagmen, Sirens, Communication etc.
   - However, the TFR representative will still need to be in contact with the Central Train Control Office to facilitate the train movements and coordination thereof.

7. **Standards & Specifications**
   - Transnet Manual for Track Maintenance 2012
   - Transnet S410: Earthworks Specifications for Rail Formation
   - Transnet S406: Testing and supply of Aggregate and Ballast for Rail
   - Transnet drawing CEE-TMG-0036 Amendment 8 – Height gauge
   - SANS 3000-2-2-1:2021 – Level Crossing
   - SANS 1200 – Construction

- **The high-level Scope of work for the Construction of the Bokkoppie Linear siding and Loading station are as follows:**

**1. Survey**

- Survey and Stake battery limits
- Reference Stakes

**2. Track Substructure (Earthworks)**

- Clear and grub construction area
- Excavate soft in-situ material.
- Excavate Hard rock material.
- Perform Blasting where Hard rock cannot be excavated.
- Prepare and test excavated material suitable for backfill material.
- If in-situ materials are suitable for back fill materials crush in-situ materials to desired sizes and specifications.
- Backfill bulk earth works ad compact.
- Import “B” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)

- Import ”A” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)
- Import ”SB” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)
- Import ”SSB” – layer materials shape and compact design specifications. (in nominal 200 mm layers with a Heavy Compacting roller)
- Final profile and compact formation to design. (Max allowed deviation is ± 20 mm from design level)
- Shape Cutting and embankment walls.
- Construct service road next to Final formation level.

**3. Track Superstructure (Construct Railway Line)**

- Place rails on the side of the formation (Nominal 18-meter rails)
- Place sleepers on the side of the formation
- Offload ballast with Road tipper trucks on top of the formation. (Do not use side tipper trucks)
- Level sub ballast layer (50 mm lower than final design level)
- Compact sub ballast layer
- Place and space concrete sleepers on sub ballast layer
- Install rails on top of sleepers.
- Flash butt weld (18 m rails into 500 m panels)
- Final space and square sleepers and fasten sleepers to the rails.
- Offload top ballast either with side tipper truck or front-end loaders or if possible, with AY railway wagon (Hoppers). This must be done within 24 hours after track was fastened to prevent stresses in the newly constructed railway track.
- Lift and align railway track to design levels. With every 500 meter still not welded.
- Box and profile ballast

**4. Turnouts**

- Offload ballast with Road tipper trucks on top of the formation. (Do not use side tipper trucks)
- Level sub ballast layer (50 mm lower than final design level)
- Compact sub ballast layer
- Place the turnout sleepers on the formation.
- Place the straight-line steel components on the sleepers (only the one leg)
- Align turnout and space sleepers.
- Place second stock and switch, square points blades.
- Space sleepers and fasten.
- Continue to place remaining turnout steel components and fasten.
- Using joggle plates fasten the rail components together.

- Offload ballast with either front-end loaders or if possible, AY rail wagons.
- Lift and align turnout to design level.
- Box and Profile ballast
- Thermit weld the joints within the turnout

**5. Finalising**

- The full track must now be destressed. (The ”A” – Frame stress measurement is to test of destressing was done correctly and not to determine if destressing is required!!)
- To destress loosen 1 km of track.
- Lift the rails with destressing rollers to ensure the rail does not have any contact with the sleepers over the full distance.
- Vibrate the rails to release any stresses. Within the required destressing temperature ranges, IF the required destressing temperature ranges cannot be achieved Rail tensors must be used.
- After the 1 km destressing is complete fasten the rails and weld the two (2) joint in the middle of the 500 m sections. The rail must also be fasten within the required temperature ranges or be fixed with the rail tensor until the track is fasten. The two (2) rails must have the same stress-free temperature (Maximum tolerance are 2 degrees)
- Continue until the full track was destressed.
- No further work except boxing and profiling ballast are allowed after destressing.
- Final record as built data sheets and survey.

A locomotive facility will also be constructed where light maintenance will be done and diesel refueling.

Alternatives considered:-

All work will be done according to South African National Standards
- SANS 3000-2-2-1:2021 – Level Crossing
- *SANS* 1200 – Construction

The siding construction is also according to Transnet standards with their involvement.

**(e) The option of not implementing the activity:**

Potential land use includes grazing and mining. The majority of the area is classified to have low to moderate potential for grazing land and no suitability for crop yield. Apart from the manganese deposits, there are also potential for iron ore mining on the property. Therefore, mining activities are believed to be one of the most economically beneficial option for the area. Whether the manganese and iron ore mining operation continue or not, the other mining operations already granted will most likely persist. The farming of livestock will only be able to continue in areas not affected by mining

operations. The most significant impacts associated with grazing activities include the provision of water. These are not expected to have a serious impact on the existing groundwater features. Cumulative impacts associated to grazing include overgrazing and destruction of natural vegetation, but the cumulative effect of mining activities on the property are expected to outweigh any potential negative effects that agriculture might have.

The PMG Mining project aims to uplift the local community. If the operation does not continue it would hold back any potential employment for the region and the families who are likely to benefit from the positive employment opportunities. Simultaneously, it may have a stagnant effect on the economy of South Africa and the manganese industry. Substantial tax benefits to the State and Local Government will also be inhibited.

Mining forms an integrated part of the social and economic growth of South Africa and more specifically the Northern Cape Province.

(ii) Details of the Public Participation Process Followed:

(Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.)

The Public Participation Process (PPP) is a requirement in terms of numerous South African legislations and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their comments are considered. A record of all comments and responses is included in the reports submitted to the Authorities. This process ensures that all stakeholders are provided an opportunity as part of a transparent process which allows for a comprehensive environmental study with stakeholder involvement. The PPP for the proposed project needs to be managed sensitively and according to best practises to ensure and promote:

Compliance with international best practice options;
Compliance with national legislation;
Establishment and management of relationships with key stakeholder groups; and
Involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:
Introduce the proposed project;
Explain the authorisations required;
Explain the environmental studies already completed and yet to be undertaken (where applicable);
Solicit and record any issues, concerns, suggestions, and objections to the project;
Provide opportunity for input and gathering of local knowledge;
Establish and formalise lines of communication between the I&APs and the project team;
Identify all significant issues for the project; and

Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

Identified interested and/or affected parties were notified of the Amendment application on the Environmental Management Programme (Environmental Authorisation) for the executed existing Mining Right as follows:

- Notices were placed at the Library in Postmasburg, Jimbo's Café and at the site PMG Bishop operational mine as well as at the Paling mine site.
- Notification letters were sent to all identified interested and / or affected parties on 27 June 2023. Attached to each of these letters was a Scoping Report Document, containing information relating to the proposed Section 102 application to add the private siding, railway crossing, service roads and new access road to the existing Environmental Authorisation.
- A newspaper advert will be placed in the 'Kathu Gazette ' local newspaper on the 30 June 2023.

Proof of notification is attached as Appendix '3'.

(iii) Summary of issues raised by I&AP's
(Complete the table summarising comments and issues raised, and reaction to those responses.)

Please refer to Appendix 3, Table 1 attached.

**(iv) The Environmental attributes associated with the sites:**

**(1) Baseline Environment:**

**(a) Type of environment affected by the proposed activity:**
(its current geographical, physical, biological, socio-economic and cultural character.)

- ***GEOLOGY:***

**REGIONAL GEOLOGY**

The project area is underlain by the rocks of the Transvaal Supergroup. The Transvaal Supergroup is subdivided into two groups, namely the Ghaap Group and the Postmasburg Group. The Ghaap Group is composed of mainly chemical sedimentary rocks. The Postmasburg group overlies the Ghaap Group and is mainly composed of a mixed chemi-sedimentary and volcanic succession (Beukes, 1986).

The Ghaap Group consist of three subgroups, namely Schmidtsdrif Subgroup (interbedded siliciclastics and corbonate rocks), Campbell Rand Subgroup (limestones and dolomites) and Koegas Subgroup (interbedded siliciclastics and iron-formation) and the Asbesheuwels Subgroup (iron formation). The Postmasburg Group consists of Makganyene Formation (diamictite), Ongeluk Formation (thick succession of andesitic flood basalts) and the Hotazel iron- and manganese- Formation and the Moodraai formation. The Transvaal Supergroup is overlain by the Olifantshoek Group and underlain by the Ventersdorp Supergroup. The Olifants Group is subdivided into the Mapedi/Gamagara Formation (basal hematite pebble conglomerate and illitic shales interbedded with fine-grained quartzites), Lucknow Formation (quartzites), Hartley Formation (volcanogenic-sedimentary geology) and the Volop Group (coarse quartzites and conglomerates) (Gutzmer, 1996).

The Regional geology for the site and geological description can be seen in Figure 7. The stratigraphic column can be seen in Figure 8 below.

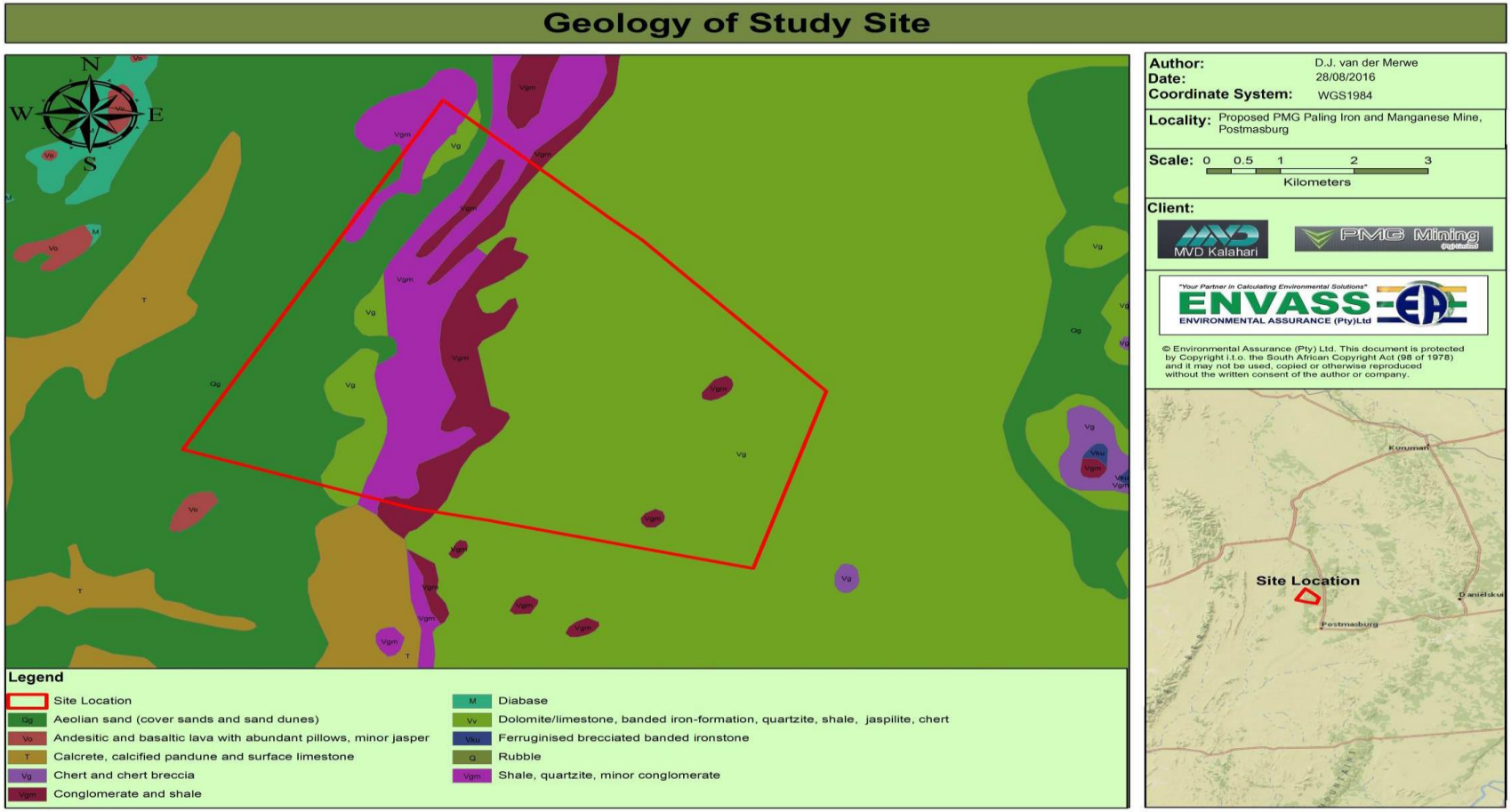


**Figure 7**. Surface Geology of Paling Farm No: 434 Area with geological descriptions. (Hydrogeological Report by ENVASS October 2016)

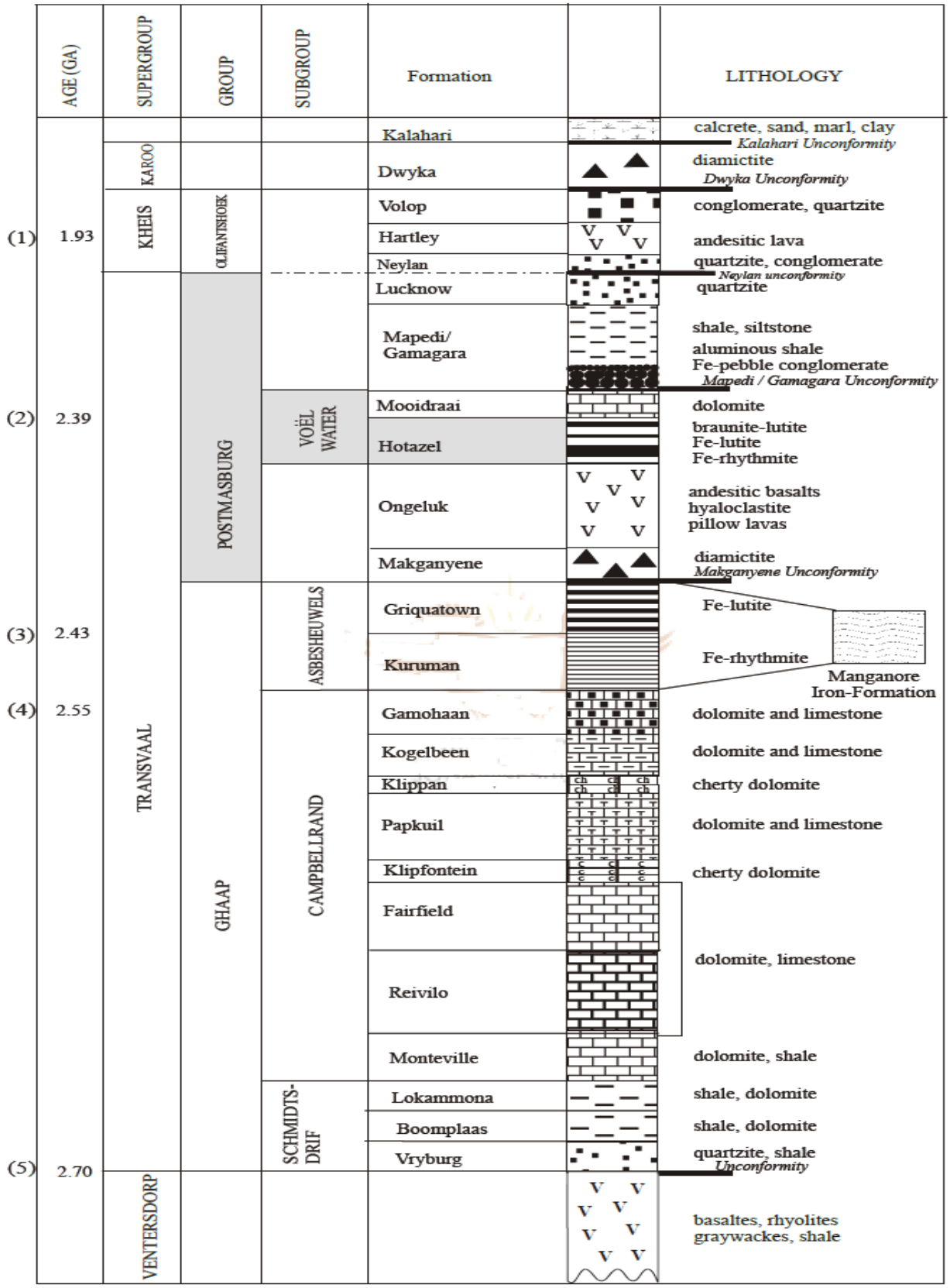


**Figure 8.** Lithostratigraphy of the Transvaal Supergroup in Griqualand West (Preston, 2001).

Two major fields of manganese deposits exist in the Northern Cape of South Africa. These are the Postmasburg Manganese Field (PMF) and the Kalahari Manganese Field (KMF). The PMF is located in two distinct deposit belts which extend along strike for about 60 km. These deposits are known as the Western and Eastern Belts of Postmasburg (Figure 9). The deposits are located from Postmasburg (South) to Sishen (North). The potential iron-ore and manganese deposits of the Paling Farm no. 434 belong to the western belt of the PMF (Kai Batla, 2010).

The PMF is situated on the Maremane dome which is defined by the iron formation of the Asbestos Hills Subgroup and the dolomites of the Campbellrand Subgroup. Managnese ores occur immediately below the Gamagara unconformity and is associated with the hemitization of Asbestos Hills iron-formation and reworked equivalents of the Doornfontein conglomerate. These ores are preserved in karstic sinkhole depressions as infills (Van Wyk, 1980). The Western belt is associated with ferruginous ores whilst the Eastern belt is associated with siliceous manganese ores (Gutzmer & Beukes, 1997).

**SITE-SPECIFIC GEOLOGY**

As stated in the previous section, the potential iron-ore and manganese deposits of the Paling Farm no. 434 belong to the western belt of the PMF (Kai Batla, 2010). According to Gutzmer & Beukes (1997), the ferruginous manganese ores of the Western belt were deposited in subaerial sinkhole depressions together with lateritic clays. This phenomenon is illustrated in Figure 10.

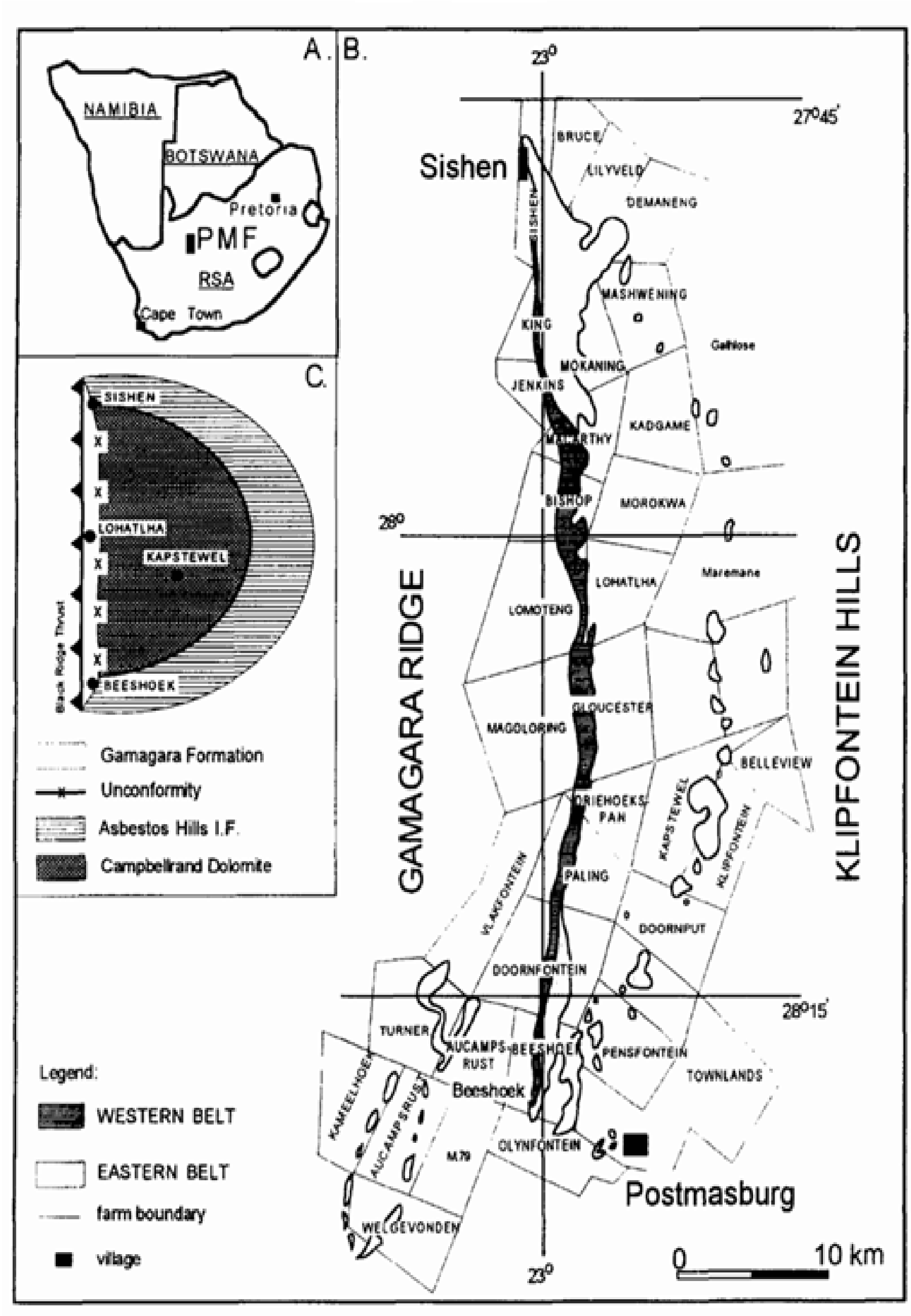


**Figure 9.** Regional scale map indicating the Eastern and Western Belts of the PMF. A: Location of PMF, B: Eastern and Western Belts of PMF, C: Maremane Dome (Gutzmer & Beukes, 1997).

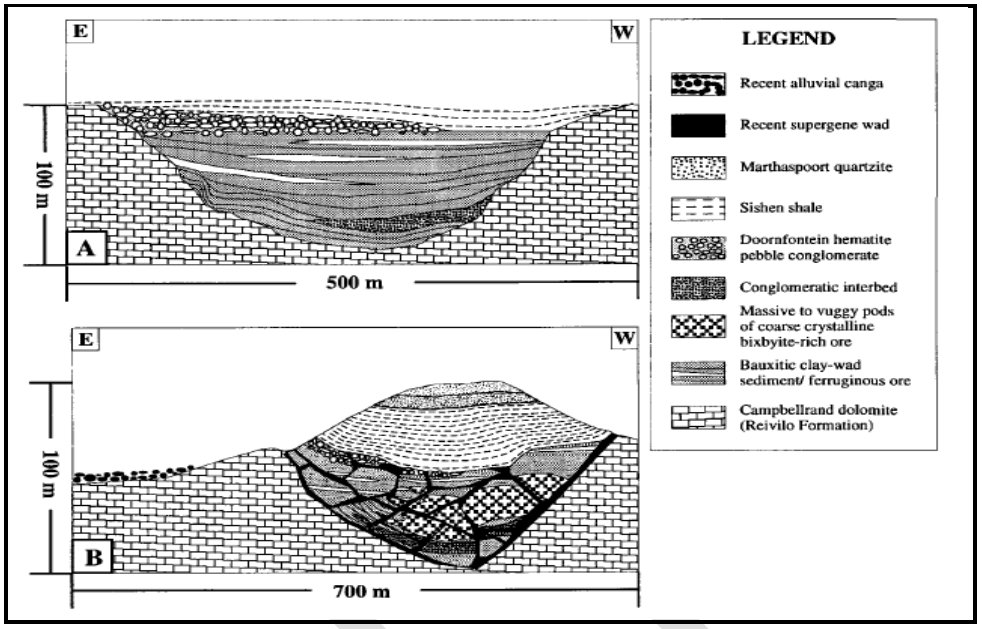


**Figure 10.** Figure illustrating Western Belt ferrigenous ores (Gutzmer & Beukes, 1997).

Frame A illustrates the conglomerate beds and a layered succession of mixed interbedded clay lenses and bauxite clay-ferromanganiferous wad which is deposited in to open Karst depressions of the Reivilo Formation. This is in turn buried beneath the Gamagara formation lateritic clays.
Frame B illustrates the metamorphism of greenschist facies succeeded by erosion and terrestrial exposure. This resulted in renewed karstification, brecciation of the manganese ore body, manganese wad accumulation of alluvial canga deposits and formation of romanè crusts (Gutzmer & Beukes, 1997).

As stated in Gutzmer & Beukes (1997), the base of the Gamagara Formation is formed by the ferruginous ores of the Western Belt. The central part of the Gamagara ridge is formed by these ferruginous ores. The manganese-rich dolomite of the Reivilo formation is overlain by this succession. The hematite pebble conglomerates and aluminous shales of the Gamagara formation rest conformably on the ferrigenous manganese ore which is confined to the karstic depressions of the Campbellrand Dolomites. (Hydrogeological Report by ENVASS October 2016).

- ***CLIMATE:***

  *Regional Climate:-*
  The climate of the Paling area is described to be semi-arid in summer and early autumn. Temperatures vary between -9º and +42ºC, with an average of 19.2ºC.

Evaporation:-
The average annual evaporation rate in the region is 2 026mm a year, which is more than 5 times greater tn the Mean Annual Precipitation (MAP) (i.e. 349 mm/year).

*Temperature:-*
The average midday temperatures for Postmasburg range from 17ºC in June to 32ºC in January. The region is the coldest during July when the mercury drops to 0ºC on average during the night.

*Rainfall:-*
Rainfall records extending a period of 6 month for the Data for station [0321110 7] – Postmasburg show that the mean annual precipitation (MAP) is 349 mm. Most of the rain falls in the later summer months of January, February and March, whilst the lowest rainfall records are recorded for the months of June, July and August. Rainfall tends to vary widely over the years as typical of most arid and semi-arid climates. The average annual evaporation rate in the region is 2 026 mm a year, which is more than 5 times greater than the MAP (i.e. 349 mm/year). Paling Mine operation is located in a low rainfall area. Most of the rainfall in this semi-arid region occurs in summer and early autumn during the months of November to April.

The DWS and SAWB where consulted for Mean Annual Precipitation (MAP) and Mean Annual Evaporation (MAE). Data from both surfaces was analysed. For this region, MAP (is 368 mm and MAE is 1 365 mm. (Based on Lohatla Rainfall Station – SAWB 0321032, located 3.5 km south of the study area, with 36 years of data).

- ***TOPOGRAPHY:***

The Paling mine area indicates undulating to generally flat terrain and the topography varies between 1298 metres above mean sea level (mamsl) (western corner of the site) and 1440 m amsl (near northern corner of the site) as indicated in Figure 11. The site area indicates various hills located roughly through the middle of the site, running from north to south. The iron and manganese minerals are associated with these hills. Hills occur in the southeastern area of the site. The area indicates no obvious surface water runoff direction, it is expected that surface water could possibly runoff in a south-western direction according to the surface elevation of the site and as indicated by the (Kai Batla, 2010).

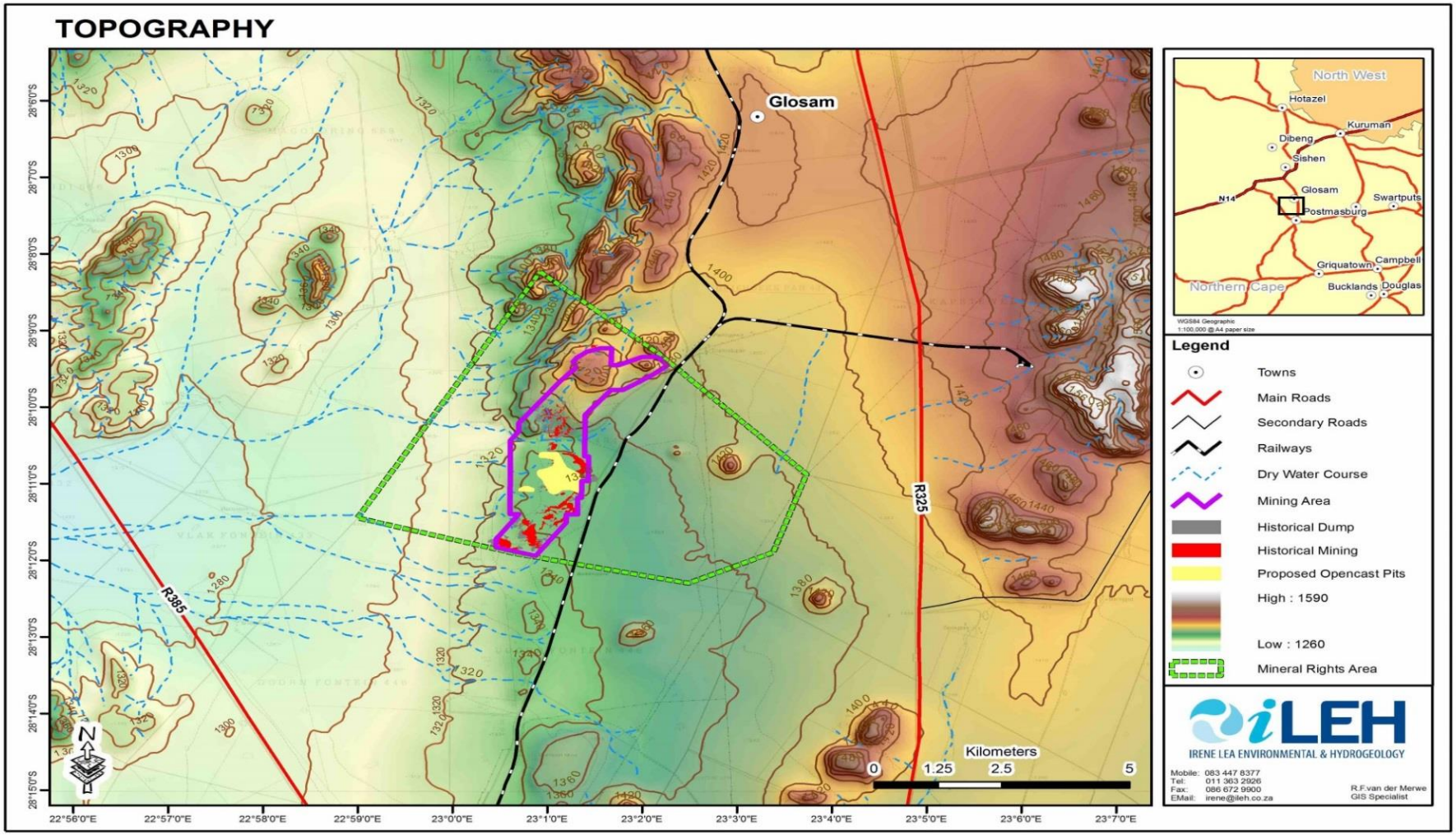


**Figure 11.** Topographic map of the study area indicating the boundaries of Paling (map out of PMG Mining Paling Project – Water Balance Report (iLEH, 2016).

- **VISUAL**

Environmental Assurance (Pty) Ltd [ENVASS] was appointed as an independent environmental consultancy firm by MVD Kalahari (Pty) Ltd, to assess the visual impact of the proposed mining activities on the farm Paling 434, for PMG Mining (Pty). This Visual Impact Assessment (VIA) will form part of the specialist work required for the Environmental Authorisation process the complete study is attached to this document as Appendix C.

**The scope of work includes a:**

- Description of the existing visual characteristics of the proposed site and its environs.
- Determination of the areas from which the proposed development will be visible.
- Proposal of mitigation measures; and
- Visual Impact Assessment (VIA) to assess the significance of the visual impacts determined to be caused by the proposed activities.

**The methodology includes the following sequential stages:**

- A desktop survey using a 1:50 000 topographic map and 1:10 000 aerial photographs to identify landforms and landscape patterns, as well as to determine the viewshed of the area in question.
- Landscape characteristics were obtained by up-to-date LiDAR (Light Detection and Ranging) height points which were converted to a digital elevation model (DEM) using the IDW (Inverse Distance Weighting) tool in ArcMap 10.1. The viewshed was derived from the DEM using the viewshed tool in ArcMap 10.1 and modified for display purposes.
- The decline of the visual impact was determined by applying concentric radii zones of 1000 m from the centre point of the proposed mining development, superimposed on the viewshed used to determine the level of visual exposure.
- The significance assessment was done by defining the closest zone to the activities of most significant impact, and the zone further than 1 km from the activities least significant. The visual exposure ratings of the zones are defined as:
  o <1000 m (very high);
  o 1000 – 2000m (high);
  o 2000 – 3000 m (moderate to low);
  o 3000– 4000 m (low to insufficient); and
  o >4000 m (not applicable).

- An extensive photographic survey of the site and surrounding areas was conducted to determine the visibility of the proposed development from various viewpoints and in the receiving environment;
- Potential visual impacts were identified using quantitative criteria such as geographic view shed and viewing distance, as well as qualitative criteria such as importance to surrounding land users and compatibility with the existing landscape;
- Viewpoints are identified to determine potential observability from specific observer points;
- Visual Exposure is determined based on the selected viewpoints identified and assessed;
- Visual sensitivity of the area is defined and determined by assessing a number of features;
- The landscape integrity is determined and a sense of place developed;
- The Visual Absorption Capacity of the proposed area is determined; and
- Possible mitigation measures where applicable.

**ASSUMPTIONS**

- The core study area can be defined as an area with a radius of not more than 5 km from the proposed development. This is because the visual impact of structures beyond a distance of 1 km would be reduced to the point that it can be considered negligible even if there is direct line of sight based on the distance from the proposed development;
- It is assumed that there are no alternative locations for the activities and therefore the visual assessment assessed only the proposed site;
- This assessment is warranted in that the no-go (no development) alternative is not relevant, particularly as the purpose of the study is to determine the impact of the proposed development; and
- A further assumption is made that mediatory measures are relevant, such as the possible lowering of the height of the planned structures.

**LIMITATIONS AND RESPONSES**

- Visual perception is by nature a subjective experience, as it is influenced largely by personal opinions and world views. For instance, what one viewer may experience as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education and

socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. In order to limit such subjectivity, combinations of quantitative and qualitative assessment methods were used. A high degree of reliance was placed on GIS-based analysis viewshed and visibility analysis, and on making transparent assumptions and value judgements where such assumptions or judgements are necessary; and

- The viewshed generated in GIS is not 100% accurate due to unknown developments and modification of the natural environment and presents a limitation. Site visits are therefore used to verify the physical land conditions; such as natural vegetation and or recent building or construction developments.

**CONCLUSION**

The construction and development of the proposed project will have a High-Medium visual impact on the natural scenic resources and the topography. However, with the correct mitigation measures the impact can be reduced to a point where the visual impact can be regarded as Low-Medium.

The moderating factors of the visual impact of the development in the close range are the following:

- Exposure time of road users;
- The sense of place that is created;
- Absorption capacity of the receiving environment;
- Visual exposure of human inhabitants located in the area;
- Natural topography and vegetation;
- Mitigation measures that will be implemented;
- Disturbed natural environment; and
- Anthropogenic environment created by surrounding activities.
- The summary of the visual impacts range is the following:
- Moderate to low exposure to road users during the life of the project;
- Medium impact on surrounding land users within 2 km of the proposed development;
- Medium impact on surrounding land users within 1 km of the proposed development;
- Medium visual impact of lighting at night on observers in close proximity to the proposed development;
- Medium visual impact on private game farm;
- Medium visual impact of the proposed development on the Sense of Place;
- Medium to Low visual impact of the proposed development during the construction phase;
- Medium visual impact of the proposed development during the operational phase

- Medium absorption capacity of the receiving environment; and
- Medium Natural topography and vegetation if proper mitigation measures are followed and implemented.

The Visual Impact that will occur due to the proposed development can be seen as having medium impact on the surrounding environment and inhabitants before mitigation measures are implemented. After mitigation has taken place, the visual impact can be seen as Low-Medium.

The visual impact that will occur from the proposed mining development can be sufficiently mitigated to a point where it can be seen as low-medium. Thus, mitigation measures are very important and one of the most significant mitigation measures of the development will be a design that is aesthetically pleasing. If the design of the proposed development is not done correctly and the design does not fit into the surrounding area, then the visual impact will be High-Medium and thus become a concern. However, with correct design, the impact will be minimal and there should be no visual dissatisfaction after the development has been completed.

Mitigation measures may be considered in two categories:

- Primary measures that intrinsically comprise part of the development design through an iterative process. Mitigation measures are more effective if they are implemented from project inception when alternatives are being considered; and Secondary measures designed to specifically address the remaining negative effects of the final development proposals. Primary measures that will be implemented should mainly be measures that minimise the visual impact by softening the visibility of the mining activities, by “blending” with the surrounding areas. Such measures will include rehabilitation of the disturbed area, such as the WRD, by re-vegetation of the area and using an aesthetically pleasing design for the proposed development.
- Secondary measures will include planting of trees, re-vegetation of the area and using lights that will not create a night sky glow. It will also include measures to minimise the visual impact during the operational phase and construction phase.

***The viewshed of the proposed development was created using ArcMap 10.1. ArcMap uses a complex algorithm, taking into account the DEM's elevation.***

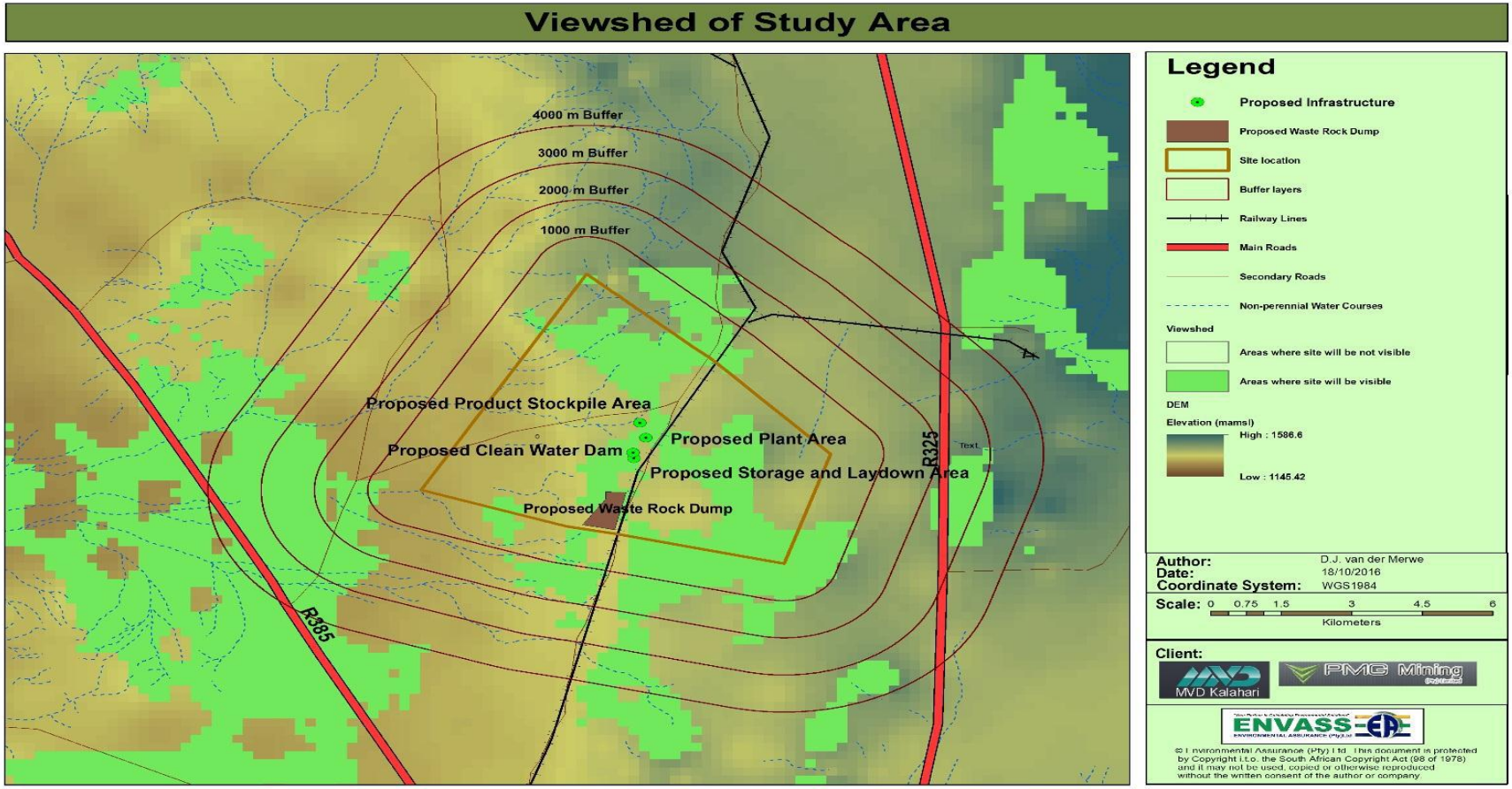


***Figure 12.*** *Viewshed Analysis Map (**Envass, Visual Impact Study, 2016)***

- ***SOILS:***

Dr Elizabeth (Betsie) Milne has been appointed by PMG Mining to provide a terrestrial fauna and flora assessment in order to highlight the ecological characteristics of the proposed mining area, and to determine the possible impact of mining on the diversity and ecological status of fauna and flora, soil was described and included in this report as part of the flora study.

**The Scope of Study**

The specific terms of reference for the study include the following:

- conduct a desktop study and field investigation in order to identify and describe different habitats and associated species of conservation concern within the environment that may be affected by the proposed activity;
- identify the relative ecological sensitivity of the project area;
- produce an assessment report that:

  - indicates identified habitats and fauna and flora species and their ecological sensitivity,
  - determines the potential impacts of the project on biodiversity,
  - provides mitigation measures and recommendations to limit project impacts.

This terrestrial fauna and flora assessment report attached as Appendix D describes the ecological characteristics of the proposed mining area, identifies the source of impacts from mining operation, and assesses the impacts, as well as the residual impacts after closure.

The study area is predominantly underlain by the rocks of the Transvaal Supergroup, Griqualand West Sequence. Here dolomitic limestone with subordinate coarsely crystalline dolomite of the Ghaapplato formation form the Campbell group covers the majority of the area; especially the eastern half. Shale flagstone, quartzite and conglomerate from the Gamagara formation of the Postmasburg group are found in the centre of the study area, while quarternary wind-blown sand is evedent in the far west. The manganese deposits of the study area falls within the Postmasburg Manganese Field and belong to its western belt deposits, which is mainly composed of ferruginous type ore.

The Soils of the study area have been described by Dr. Milne as of the Hutton form and range from shallow stony to deep sandy soils. The land type is predominantly Ag (RED YELLOW APEDAL, FREELY DRAINED SOILS; Red, high base status < 300 mm deep), but Ib (Rocky areas (mainly hills) with miscellaneous soils) and Ae (RED-YELLOW APEDAL, FREELY DRAINED SOILS); Red, high base status > 300 mm deep (no dunes) are also present (Figure 13) (Dr. B Milne, 2015).

To conclude, Dr. Milne stated that it is clear that the destruction of the natural habitat within the mining area is inevitable. The significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the mining area.

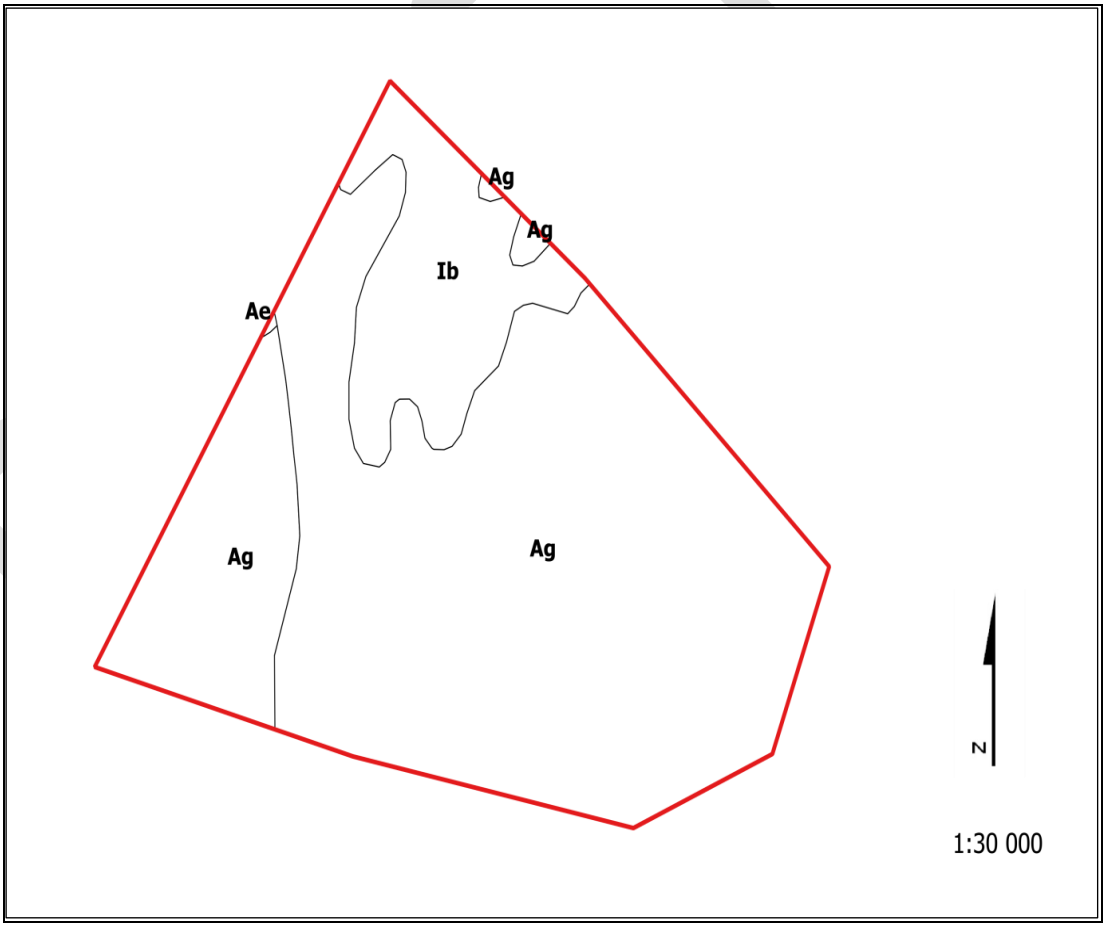


**Figure 13.** The distribution of soil land types in the study area (Map by Dr. B Milne, 2015).

- ***LAND CAPABILITY AND LAND USE:***

The majority of the study area is currently utilized for grazing by livestock such as goats and cattle, but a section in the far west of the property is managed as a private game farm (Dr. B Milne, 2015).

- ***SURFACE WATER AND DRAINAGE:***

The information on surface water was obtained from the specialist Strom Water Management Plan report done by Kalahari MVD. The Complete Report will be attached to this document as Appendix B.

The mine site is located within the Lower Vaal River Catchment Area (D73A Quaternary Catchment Area) a largely arid region with a harsh climate.

**Scope or Work**

The site is located on the remainder of the farm Paling 434, in the District of Hay, Northern Cape Province. The main purpose of this document is to develop a SWMP for the mining operations of the manganese ore in support of the water use application in terms of the National Water Act, 1998 (Act No 36 of 1998). The main objectives of the SWMP are as follows:

- Protection of life and property from flood hazards,
- Prevention of erosion due to mine activities,
- Protection of water resources from pollution,
- Ensure continuous operation through different hydrological cycles,
- Maintaining downstream water quality and quantity requirements,
- Protection of the natural environment with the emphasis on the water courses and their ecosystems.

**Methodology**

- Desktop assessment of all available hydrological and rainfall data, topographic information, contours, aerial images and previous reports which forms part of the WULA.
- On site assessment of surface water features, and potential sources of contamination.
- Interpretation of surface water flow patterns calculated from available survey data.

**Principals that were considered during the Development of the SWMP**

- Prevent the contamination of clean storm water runoff.
- Dirty water must be contained, disposed, treated and/or re-used in an environmentally responsible manner.
- The SWMP must be sustainable for the life span of the mine and relevant for all different hydrological cycles.
- The statutory requirements of the various regulatory authorities and stakeholders must be considered and incorporated.

In **conclusion** the following must be adhered to namely:
The non-perennial stream is classified as a water system according to GN704 and is a natural storm water accumulation stream. No water system shall be mined before an authorization is obtained from DWAF. This water system will however not be mined.
Historical excavation sites that were identified and which contribute to catchment flow reduction must be rehabilitated following mining activities.

- Monitoring of surface water runoff: Chemical analysis of water samples as per hydrogeological report.
- Risk rating: Potential risk assessed is rated acceptable if mitigation measures are in place.
- Regular inspections (monthly basis) of the dirty water collection dams and perimeter storm water canals are proposed.
- Rehabilitation of disturbed areas during the mine life cycle as well as during closure phase has to be done to minimize erosion and/or pollution of natural streams.

- **WETLANDS AND AQUATIC**

Dr Dr. J.C. Roos has been appointed by PMG Mining to provide a Wetland Assessment Report (Aquatic ecology – Specialist report) Appendix E to obtain ecological information for the proposed area and identify the ecological characteristics and sensitivity of the site.

The terms of reference of the project aims to identify environmental issues and concerns to safeguard the wetlands

(streams and pans) on the proposed mining area on the farm Paling 434.

Dr Jan Roos of Water Quality Consultants (CC) has been appointed by MVD Kalahari Consulting Engineers to provide an aquatic wetland assessment to highlight the ecological characteristics of the proposed mining area, and to determine the possible impact of mining on the aquatic environment.

A desktop study and field investigation were performed to obtain ecological information for the proposed area and identify the ecological characteristics and sensitivity of the site.

A site visit to the Farm was undertaken by Mr. Petrus Oosthuizen of MVD Kalahari Consulting Engineers and Dr. Jan Roos on Friday 6 May 2016.

The purpose was to do an onsite investigation and to evaluate the condition of wetlands and recommend possible environmental strategies for the long-term sustainability.

The main findings (Conclusions) of the report highlighted the following findings:

- The streams and pans are perennial/seasonal with the present ecological category of approximately B, i.e. largely unmodified.
- The Ecological Importance and Sensitivity (EIS) is Moderate, i.e. Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale.
- The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.
- The high sensitivity areas occur largely within the hilly water catchment area. The mining of the pristine hills would cause a large impact on the broad-scale ecological processes such as the natural water flow dynamics.
- Land clearing is perhaps the single most important cause of environmental degradation, loss of habitats, loss of species, and depletion of ecological communities.
- The impact of the mining on the vegetation clearance and soil erosion will be mainly restricted to the proposed pit mining area 1 (the immediate area of impact), however, the duration is long-term (permanent); and the intensity is high.
- The mining activities close to the pans and streams could:
- Isolate the wetlands from the effective drainage area from which runoff is generated, thus impede the natural water flow. Cause alteration of the flow regime of the aquatic system. Negatively affect the water quantity (the depth

and duration of inundation), the water quality (water and sediment chemistry), habitat (mainly vegetation) and biota (wetland habitat is likely to support populations of birds). Contribute to soil erosion and sediment load to the streams and pans.

- Ecological processes: The proposed mining/development activities will affect aquatic ecosystems, which are associated with ecological processes such as draining, transporting and retaining water, however, mainly limited to the proposed pit mining area 1.
- However, the impact of the mining on the other major streams (S2 – S3) and wetlands (pans; P2 & P3; dam 1) will be insignificant because these aquatic systems falls outside the proposed pit mining area.
- Transformation of intact habitat would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the water and landscape for fauna and flora and impair their ability to respond to environmental fluctuations.
- PMG Mining need to minimize and mitigate the environmental impacts in the short and long-term, as described in the environmental legislation, to ensure a sustainable future.

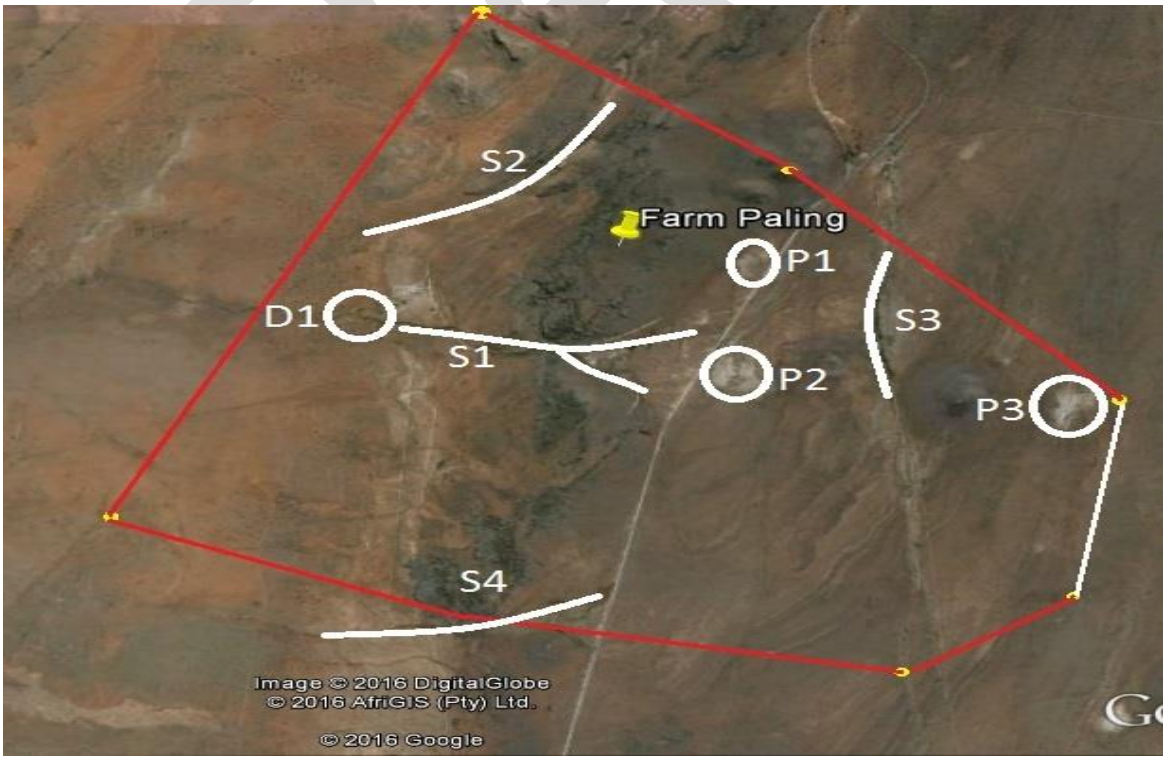


**Figure 14.** Map indicating major pans (P1 – P3), small streams (S1 – S4) and dam (D1) on the farm.

- **GROUND WATER:**

Environmental Assurance (Pty) Ltd ('ENVASS') has been appointed by MVD Kalahari (Pty) Ltd ('the consultant', hereafter referred to as MVD) to conduct a hydrogeological investigation of the proposed Manganese Mining ('the mine') owned by PMG Mining Pty (Ltd) (' PMG Mining' or 'the client'), located near Postmasburg in the Northern Cape. The complete report is attached to the EIA/EMP as Appendix F.

This hydrogeological investigation forms part of the specialist investigation component for the water use license application (WULA) for the mine. The hydrogeological investigation aims to determines the baseline hydrogeological conditions and the overall impacts (if any) of the proposed mining activities would have on the receiving hydrogeological environment and the local water users.

The **scope of work** has been established to ensure that the hydrogeological investigation will determine the baseline hydrogeological conditions and the overall impacts (if any) of the proposed mining activities would have on the receiving hydrogeological environment and the local water users. The scope of work for the project included the following to ensure that the impact of the proposed development can be determined.

- Initial Regional Assessment
- Desktop Review and Site Visit;
- Hydrocensus Investigation;
- Hydrogeological Conceptual Model Development;
- Numerical Modelling;
- Groundwater Reserve Determination;
- Impact Assessment of the proposed the Mining Activities; and
- Reporting

The methodology that was followed included the following:

**Initial regional assessment**:

The initial regional assessment was conducted to determine the information that is necessary for a new Water User License application in terms of section 21(a) of the National Water Act, 1998 (the abstraction of Groundwater).

The scale of abstraction was calculated at 142% and tt was therefore concluded that the site abstractions would fall within Category C.

**Data review:**

The data review included a desktop review for the site, which included both public domain and client-supplied data and which was consolidated.

**Hydrocensus investigation:**

This survey was conducted within a 5km radius around the site for the purpose to identify and collect information with regard to sensitive groundwater receptors. These include private farm abstraction boreholes, community water supply wells, springs and any potential pollution sources.

A total number of 41 boreholes were investigated and the average water level was calculated at 17.9 m bgl. It was further found that the groundwater flow generally follows the topography, and the flow occurs under semi-confined conditions.

The chemical analysis of the water samples showed that the water exceeds the 'Domestic Water Use Guideline Limits' in terms of Ca, K and TDS. Important however is that for the parameters that were analysed, all of the samples that were taken indicated compliance with SANS 24:2015 and the 'Livestock Watering limits'.

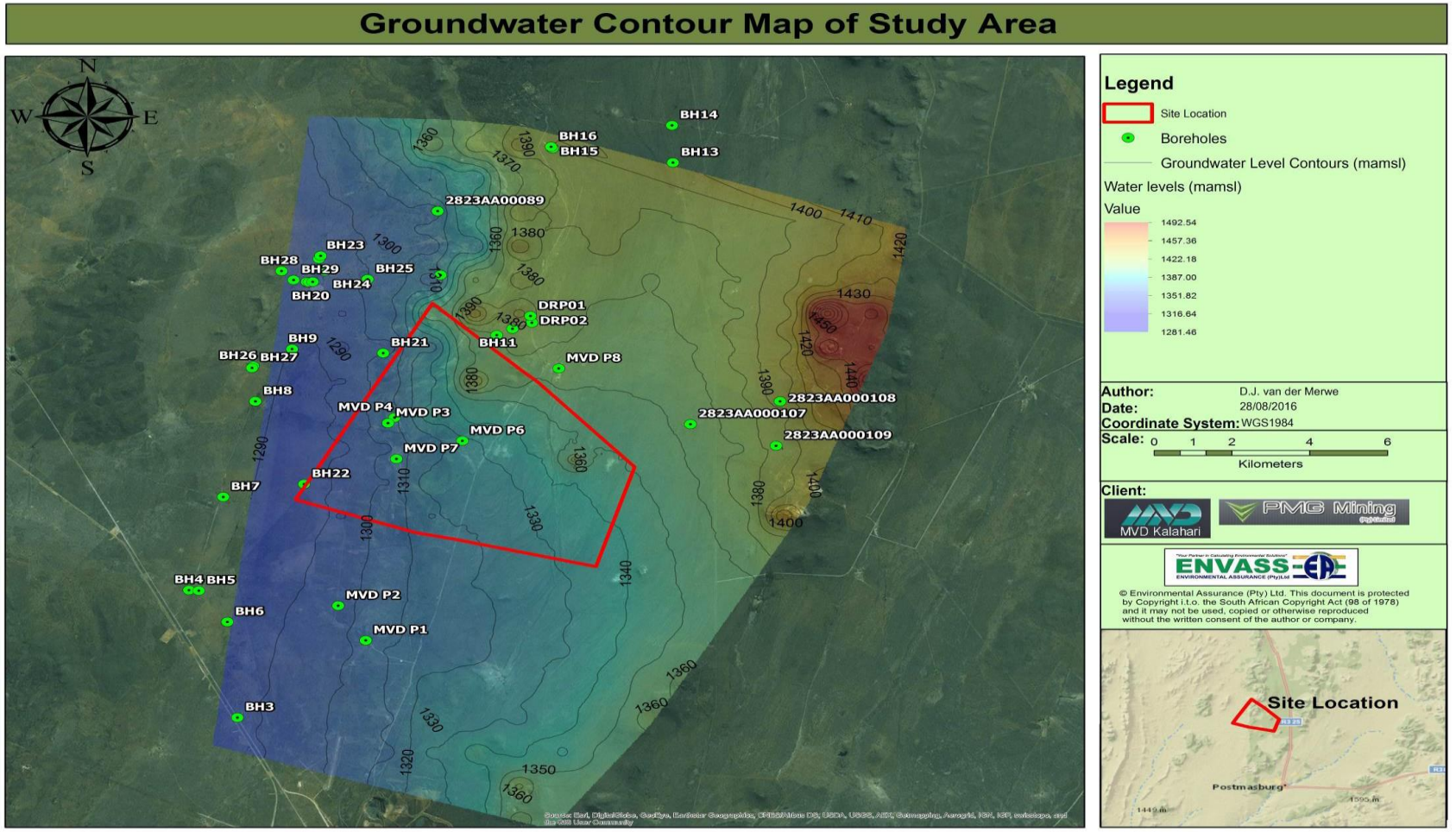


**Figure 15.** Groundwater Level Contours (Hydrogeological Report by ENVASS October 2016, page 31)

**Hydrogeological conceptual model:**

The conceptual model aimed to describe the topographic, hydrological, geological and hydrogeological environments and to quantify their interactions. Data that was incorporated into the conceptual model included the following:

- The regional and site-specific geological framework;
- Topographic data;
- Hydraulic properties;
- Sources and sinks to the groundwater system;
- Spatial and temporal trends in hydraulic head and recharge rates.

**Numerical modelling:**

The methodology was adapted from the 'Standard guide for application of a groundwater flow model to a site-specific problem'.

At the time of the model construction, the mining area was limited to one open pit area with an associated waste rock dump (WRD) where mining takes place to maximum of depth of 60 m. The Life of Mine was assumed to be seven years.

The model that was constructed to represent the hydrogeological environment of the site and it compromised of one layer (Type 3 – Semi-Confined), representing both the upper weathered aquifer system and the lower fractured rock and the maximum aquifer depth was taken as 100 m below ground level.

The flow of the groundwater was governed by artificial boundaries (far away enough not to influence the results of the modelling exercise).

The introduction of a contaminant into the site groundwater system was simulated using variable recharge for the WRD are per simulation scenario, namely:

- Recharge to the WRD area where no liner is installed and was set as 6% of MAP;
- Recharge to the WRD where a class D liner is installed and was set to as 1.2% of MAP; and
- Recharge to the WRD area where concurrent rehabilitation takes place and was set as 1% of MAP.

A calibrated flow model for the LOM and closure phases was used for running the following scenarios:

- Base Case scenario, where groundwater reporting the pit is extracted using in-pit sump systems only; and
- Scenario 1, where groundwater reporting to the pit is extracted using a combination of in-pit sumps and out-of-pit dewatering boreholes.

A transport model for the LOM (seven years) and closure phases (hundred years) was used to run the following scenarios:

- Base Case scenario, where the WRD facility is unlined and rehabilitated and capped during closure phase;
- Scenario 1, where the WRD facility is lined using a Class D liner and rehabilitated and capped during closure phase; and
- Scenario 2, where the WRD undergoes concurrent rehabilitation during operations and is fully rehabilitated and capped during the closure phase.

The liners in the scenarios were selected based on the expected waste class that may be present at the site and where no liner was applied to the WRD was to simulate a worst case scenario for the site.

Assumptions that were applied during the numerical modelling process are:

- Aquifer parameters such as transmissivity and storage were taken from literature and are assumed to be applicable to the site environment;
- Recharge values were taken from literature and previous studies at the site. The values are assumed to be applicable to the site environment;
- There will only be one waste rock dump at the site; and
- It was assumed that mining would commence in January 2019 for a period of seven years.

Limitations:

- The complexities of fractured rock aquifers imply that the model can only be used as a guide to determine the order of magnitude of dewatering and contaminant transport; and
- The interpretation of modelled results should be based on the assumptions the model was built on and actual results will

vary as unknown aquifer conditions and parameters vary in the natural system.

**Groundwater reserve determination:**

The groundwater reserve determination used the Groundwater Reserve Directed Measures. It was completed using the desktop data available for the region as well as field investigation results. In performing the calculation values from the following were obtained and used:

- Basic human needs;
- The groundwater contribution to baseflow;
- The area;
- Recharge for the area;
- Total rainfall recharge;
- Existing abstraction;
- Proposed abstraction.

**Hydrogeological Impact Assessment:**

Using the results from the numerical modelling scenarios a hydrological impact assessment was done, including the construction, operational and closure phases of the LOM.

**Construction phase:**

The construction phase involves the construction of necessary site infrastructure, such as access and haul roads, power lines, site buildings, processing plant and product and waste storage facilities.

During the construction phase the activities at the site will include construction of mining infrastructure as well as the overburden removal at the pit area. Potential impacts include localised groundwater dewatering and possible contamination from hydrocarbon spills. In the event that groundwater is used to supply the construction activities, the localised dewatering of the groundwater could occur which would be a low impact both before and after management measures are put into place due to the localised extent of the dewatering as well as the short duration of the impact.

Hydrocarbon spills could result in localised groundwater contamination, which is a medium impact on the receiving environment. In the event that proper management measures are put in place the impact on the receiving environment would be reduced to a low impact.

**Recommendation** – borehole abstraction should be managed effectively and the borehore water levels and abstraction volumes from the boreholes should be recorded at regular intervals.

All staff and supervisors should be trained in hydrocarbon spill response and each of the identified areas in the study, such as workshops, yellow metal laydown areas and fuel storage areas, should be trained in hydrocarbon spill response and the areas should be equipped with the appropriate spill response kits. Contaminated soil must be disposed of correctly.

**Operational phase:**

During the operational phase, the ore is extracted from the mine operations, processed and transported off-site for sale into the market. This is usually where dewatering of the aquifers within the mine area take place.

The simulated impacts for the base case scenario on the receiving groundwater environment due to dewatering are low. Further due to the limited extent of the drawdown cone at the site, is is unlikely that any groundwater users would be significantly be impacted on during the mining operations.

The simulated impacts for scenario 1 on the receiving groundwater environment due to dewatering are low.

Waste material will be generated on site and will be disposed of at one of the WRD. The waste facility, along with low grade ore stockpiles on site may release poor quality into the groundwater environment.

Both the waste rock dumps and the stockpile areas are low impact during the mining.

The base case scenario for the WRD, of all of the contaminants for the WRD showed limited concentrations entering the groundwater environment and the resultant contaminant plume did not migrate further than 100 m from the WRD boundary. The overall impact for the base case scenario is low. If proper management measures (such as proper storm water management) are in place, the impact rating would remain low.

Scenario 1, for all of the contaminants for the WRD, showed limited concentrations entering the groundwater environment and the resultant plume did not migrate further than 100 m from the WRD boundary. The overall impact for scenario 1 is low.

With regard to scenario 2, all of the contaminants for the WRD showed limited concentration entering the groundwater environment and the resultant contaminant plume did not migrate further than 100 m from the WRD boundary. The overall impact for scenario 2 is low.

If proper managements measures are in place (such as proper storm water management plan and infrastructure) the impact raiting will remain low.

**Recommendation** – for the base case scenario. No mitigation is possible for the impact due to dewatering however the groundwater levels at the pit area should be monitored and discharge from the pit should be disposed of in a safe manner.

The groundwater at the pit is expected to be of a good quality and subject to licensing it would be suitable for discharge into the environment. The water quality of the pit inflow should comply with the conditions of an approved license prior to discharging into the environment.

The material at the stockpile areas should be stored for as short as possible to avoid the oxidation of material and waste rock dumps should be maintained in such a manner to ensure minimal infiltration of rainwater and runoff.

The storm water management infrastructure should be sufficiently maintained to prevent any seepage of rainfall into the waste material and thus to avoid impact developing at the site. Additional to the storm water management infrastructure, class D liner should be constructed during construction to ensure the hydraulic conductivity is sufficiently reduced to ~0.25 of the regional soil hydraulic conductivity, regarding scenario 1.

To avoid impacts regarding scenario 2, the storm water management infrastructure should be sufficiently maintained to prevent seepage of rainfall into the waste material.

**Closure phase:**
This is where the operations of the mine cease and rehabilitation of the site is conducted and water levels affected by dewatering begin to rebound.

The groundwater levels ought to recover towards their original state. The probability of decant at the site is low. There are no mitigation measures for the rebound of the groundwater level and the impact

would be low. The overall impact rating for the closure phase, including the vegetation and grading of WRD and stockpile areas is low.

**Recommendation** – In order to avoid decant occurring at the open pit, the pit area should be backfilled with suitable materials in order to mimic the natural groundwater environment as far as possible.

The stockpile areas should be cleared and vegetated during the closure phase as well as the slopes of the WRD as well as graded to allow runoff and to prevent infiltration to the material.

**Groundwater Management Plan.**

In developing the Groundwater Management Plan, the following aspects were considered and included:

- Management options (actions and policies that are to be installed at the site and managed throughout the LOM);
- Mitigation measures (actions which will be implemented in the event of the impact becoming present at the site during the operational or closure phases; and
- Emergency response measures (to mitigate worst case scenario impacts may occur at the site).

The management procedures included in the Groundwater Management Plan are:

- Maintenance of an effective response mechanism to deal with issues, including unexpected events and complaints; and
- Insurance of suitability dry pit conditions for safe mining to occur.

The key principles of the Ground Water Management Plan are:

- Minimise and manage the loss of the water resource while ensuring safe mining conditions; and
- Measure, monitor, evaluate and update management measures continuously through the life of mine.

The simulation shows a minimal inflow into the mine working and this inflow can be sufficiently controlled using a sump pump where the water is evacuated from the pit and discharged. Again the water quality of the inflow should comply with the license. Water at the pit should be discharged away from the pit in a manner that is safe for both mining activities and the environment, to avoid potential water-rock interactions.

An alternative is that two of the nine monitoring boreholes should act as dedicated dewatering points for the pit area.

It is further recommended that in order to monitor the water, nine boreholes should be drilled. The identification thereof is crucial and depends on the chemistry of possible pollution sources, which include both physical and/or chemical parameters.

A compliance report should be submitted annually for evaluation and comment.

Lastly, it is recommended that the mine should develop a monitoring response protocol. This protocol will describe procedures in the event that groundwater monitoring information indicates that action is required.

***WATER BALANCE:***

Irene Lea Environmental and Hydrogeology CC was appointed by PMG Mining to determine the water balance for the water use license. A summary of the water balance is included for the completeness of the report. The complete Water Balance report is attached to the EIA/EMP as Appendix M.

PMG Mining (Pty) Ltd (PMG) executed its mining right and for this mining right, PMG is in the process of developing an opencast mining operation 14 km northwest of Postmasburg in the Northern Cape.

The project area forms part of the Molopo River catchment in the Lower Vaal Water Management Area (WMA).

It is estimated that by the year 2025, there will be zero potential for water development in the WMA. For the high consumption scenario, a deficit in water availability is forecasted for this catchment. The drought that is currently being experienced, places further stress to water availability in the region.

The project falls in the D73A quaternary catchment and is managed by the Tshiping Water User Association. The catchment is endoreic which means that none of its rivers or streams reaches the ocean. The main drainages in the catchment are non-perennial. The MAP, for the catchment is 330 mm/a and the MAE is 2016 mm/a.

The Groenwater Spruit, a non-perennial stream, is the major watercourse in the region, flowing from east to southeast of the project area. The stream is episodic and is fed by numerous small tributaries, one of which transects the project area. Flow in these

streams only takes place after heavy rainfall events and is short lived in nature. Streamflow also only occur every couple of years. The non-perennial streams draining the project area flows in a westerly direction towards an unnamed tributary of the Groenwater Spruit. This tributary flows in a southern direction into the Groenwater Spruit before the confluence with the Soutloop Spruit approximately 40 km south of Postmasburg.

The surface water resources are limited in this area and therefore groundwater is an important resource, especially farmers and municipalities. Several mining companies and businesses consume large volumes of groundwater such as Kolomela Iron Ore Mine, Assmang Beeshoek Mine, PPC Lime and Finsch Diamoned Mine. As mining operatins progress a significant decline in groundwater will occur around Kolomelo and Beeshoek mines.

The safe yield of the aquifers from which groundwater is abstracted is estimated to be around 62.4Mm³/a, based on 4% of MAP recharge rate and the estimated volume of groundwater not utilised is around 40Mm³/a.

Project Methodology

A spreadsheet water balance was constructed for the project. The spreadsheet water balance was constructed as follows:

All available project information was evaluated. It included the following:

Groundwater:

Memo from Impulse Water (Pty) Ltd dated 1 July 201 providing provisional feedback on numerical modelling results;

A report detailing the results of the hydrogeological investigation conducted by ENVASS as dealt with in the above section.

**Surface water**

A report on the 1:100 year flood line determination conducted by MVD Kalahari;

Several email discussions with the consulting engineer from MVD Kalahari, Mr P Oosthuizen, detailing the dam volumes, runoff and the storm event calculations;

The Surface Water Management Plan as conducted by MVD Kalahari.

Proposed Mining Workprogramme, 2016

The surface layout plan provided by PMG;

A mining engineering report prepared for the project by VBKOM;

Several emails from the consulting engineer from VBKOM, Mr H Cronje, regarding the water demand and use for the operations;
A water use spreadsheet, dated 9 September 2016 that describes the water use license application parameters.

A literature search was conducted to obtain information regarding the water management area;
A conceptual water balance was developed for the project and presented to the consultants and engineers. The purpose of the conceptual balance was to improve the understanding of water management at the operations and to identify and address the data gaps;
Meetings were held with several consultants and engineers working on the project in order to finalise the water balance;
The water balance report was undertaken according to the Department of Water Affairs' Best Practice Guideline G2.

The Objectives of the Water Balance

An accurate water balance is an important component to overall water management for the proposed project. The objectives, based on the 2006 Department of Water Affairs' Best Practice Guideline G2: Water and Salt Balances (BPG) are defined as follows:

- The Water balance will provide the necessary information that will assist PMG in defining and driving water and waste management strategies;
- The water balance will be used to identify gaps in available data and to guide the monitoring programme;
- The water balance is used to audit and assess the water reticulation system, with the main focus on water usage and the containment of dirty water;
- The output from the water balance;
- Assist with determining the maximum operational capacity of the mine's dams.

The objectives must be revised if monitoring information becomes available or if the activities and/or water use patterns at the mine change.

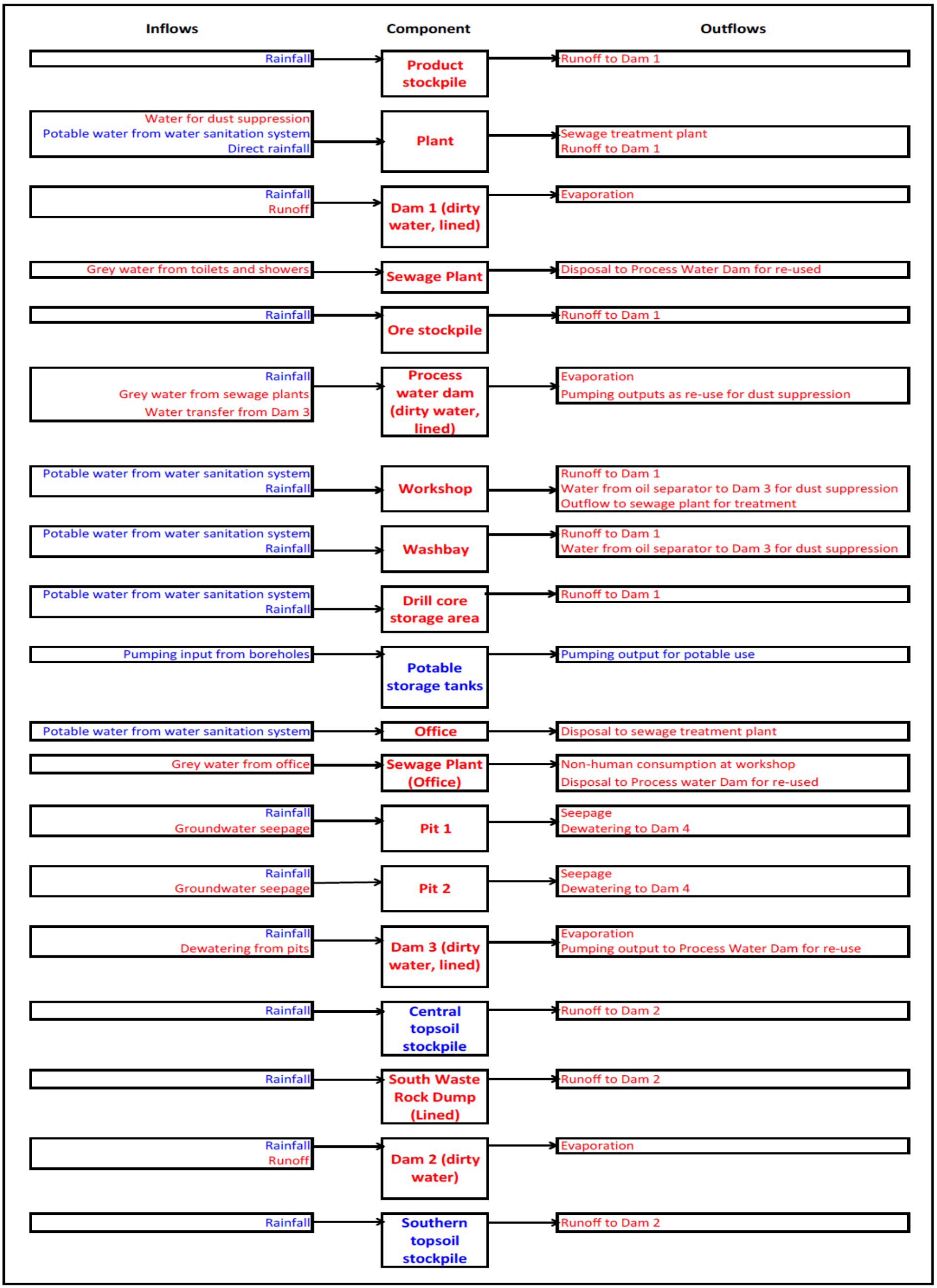


**Figure 16.** Conceptual Water balance

The water demand and supply is set out in Table 2

**Table 2 :** Project water demand and supply volumes (Table out of PMG Mining Paling Project – Water Balance Report (iLEH, 2016).

| Water demand | Volume ($m^3$/d) |
|---|---|
| Domestic use at the plant, office, workshop, wash bay and core shed | 40 |
| Dust suppression on mine access and haul roads | 140 |
| Dust suppression and plant processes | 14 |
| **TOTAL** | **194** |
| **Potential water supply** | **Volume ($m^3$/d)** |
| Groundwater from boreholes on site | 233 |
| Sedibeng pipeline (considered as an alternative supply source, if required) | 0 |
| Water pumped from the pits to Dam 3 as part of the dewatering schedule | 530 |
| Recycling of grey water from offices and workshops | 16 |
| **TOTAL** | **934** |

The dam storage capacities are shown in Table 3

**Table 3:** Dam storage volumes (Table out of PMG Mining Paling Project – Water Balance Report (iLEH, 2016).

| Dam name | Description | Storage capacity ($m^3$) |
|---|---|---|
| Dam 1 | Stormwater dam receiving runoff from the plant and office area. The dam will be lined with HDPE and will be used for evaporation of excess water. | 14 360 |
| Dam 2 | Stormwater dam receiving runoff from the Southern waste dump as well as the central and southern topsoil stockpiles. The dam will be lined with HDPE and will be used for evaporation of excess water. | 7 860 |
| Process Water Dam | Process water dam for the storage and re-use of dirty water at the operations. It will receive grey water from the two sewage plants and the oil separator. Groundwater dewatered from the two pits will be transferred to this dam from Dam 3 for re-use at the operations. | 3 475 |
| Dam 3 | Dewatering dam at the pits. The dam will be lined with HDPE and will be used for evaporation of excess water. Water from the dam will be transferred to the Process Water Dam for re-use at the operations. | 12 920 |

The annual average water balance diagram is set out in Figure 17 in the document.

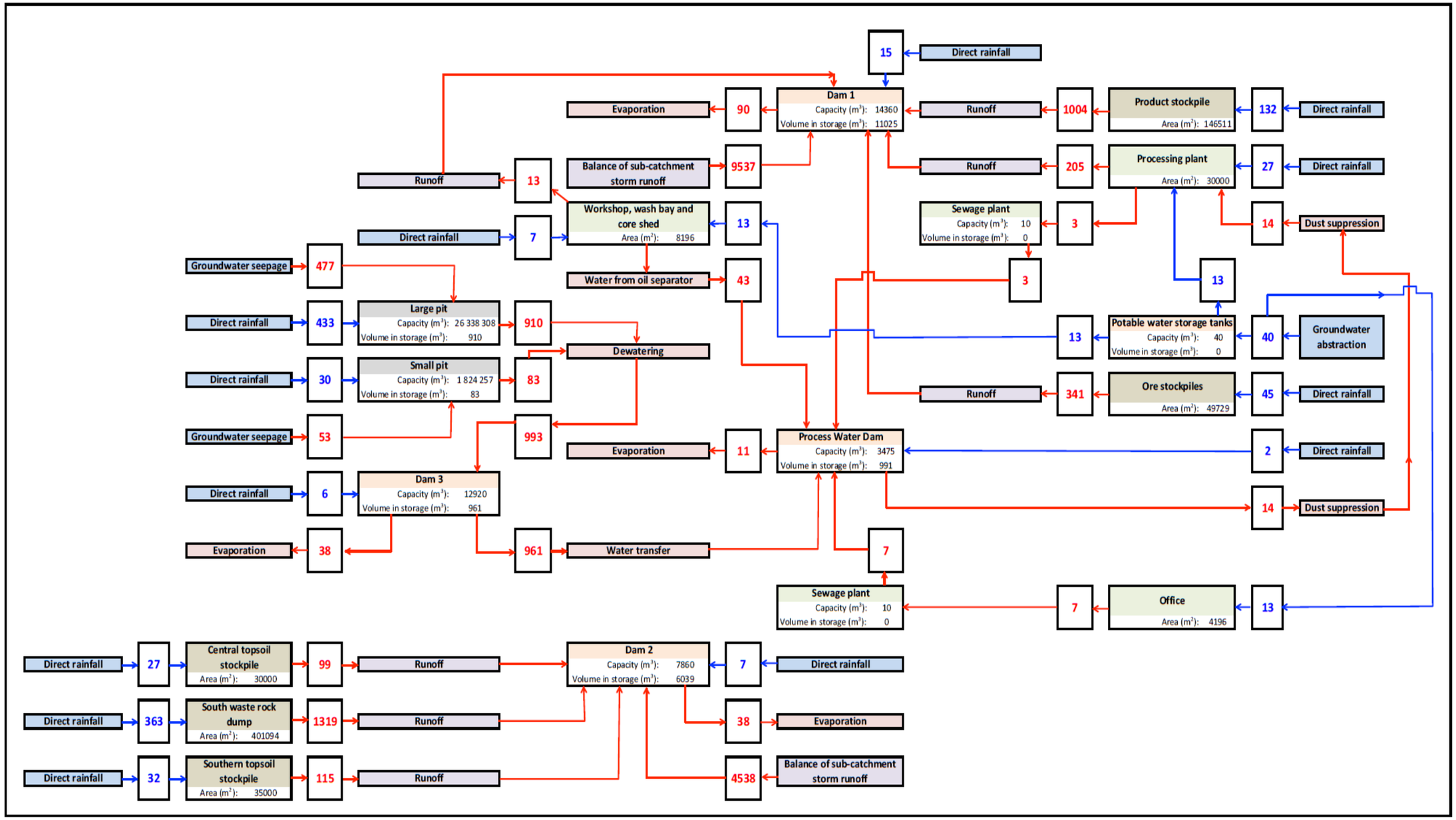


**Figure 17.** PMG Paling Mine Annual Average Water Balance Diagram ((Diagram out of PMG Mining Paling Project – Water Balance Report (iLEH, 2016).

All volumes are indicated in m³/d
All areas are indicated in m²
Clean water is indicated in **blue.**
Dirty water is indicated in **red.**

Causes of imbalances and addressing the causes of imbalances:
The mine water circuits were identified by the project engineers and were included in the water balance report. The accuracy of the water balance can be improved through implementing a water circuit monitoring programme. The information however in the report is the most updated reflection of the water use at the operation based on available information.

The process of developing the water balance has addressed the imbalances that were originally identified. It related to the volumes of water that would be stored in the four dams at the operations. The results however balances indicate that the dams have sufficient capacity to contain the annual average volumes.

**Recommendations:**

In order to manage the water balance for the project, the following actions are recommended:

- All dams, sumps and pipelines that form part of the water management system must be inspected on a daily basis to determine the available storage volume as well as to detect leaks or overflows;
- If non-compliance are identified, these should be rectified immediately;
- Flow meters should be fitted on the boreholes that will be used for potable groundwater abstraction. The volume of groundwater abstracted per day must be recorded and used to update and manage the water balance;
- The volume of groundwater abstracted per day from the potable supply boreholes must be adjusted if the capacity of the clean water tanks is reached. This should be controlled with an overflow valve that automatically cuts the pump when the tanks are full;
- Groundwater levels should be measured on a monthly basis in the boreholes used for groundwater abstraction. This information must be used to establish whether the boreholes are pumped at sustainable rates. If a decline in groundwater levels is observed, the pumping strategy must be adjusted or the alternative water resource (Sedibeng pipeline) must be triggered;
- Flow meters should also be installed on pipelines that deliver water to and from the four mine dams in order to obtain accurate information for the water balance;

- The volume of groundwater seepage from the pits that is available to the mine water balance must be closely monitored;
- The quality of groundwater abstracted as well as the depth to groundwater level must be monitored on a quarterly basis to ensure fitness of sue;
- The quality of water in the four mine dams must be monitored on a quarterly basis. This information should be used to confirm the fitness of use of water for dust suppression and other uses at the operations;
- The water quality information should be used to construct a salt balance for the operations;
- Rainfall must be measured daily on site;
- The operations should re-use dirty water as far as possible to limit the intake of clean water;
- The mine water balance must be updated on an annual basis or if there are changes in the units that have been used to present the water balance.

- **AIR QUALITY:**

A dust fallout monitoring system was implemented to measure the baseline air quality of the proposed mining area. Buckets for dust fall-out was installed on site at strategic points. Samples were collected on a monthly basis for analysis. There are 8 (eight) dust fallout monitoring locations at the Paling project site and they are numbered P1 – P8.

Baseline monitoring, according to information supplied by PMG's Environmental Officer at their Bishop Manganese Mine, indicated that that the monitoring period commenced in 2014, however results for the baseline monitoring period from March 2015 to November 2015 are available.

According to the PMG Mining Dust Fallout Reports (Aquatico Scientific (Pty) Ltd, 2015), the evaluation criteria for dust deposition in terms of SANS: 1929:2011 (Ambient Air Quality) is as follows:

| Band Number | Band Description | Dust-fall Rate (mg/m2/day) | Comment |
|---|---|---|---|
| 1 | Residential | <600 | Permissible for residential and light commercial |
| 2 | Industrial | 600 – 1200 | Permissible for heavy commercial and industrial |

| | | | |
|---|---|---|---|
| 3 | Action | 1200 – 2400 | Requires investigation and remediation if two sequential months in this band, or more than three occurrences in an year. |
| 4 | Alert | >2400 | Immediate action and remediation required following the first incidence of the Dust-fall rate being exceeded. Incident report to be submitted to relevant authority. |

According to the Aquatico reports, the dust-fall results for all of the monitoring points revealed levels below permissible commercial and light industrial standard and that no action or remediation is required.

- **NOISE AND VIBRATION**

Barend J B van der Merwe, as duly authorised representative of dBAcoustics has been appointed by PMG Mining to provide a Noise and Vibration assessment in order to assess proposed changes to noise and vibration during the construction, operational and decommissioning phases of the mine which will require approved management measures and ongoing noise and vibration surveys will have to be carried out to ensure compliance to the relevant noise regulations and/or standards. (see study as Appendix G).

In terms of the Noise Regulations a noise disturbance is created when the prevailing ambient noise level is exceeded by 7.0dBA or more. Noise however becomes audible when the prevailing ambient noise level is exceeded by 5.0dBA. It will therefore be more environmentally sustainable for a new development that the latter benchmark be used as a completely mechanised development will be introduced into the study area. Noise, vibration or sound is part of our daily exposure to different sources which is part of daily living and some of these physical attributes which may at times be intrusive forms part of the ambient levels that people get used to without noticing the higher levels.

Two aspects are important when considering potential impacts of a project:

- The increase in the noise and vibration levels, and;

- The overall noise and vibration levels produced.

The study area covered the boundaries of the mine, access road, along the railway corridor and at the noise receptors. The residents of the farm houses in the vicinity of the proposed mine complex are exposed to farming activity noise, existing mine activity noise, traffic noise and rail road noise. Domestic noise and natural noises such as insects, wind and animal noises is part of the prevailing environmental ambient noise level.

**The purpose of the noise and vibration study was:**
To determine the environmental baseline noise and vibration levels along the boundaries of the mine, at the vicinity of noise receptors, along the R385 & R325 routes, and along the railway line. The noise baseline information will be used to calculate the possible intrusion levels at the noise receptor areas. The possible noise and air vibration increase from the proposed mine activities will be determined at the abutting residential areas.

The measuring points for the study area were selected to be representative of the prevailing ambient noise levels for the study area and include all the noise sources such as distant traffic noise, agricultural activities but exclude traffic noise which was intermittent in the vicinity of the measuring point. The measuring points are illustrated in Figure 18.

**Conclusion**

The prevailing ambient noise levels are different throughout the study area and the arithmetic average for the study area was calculated at 31.4dBA during the day and 28.1dBA during the night for the winter. The prevailing ambient noise level for the study area during the summer is slightly higher due to increased insect activities and is 35.0dBA during the day and 32.9dBA during the night. There are mine activities in the vicinity of the proposed mine with a railway corridor where trains use the railway line on a regular basis during the day and the night. This creates a finite type noise increase with a maximum noise level of 68.7dBA at 250m from the railway activities. The mine activities were audible at MP's 1, 2, 10, 12, 14, 15 and 17 at the time of the noise survey. The aircraft activities in and around the Ronny's airstrip and traffic along the existing gravel road (R385) also create a noise increase at times.

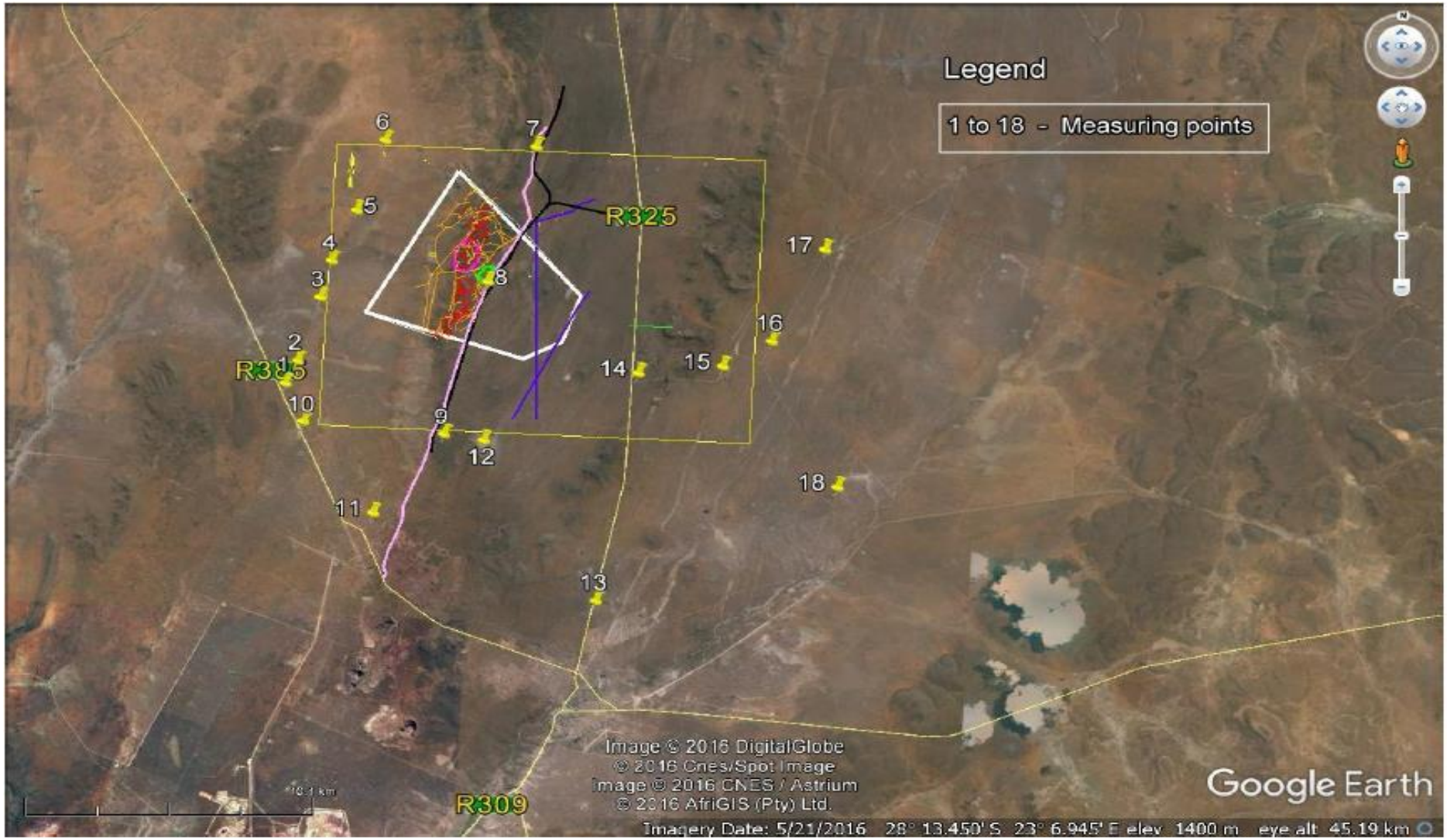


**Figure 18.**–Noise Measuring points (Map by Barend J B van der Merwe, October 2016).

The noise impact during the construction phase, which will take place during daytime periods only, will be insignificant. The noise regime will change during the operational phase where the noise intrusion will be more noticeable during the night time periods in the winter periods at noise receptors A to D.

This is based on a noise intrusion level of 5.0dBA and not the benchmark noise intrusion of 7.0dBA before a noise disturbance is created. The noise increase will therefore be noticeable at some of the residential areas but will not contravene the Noise Control Regulations. Noise mitigatory measures must be in place to comply with the Noise Control Regulations.

There will be a noise intrusion during the night time in winter with a lower level during the summer period at the game lodge west of the mining area due to the proximity of the lodge to the mine activities. Acoustic screens will have to be erected as close as possible to the mine activities. A crack survey will have to be carried out at all the habitable areas at the game lodge prior to the commencement of mine activities. All existing cracks and defects will have to be registered and photos must be kept at a safe place. The opencast mining area has been divided in sectors (A to E) and the noise and ground vibration levels were calculated by using the distances between the noise receptors and the different mine activities. The highest ground vibration levels will be at the game lodge during blasting activities at opencast pit C. Ground vibration levels of between 4.07mm/s to Integrated Environmental Management (IEM) is a continuous process that ensures that the environmental impacts which can be introduced by mechanised activities during the construction phase and during the operational phase process (such as noise and vibration) are avoided or mitigated throughout the project life cycle from design to the operational phase of the project (DEAT, 2004).

7.08mm/s was calculated to take place at the lodge during blasting. It is generally accepted that residential buildings of sound construction can safely withstand peak particle velocity (PPV) in m/s of 25mm/s. Poorly constructed buildings should however not be subjected to PPV's of more than 10mm/s (USBM).

Animals depend on acoustic signals for essential functions. Some species have become threatened or endangered because of loss of habitat and further relocation as a result of noise disturbance is not possible. There is still an absence of

understanding how observed behavioural and physiological effects translate into ecological consequences for wildlife. There are examples where mining activities did not impact on the breeding and well-fare of wild life inside mining areas and this was successfully introduced in mines in the Limpopo (IEMR, 2000). The distance of 500m between the blast and the receptors will be maintained at all times as the game lodge and all the other noise receptors will be further than 1 000m from the blasting activity.

There will be a shift in the immediate noise levels of the proposed activities on a temporary basis during the construction phase and a permanent basis during the operational phase and the communities will have to be briefed and informed of this during the public participation process. Regular feed-back to the community during the operational phase of the project of the baseline noise and ground vibration monitoring must take place. A system whereby complaints are recorded and investigated must be made available.
The possible noise intrusion from the blasting and mine activities can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles and compliance to the Local Noise By-laws, and the International Finance Corporation's Environmental Health and Safety Guidelines. The proposed noise and vibration management plan must be in place during the construction and operational phases so as to identify any noise increase on a pro-active basis and to address the problem accordingly.

- ***NATURAL VEGETATION:***

Dr Elizabeth (Betsie) Milne has been appointed by PMG Mining to provide a terrestrial fauna and flora assessment in order to highlight the ecological characteristics of the proposed mining area, and to determine the possible impact of mining on the diversity and ecological status of fauna and flora.

**The Scope of Study**
The specific terms of reference for the study include the following:

- conduct a desktop study and field investigation in order to identify and describe different habitats and associated species of conservation concern within the environment that may be affected by the proposed activity;
- identify the relative ecological sensitivity of the project area;

- produce an assessment report that:

  - indicates identified habitats and fauna and flora species and their ecological sensitivity,
  - determines the potential impacts of the project on biodiversity,
  - provides mitigation measures and recommendations to limit project impacts.

This terrestrial fauna and flora assessment report attached as Appendix D describes the ecological characteristics of the proposed mining area, identifies the source of impacts from mining operation, and assesses the impacts, as well as the residual impacts after closure.

A desktop study and field investigation was performed by Dr. Betsie Milne to obtain ecological information for the proposed area and identify the ecological characteristics and sensitivity of the site. Four broad-scale vegetation types occur within the mining area; i.e. Kuruman Mountain Bushveld, Kuruman Thornveld, Postmasburg Thornveld and Olifantshoek Plains Thornveld. None of these vegetation units have been significantly transformed and are classified as least threatened. Seven fine-scale plant communities were identified on site of which Thornveld on the plains and the Open shrubland on deep sand host a large population of by Boscia albitrunca and Vachellia erioloba trees respectively. The Pristine and Isolated Rocky Hills are identified as being most sensitive and most unsuitable for mining activities.

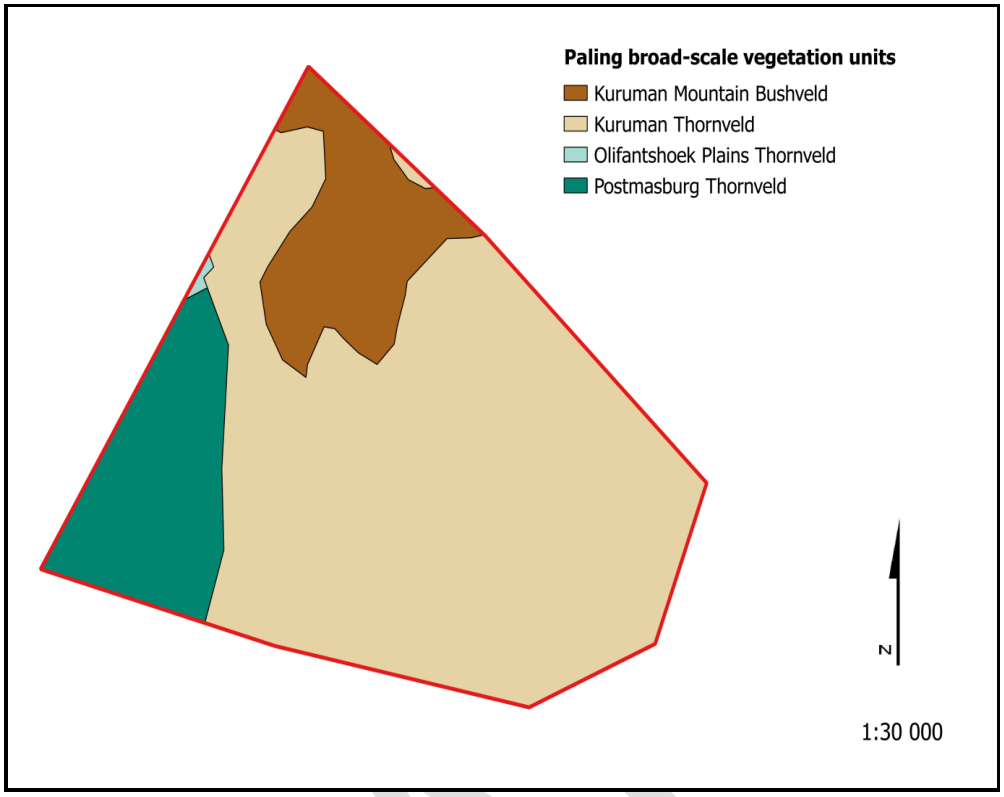


**Figure 19.** The distribution of four broad-scale vegetation units (Mucina et al. 2005) that is present in the study area. (Dr. Betsie Milne, August 2015).

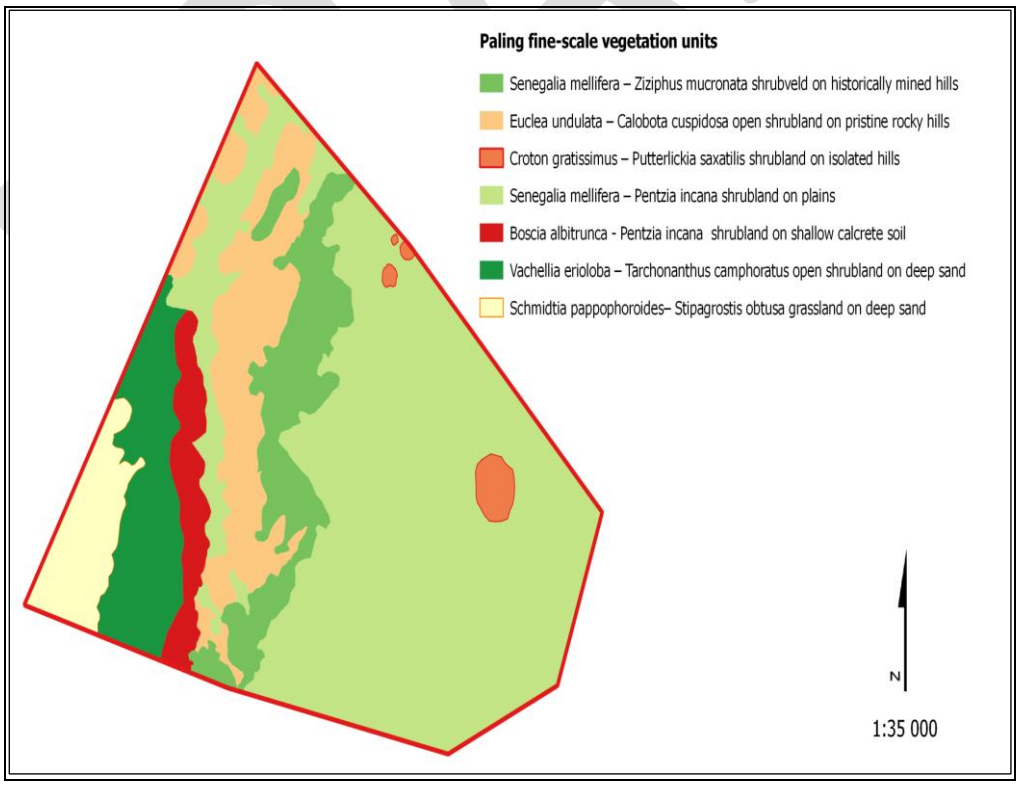


**Figure 20.** The distribution of fine-scale vegetation units in the study area. (Dr. Betsie Milne, August 2015)

**Conclusion**

Seven plant communities were identified on site of which the Pristine and Isolated Rocky Hills are identified as being most sensitive. The Senegalia mellifera – Ziziphus mucronata shrubveld on historically mined hills and the Euclea undulata – Calobota cuspidosa open shrubland on pristine rocky hills comprise the core mining area. The first have already been impacted in the past by historic mining activities and is therefore not considered highly sensitive, and impacts on vegetation and fauna are likely to be relatively low after mitigation here. The second community however, is regarded as highly sensitive due to the high number of provincially protected species occurring here as well as the unique habitat this community potentially provides to fauna. Impacts on vegetation and fauna are likely to be relatively high even after mitigation here.

Re-established stunted Boscia albitrunca shrubs are widespread across the site and more than 100 individuals are expected to be destroyed by the mining activities. A licence application regarding protected trees need to be lodged with Department of Agriculture, Forestry and Fisheries prior to the removal or damaging of any of the protected trees.

The construction of infrastructure and the mining operation will result in the removal of provincially protected flora and will constitute large-scale clearance of indigenous vegetation. A permit application regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation prior to any clearance of vegetation.

To conclude, it is clear that the destruction of the natural habitat within the mining area is inevitable. The significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the mining area.

- **NATURAL FAUNA:**

  Dr Elizabeth (Betsie) Milne has been appointed by PMG Mining to provide a terrestrial fauna and flora assessment in order to highlight the ecological characteristics of the proposed mining area, and to determine the possible impact of mining on the diversity and ecological status of fauna and flora attached as Appendix D.

  **The Scope of Study**
  The specific terms of reference for the study include the following:

- conduct a desktop study and field investigation in order to identify and describe different habitats and associated species of conservation concern within the environment that may be affected by the proposed activity;
- identify the relative ecological sensitivity of the project area;
- produce an assessment report that:
    - indicates identified habitats and fauna and flora species and their ecological sensitivity,
    - determines the potential impacts of the project on biodiversity,
    - provides mitigation measures and recommendations to limit project impacts.

A desktop survey was undertaken to obtain lists of mammals, reptiles and amphibians which are likely to occur in the study area. These were derived based on distribution records from the literature and various spatial databases, i.e. SANBI's SIBIS and BGIS databases. Literature consulted includes Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals, Branch (1998) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians.

A list of Plant species found in the study area that are of conservation concern are attached on page 31; Appendix D.

The categorisation of weeds and invader plant species, according to NEMBA and CARA is attached on page 34; Appendix D.

A list of declared weeds and invasive species recorded in the study area is attached on page 34; Appendix D.

A list of declared indicators of bush encroachment in the Northern Cape recorded in the study area is attached on page 35; Appendix D.

Apart from the literature sources, additional information on faunal presence was extracted from the various databases hosted by the ADU web portal, http://adu.org.za, as well as from Robert's Multimedia Birds of Southern Africa (Gibbon 2006). The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a

preliminary assessment of the availability and quality of suitable habitat at the site.

The likelihood of Red Data species occurring on site has been determined using the distribution maps in the Red Data reference books and comparing their habitat preferences with the habitat described from the field survey. The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria (IUCN 2014) and Friedmann and Daly (2004).

The faunal field survey was conducted concurrent with the vegetation survey. The habitats on site were assessed to compare with the habitat requirements of Red Data species determined during the literature survey. The presence of faunal species was determined using the following methods:

- Identification by visual observation;
- Identification of bird and mammal calls and
- Identification of signs (spoor, faeces, burrows and nests).

**Faunal communities**

According to Section 3(a) and 4(a) of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009, no person may, without a permit by any means hunt, kill, poison, capture, disturb, or injure any protected or specially protected animals. Furthermore, Section 12 (1) of NCNCA states that no person may, on a land of which he or she is not the owner, hunt a wild animal without the written permission from the landowner.

The core mining activities are expected to take place on the rocky hills and ridges of the property. None of these listed species are associated with a rocky habitat and therefore the impact of the proposed mining activities on habitat loss for these species would be minimal. It is therefore also unlikely that the proposed mining activities will have a long-term impact on these species.

Rocky hills are generally known to contain high mammal species richness. Most of the habitats presented by the historically mined rocky hills of the property have already been transformed by historic mining activities and are therefore not expected to host such high mammal diversity. However, those habitats presented on pristine rocky hills are expected to host high mammal diversity and therefore precautions to limit potential impacts on the local fauna population found here, are necessary.

A list of mammal species found in the study area, which are of conservation concern is listed in the study on page 36; Appendix D.
A list of Bird species found in the study area that are of conservation concern is listed on page 39; Appendix D.

Although there are likely to be a number of listed fauna and avifauna present at the site, the surrounding landscape is still overwhelmingly intact and it is not likely that the mining activities would lead to the regional declines in these species. As faunal abundance in the area is quite high, mitigation measures to reduce the potential impact of the mining activities are important to ensure a low faunal impact.

To conclude, it is clear that the destruction of the natural habitat within the mining area is inevitable. The significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the mining area.

- **SOCIO-ECONOMIC STRUCTURE OF THE REGION:**

Ms. Ingrid Snyman from Batho Earth has been appointed by Wadala Mining and Consulting to provide a Social Impact Assessment (SIA) Report for PMG Mining Paling Mine. The complete report is attached to this EIA/EMP as Appendix H.

**Purpose of the Report**
The purpose of the SIA report is therefore to provide the findings of the SIA undertaken through the following.

- Determining the current socio-economic status of the area and the social characteristics of the receiving environment;
- Indicating the anticipated core impact categories and impact areas (possible hot spots);
- Identifying anticipated positive socio-economic impacts of the proposed project, including positive impacts and provide management measures for these impacts;
- Identifying and highlighting negative social impacts (social hot spots) of the proposed project and indicate mitigation measures to deal with these impacts;
- Presenting the findings, recommendations and conclusions of the social study.

**Scope of the Assessment**

This involves an investigation to identify the framework of the project through the identification and demarcation of the study area. Once the study area has been determined, an evaluation framework was developed which assisted in identifying the main anticipated social impacts. Scoping further involves an outline of the social characteristics of the area which included the following:

- Background of the study area;
- Existing social characteristics of the affected communities;
- Culture, attitudes and socio-psychological conditions;
- Population characteristics and demographics;
- Community and institutional structures;
- Community resources; and
- A broad economic profile of the area.

**Concluding Remarks**

The social impacts associated with the mining operations are not viewed as a major threat to the quality of life of the residents of the area. The impacts fall within the low impact category. In addition, the assessment of the key issues indicates that there are no socio-economic impacts that could be classified as fatal flaws and which are of such significance that it cannot be mitigated. The proposed Paling mine will make a positive contribution from a number of perspectives.

Based on the findings derived from the information available at this stage it is concluded that the likely benefits of the proposed project outweigh the potential social risks and/or threats to the local communities. However, as indicated earlier in the report, the possible impact on the infrastructure and service needs due to the inflow of an additional workforce should be addressed. It would remain the responsibility of the Tsantsabane Local Municipality, but considering the social framework within which the mine operates, it is important for the mine to engage with the TLM in this regard to minimise any possible negative impacts. Such engagement should also contribute to meaningful contributions to the communities situated in close proximity to the mine.

It is furthermore important to ensure that any negative impacts as a result of the mining activities on the Maremane Village and Settlement should be limited.

The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.

On a more detailed level, the following positive impacts are anticipated:

- The creation of job opportunities in the area, and associated local economic development;
- Support to the Tsantsabane Local Municipality in respect of service delivery and infrastructure development/maintenance through the implementation of the Social and Labour Plan of Paling Mine;
- Economic and revenue contribution to the local municipal area, as well as the ZF Mgcawu District and adjacent municipalities;
- The involvement of Paling Mine with regards to training and capacity building of its employees and subsequent improvement of the livelihoods of the employees' families, as well as its efforts in sustaining the socio-economic development of the communities in close proximity to the operation;
- The involvement of Paling Mine with regards to social development projects and support through the Integrated Development Plans (IDPs);
- The positive impact of mining activity on the regional and local economy; and
- Positive impact of extensive local procurement focus.

Negative impacts as a result of the mining activity refer to:

- Inconvenience and intrusion impacts during the start-up and construction phases of the project such as the inflow of an additional workforce to the area, the possible influx of jobseekers, possible increase in the criminal activities (safety and security issues), disruption of social networks, as well as possible health risks;
- Possible negative impacts on the game farming activities in the area;
- Possible negative impacts of blasting;
- Disruptions in the daily living and movement patterns (increased traffic and possible dust pollution);
- Additional pressure on infrastructure development and maintenance;
- General intrusion impacts such as visual and noise pollution.

From a social perspective it can be concluded that the proposed Paling Mine Project would not result in permanent damaging social impacts. The socio-economic benefits associated with the mine outweigh the negative social impacts. It is thus concluded that the proposed project

is acceptable from a social point of view, provided that mitigation measures are implemented.

- ***ARCHAEOLOGICAL***

Several ARCHAEOLOGICAL studies were conducted by various specialists. Herewith a summary of the studies that were conducted:

- Pelser, A.J., Lombard, M,. 2013. A Report on the Archaeological Investigation of Stone Age Finds on the Farm Paling 434 Hay Magisterial District, Near the Postmasburg in the Northern Cape (Appendix 2013B; L);
- Pelser, A.J., Lombard, M., 2013. A Report on the Historical-Archaeological Excavations of Features Dating to the Late 19th/ Early 20th Century on the Farm Paling 434 Hay Magisterial District, Near Postmasburg in the Norhtern Cape (Appendix 2013A: N);
- Pelser, A.J., 2012. A Report on the Historical – Archaeological Investigation and Relocation of known and unknown Burials dating to the Late 19th/ Early 20th Century on the Farm Paling 343 Hay Magisterial District, Near Postmasburg in the Northern Cape (Appendix 2012: I);
- Pelser, A.J., Van Vollenhoven, A.C., 2010. A Report on an Archaeological Impact Assessment (AIA) for proposed mining operations on the Remainder of the Farm Paling 434, Hay Magisterial District Northern Cape (Appendix 2010B J);
- Pelser, A.J., 2010. Heritage impact Assessment Report: Proposed Managanese and Iron Ore Mining Right Application, in respect of the Remainder of the Farm Paling 434, Hay Magisterial District, Northern Cape Province (Appendix 2010A:K)..

Appendix 2010A **K**
This Heritage Impact of Assessment was conducted in lieu of the application for the Mining Right.

The purpose of the Heritage Impact Assessment is to identify and assess features of heritage significance, identify possible impacts and propose management measures to mitigate negative impacts. This information must enable the relevant heritage authority to approve the proposed development as required in terms of Section 38 of the National Heritage Act 25 of 1999.

The Terms of Reference:

- To identify and map heritage resources that may be affected directly and indirectly'
- To assess the cultural significance of these heritage resources;
- To assess the impact of the mining on the heritage resources;

- To assess the benefits of conserving these heritage resources in relationship in the socio-economic benefits of the development;
- To provide the public with an opportunity to comment on the heritage aspects of the proposed mining;
- To consider alternatives if heritage resources will be affected in a negative manner;
- To determine methods to mitigate impacts before, during and after construction activities.

The Heritage Impact Assessment (HIA) was conducted as follows:

- Desktop study;
- Field survey in May 2010;
- Verbal information from the former farm owner.

Limitations in the HIA were:

- Unpredictability of buried archaeological remains;
- The occurrence of ancient specularite mine workings came to light during further desktop research after the completion of the field work;
- No historical aerial images were available at the time the field work took place.

Heritage Impacts are categorised as:

- Neutral (no impact);
- Direct or physical impacts;
- Indirect impacts;
- Cumulative impacts.

The impacts can be managed through one or a combination of the following measures:

- Mitigation;
- Avoidance;
- Compensation;
- Enhancement;
- Rehabilitation;
- Interpretation;
- Memoralisation;
- No action;
- Relocation; and
- Alternatives.

Findings and impact management recommendations

It was founded that the operations for the mining and iron deposits may impact upon a number heritage resources associated with the site's farming and mining industry. Some of them are of medium to high local significance and should be sampled (Stone Age artefacts), documented (ruin of small structure), preserved (air compressor plant) or relocated (cemetery) before any mining operations can commence. It was further concluded that the nature and significance of what has been found is not of such importance that the proposed mining area should be changed or that an alternative mining area should be considered.

The proposed mining activity is a direct and historical continuation of the mining of the farm's manganese deposits that began in the 1920s and ended in the 1980s.

There are no compelling reasons to delay or prevent the proposed amendment, provided that the recommended mitigation measures are applied as listed below:

- Should any further graves be disturbed, exposed or uncovered during site preparations, these should be immediately reported to an accredited archaeologist, Burial remains should not be disturbed or removed until inspected by an archaeologist;
- The cemetery may be relocated by an archaeologist in accordance with a NHRA Section 36 permit application;
- The ruin should be documented before destruction;
- The archaeologist site P-6 should be sampled for any further artefacts.
- The homestead area should be cleared and the midden should be excavated before destruction;
- The air compressor plant should be preserved and fenced off with some form of interpretation;
- The sampling of P-6, excavation of P-7 and exhumation of P-3 should be planned and implemented to run concurrent with a search for evidence of specularite mining activities please refer to study Figure 21 for the location of the sites;
- If significant specularite mining sites are found, one of them should be sampled for any evidence of artefacts, animal bones and other forms of human use of the area, subject to a SAHRA section 35 permit application;
- It is suggested that the new main entrance to the mine may be located at the old weigh-bridge (P-8) which could be a new focal point.

Appendix 2010B: **J**

Archaetnos CC was requested by Cultmatrix Heritage Consultants on behalf of Kai Batla (the then EAP) to conduct an Archaeological Impact Assessment on the remainded of the farm Paling 434.

A number of sites of cultural (archaeological and historical) heritage significance were found in the area, dating to the Stone Age and more recent Historical period. Some of the historical sites are related to past mining activities on Paling. The report gives a discussion of the sites and also gives an indication of the methodology followed. It also indicates how to deal with any archaeological material that may be unearthed during future development acitivites.

The sites are of low to high significance. Mitigation measures to minimise the impact of the development on these sites are put forward in this report. In the event that the mitigation measures have been implemented the development can continue.

The Terms of Reference:

- Identify all objects, occurrences and structures of an archaeological or historical nature located in the area of the proposed development.
- Assess the significance of the cultural resources in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value;
- Describe the possible impact of the proposed development on these cultural remains, according to a standard set of conventions;
- Propose suitable mitigation measures to minimise possible negative impacts on the cultural resources;
- Review applicable legislative requirements.

Conditions and assumptions that have a bearing on the survey and the report:

- Cultural resources are all non-physical and physical man-made occurrences, as well as natural occurrences associated with human activity;
- The significance of the sites, structures and artefacts is determined by means of their historical, social aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive and the evaluation of any site is done with reference to any number of these aspects;

- Cultural significance is site-specific and relates to the content and context of the site. Sites regarded as having low cultural significance have already been recorded in full and require no further mitigation. Sites with medium cultural significance may or may not require mitigation depending on other factors such as the significance of impact on the site. Sites with a high cultural significance require further mitigations;
- The latitude and longitude of any archaeological or historical site or feature, is to be treated as sensitive information by the developer and should not be disclosed to members of the public;
- All recommendations are made with full cognisanse of the relevant legislation;
- It has to be mentioned that it is almost impossible to locate all the cultural resources in a given area, as it will be very time consuming. Developers should however note that the report should make it clear how to handle any other finds that might be found;
- In this particular case certain areas had a thick grass cover which made archaeological visibility difficult.

**Conclusions and recommendations**

The Archaeological Impact Assessment as part of the Heritage Impact Assessment of the area was conducted successfully. Seven sites, dating from the Stone Age and the more recent historical period, was identified. Dense vegetation made archaeological visibility difficult, and more sites might be present. This includes unmarked and low stone packed graves. Two sites (Site3 – historical graves and Site 7 – farmstead related to Site 3) are deemed as of medium to high significance and because it will be impacted on negatively by the development, a number of mitigation measures will have to be implemented before the mining activities can continue. Mitigation measures that were recommended:

- Site 3 (Historical graves) – Exhumation and relocation of graves. This was completed in 2012;
- Site 7 (possible historical farmstead site related to the graves) – cleaning the area and detailed assessment of the area. A permit from SAHRA will have to be obtained;
- Site 6 (MSA/LSA open-air site: The site should be sampled through mapping and recording of Stone Age material, as well as surface collection of representative material. A SAHRA permit will be required.

From a Cultural Heritage point of view there would be no objection to the development should be the mitigation measures be implemented.

Finally, it should be noted that the subterranean presence of archaeological and/or historical sites, features or artefacts are always a distinct possibility.

Appendix 2012: **I**
In 2010 (Appendix 2010A), an assessment was conducted, whereby a graveyard with eight graves that were identified. It was recommended that the graves be exhumed and relocated after all required legal procedures and processes had been followed. In 2010 a permit was granted under number BG/10/09/003/87 by SAHRA. Due to the application for the mining right which was not granted at that stage, the projected was halted. The project was only restarted in the beginning of 2012 after the expiry of the permit and an application was made for the renewal of the permit and the work on the graves was undertaken during June 2012.

Initially eight identifiable graves were found in the fenced-in cemetery located close to old manganese mine trenches. Four of these had headstones with legible inscriptions. Some possible other graves inside of and just outside the fenced-off graveyard were also investigated. This was done to ensure that no possible previously unknown graves are left behind at the site and to minimise the liability of PMG. As a result 5 graves with remains were discovered just outside the cemetery.

The aims of the investigation were:

- To conduct archival and historical research that focused on obtaining information on the grave site and the individuals buried there;
- The detailed investigation of all burials on the site, including the unknown ones. The investigation included the producing of a basic map of the site indicating the position of each grave;
- To conduct social consultation. This included the placing of notices and advertisements in local and other newspapers, as well as radio announcements and consultation with local residents. No family or descendants responded or could be traced through this process;
- To submit a final report on the results of the archival/ historical research and the physical investigation and relocation of the burials.

**Conclusions and Recommendations**

It was concluded that the archaeological and historical investigation, exhumation and relocation of the historical graves located on the remainder of Paling 434 was completed successfully.

Over and above the eight graves initially identified (one turned out not be a grave), six previously unknown graves were also identified just outside the fenced in cemetery. Thirteen burials were investigated and exhumed. These were relocated to and reburied in the municipal cemetery in Postmasburg.

Four of the graves were identifiable, however it is unsure of whom the other graves belonged to. However it is possible to say that the graves that were fenced in belonged to the identifiable families and the graves that were not fenced in, to labourers on the farm.

With the discovery of previously unknown graves during the site clearance there is a possibility that many similar sites could still be located in the mining area. The vegetation in the area is extremely dense and visibility is very limited. It is therefore possible that sites could have been missed during initial assessments and once site clearance for the purpose of mining related activities commence that more sites will be identified.

There was an indication that there is a grave site with more than hundred graves, it was however not confirmed.

It is recommended that the site be located and assessed during the archaeological excavation work on the historical homestead and midden site in order to determine if this site falls within the mining right areas and then the way forward will have to be determined. It should also be mentioned that there is always the possibility of the accidental uncovering of sites, features or objects during mining activities due to subterranean nature of archaeological or historical sites. This will include human skeletal remains from unmarked graves. When these discoveries are made a specialist should be called in to investigate.

It was concluded that mining operation can commence in the area where the site was located.

Appendix 2013A: **N**

The report focuses on the historical-archaeological excavations near the location of the old homestead on the scatters of historical

material. Three excavations were carried out, with two on possible midden areas and one on a stone-packed feature.

The aims of the report were:

- To conduct archival and historical research that focused on obtaining information on the history of the farm and area;
- The recovery of cultural material from both the surface of the site, as well as in the excavations, that could assist with the dating and interpretation of the site;
- To submit a final report on the results of the archival/ historical research and the archaeological investigations to the client and SAHRA.

The methodology that was followed:

- Background archival and historical research – Historical research was undertaken in order to place the site and features within a more clearly identified time-period and set of historical events;
- Mapping and photography – A basic map of the site was produced using a hand-help GPS device. Individual locations of concentrations of cultural material, stone-packed features and the various excavations were plotted. All the features, excavations and individual objects were also photographically documented please refer to Figure 21 of the study;
- Archaeological Excavations – Three excavations were measured out and conducted. Two of these were on concentrations of cultural material, while a third was on a stone-packed feature. All the material recovered from these were analysed and recorded as part of the research process. Cultural material scattered across the surface of the site was also sampled, with the focus being on the collection of identifiable objects, as well as decorated porcelain and other material with maker's names and numbers.

**Conclusions and Recommendations**:
The historical-archaeological excavations of the late 19$^{th}$/ early 20$^{th}$ century on the site located on the remainder of Paling 434 were completed successfully. It was concluded that the site is going to be impacted on by the proposed manganese mining and therefore the investigations were necessitated.

During the excavations a relatively large amount of Stone Age material was also recovered, as well as from the surface of the site.

Based on the expert analysis of these artefacts, dating most of them to the final Later (ceramic) Stone Age, however it is within reason that these artifices could be associated with the European farming phase of settlement here. The best explanation at this stage is that Khoi communities were present here prior to European farmers arriving and that they used to provide labour to these farmers during this time-period.

Further evidence for presence of local communities is the stone packed circular features located on the site. One of these were investigated and both historical material and final Later Stone Age objects were recovered. Most of the so-called European objects were possible to be dated to the late 19th/ early 20th century. This coincides with the known historical facts placing European farmers and others in the area and on the farm Paling by at least 1881 when the farm was first surveyed. Earlier Stone Age presence in the area is clear, with Middle Stone Age material found on the site and in the wider area, while Early Stone Age material is also present at other locations on Paling.

The archaeological investigation of the site can therefore be declared as successfully completed. When mining operations commence on the farm it should be very clearly noted that more cultural material and features could be uncovered as a result and that such finds should be reported to an archaeologists/ heritage specialist to investigate. The presence of unmarked graves should also be considered.

Appendix 2013B: **L**
The report discusses the results of the Stone Age archaeological investigations on the farm Paling 434, also including an expert analysis of the material is included.

The aims of the report are:

- To conduct background Stone Age archaeological research that focused on obtaining information on the Stone Age prehistory of the area, as well as previous Stone Age research conducted on Paling in order to put the sites in an archaeological context;
- The mapping and sampling of representative Stone Age material for analytical purposes in order to provide a date and range for Stone Age presence and activities in the area;
- To submit a final report on the results of the background research and the fieldwork to SAHRA and the client.

The methodology of the assessment:

- Background archaeological research – Various searches were consulted for information on the prehistory of the area, as well as n previous research on known Stone Age on Paling and the larger area;
- Mapping and Photographing – Mapping was done using a hand-held GPS device. Individual tools and larger scatters/ concentrations of material were mapped in this fashion, while photographic documentation was also done in the field;
- Sampling of Stone Age material – This was done by walking over the sites that will be impacted by the mining operations in future. The focus of the sampling was to collect representative materials.
- Expert Analysis – The material collected was analysed and an export report was provided.

**Conclusions and Recommendations**:
Based on the expert analysis of the material (of the 114 tools that were collected) from the open-air Stone Age site it is possible to conclude that Stone Age presence and activity in the area could stretch as far back as nearly 1.5 million years BP, although most of the material belongs to the final Later Stone Age phases, dating to between as recently as 100 years to 4000 years BP. This is confirmed by material recovered by A.J. Pelser (Appendix 2013A: **N**), as well as research conducted in th 1960s by Beaumont et al, at Doornfontein close to this area (as making reference in the said report).

The open air-site identified and other open-air surface sites should not be seen in isolation, but should be interpreted in conjunction with for instance the sites researched by other previously. The cave indicated on the 1881 map of Paling would be related to these sites and would have been utilised by the same groups or individuals that left behind their tools close to the outcrops and streams in the area. The sampling of the Stone Age material during the 2012 fieldwork, and the information obtained as a result, complements the earlier archaeological of the area. However, further archaeological research on the specularite mining in the area and on Paling should be considered seriously as part of a more detailed and regional Stone Age Archaeological Research program.

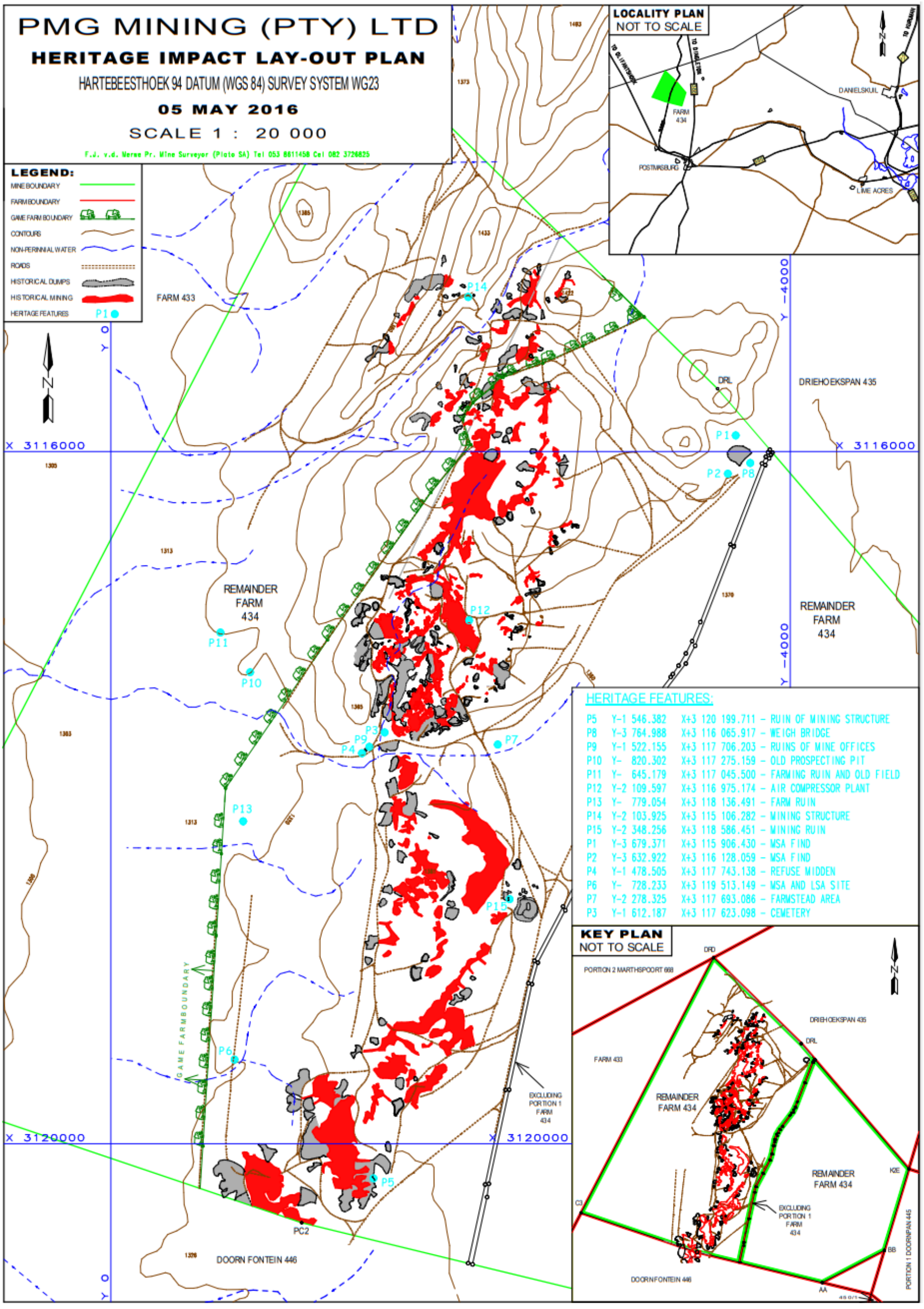


**Figure 21.** Heritage sites

**(b) Description of the current land uses.**

- **Current land use:**

  The majority of the study area is currently utilized for grazing by livestock such as goats and cattle, but a section in the far west of the property is managed as a private game farm (Dr B Milne p15 of the Terrestrial Fauna and Flora Assessment Report, 2015).

- **Evidence of disturbance:**

  The property was mined by ASSMANG between the early 1930's to 1940 and substantial evidence of the mining activities and associated disturbance are visible today.

**(c) Description of specific environmental features and infrastructure on the site.**

The infrastructure on site is comprehensively discussed in section d) ii) as part of the methodology discussion and a basic description of the environment was presented in section h iv) (A) as part of the baseline report. Specific environmental features and infrastructure will be comprehensively discussed in the EIA report after all specialist assessments have been completed.

- **Existing structures:**

1. The existing structures found within the Mining Right area are numerous tracks, excavations and dumps from previous mining operations.

2. Various Heritage Resources of significance: Refer to attached study for the location of the heritage sites within the Mining Right area.

3. A housing structure for the herders of cattle and the cattle kraal and drinking troves.

4. The Transnet railway line that runs through the property and an existing crossing.

**(d) Environmental and current land use map:**
(Show all environmental and current land use features.

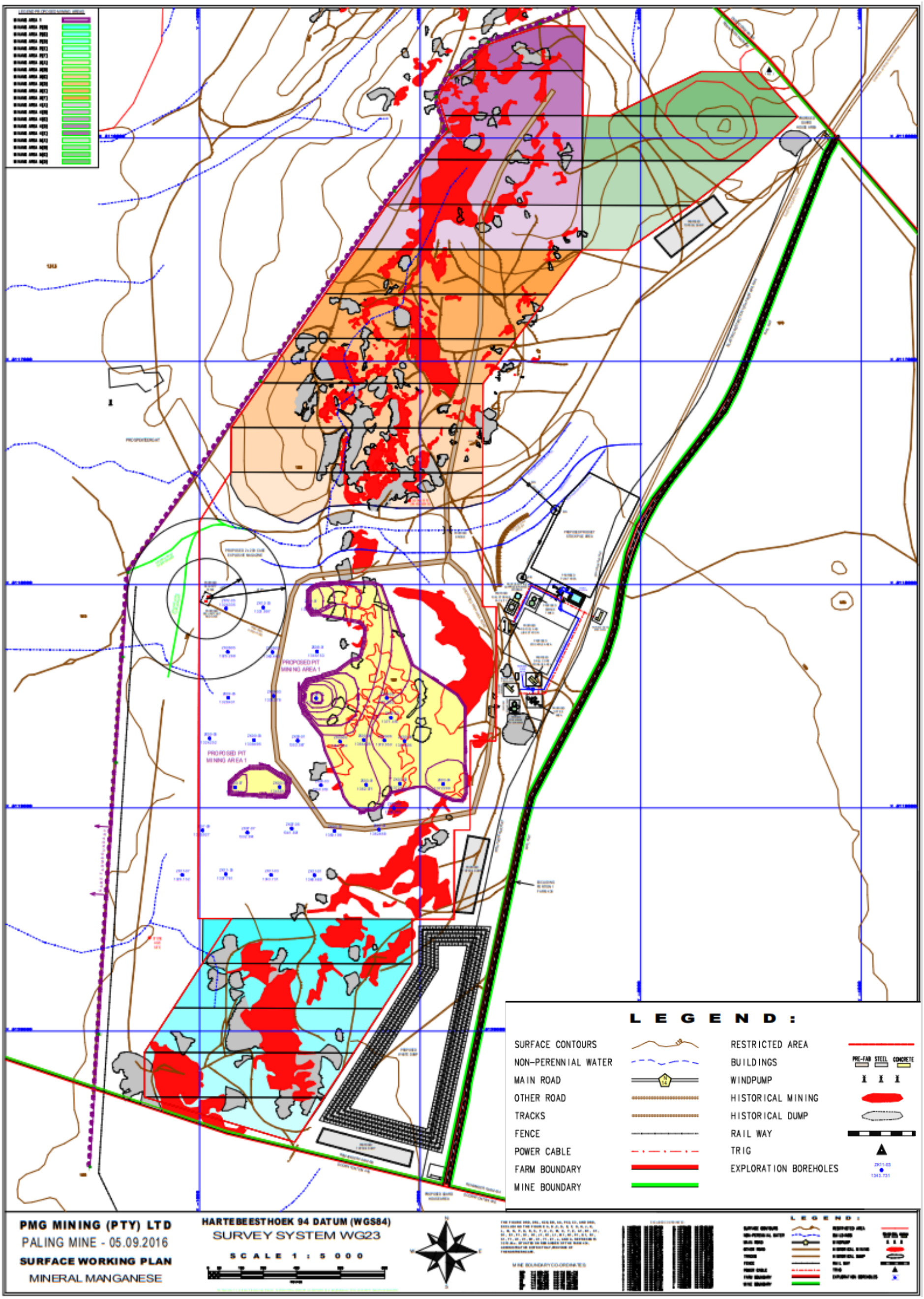


**Figure 22**. Current land use and environmental map.

**(v) Impacts identified:**

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability and duration of the impacts.)

Table : 4

| Potential Impacts | Significance rating of impacts (positive or negative) | Proposed mitigation | Significance of impacts after mitigation<br><br>Probalility | Risk of the impact and mitigation not being implemented<br><br>Duration |
|---|---|---|---|---|
| Emissions to atmosphere | | | | |
| Vehicle/machine exhaust emissions – air pollution | Low | Prohibit vehicles from idling when not in use. | Low<br>Probable | Low<br>Medium |
| Dust generation from earth works and vehicle movement | Medium | Enforce vehicle speed limits.<br>Apply dust suppression on dirt roads .<br>Dust fall monitoring must be conducted to detect increase levels of dust fall.<br>Dust suppression must be conducted on all haul roads.<br>Suitable dust suppression products should be used. | Low<br>Definite | Low<br>Long term |
| Storm water discharge and surface water pollution | | | | |
| Hydrocarbon spillages from vehicles and other construction equipment - storm water pollution | Medium | Place drip trays under parked vehicles if required.<br>Spill kits must be made available, and employees trained<br>to utilise spill kits. | Low<br>Improbable | Low<br>Medium Term |
| Storage of diesel on-site | Medium | Clean up spillages immediately. | Low | Low |

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| | | Inform contractors of the need for appropriate measures to manage cement in an environmentally sound manner.<br><br>Cement spillages must be cleaned appropriately.<br><br>Store diesel/oil in a designated area only. | Improbable | Medium Term |
| Handling and use of cement during construction | Low | Inform contractors of the need for appropriate measures to manage cement in an environmentally sound manner.<br><br>Cement spillages must be cleaned appropriately. | Low<br>Probable | Low<br>Short Term |
| Ground Water | | | | |
| Water for the project will be obtained from two sources. Potable water will be abstracted from boreholes drilled at the operations. ENVASS (2016) indicates that groundwater can be abstracted at a rate of 233 m3/d. VBKOM indicated that the potable water demand could be as high as 388 m3/d (pers. comm Mr H | Low | • Refuelling must take place in well demarcated areas and over suitable drip trays to prevent ground water pollution.<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site.<br>• Workers must undergo induction to ensure that they | Low<br>Improbable | Low<br>Medium |

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| Cronje, email dated 19/9/16). Both volumes exceed the demand for potable water at the operations. However, if needed, PMG may consider supplementing potable water from the Sedibeng pipeline in the event that groundwater supply is insufficient. Available information however suggests that this will not be the case at the operations. Process water will be sourced from the water dewatered from the opencast pits to Dam 3.<br><br>Storage of diesel on-site | | are prepared for rapid clean-up procedures.<br>• All facilities where dangerous materials are stored must be contained in a bund wall.<br>• Vehicles and machinery should be regularly serviced and maintained.<br>• Monitoring of groundwater abstraction and quality; and<br>• Clean & Dirty water system must be well maintained.<br>• Provide for establishing a monitoring program to detect groundwater response to seasonal variations and pit dewatering as well as possible potential contamination of groundwater. | | |
| Soil erosion and deterioration | | | | |
| Soil erosion due to soil disturbance and increased runoff volumes and velocity and Loss of topsoil | Medium | Establish a suitable storm water management system to divert runoff from operational areas or potentially contaminated areas.<br><br>Report and rectify erosion when detected.<br><br>Store excavated topsoil in a demarcated area, designed to | Low<br>Improbable | Low<br>Long term |

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| | | prevent contamination for later rehabilitation purposes.<br><br>• At no point may plant cover be removed within the no-development zones;<br>• All attemps must be made to avoid exposure of dispersive soils;<br>• Re-establishment of plant cover on disturbed areas must take place as soon as possible, once activities in the area have ceased;<br>• Ground exposure should be minimized in terms of the surface area and duration, wherever possible;<br>• Construction that requires the clearing of large areas of vegetation and excavation should ideally occur during the dry season only;<br>• Construction during the rainy season (November to March) should be closely monitored and controlled;<br>• The run-off from the exposed ground should be controlled with the careful placement of flow retarding barriers; | | |

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| | | • The soil that is excavated during construction should be stock-piled in layers and protected by berms to prevent erosion;<br>• All stockpiles must be kept as small as possible, with gentle slopes (18 degrees) ihn order to avoid excessive erosional induced losses;<br>• Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any storm water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate;<br>• Stockpiles susceptible to wind erosion are to be covered during windy periods;<br>• Audits must be carried out at regular intervals to identify areas where erosion is occurring;<br>• Appropriate remdial action, including the rehabilitation of eroded areas, must occur;<br>• Rehabilitation of the erosion channels and gullies; | | |

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| | | • The mining operation should avoid land with steep slopes;<br>• Dust suppression should take place, without compromising the sensitive water balance of the area;<br>• Linear infrastructure such as roads and pipelines will be inspected at least monthly to check that the associated water management infrastructure is effective in controlling erosion;<br>• Topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions;<br>• Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired;<br>• Topsoil must not be handled when the moisture content exceeds 12%;<br>• Topsoil stockpiles must be kept separate from sub-soils;<br>• The topsoil should be replaced as soon as possible on to the backfilled areas, thereby allowing for the re-growth of | | |

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| | | the seed bank contained within the topsoil;<br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent soil pollution;<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures;<br>• All facilities where dangerous materials are stored must be contained in a bund wall;<br>• Vehicles and machinery should be regularly serviced and maintained. | | |
| Waste Management | | | | |
| Poor on-site waste management - wind-blown litter, soil and water contamination, burning of waste. | Low | Store general waste in a designated area, designed to prevent wind-blown litter.<br><br>Where possible recycle, recover or reuse waste.<br><br>Ensure that all general waste is removed and disposed of at a licensed general waste disposal site. | Low<br>Improbable | Low<br>Medium |
| Storage and handling of hazardous waste - water and soil pollution, harm to surrounding neighbours | Low | | Low<br>Improbable | Low<br>Long term |

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| | | Use only licenced contractors to remove waste.<br><br>Waste should not cause nuisance conditions.<br><br>Inspect waste storage areas regularly during construction.<br><br>Prohibit the burning of waste hazardous waste site.<br><br>Hazardous waste such as oily rags must be removed and disposed of at a licensed hazardous waste site and the safe disposal certificates kept on file.<br><br>Place use hydrocarbon waste in a designated area. | | |
| Hazardous substances Management | | | | |
| Hazardous substances (cleaning detergents, paint etc.) | Low | Store chemical substances in a designated area.<br><br>Store only compatible substances in a specific area.<br><br>Fire-fighting equipment must be available in the case of a fire - if required. | Low<br>Improbable | Low<br>Long term |

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| | | Safety Data Sheets must be available for all hazardous substances.<br><br>Clean up spillages immediately.<br><br>Only competent staff must manage hazardous substances. | | |
| Heritage Resources | | | | |
| Construction activities resulting in the destruction of heritage resources older than 60 years | Low | Implement a chance find procedure.<br>Obtain permits from SAHRA if required. | Low<br>Probable | Low<br>Medium term |
| Noise generation | | | | |
| Groundworks | Medium | Machinery with low levels to be used.<br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | Low<br>Probable | Low<br>Short term |
| Foundations | Medium | Machinery with low noise levels to be used.<br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours; | Low<br>Probable | Low<br>Short term |

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| | | • Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | | |
| Building activities | Medium | Building activities to take place during daytime periods only. | Low<br>Probable | Low<br>Short term |
| Transportation of building material to and from the site | Medium | Use machinery with low noise levels and maintained in a good order to be used and to comply with the Mine Health and Safety Regulations | Low<br>Probable | Low<br>Short term |
| Assembly of equipment/machinery | Medium | Machinery with low noise levels to be used.<br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | Low<br>Probable | Low<br>Short term |
| Traffic impacts | | | | |
| Increased traffic volumes due to construction activities | Low | Inform neighbours of planned activities that would affect vehicle/ pedestrian traffic.<br><br>Optimise the hauling plan to minimise disruption of movement patterns. | Low<br>Probable | Low<br>Short term |

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| | | Ensure the required signage has been erected to warn road users of mine traffic.<br><br>Ensure that access to residences and business properties is uninterrupted by providing alternative routes. | | |
| Biodiversity | | | | |
| Construction activities - decline in Threatened and red data species | Medium | Establish buffer zones around natural drainage channels and wetlands as per mitigation measures.<br><br>Where possible, trees naturally growing on the site should be retained as part of the landscaping.<br><br>Dumping of builders" rubble and other waste in the areas earmarked for exclusion must be prevented, through fencing or other management measures.<br><br>Outside lighting should be designed to minimize impact on fauna. | Low<br>Probable | Low<br>Short term |
| Construction activities - destruction of terrestrial faunal habitat | Low | | Low<br>Probable | Low<br>Short term |
| Construction activities - destruction of aquatic habitats | Medium | | Low<br>Probable | Low<br>Short term |
| Construction activities - reduction in natural migratory and faunal dispersal routes | Low | | Low<br>Probable | Low<br>Short term |
| Non perennial drainange channels | | | | |

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| Loss of drainage alteration or obstruction of drainage channels or wetlands due to construction activities | Medium | Drainage channels or wetlands areas are to be avoided as far as possible.<br>Construction activities must take place as far away from the drainage channels or wetlands as possible.<br><br>Heavy vehicles for construction of the stormwater culverts should be avoided as far as practically possible.<br><br>No unnecessary clearance of drainage channels or wetlands and habitat is allowed to take place in unauthorized areas.<br><br>All further mitigation measures as determined in the water use license must be adhered to.<br><br>No animals or avifauna are to be hunted, captured, trapped, removed, harmed, killed or eaten.<br><br>The Environmental Representative must be contacted if the mitigation measures are not adhered to.<br><br>Construction must take place in the low flow season (winter | Low<br>Probable | Low<br>Short term |

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| | | months being May/June/ July) as far as practically possible.<br><br>The time that surfaces are left exposed must be kept to a minimum and re-vegetation should be implemented where applicable. | | |
| Increased runoff, erosion and sedimentation | Medium | A stormwater management plan must be compiled and implemented.<br><br>Stormwater management must take into consideration potential flood impacts and must be managed to deal with potential floods, as well as to reduce silt and sediment loads from entering the drainage channels or wetlands.<br><br>Implementation of soft engineering structures to mitigate increased run-off and sedimentation.<br><br>Run-off from the construction site in general must only be allowed to exit the site in a controlled and diffuse manner.<br><br>Construction close to and in the wetlands, where a water use | Low<br>Probable | Low<br>Short term |

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| | | license has been obtained to do so, is to take place in the low flow season (winter months May/ June/ July/August) as far as practically possible.<br><br>The time that surface areas exposed must be kept to a minimum and re-vegetation must be implemented where applicable as soon as possible.<br><br>No establishment of new roads into or within the buffer zones of the drainage channels or wetlands identified are allowed unless water use licensing has been granted. | | |
| Construction impacts related to water quality | Medium | All construction materials are to be stored in the temporary construction area outside of the wetlands.<br><br>All soil stockpiles must be contained by bunded areas.<br><br>All vehicles and equipment must be regularly maintained to avoid any oil, fuel or hazardous leaks or spills.<br><br>Movement of contractors and vehicles within wetland | Low<br>Probable | Low<br>Short term |

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| | | areas must be minimised.<br><br>Chemical toilets must be provided and must be serviced on a regular basis.<br><br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent surface water pollution;<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures;<br>• All facilities where dangerous materials are stored must be contained in a bund wall;<br>• Vehicles and machinery should be regularly serviced and maintained;<br>• Storm water control;<br>• Clean & dirty water plan | | |
| Social benefits | | | | |
| Employment opportunities for local and regional residents | Medium Positive | | | |

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| Use of local suppliers - contribution to local economic development | Medium Positive |

Operational Phase impacts and mitigation measures

| Potential Impacts | Significance rating of impacts (positive or negative) | Proposed mitigation | Significance of impacts after mitigation<br><br>Probability | Risk of the impact and mitigation not being implemented<br><br>Duration |
|---|---|---|---|---|
| Air quality | | | | |
| Atmospheric emissions | Low | Apply dust suppression on the dirt roads.<br><br>Conduct dust fall monitoring - when increased dust fall is detected investigate additional dust control methods.<br><br>Clean up ore spillages immediately.<br><br>Train staff to report and clean up ore spillages immediately .<br><br>Maintain a complaint register.<br><br>Limit stockpile height. | Low<br>Probable | Low<br>Long term |
| Dust generation from the transportation of ore to the siding via truck | Medium | | Low<br>Probable | Low<br>Long term |
| Dust generation from the stockpiling and loading of manganese at the siding | Medium | | Medium<br>Probable | Low<br>Long term |
| Surface Water Pollution | | | | |
| Effluent discharge into the environment (water | Medium | It is important therefore that a stormwater management system is implemented whereby all dirty water | Low<br>Probable | Low<br>Long term |

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| resources) from the ore stockpile and spillages<br><br>Reduced infiltration due to compacted soils and other impermeable surfaces associated with infrastructure increasing runoff volumes and velocities with subsequent increase in erosion at discharge points. | | is collected and clean water is separated.<br><br>Where dirty water is separated and stored, this can be used for dust suppression purposes.<br><br>Quality of this water must be regularly checked to ensure that it meets minimum standards as required by the DWS.<br><br>All vehicles and equipment must be regularly maintained to avoid any oil/fuel leaks or spills.<br><br>If any spill or leak does occur, it must be ensured that it is properly cleaned up as soon as possible to avoid significant effects.<br><br>Keep the construction footprint area to a minimum and retain vegetation in all areas outside the direct footprint.<br><br>Where vegetation destruction does occur outside the footprint rip the soil and re-vegetate as soon as possible.<br><br>Where this is not possible, implement water management | | |

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| | | measures to disperse the water to a variety of points along the road where the flow can be controlled, and the energy dissipated.<br><br>Prevent sediments in runoff from entering the drainage channels or wetlands by placing a berm between the workings / soil stockpiles and the drainage channels or wetlands.<br><br>Divert clean stormwater around exposed areas. Where stormwater is discharged into drainage channels or wetlands, construct gabions in an effective and appropriate manner to contain erosion.<br><br>The stormwater diversion canal must incorporate energy dissipating structures into the design of the canal to reduce accelerated run-off entering any drainage channels or wetlands.<br><br>Repair and reseed areas damaged by erosion and monitor until it can be shown to the satisfaction of a suitably qualified specialist that soil erosion is under control. | | |

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| | | Monitor re-vegetated areas at least monthly to ensure successful reestablishment of vegetation and that no erosion gullies are forming. Take corrective actions on the basis of monitoring results.<br><br>Undertake concurrent rehabilitation as soon as the disturbing activity has ceased according to a Rehabilitation Plan which will inform the final design of the landscape in advance.<br><br>Where erosion begins to take place in the natural drainage channels a rehabilitation plan will be required. Recommendations from a suitably qualified specialist must be obtained and implemented.<br><br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent surface water pollution;<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures; | | |

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| | | • All facilities where dangerous materials are stored must be contained in a bund wall;<br>• Vehicles and machinery should be regularly serviced and maintained;<br>• Storm water control;<br>• Clean & dirty water plan | | |
| Deterioration of water quality due to possible release of dirty storm water:<br>Storm water typically contains various pollutants that could contribute to deteriorating the water quality in the drainage channels or wetlands where stormwater is released.<br><br>In addition, stormwater runoff will carry pollutants from accidental spills, dust or eroded materials. | Medium | The storage (stockpile) and loading surface of the siding must comply to DWS requirements.<br><br>Maintain the routine monitoring program during decommissioning and post closure for early detection of impacts and implementation of corrective action. | Low<br>Probable | Low<br>Long term |
| Abstraction of surface water - Impact on the quantity of water resource | Medium | Ensure any abstraction is done according to IWWMP and WUL conditions. | Low<br>Definite | Low<br>Long term |

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| Waste Management | | | | |
| Storage and handling of general waste<br>- litter leading to nuisance conditions | Low | Store general waste in a designated area, designed to prevent windblown litter.<br><br>Ensure that all general waste is removed and disposed of at a licensed general waste disposal site.<br><br>Use only licenced contractors.<br><br>Burning of waste must be prohibited on site.<br><br>Maintain an inventory of waste generated.<br><br>Place used hydrocarbon waste in a designated container. | Low<br>Probable | Low<br>Long term |
| Groundwater | | | | |
| Water for the project will be obtained from two sources. Potable water will be abstracted from<br>boreholes drilled at the operations. ENVASS (2016) indicates that groundwater can be<br>abstracted at a rate of 233 m3/d. VBKOM | Low | • Refuelling must take place in well demarcated areas and over suitable drip trays to prevent ground water pollution.<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site. | Low<br>Improbable | Low<br>Medium |

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| indicated that the potable water demand could be as high as 388 m3/d (pers. comm Mr H Cronje, email dated 19/9/16). Both volumes exceed the demand for potable water at the operations. However, if needed, PMG may consider supplementing potable water from the Sedibeng pipeline in the event that groundwater supply is insufficient. Available information however suggests that this will not be the case at the operations. Process water will be sourced from the water dewatered from the opencast pits to Dam 3.<br><br>Storage of diesel on-site | | • Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures.<br>• All facilities where dangerous materials are stored must be contained in a bund wall.<br>• Vehicles and machinery should be regularly serviced and maintained.<br>• Monitoring of groundwater abstraction and quality; and<br>• Clean & Dirty water system must be well maintained.<br>• Provide for establishing a monitoring program to detect groundwater response to seasonal variations and pit dewatering as well as possible potential contamination of groundwater. | | |
| Hazardous waste | | | | |
| Storage and handling of hazardous substances such as | Medium | Chemical storage containers must be compatible with the respective | Low<br>Probable | Low<br>Long term |

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| diesel and oil - spillages leading to stormwater contamination | | substances to prevent any corrosion that may lead to leakages.<br><br>Inspect containers regularly to detect leakages.<br><br>Chemical containers must be placed in a bunded area with a capacity to contain 110% of the tank's capacity.<br><br>Ensure that drainage valves for bunds are closed at all times.<br><br>A Safety Data Sheet must be available for all hazardous substances stored on-site.<br><br>Signage must be placed on all chemical storage tanks indicating the name of the substance and the hazards associated with the respective substances.<br><br>Firefighting equipment must be readily available | | |
| Noise | | | | |
| Increase in the traffic noise from the additional traffic along the existing roads and loading of ore with a front end Loader | Low | Enforce strict speed limits and erect speed humps if required.<br><br>Maintain vehicles in good working conditions. | Low<br>Probable | Low<br>Long term |

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| Loading Activities | Medium | The following noise mitigatory measures must be in place:<br>• Front End Loaders which comply with the manufacturer's specifications according to recommended noise levels to be used at all times;<br>• The reverse signal to be replaced with a low frequency vibrating unit;<br><br>Conduct environmental noise monitoring on a biennial basis.<br><br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Controlled drilling & blasting operations;<br>• Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | Medium<br>Probable | Low<br>Long term |
| Visual | | | | |
| Dust generation<br><br>Footprint of the facility | Medium | Ensure good house-keeping<br><br>Maintain ore stockpiles as low as possible | Low<br>Probable | Low<br>Long term |
| Biodiversity | | | | |

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| Operational activities - reduction in general floral biodiversity | Low | Activities must be planned, where possible in order to encourage (faunal dispersal) and should minimise dissection or fragmentation of any important faunal habitat type.<br><br>The extent of the development area should be demarcated on site layout plans (preferably on disturbed areas or those identified with low conservation importance).<br><br>No construction personnel or vehicles may leave the demarcated area except those authorized to do so.<br><br>Those areas surrounding the mine site that are not part of the demarcated development area should be considered as a no go zone for employees, machinery or even visitors.<br><br>Appointment of a full-time ECO must render guidance to the staff and contractors with respect to suitable areas for all related disturbance, and must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site. | Low<br>Probable | Low<br>Long term |
| Operational activities - reduction in general faunal biodiversity | Low | | Low<br>Probable | Low<br>Long term |
| Operational activities - destruction of terrestrial faunal habitat | Low | | Low<br>Probable | Low<br>Long term |
| Operational activities - reduction in natural migratory and faunal dispersal routes | Low | | Low<br>Probable | Low<br>Long term |
| Encroachment of alien and invasive species as a result of disturbance. | Medium | | Low<br>Probable | Low<br>Long term |

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| | | All those working on site must undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.<br>All those working on site must be educated about the conservation importance of the fauna and flora occurring on site.<br>The environmental induction should occur in the appropriate launguages for the workers who may require translation.<br>Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert.<br>In the case of any mortalities resulting from birds flying into power lines, these should be recorded including the date of the observation and the species affected and any other relevant information.<br>Employ measures that ensure adherence to the speed limit.<br>Careful considereation is required when planning the placement for stockpiling topsoil and the creation | | |

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| | | of access routes in order to avoid the destruction of pristine habitats and minimise the overall mining footprint.<br><br>The Footprint areas of the development activities must be scanned for Red Listed and protected plant species prior to Construction;<br><br>Snares & traps removed and destroyed; and<br><br>Maintenance of firebreaks.<br><br>Implement measures to prevent sediment load in the naural drainage channels or wetlands.<br><br>Buffer zones around sensitive environmental areas must be maintained during operational phase.<br><br>Prevent pollution of natural areas around the site.<br><br>• Footprint areas of the development / mining activities must be scanned for Red Listed and protected plant species prior to mining; | | |

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| | | • It is recommended that these plants are identified and marked prior to development / mining.<br>• These plants should where possible, be incorporated into the design layout and left in situ.<br>• However if threatened of destruction by mining these plants should be removed (with the relevant permits from DAFF and DENC) and relocated if possible.<br>• A management plan should be implemented to ensure proper establishment of ex situ individuals, and should include a monitoring programme for at least two years after re-establishment in order to ensure successful translocation.<br>• All those working on site must be educated about the conservation importance of the fauna and flora occurring on site.<br>• Minimise the footprint of transformation<br>• Encourage proper rehabilitation of development / mined areas<br>• Encourage the growth of natural plant species (diverse selection of natural plant species). | | |

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| | | • Mechanical methods (hand-pulling) of control to be implemented extensively.<br>• Annual follow-up operations to be implemented.<br>• Ensure measures for the adherence to speed limit.<br>• Maintenance of firebreaks;<br>• No trees felled for firewood; | | |
| Health and safety | | | | |
| Injuries due to occupational hazards | Low | Implement the requirements of the Occupational Health and Safety Act and Regulations.<br><br>Implement best practice guidelines | Low<br>Probable | Low<br>Long term |
| Natural Resource Management | | | | |
| Wasteful use and resources like water and electricity leads to unnecessary impacts to the national resources. | Low | No running taps to be left unattended.<br><br>Switch off lights when not in use.<br>Maintenance of water infrastructure<br><br>Investigate energy saving mechanisms such as energy saving lights | Low<br>Probable | Low<br>Long term |
| Social Benefits | | | | |
| Employment opportunities for local and regional residents | High positive in combiniation with surrounding mines. | | | |

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| Use of local suppliers- contribute to local economic development | High Positive | | | |
| Indirect knock on economic impacts | Medium positive | | | |
| Emissions to atmosphere (dust and exhaust emissions) | | | | |
| Dust generation from vehicle movement on unprepared soil - increased dust generation and nuisance conditions | Medium | Appoint registered demolition contractors with appropriate procedures and equipment.<br><br>Restrict vehicle movement to demarcated areas.<br><br>All vehicles to be maintained in good working order to keep their atmospheric emissions under control.<br><br>Enforce vehicle speed limits to reduce dust emissions.<br><br>Prohibit idling of vehicles when not in use.<br><br>Spraying of surfaces with water;<br><br>Avoidance of unnecessary removal of vegetation;<br><br>Re-vegetation;<br><br>Monitoring; | Low<br>Probable | Low<br>Short term |
| Vehicle exhaust emissions - air pollution | Low | | Low<br>Probable | Low<br>Short term |
| Generation of dust from demolition activities | Medium | | Low<br>Probable | Low<br>Short term |
| Surface water discharge | | | | |

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| Hydrocarbon spillages from decommissioning vehicles – storm water and soil pollution | Medium | Refuel vehicles off site or in a dedicated/paved area with a sump to capture runoff.<br><br>Place drip trays under parked vehicles, where necessary.<br><br>Clean hydrocarbon spills up immediately.<br><br>Contaminated soil must be cleaned up with a readily available spill kit or excavated immediately, followed by proper disposal at a licensed disposal site. | Low<br>Probable | Low<br>Short term |
| Waste Management | | | | |
| Storage and handling of general waste and building rubble - windblown litter leading to nuisance conditions | Low | Store general waste in a designated area, designed to prevent windblown litter.<br><br>Ensure that all general waste and building rubbles is removed and disposed of at a licensed general waste disposal site.<br><br>Use only licenced contractors.<br><br>Maintain an inventory of waste generated.<br><br>Store building rubble in a designated area. | Low<br>Probable | Low<br>Short term |

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| Storage and handling of hazardous waste - water and soil pollution, harm to surrounding neighbours | Low | Hazardous waste generated during decommissioning activities must be removed and disposed of at a licensed hazardous waste site and the safe disposal certificates kept on file<br><br>Place used hydrocarbon waste in special containers.<br><br>Contaminated general waste and building waste must be managed as hazardous waste.<br><br>Hazardous and general waste must be managed separately. | Low<br>Probable | Low<br>Short term |
| Noise | | | | |
| Noise impact on surrounding Neighbours due to demolition activities | Low | Restricting the decommissioning activities to daylight hours.<br><br>Switching off equipment when not in use.<br><br>Maintain equipment and vehicle in good working condition.<br><br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Controlled drilling & blasting operations; | Low<br>Probable | Low<br>Short term |

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| | | • Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | | |
| Non perennial drainange channels | | | | |
| Loss of drainage alteration or obstruction of drainage channels or wetlands due to decommissioning activities | Medium | Adhere to all specialist stipulated mitigation measures.<br><br>A construction and operational stormwater management plan is critical to prevent contamination and degradation of Natural drainage channels or wetlands in the construction and operation phase of the proposed development. It is also important to prevent flood related disasters affecting the proposed development during both phases.<br><br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent surface water pollution;<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures; | Low<br>Probable | Low<br>Short term |
| Increased runoff, erosion and sedimentation | Medium | | Low<br>Probable | Low<br>Short term |
| Decommissioning impacts related to water quality | Medium | | Low<br>Probable | Low<br>Short term |

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| | | • All facilities where dangerous materials are stored must be contained in a bund wall;<br>• Vehicles and machinery should be regularly serviced and maintained;<br>• Storm water control;<br>• Clean & dirty water plan | | |
| Rehabilitation | | | | |
| Decommissioning and rehabilitation of the site will prevent further environmental impacts and improve the visual appearance of the site | Positive High | | | |
| Social | | | | |
| Loss of employment opportunities | High | Engagement with employees in advance | Medium | Low |

**(vi) Methodology used in determining the significance of environmental impacts:**

(Describe how the significance, probability and duration of the aforesaid identified impacts that were identified through the consultation process were determined in order to decide the extent to which the initial site layout needs revision.)

The assessment of the impacts has been conducted according to a synthesis of criteria required by the integrated environmental management procedure.

**Nature of impact**

This is an appraisal of the type of effect the activity would have on the affected environmental component. Its description should include what is being affected, and how.

**Extent**

The physical and spatial size of the impact. This is classified as follows:

- **Local**
  The impacted area extends only as far as the activity, e.g. a footprint.
- **Site**
  The impact could affect the whole, or a measurable portion of the property.
- **Regional**
  The impact could affect the area including the neighbouring farms, transport routes and the adjoining towns.

**Duration**

The lifetime of the impact which is measured in the context of the lifetime of the proposed phase (i.e. construction or operation).

- **Short term**
  The impact will either disappear with mitigation or will be mitigated through natural process in a short time period.
- **Medium term**
  The impact will last up to the end of the mining period, where after it will be entirely negated.
- **Long term**
  The impact will continue or last for the entire operational life of the mine, but will be mitigated by direct human action or by natural processes thereafter.
- **Permanent**
  The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

**Intensity**

This describes how destructive, or benign, the impact is. Does it destroy the impacted environment, alter its functioning, or slightly alter it. These are rated as:

- **Low**
  This alters the affected environment in such a way that the natural processes or functions are not affected.
- **Medium**
  The affected environment is altered, but function and process continue, albeit in a modified way.
- **High**

Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

**Probability**

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:

- **Improbable**
  The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
- **Probable**
  There is a possibility that the impact will occur to the extent that provisions must be made therefore.
- **Highly probable**
  It is most likely that the impacts will occur at some or other stage of the development.
- **Definite**
  The impact will take place regardless of any preventative plans, and mitigation measures or contingency plans will have to be implemented to contain the impact.

**Determination of significance**

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The classes are rated as follows:

- **No significance**
  The impact is not likely to be substantial and does not require any mitigatory action.
- **Low**
  The impact is of little importance, but may require limited mitigation.
- **Medium**
  The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
- **High**
  The impact is of great importance. Failure to mitigate, with the objective to reduce the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

**(vii) 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:**

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties.)

During the operational stages of the development, there is a possibility of sterilisation of the mineral reserves and resources due to improper placement of infrastructure. The infrastructure and stockpiles will alter the topography by adding features to the landscape. Topsoil removal and preparation for development will unearth the natural topography. The construction of infrastructure and various facilities in the development area can also result in loss of soil due to erosion. Vegetation will be stripped in preparation for placement of infrastructure, and therefore the areas will be bare and susceptible to erosion.

The topsoil that is stripped and piled on surrounding areas can be eroded by wind and rain. The soil will be carried away during runoff. The cleared areas will be rehabilitated, but full restoration of soils might only occur over a number of years, subsequent to the re-establishment of vegetation. Furthermore, improper stockpiling and soil compaction can result in soil sterilisation. Leaching can also occur, resulting in the loss of nutrients.

There is also a possibility that equipment might leak oil, thus causing surface spillages. The hydrocarbon soil contamination will render the soil useless unless they are decontaminated. The storage of fuels on site might have an impact on soil if the tanks that are available on site are not properly monitored and maintained to avoid leakages. Then there is the potential that contaminated soil can be carried through runoff to contaminate water resources and soil stockpiled for rehabilitation. Soil pollution is therefore possible, but through mitigation it can be minimised.

The loss of land capability and land use can occur in two ways. Firstly, through topsoil removal, disturbances and loss of soil fertility; and secondly through the improper placement of infrastructure. Most of the site has a land capability for grazing, but grazing activities can still be performed in areas not earmarked for the operation, and with proper rehabilitation the land capabilities and land use potential can be restored.

Groundwater could be directly affected, if any oil and fuel spillages occur during these scenarions and activities, then groundwater will be directly contaminated. Similarly, hazardous surface spillages will seep into the underlying aquifers and contaminate ground water. Improper handling of hazardous material will cause contamination of nearby surface water resources (pans and drainage lines) during runoff episodes. Lack of storm control structures will lead to erosion of stockpiles during heavy rains and runoff will carry suspended solids into the downstream environment. This might cause high silt load and affect stream flow. If no, or inadequate ablution facilities are available then workers might feel the need to use the veld for this purpose, which can contaminate natural resources.

Any development within the pans or drainage lines will impact on the surface water environment by altering their physical characteristics. These impacts

include the alteration of flow patterns, ponding and an increase in the concentration of suspended solids and sedimentation. Furthermore, species eggs/seeds that usually remain dormant due to their adaptations to ephemerality, will be lost when the top biological layer of the pans are removed during excavations.

Development activities on site will reduce the natural habitat for ecological systems to continue their operation. It is not expected that the areas of high ecological function will rehabilitate following disturbance events. It is likely that the pristine vegetation and any protected species will be destroyed during the operation. While general clearing of the area and development activities destroy natural vegetation, invasive plants can increase due to their opportunistic nature in disturbed areas. If invasive plants establish in disturbed areas, it may cause an impact beyond the boundaries of the development site. These alien invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity and ecological value of the area. Therefore, if alien invasive species are not controlled and managed, their propagation into new areas could have a high impact on the surrounding natural vegetation in the long term. With proper mitigation, the impacts can be substantially reduced.

The transformation of natural habitats to development and associated infrastructure will result in the loss of habitat affected individual species, and ecological processes. In turn this will result in the displacement of faunal species dependent upon such habitat. Increased noise and vibration due to operational activities will disturb and possibly displace birds and other wildlife. Fast moving vehicles take a heavy toll in the form of road kills of small mammals, birds, reptiles, amphibians and a large number of invertebrates. Associated infrastructure will result in the loss of connectivity and fragmentation of natural habitat. Fragmentation of habitat will lead to the loss of migration corridors, in turn resulting in degeneration of the affected population‟s genetic make-up. This results in a subsequent loss of genetic variability between meta-populations occurring within the study site. Pockets of fragmented natural habitats hinder the growth and development of populations.

During the development the abovementioned activities have potential for dust generation. It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity and the specific operations. The operation will typically have low to moderate levels of noise, along with man-influenced sounds such as traffic on the secondary road, activities on the farm and very occasional air traffic. The proposed development will add a certain amount of noise to the existing noise in the area. However, levels of noise generated by mining activities especially with blashing can be substantial.

The impact of site generated trips on the traffic and infrastructure of the existing roads is expected to be moderate. Furthermore, if road safety is not administered it can have a high impact on the safety of fellow road users.

The activities on site have the potential to impact upon heritage resources. Heritage sites are fixed features in the environment, occurring within specific spatial confines. Any impact upon these resources will be permanent and

irreversible. Any movement of vehicles, equipment or personnel through areas containing these artefacts could result in the permanent destruction of the artefacts and loss of heritage resources.

The development will create a number of new employment opportunities and uplift the local community. The magnitude of this impact will depend on the number of people that will be employed and the number of contractors sourced. An influx of people into the area could possibly impact on safety and security of local farm residents. During the decommissioning and at closure of the site, staff will most likely be retrenched, resulting in people being unable to find new employment for a long period of time.

Economic slump of the local towns after site closure is not considered to be an associated potential impact, because there are numerous other mining operations in the region. However, income streams from wage bills as well as goods and services contracts (at all geographical levels) will come to an end, reducing the monetary income of individuals and operation-related businesses.

It is likely, however that there will be residual positive economic impacts that are not fully reversed with the closure of the site, and that the economy will not decline to its original level prior to the development of this project. This is because the operation will generate substantial income for the regional and local economy, both directly and indirectly, during its life.

**(viii) The possible mitigation measures that could be applied and the level of risk:**

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment / discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered.)

Mitigation measures (Construction, Operational and Closure Phase)

**Table: 5**

| Potential Impacts | Significance rating of impacts (positive or negative) | Proposed mitigation | Significance of impacts after mitigation | Risk of the impact and mitigation not being implemented |
|---|---|---|---|---|
| Emissions to atmosphere | | | | |
| Vehicle/machine exhaust emissions – air pollution | Low | Prohibit vehicles from idling when not in use. | Low | Low |
| Dust generation from earth works and vehicle movement | Medium | Enforce vehicle speed limits.<br>Apply dust suppression on dirt roads .<br>Dust fall monitoring must be conducted to detect increase levels of dust fall.<br>Dust suppression must be conducted on all haul roads.<br>Suitable dust suppression products should be used. | Low | Low |
| Storm water discharge and surface water pollution | | | | |
| Ground works and stripping of vegetation resulting in a changed land profile.<br><br>Runoff from stockpiled soil and vegetation may | Medium to Low | Water Quality deterioration: change in water quality is caused by a change in natural conditions and/or an enhancement of pollution from sources. | Low | Low |

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| contain high levels of silt.<br><br>Transport of construction materials to and from site. Significant levels of dust may emanate from the use of heavy construction vehicles which in turn will impact on runoff water quality.<br><br>Materials used during construction may impact negatively on the runoff water quality. | | A decrease or reduction in runoff could result in a more pronounced pollution effect.<br><br>Catchment Yield and hydrology:<br>Due to a reduction in natural runoff the contribution of the stream towards the broader catchment will be affected negatively. The natural runoff in areas that has been disturbed is now polluted storm water that will now be retained in excavations and pollution control dams.<br><br>Dirty storm water trenches should be inspected regularly (once before the rainy season and after each occurrence of a storm) to clean the trench from excess soil particles to prevent overtopping of the channel wall during a sudden storm which will result in mixing of the dirty and clean water systems. | | |
| Spillages that may occur on access and haul roads may impact negatively on surface water quality.<br><br>A high potential of soil erosion exists due to an | High | Mitigation measures (or safety precautions) that are taken in order to eliminate any risk the project area could have on the natural, cultural and social environment of the concerned area and that must be implemented during the different phases i.e. construction, | Low | Low |

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| increased percentage of bare surfaces.<br><br>Possible leaching of polluted soil through infiltration and runoff resulting in surface water pollution.<br><br>Removal of vegetation could lead to erosion and sediment transportation.<br><br>Significant dust levels will emanate from the use of heavy construction vehicles. | | operational and post closure to minimize the impacts are as follows:<br><br>• Only environmental friendly materials must be used during the construction phase to minimize pollution of surface water runoff and/or underground water resources.<br>• Pipe leakages should be minimized.<br>• Proper clean and dirty water separation techniques must be used to ensure uncontaminated water returning to the environment.<br>• Any sediment traps used during further construction phases should be left in place until after the first rainstorm following construction. This item will only be applicable for any further construction phases due to the fact that the mine is already operational.<br>• Storm water canals must be inspected regularly and silt build up removed as and when required to ensure proper functioning of the facility.<br>• Non mining waste i.e. grease, lubricants, paints, flammable | | |

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| | | liquids, garbage, historical machinery and other combustible materials generated during activities should be placed and stored in a controlled manner in a proper designed area.<br>• The topography of rehabilitation disturbed areas must be rehabilitated in such a manner that the rehabilitated area blends in naturally with the surrounding natural area. This will reduce soil erosion and improve natural re-vegetation. | | |
| Hydrocarbon spillages from vehicles and other construction equipment - storm water pollution | Medium | Place drip trays under parked vehicles if required.<br>Spill kits must be made available, and employees trained<br>to utilise spill kits. | Low | Low |
| Storage of diesel on-site | Medium | Clean up spillages immediately.<br>Inform contractors of the need for appropriate measures to manage cement in an environmentally sound manner.<br>Cement spillages must be cleaned appropriately.<br>Store diesel/oil in a designated area only. | Low | Low |
| Handling and use of cement during construction | Low | Inform contractors of the need for appropriate measures to manage | Low | Low |

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| | | cement in an environmentally sound manner.<br>Cement spillages must be cleaned appropriately. | | |
| Ground Water | | | | |
| Hydrocarbon Spills<br>Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally | Medium | • Staff at Workshop areas, yellow metal laydown zones and fuel storage areas should be sufficiently trained in hydrocarbon spill response.<br>• Each area where hydrocarbons are stored or likely to spill should be equipped with sufficient spill response kits and personnel, contaminated soil should be disposed of correctly at a suitable location.<br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent ground water pollution.<br>• All facilities where dangerous materials are stored must be contained in a bund wall.<br>• Vehicles and machinery should be regularly serviced and maintained.<br>• Monitoring of groundwater abstraction and quality; and | Low | Low |

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| | | • Clean & Dirty water system must be well maintained.<br>• Provide for establishing a monitoring program to detect groundwater response to seasonal variations and pit dewatering as well as possible potential contamination of groundwater. | | |
| Soil erosion and deterioration | | | | |
| Soil erosion due to soil disturbance and increased runoff volumes and velocity and Loss of topsoil | Medium | Establish a suitable storm water management system to divert runoff from operational areas or potentially contaminated areas.<br><br>Report and rectify erosion when detected.<br><br>Store excavated topsoil in a demarcated area, designed to prevent contamination for later rehabilitation purposes.<br><br>• At no point may plant cover be removed within the no-development zones;<br>• All attemps must be made to avoid exposure of dispersive soils;<br>• Re-establishment of plant cover on disturbed areas must take | Low | Low |

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| | | place as soon as possible, once activities in the area have ceased;<br>• Ground exposure should be minimized in terms of the surface area and duration, wherever possible;<br>• The mining operation must co-ordinate different activities in order to optimise the utilisation of the excavated trenches and thereby prevent repeated and unnesessary excavations;<br>• Construction that requires the clearing of large areas of vegetation and excavation should ideally occur during the dry season only;<br>• Construction during the rainy season (November to March) should be closely monitored and controlled;<br>• The run-off from the exposed ground should be controlled with the careful placement of flow retarding barriers;<br>• The soil that is excavated during construction should be stock-piled in layers and protected by berms to prevent erosion;<br>• All stockpiles must be kept as small as possible, with gentle | | |

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| | | slopes (18 degrees) ihn order to avoid excessive erosional induced losses;<br>• Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any storm water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate;<br>• Stockpiles susceptible to wind erosion are to be covered during windy periods;<br>• Audits must be carried out at regular intervals to identify areas where erosion is occurring;<br>• Appropriate remdial action, including the rehabilitation of eroded areas, must occur;<br>• Rehabilitation of the erosion channels and gullies;<br>• The mining operation should avoid land with steep slopes;<br>• Dust suppression should take place, without compromising the sensitive water balance of the area;<br>• Linear infrastructure such as roads and pipelines will be | | |

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| | | inspected at least monthly to check that the associated water management infrastructure is effective in controlling erosion;<br>• Topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions;<br>• Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired;<br>• Topsoil must not be handled when the moisture content exceeds 12%;<br>• Topsoil stockpiles must be kept separate from sub-soils;<br>• The topsoil should be replaced as soon as possible on to the backfilled areas, thereby allowing for the re-growth of the seed bank contained within the topsoil;<br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent soil pollution;<br>• Spill kits to clean up accidental spills from earthmoving | | |

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| | | machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures;<br>• All facilities where dangerous materials are stored must be contained in a bund wall;<br>• Vehicles and machinery should be regularly serviced and maintained. | | |
| Waste Management | | | | |
| Poor on-site waste management - wind-blown litter, soil and water contamination, burning of waste. | Low | Store general waste in a designated area, designed to prevent wind-blown litter.<br><br>Where possible recycle, recover or reuse waste.<br><br>Ensure that all general waste is removed and disposed of at a licensed general waste disposal site.<br><br>Use only licenced contractors to remove waste.<br><br>Waste should not cause nuisance conditions.<br><br>Inspect waste storage areas regularly during construction. | Low | Low |
| Storage and handling of hazardous waste - water and soil pollution, harm to surrounding neighbours. | Low | | Low | Low |

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| | | Prohibit the burning of waste hazardous waste site.<br><br>Hazardous waste such as oily rags must be removed and disposed of at a licensed hazardous waste site and the safe disposal certificates kept on file.<br><br>Place use hydrocarbon waste in a designated area. | | |
| Hazardous substances Management | | | | |
| Hazardous substances (cleaning detergents, paint etc.) | Low | Store chemical substances in a designated area.<br><br>Store only compatible substances in a specific area.<br><br>Fire-fighting equipment must be available in the case of a fire - if required.<br><br>Safety Data Sheets must be available for all hazardous substances.<br><br>Clean up spillages immediately.<br><br>Only competent staff must manage hazardous substances. | Low | Low |
| Heritage Resources | | | | |

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| Construction activities resulting in the destruction of heritage resources older than 60 years. | Low | Implement a chance find procedure. Obtain permits from SAHRA if required.<br><br>The heritage and cultural resources (e.g. graveyards, ruins, historic structures, etc.) must be protected and preserved by the delineation of a no go zone.<br><br>Should any graves be disturbed, exposed or uncovered during site preparations, these should immediately be reported to an accredited archaeologist. Burial remains should not be disturbed or removed until inspected by an archaeologist.<br><br>Stone tools should be avoided where possible and fresh exposures should be recorded before destruction. All stone tool artefacts should be recorded, mapped and collected before destruction.<br><br>Should development necessitate impact on any building structures, the developer should apply for a SAHRA Site destruction permit prior to commencement of construction. | Low | Low |

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| | | If significant specularite mining sites are found, one of them should be sampled for any evidence of artefacts, animal bones and other forms of human use of the area, subject to a SAHRA Section 35 permit application.<br><br>It is suggested that the new main entrance to the mine may be located at the old weigh-bridge (P-8) which could be a new focal point refer to Figure 21 in th the report.<br><br>The "cave" at the farm's south-eastern corner (indicated on the 1881 survey diagram) should be investigated, although it is for now outside the proposed mining area. | | |
| Noise generation | | | | |
| Groundworks | Medium | Machinery with low levels to be used.<br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | Low | Low |

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| Foundations | Medium | • Machinery with low noise levels to be used.<br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | Low | Low |
| Building activities | Medium | Building activities to take place during daytime periods only. | Low | Low |
| Transportation of building material to and from the site | Medium | Use machinery with low noise levels and maintained in a good order to be used and to comply with the Mine Health and Safety Regulations | Low | Low |
| Assembly of equipment/machinery | Medium | Machinery with low noise levels to be used.<br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | Low | Low |
| Traffic impacts | | | | |

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| Increased traffic volumes due to construction activities | Low | Inform neighbours of planned activities that would affect vehicle/ pedestrian traffic.<br><br>Optimise the hauling plan to minimise disruption of movement patterns.<br><br>Ensure the required signage has been erected to warn road users of mine traffic.<br><br>Ensure that access to residences and business properties is uninterrupted by providing alternative routes. | Low | Low |
| Biodiversity | | | | |
| Construction activities - decline in Threatened and red data species | Medium | Establish buffer zones around natural drainage channels or wetlands as per mitigation measures.<br><br>The areas earmarked for exclusion from development must be fenced off during the construction phase to ensure that the developer and his contractors do not damage these areas or do not cover them with soil, builders‟ rubble or waste.<br>No vehicles may enter the exclusion zones. | Low | Low |
| Construction activities - destruction of terrestrial faunal habitat | Low | | Low | Low |
| Construction activities - destruction of aquatic habitats | Medium | | Low | Low |
| Construction activities - reduction in natural migratory and faunal dispersal routes | Low | | Low | Low |

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| | | Where possible, trees naturally growing on the site should be retained as part of the landscaping.<br>Dumping of builders‟ rubble and other waste in the areas earmarked for exclusion must be prevented, through fencing or other management measures.<br>Outside lighting should be designed to minimize impact on fauna. | | |
| Non perennial drainange channels | | | | |
| Loss of drainage alteration or obstruction of drainage channels or wetlands due to construction activities | Medium | Drainage channels or wetlands areas are to be avoided as far as possible.<br><br>Construction activities must take place as far away from the drainage channels or wetlands as possible.<br><br>Heavy vehicles for construction of the stormwater culverts should be avoided as far as practically possible.<br><br>No unnecessary clearance of drainage channels or wetlands and habitat is allowed to take place in unauthorized areas.<br><br>All further mitigation measures as determined in the water use license must be adhered to. | Low | Low |

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| | | No animals or avifauna are to be hunted, captured, trapped, removed, harmed, killed or eaten.<br><br>The Environmental Representative must be contacted if the mitigation measures are not adhered to.<br><br>Construction must take place in the low flow season (winter months being May/June/ July) as far as practically possible.<br><br>The time that surfaces are left exposed must be kept to a minimum and re-vegetation should be implemented where applicable. | | |
| Increased runoff, erosion and sedimentation | Medium | A stormwater management plan must be compiled and implemented.<br><br>Stormwater management must take into consideration potential flood impacts and must be managed to deal with potential floods, as well as to reduce silt and sediment loads from entering the drainage channels or wetlands.<br><br>Implementation of soft engineering structures to mitigate increased run-off and sedimentation. | Low | Low |

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| | | Run-off from the construction site in general must only be allowed to exit the site in a controlled and diffuse manner.<br><br>Construction close to and in the wetlands, where a water use license has been obtained to do so, is to take place in the low flow season (winter months May/ June/ July/August) as far as practically possible.<br><br>The time that surface areas exposed must be kept to a minimum and re-vegetation must be implemented where applicable as soon as possible.<br><br>No establishment of new roads into or within the buffer zones of the drainage channels or wetlands identified are allowed unless water use licensing has been granted. | | |
| Construction impacts related to water quality | Medium | All construction materials are to be stored in the temporary construction area outside of the wetlands.<br><br>All soil stockpiles must be contained by bunded areas. | Low | Low |

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| | | All vehicles and equipment must be regularly maintained to avoid any oil, fuel or hazardous leaks or spills.<br><br>Movement of contractors and vehicles within wetland areas must be minimised.<br><br>Chemical toilets must be provided and must be serviced on a regular basis.<br><br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent surface water pollution;<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures;<br>• All facilities where dangerous materials are stored must be contained in a bund wall;<br>• Vehicles and machinery should be regularly serviced and maintained;<br>• Storm water control;<br>• Clean & dirty water plan | | |

| Social benefits | |
|---|---|
| Employment opportunities for local and regional residents | Medium Positive |
| Use of local suppliers - contribution to local economic development | Medium Positive |

Operational Phase impacts and mitigation measures

| Potential Impacts | Significance rating of impacts (positive or negative) | Proposed mitigation | Significance of impacts after mitigation | Risk of the impact and mitigation not being implemented |
|---|---|---|---|---|
| Air quality | | | | |
| Atmospheric emissions | Low | Apply dust suppression on the dirt roads.<br><br>Conduct dust fall monitoring - when increased dust fall is detected investigate additional dust control methods.<br><br>Clean up ore spillages immediately.<br><br>Train staff to report and clean up ore spillages immediately .<br><br>Maintain a complaint register.<br><br>Limit stockpile height. | Low | Low |
| Dust generation from the transportation of ore to the siding via truck | Medium | | Low | Low |
| Dust generation from the stockpiling and loading of manganese at the siding | Medium | | Medium | Low |
| Surface Water Pollution | | | | |

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| Effluent discharge into the environment (water resources) from the ore stockpile and spillages<br><br>Clearing of vegetation and erosion of the bare side slopes of the stockpile;<br><br>Reduced infiltration due to compacted soils and other impermeable surfaces associated with infrastructure increasing runoff volumes and velocities with subsequent increase in erosion at discharge points. | Medium | It is important therefore that a stormwater management system is implemented whereby all dirty water is collected and clean water is separated.<br><br>Where dirty water is separated and stored, this can be used for dust suppression purposes.<br><br>Quality of this water must be regularly checked to ensure that it meets minimum standards as required by the DWS.<br><br>All vehicles and equipment must be regularly maintained to avoid any oil/fuel leaks or spills.<br><br>If any spill or leak does occur, it must be ensured that it is properly cleaned up as soon as possible to avoid significant effects.<br><br>Keep the construction footprint area to a minimum and retain vegetation in all areas outside the direct footprint.<br><br>Where vegetation destruction does occur outside the footprint rip the soil and re-vegetate as soon as possible. | Low | Low |

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| | | Place access so that the grade of the road is minimized.<br><br>Where this is not possible, implement water management measures to disperse the water to a variety of points along the road where the flow can be controlled, and the energy dissipated.<br><br>Prevent sediments in runoff from entering the drainage channels or wetlands by placing a berm between the workings / soil stockpiles and the drainage channels or wetlands.<br><br>Divert clean stormwater around exposed areas. Where stormwater is discharged into drainage channels, construct gabions in an effective and appropriate manner to contain erosion.<br>The stormwater diversion canal must incorporate energy dissipating structures into the design of the canal to reduce accelerated run-off entering any drainage channels.<br><br>Re-vegetate all cleared areas and berms immediately according to a re-vegetation plan. | | |

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| | | Repair and reseed areas damaged by erosion and monitor until it can be shown to the satisfaction of a suitably qualified specialist that soil erosion is under control.<br><br>Monitor re-vegetated areas at least monthly to ensure successful reestablishment of vegetation and that no erosion gullies are forming. Take corrective actions on the basis of monitoring results.<br><br>A water quality monitoring program will be developed and implemented to commence prior to construction, in order to develop adequate baseline data. Water quality monitoring should be ongoing during construction, operation and decommissioning until such time that adequate water quality has been achieved.<br><br>Undertake concurrent rehabilitation as soon as the disturbing activity has ceased according to a Rehabilitation Plan which will inform the final design of the landscape in advance.<br><br>Where erosion begins to take place in a wetland, a wetland | | |

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| | | rehabilitation plan will be required. Recommendations from a suitably qualified wetland specialist must be obtained and implemented.<br><br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent surface water pollution;<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures;<br>• All facilities where dangerous materials are stored must be contained in a bund wall;<br>• Vehicles and machinery should be regularly serviced and maintained;<br>• Storm water control;<br>• Clean & dirty water plan | | |
| Deterioration of water quality due to possible release of dirty storm water:<br>Storm water typically contains various pollutants that could | Medium | The storage (stockpile) and loading surface of the siding must comply to DWS requirements.<br><br>Maintain the routine monitoring program during decommissioning and post closure for early detection | Low | Low |

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| contribute to deteriorating the water quality in the drainage channels or wetlands where stormwater is released.<br><br>In addition, stormwater runoff will carry pollutants from accidental spills, dust or eroded materials. | | of impacts and implementation of corrective action. | | |
| Abstraction of surface water - Impact on the quantity of water resource | Medium | Ensure any abstraction is done according to IWWMP and WUL conditions. | Low | Low |
| Waste Management | | | | |
| Storage and handling of general waste<br>- litter leading to nuisance conditions | Low | Store general waste in a designated area, designed to prevent windblown litter.<br><br>Ensure that all general waste is removed and disposed of at a licensed general waste disposal site.<br><br>Use only licenced contractors.<br><br>Burning of waste must be prohibited on site.<br><br>Maintain an inventory of waste generated. | Low | Low |

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| | | Place used hydrocarbon waste in a designated container. | | |
| Ground water | Low | • Refuelling must take place in well demarcated areas and over suitable drip trays to prevent ground water pollution.<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site.<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures.<br>• All facilities where dangerous materials are stored must be contained in a bund wall.<br>• Vehicles and machinery should be regularly serviced and maintained.<br>• Monitoring of groundwater abstraction and quality; and<br>• Clean & Dirty water system must be well maintained.<br>• Provide for establishing a monitoring program to detect groundwater response to | Low | Low |

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| | | seasonal variations and pit dewatering as well as possible potential contamination of groundwater. | | |
| Hazardous waste | | | | |
| Storage and handling of hazardous substances such as diesel and oil - spillages leading to stormwater contamination | Medium | Chemical storage containers must be compatible with the respective substances to prevent any corrosion that may lead to leakages.<br><br>Inspect containers regularly to detect leakages.<br><br>Chemical containers must be placed in a bunded area with a capacity to contain 110% of the tank's capacity.<br><br>Ensure that drainage valves for bunds are always closed.<br><br>A Safety Data Sheet must be available for all hazardous substances stored on-site.<br><br>Signage must be placed on all chemical storage tanks indicating the name of the substance and the hazards associated with the respective substances.<br><br>Firefighting equipment must be readily available | Low | Low |

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| Noise | | | | |
| Increase in the traffic noise from the additional traffic along the existing roads. | Low | Enforce strict speed limits and erect speed humps if required.<br><br>Maintain vehicles in good working conditions.<br><br>The following noise mitigatory measures must be in place:<br>• Front End Loaders which comply with the manufacturer's specifications according to recommended noise levels to be used at all times;<br>• The reverse signal to be replaced with a low frequency vibrating unit;<br><br>Conduct environmental noise monitoring on a biennial basis.<br><br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Controlled drilling & blasting operations;<br>• Silencers on equipment and vehicles;<br>• Acoustic enclosure for generators; | Low | Low |
| Loading Activities | Medium | | Medium | LOw |
| Visual | | | | |
| Dust generation | Medium | Ensure good house-keeping | Low | Low |

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| Footprint of the facility | | Maintain ore stockpiles as low as possible | | |
| Biodiversity | | | | |
| Operational activities - reduction in general floral biodiversity | Low | Activities must be planned, where possible in order to encourage (faunal dispersal) and should minimise dissection or fragmentation of any important faunal habitat type.<br><br>The extent of the development area should be demarcated on site layout plans (preferably on disturbed areas or those identified with low conservation importance).<br><br>No construction personnel or vehicles may leave the demarcated area except those authorized to do so.<br><br>Those areas surrounding the mine site that are not part of the demarcated development area should be considered as a no go zone for employees, machinery or even visitors.<br><br>Appointment of a full-time ECO must render guidance to the staff and contractors with respect to suitable areas for all related | Low | Low |
| Operational activities - reduction in general faunal biodiversity | Low | | Low | Low |
| Operational activities - destruction of terrestrial faunal habitat | Low | | Low | Low |
| Operational activities - reduction in natural migratory and faunal dispersal routes | Low | | Low | Low |
| Encroachment of alien and invasive species as a result of disturbance. | Medium | | Low | Low |

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| | | disturbance, and must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site.<br><br>All those working on site must undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.<br>All those working on site must be educated about the conservation importance of the fauna and flora occurring on site.<br>The environmental induction should occur in the appropriate languages for the workers who may require translation.<br>Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert.<br>In the case of any mortalities resulting from birds flying into power lines, these should be recorded including the date of the observation and the species affected and any other relevant information. | | |

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| | | Employ measures that ensure adherence to the speed limit.<br>Careful consideration is required when planning the placement for stockpiling topsoil and the creation of access routes in order to avoid the destruction of pristine habitats and minimise the overall development/ mining footprint.<br><br>The Footprint areas of the development activities must be scanned for Red Listed and protected plant species prior to Construction;<br><br>Snares & traps removed and destroyed; and<br><br>Maintenance of firebreaks.<br><br>Implement measures to prevent sediment load in the natural drainage channels or wetlands.<br><br>Buffer zones around sensitive environmental areas must be maintained during operational phase.<br><br>Prevent pollution of natural areas around the site. | | |

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| | | Footprint areas of the development/ mining activities must be scanned for Red Listed and protected plant species prior to development / mining;<br>It is recommended that these plants are identified and marked prior to development / mining.<br>These plants should where possible, be incorporated into the design layout and left in situ.<br>However if threatened of destruction by development / mining these plants should be removed (with the relevant permits from DAFF and DENC) and relocated if possible.<br>A management plan should be implemented to ensure proper establishment of ex situ individuals and should include a monitoring programme for at least two years after re-establishment in order to ensure successful translocation.<br>All those working on site must be educated about the conservation importance of the fauna and flora occurring on site.<br>Minimise the footprint of transformation.<br>Encourage proper rehabilitation of mined areas | | |

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| | | Encourage the growth of natural plant species (diverse selection of natural plant species).<br>Mechanical methods (hand-pulling) of control to be implemented extensively.<br>Annual follow-up operations to be implemented.<br>Ensure measures for the adherence to speed limit.<br>Maintenance of firebreaks;<br>No trees felled for firewood; | | |
| Health and safety | | | | |
| Injuries due to occupational hazards | Low | Implement the requirements of the Occupational Health and Safety Act and Regulations.<br><br>Implement best practice guidelines | Low | Low |
| Natural Resource Management | | | | |
| Wasteful use and resources like water and electricity leads to unnecessary impacts to the national resources. | Low | No running taps to be left unattended.<br>Switch off lights when not in use.<br>Maintenance of water infrastructure<br><br>Investigate energy saving mechanisms such as energy saving lights | Low | Low |
| Social Benefits | | | | |
| Employment opportunities for local and regional residents | High positive in combination with surrounding mines. | | | |

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| Use of local suppliers- contribute to local economic development | High Positive | | | |
| Indirect knock on economic impacts | Medium positive | | | |
| Emissions to atmosphere (dust and exhaust emissions) | | | | |
| Dust generation from vehicle movement on unprepared soil - increased dust generation and nuisance conditions | Medium | Appoint registered demolition contractors with appropriate procedures and equipment.<br><br>Restrict vehicle movement to demarcated areas.<br><br>All vehicles to be maintained in good working order to keep their atmospheric emissions under control.<br><br>Enforce vehicle speed limits to reduce dust emissions.<br><br>Prohibit idling of vehicles when not in use.<br><br>Spraying of surfaces with water;<br><br>Avoidance of unnecessary removal of vegetation;<br><br>Re-vegetation;<br><br>Monitoring; | Low | Low |
| Vehicle exhaust emissions - air pollution | Low | | Low | Low |
| Generation of dust from demolition activities | Medium | | Low | Low |
| Surface water discharge | | | | |

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| Hydrocarbon spillages from decommissioning vehicles – storm water and soil pollution | Medium | Refuel vehicles off site or in a dedicated/paved area with a sump to capture runoff.<br><br>Place drip trays under parked vehicles, where necessary.<br><br>Clean hydrocarbon spills up immediately.<br><br>Contaminated soil must be cleaned up with a readily available spill kit or excavated immediately, followed by proper disposal at a licensed disposal site. | Low | Low |
| Waste Management | | | | |
| Storage and handling of general waste and building rubble - windblown litter leading to nuisance conditions | Low | Store general waste in a designated area, designed to prevent windblown litter.<br>Ensure that all general waste and building rubbles is removed and disposed of at a licensed general waste disposal site.<br><br>Use only licenced contractors.<br><br>Maintain an inventory of waste generated.<br><br>Store building rubble in a designated area. | Low | Low |
| Storage and handling of hazardous waste - | Low | Hazardous waste generated during decommissioning activities must be | Low | Low |

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| water and soil pollution, harm to surrounding neighbours | | removed and disposed of at a licensed hazardous waste site and the safe disposal certificates kept on file.<br><br>Place used hydrocarbon waste in special containers.<br><br>Contaminated general waste and building waste must be managed as hazardous waste.<br><br>Hazardous and general waste must be managed separately. | | |
| Noise | | | | |
| Noise impact on surrounding Neighbours due to demolition activities | Low | Restricting the decommissioning activities to daylight hours.<br><br>Switching off equipment when not in use.<br><br>Maintain equipment and vehicle in good working condition.<br><br>• Hearing protection;<br>• Non-metallic washers to join infrastructure;<br>• Working hours;<br>• Controlled drilling & blasting operations;<br>• Silencers on equipment and vehicles; | Low | Low |

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| | | • Acoustic enclosure for generators; and. | | |
| Non perennial drainange channels | | | | |
| Loss of drainage alteration or obstruction of drainage channels or wetlands due to decommissioning activities | Medium | Adhere to all specialist stipulated mitigation measures.<br><br>A construction and operational stormwater management plan is critical to prevent contamination and degradation of Natural drainage channels or wetlands in the construction and operation phase of the proposed development. It is also important to prevent flood related disasters affecting the proposed development during both phases.<br><br>• Refuelling must take place in well demarcated areas and over suitable drip trays to prevent surface water pollution;<br>• Spill kits to clean up accidental spills from earthmoving machinery must be well marked and available on site;<br>• Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures;<br>• All facilities where dangerous materials are stored must be contained in a bund wall; | Low | Low |
| Increased runoff, erosion and sedimentation | Medium | | Low | Low |
| Decommissioning impacts related to water quality | Medium | | Low | Low |

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| | | • Vehicles and machinery should be regularly serviced and maintained;<br>• Storm water control;<br>Clean & dirty water plan | | |
| Rehabilitation | | | | |
| Decommissioning and rehabilitation of the site will prevent further environmental impacts and improve the visual appearance of the site | Positive High | | | |
| Social | | | | |
| Loss of employment opportunities | High | Engagement with employees in advance | Medium | Low |

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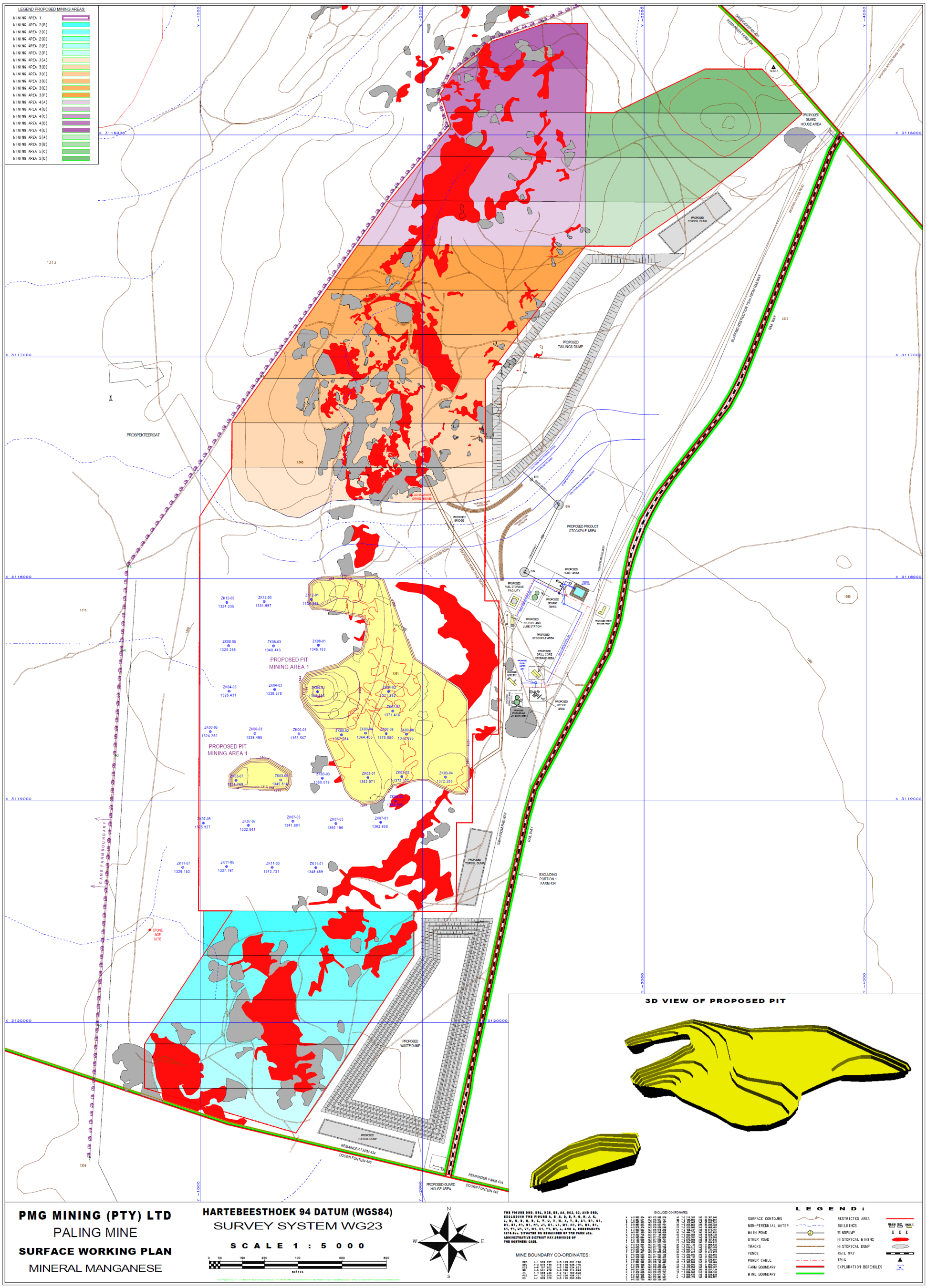
**(ix) The outcome of the site selection Matrix:- Final site layout plan:**
(Provide a final site layout plan as informed by the process of consultation with interested and affected parties.)


LEGEND PROPOSED MINING AREAS:
MINING AREA 1
MINING AREA 2(B)
MINING AREA 2(C)
MINING AREA 2(D)
MINING AREA 2(E)
MINING AREA 2(F)
MINING AREA 3(A)
MINING AREA 3(B)
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MINING AREA 3(F)
MINING AREA 4(A)
MINING AREA 4(B)
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MINING AREA 4(E)
MINING AREA 5(A)
MINING AREA 5(B)
MINING AREA 5(C)
MINING AREA 5(D)
PROPOSED PIT MINING AREA 1
PROPOSED PIT MINING AREA 1
PROPOSED GUARD HOUSE AREA
PROPOSED TOPSOIL DUMP
PROPOSED TAILINGS DUMP
PROPOSED BRIDGE
PROPOSED PRODUCT STOCKPILE AREA
PROPOSED PLANT AREA
PROPOSED FUEL STORAGE FACILITY
PROPOSED STORAGE TANKS
PROPOSED RE-FUEL AND LUBE STATION
PROPOSED STOCKPILE AREA
PROPOSED DRILL CORE STORAGE AREA
PROPOSED OFFICE AREA
PROPOSED WASTE DUMP
PROPOSED TOPSOIL DUMP
PROPOSED GUARD HOUSE AREA
EXCLUDING PORTION 1 FARM 434
REMAINDER FARM 434
DOORN FONTEIN 446
PROSPEKTEERGAT
GAME FARM BOUNDARY
STONE AGE SITE
150m FROM RAILWAY
RAIL WAY
3D VIEW OF PROPOSED PIT
PMG MINING (PTY) LTD
PALING MINE
SURFACE WORKING PLAN
MINERAL MANGANESE
HARTEBEESTHOEK 94 DATUM (WGS84)
SURVEY SYSTEM WG23
SCALE 1 : 5 000
metres
LEGEND:
SURFACE CONTOURS
NON-PERENNIAL WATER
MAIN ROAD
OTHER ROAD
TRACKS
FENCE
POWER CABLE
FARM BOUNDARY
MINE BOUNDARY
RESTRICTED AREA
BUILDINGS
WINDPUMP
HISTORICAL MINING
HISTORICAL DUMP
RAIL WAY
TRIG
EXPLORATION BOREHOLES

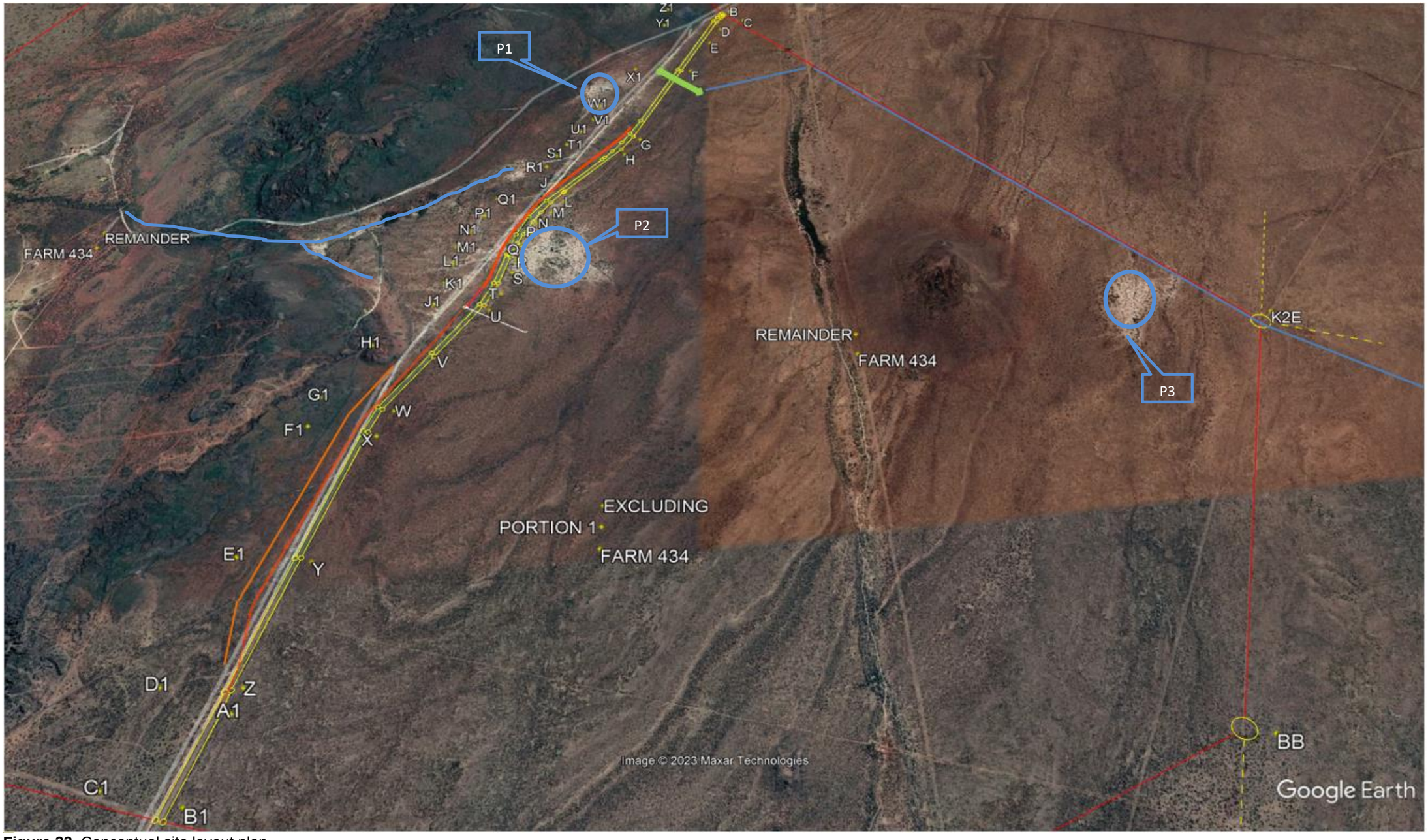


**Figure 23**. Conceptual site layout plan.

**(x) Motivation where no alternative sites were considered:**

No viable alternative sites were identified for the following reasons:

- PMG Mining holds a valid Mining Right over the application area. The placing of the private siding, service roads, crossing and access is in already disturbed areas.
- The private siding, service crossing as well as service roads falls within the proposed mining area and fits into the design done for the mine.
- The final locality of the above infrastructure was decided upon after taking into account of the following:-
  - Locality of the ore bodies;
  - Already disturbed areas;
  - Planned infrastructure;
  - Topography of the area;
  - Environmental features;

**(xi) Statement motivating the preferred site:**
(Provide a statement motivating the final site layout that is proposed.)

The site was firstly determined as PMG Mining has an existing Mining right over the property. The private siding, level crossing and service roads will assist the mine to be more competitive and to get their product to the port in Saldanha. The final site layout was determined by taking into account all positive and negative environmental impacts, inputs from the mine and all operational requirements.

**i) Plan of study for the Environmental Impact Assessment process:**

**(i) Description of alternatives to be considered including the option of not going ahead with the activity:**

- Land use development alternatives:
  The site layout may vary, depending on the operational requirements. However the final design and layout of the infrastructure have been planned and decided upon by the SANRAL and Transnet and engineers appointed by the mine and in consultation with the Mining Right Holder on the grounds of reserves, and placement of infrastructure based on hauling distance, wind direction and stormwater management on the mine.

- No-go option:
  The following positive impacts will be lost if the proposed private siding, crossing and service roads for the mining project is not developed:
  - TAX and VAT obligations to SARS as well as Royalties;
  - CAPEX spent locally and regionally;
  - Employment opportunities;
  - Payroll income;
  - Operating expenditure and maintenance (OPEX);
  - Revenue.

## (ii) Description of the aspects to be assessed as part of the environmental impact assessment process:

(The EAP must undertake to assess the aspects affected by each individual mining activity whether listed or not, including activities such as blasting, loading, hauling and transport, and mining activities such as excavations, stockpiles, discard dumps or dams, water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc…)

| LIST OF STUDIES UNDERTAKEN | RECOMMENDATIONS OF SPECIALIST REPORTS |
|---|---|
| Storm Water Management Plan by MVD Kalahari Consulting Engineers Prepared by Petrus J Oosthuizen September 2016<br>**Appendix B** | The non-perennial stream is classified as a water system according to GN704 and is a natural storm water accumulation stream. No water system shall be mined before an authorization is obtained from DWAF. This water system will however not be mined.<br><br>Historical excavation sites that were identified and which contribute to catchment flow reduction must be rehabilitated following mining activities.<br><br>Monitoring of surface water runoff: Chemical analysis of water samples as per hydrogeological report.<br><br>Risk rating: Potential risk assessed is rated acceptable if mitigation measures are in place.<br><br>Regular inspections (monthly basis) of the dirty water collection dams and perimeter storm water canals are proposed.<br><br>Rehabilitation of disturbed areas during the mine life cycle as well as during closure phase has to be done to minimize erosion and/or pollution of natural streams. |
| Visual Impact Assessment by David J van der Merwe from ENVASS<br>19 October 2016<br>**Appendix C** | The construction and development of the proposed project will have a medium to low visual impact on the natural scenic resources and the topography. However, with the correct mitigation measures the impact can be reduced to a point where the visual impact can be regarded as be of low significance.<br>The moderating factors of the visual impact of the development in the close range are the following:<br>• Exposure time of road users;<br>• The sense of place that is created;<br>• Absorption capacity of the receiving environment;<br>• Visual exposure of human inhabitants located in the area;<br>• Natural topography and vegetation;<br>• Mitigation measures that will be implemented;<br>• Disturbed natural environment; and<br>• Anthropogenic environment created by surrounding activities.<br><br>The summary of the visual impacts range is the following:<br>• Moderate to low exposure to road users during the life of the project; |

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| | • Medium impact on surrounding land users within 2 km of the proposed development;<br>• Medium impact on surrounding land users within 1 km of the proposed development;<br>• Medium visual impact of lighting at night on observers in close proximity to the proposed development;<br>• Medium visual impact on private game farm;<br>• Medium visual impact of the proposed development on the Sense of Place;<br>• Medium to Low visual impact of the proposed development during the construction phase;<br>• Medium visual impact of the proposed development during the operational phase<br>• Medium absorption capacity of the receiving environment; and<br>• Medium Natural topography and vegetation if proper mitigation measures are followed and implemented. |
| Terrestrial Fauna and Flora Assessment Report by Dr. Betsie Milne from Betsie Milne Environmental and Ecological Consultant August 2015<br>**Appendix D** | Seven plant communities were identified on site of which the Pristine and Isolated Rocky Hills are identified as being most sensitive. The Senegalia mellifera – Ziziphus mucronata shrubveld on historically mined hills and the Euclea undulata – Calobota cuspidosa open shrubland on pristine rocky hills comprise the core mining area. The first have already been impacted in the past by historic mining activities and is therefore not considered highly sensitive, and impacts on vegetation and fauna are likely to be relatively low after mitigation here. The second community however, is regarded as highly sensitive due to the high number of provincially protected species occurring here as well as the unique habitat this community potentially provides to fauna. Impacts on vegetation and fauna are likely to be relatively high even after mitigation here.<br>Re-established stunted Boscia albitrunca shrubs are widespread across the site and more than 100 individuals are expected to be destroyed by the mining activities. A licence application regarding protected trees need to be lodged with Department of Agriculture, Forestry and Fisheries prior to the removal or damaging of any of the protected trees.<br>The construction of infrastructure and the mining operation will result in the removal of provincially protected flora and will constitute large-scale clearance of indigenous vegetation. A permit application regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation prior to any clearance of vegetation.<br>Although there are likely to be a number of listed fauna and avifauna present at the site, the surrounding landscape is still overwhelmingly intact and it is not likely that the mining activities would lead to the regional declines in these species. As faunal abundance in the area is quite high, mitigation measures to reduce the potential impact of the mining activities are important to ensure a low faunal impact.<br>To conclude, it is clear that the destruction of the natural habitat within the mining area is inevitable. The significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the mining area. |
| Aquatic and Wetland Assessment prepared by Dr. JC Roos of Water Quality consultants<br>June 2016<br>**Appendix E** | Provision should be made for conservation areas and ecological corridors to preserve vegetation, wetlands and allow faunal movement through the site and to nearby ecosystems. Preserve the 4 main streams and 3 pans (S1-S4 & P1 – P3; Fig. 4).<br>○ These conservation areas will: i) Protect the unique biodiversity of plants and animals of this region. ii) Ensure the preservation of the local plants, animals, and ecosystems. iii) Creating refugia for natural flora population. iv) Preserve a significant area with natural vegetation and functioning. v) Create hydrological and environmental connectivity |

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| | between valleys and river. vi) Sustain water supply (quantity and quality) from these small streams to downstream aquatic systems.<br><br>Form a wildlife corridor, or green corridor. This is an area of habitat connecting wildlife populations separated by human activities or structures (such as roads, development, or logging). The main goal of implementing habitat corridors is to increase/maintain biodiversity.<br><br>Best Management Practices can reduce the discharge of sediment and other pollutants and minimize the impact of construction activities on watercourses.<br><br>Maintain a buffer zone of 100 m around the pans and streams. Note that these buffer zones are essential to ensure healthy functioning and maintenance of wetland.<br><br>Minimizing – unavoidable impacts shall be minimized by taking appropriate and practicable measures such as transplanting important plant specimens, confining works in specific area or season, restoration (and possibly enhancement) of disturbed areas, etc.<br><br>Special care needs to be taken during the construction phase to prevent surface storm water rich in sediments and other pollutants from entering the natural drainage systems / wetlands.<br>Effluents and waste should be recycling and re-use as far as possible.<br>PMG Mining (Pty) Ltd must have an Environmental Management Plan (EMPlan) for the farm. |
| Hydrogeological Investigation of Paling Mine for WUL application, PMG Mining Pty Ltd by ENVASS, David J van der Merwe, October 2016)<br>**Appendix F** | Initial Regional Assessment<br>In according with the requirements for Groundwater Abstraction (S 21 (a)), an Initial Regional Assessment is required to determine the information necessary for a new WUL Application for the abstraction of groundwater. According to the initial regional assessment, the proposed site abstractions fall within Category C as the scale of abstraction was calculated at 142%.<br><br>Hydrocensus Investigation Water Levels<br>A total of 41 boreholes were visited during the project hydrocensus investigation. Water levels could not be measured at 13 of the boreholes due to either obstruction in the boreholes, the boreholes being collapsed or the boreholes being closed by pumping equipment and or other causes.<br>Water levels varied between 6.68 m bgl and 50.79 m bgl. The average water level was calculated at 17.69 m bgl. Groundwater levels indicated a 95.21% correlation to surface topography. This suggests that groundwater flow that generally follows topography and occurs under semi-confined conditions.<br><br>Water Quality<br>Six water samples were taken during the hydro census investigation of this study for chemical analysis. The localities of those water samples as well as the chemical analysis results are indicated in and compared to the SA Water Quality Guideline Limits: Domestic Water Use Guidelines (DWAF. 1996). The chemical analysis results were used to produce the Piper diagram (Figure 8) in the report to identify the chemical quality of the water during the hydro census investigation. |

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| | As most of the ground water in the area is being used for livestock watering, the limits of South African Water Quality Guidelines: Livestock Watering (DWAFb, 1996) was included together with SANS 241:2015 and the South African Water Quality Guidelines: Domestic Water Use (DWAFb, 1996).<br>According to the chemical analysis results, the water exceeds the given DWAF: Domestic Water Use Guideline Limits in terms of Ca, K and TDS. These guidelines are target water qualities for consumption purposes. All of the samples can be classified as very hard water according to the HCO32- results, whilst all of the sampling points exceeded the set limits in terms of TDS, except for the MVD-P2 and MVD-P3 sampling points in terms of DWAF. However for the parameters analysed, all of the samples indicated compliance in terms of SANS 241:2015 and DWAF: Livestock Watering limits.<br><br>Groundwater Reserve Determination<br>A groundwater reserve determination (GRD) was completed using the desktop data available for the region, as well as field investigation results. The groundwater reserve determination used the Groundwater Reserve Directed Measures (GRDM) methodology as approved by the Department of Water and Sanitation (DWS).<br>According to the GRDM, the total abstraction (existing and proposed) for the UA was 11%, indicating an allocable reserve of 89% (i.e. 823 853 m3/a) for the Unit of Analysis (UA). This calculation was performed by using the following input values:<br>- Basic human needs was calculated at 40.60 m3;<br>- The groundwater contribution to baseflow was 0 m3;<br>- The unit of analysis had an area of 216 798 343.38 m2;<br>- The recharge for the area was taken as 1.3 %;<br>- The total rainfall recharge was calculated at 930064.9 m3/d;<br>- The existing abstraction indicated that 17.59 m3/d of water is currently being abstracted; and<br>- The proposed abstraction was assumed at 232.8 m3/d.<br><br>Hydrological Impact Assessment<br>During the construction phase the activities at the site will include construction of mining infrastructure (e.g. haul roads, offices etc.), as well as overburden removal at the pit area. The potential impacts on the receiving groundwater environment during the construction phase include localized groundwater dewatering (if groundwater is used to supply construction activities), contamination from hydrocarbon spills (if any). No domestic waste will be stored at the site during the construction phase.<br>Should groundwater be used to supply the construction activities (e.g. drinking water or dust suppression), localized dewatering at the borehole could occur. This would be a low impact both before and after management measures are put in place due to the localized extent of dewatering and the short duration of the impact. Borehole abstraction (if any) should be managed effectively and borehole water levels and abstraction volumes from the borehole should be recorded at regular intervals, ideally on a monthly basis.<br>Hydrocarbon spills from construction vehicles and/or fuel storage areas could result in localised groundwater contamination, which is a medium impact on the receiving environment. In order to manage these impacts all staff and supervisors at workshops, yellow metal laydown areas and fuel storage areas should be trained in hydrocarbon spill response and each of these areas should be equipped with the appropriate spill response kits and any contaminated soil must be disposed of correctly at a suitable location. Should these management measures be put in place the impact on the receiving environment would be reduced to a low impact. |

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| | In terms of ground water quantity during the operational phase, the simulated impacts for the base case scenario on the receiving groundwater environment due to dewatering are low, with the drawdown extent reaching a maximum of 250 m from the pit boundary. The simulated groundwater inflows to the mining area over the LOM were between 400 and 600 m3/day, which is likely to represent the maximum inflows that could be expected during the LOM. Due to the limited extent of the drawdown cone at the site it is unlikely that any groundwater users would be significantly impacted on during mining operations. However, should any users be impacted on the mine would need to supply, at their own cost, an equivalent quantity of water to these impacted parties. No mitigation is possible for the impact due to dewatering, however groundwater levels at the pit area should be monitored and discharge from the pit should be disposed of in a safe manner. The groundwater at the pit is expected to be of a good quality and would be suitable for discharge into the environment if suitable licensing is obtained by the mine. However, the water quality of the pit inflow must comply with relevant license conditions and/or in-stream water quality guidelines before it would be suitable for discharge into the environment.<br>The simulated impacts for scenario 1 on the receiving groundwater environment due to dewatering are low, with the drawdown extent reaching a maximum of 450 m from the pit boundary where dewatering at the boreholes is started 12 months prior to mining commencing. The simulated groundwater inflows to the mining area over the LOM was between 100 and 300 m3/day, with 165 m3/day being extracted from the two dewatering boreholes, which is likely to represent the maximum inflows that could be expected during the LOM5.<br>Due to the limited extent of the drawdown cone at the site it is unlikely that any groundwater users would be significantly impacted on during mining operations. However, should any users be impacted on the mine would need to supply, at their own cost, an equivalent quantity of water to these impacted parties. No mitigation is possible for the impact due to dewatering, however groundwater levels at the pit area should be monitored and discharge from the pit should be disposed of in a safe manner. The groundwater at the pit is expected to be of a good quality and would be suitable for discharge into the environment if suitable licensing is obtained by the mine. The water quality of the pit inflow must comply with relevant license conditions and/or in-stream water quality guidelines before it would be suitable for discharge into the environment.<br><br>During the operational phase in terms of groundwater quality, waste material will be generated on site. The waste material will be disposed of at one waste rock dump. This waste facility, along with the low grade ore stockpiles on site, may release poor quality seepage into the groundwater environment. The waste rock dumps and stockpile areas are both low impact during mining, as both are kept relatively small and will not result in large amounts of seepage. The material at the stockpile areas should be stored there for as short a time span possible to avoid oxidation of the material and the waste rock dumps should be maintained in such a manner to ensure minimal infiltration of rainwater and runoff.<br>In terms of the groundwater quality of for the base case scenario, all of the contaminants simulated for the WRD showed limited concentrations entering the groundwater environment and the resultant contaminant plume did not migrate further than 100 m from the WRD boundary. Thus the overall impact for the base case scenario was low.<br><br>However, to avoid impacts developing at the site the storm water management infrastructure should be sufficiently maintained to prevent seepage of rainfall into the waste material. Should these management measures be in place the impact rating would remain low.<br>In terms of the groundwater quality of for scenario 1, all of the contaminants simulated for the WRD showed limited concentrations entering the groundwater environment and the resultant contaminant plume did not migrate further than 100 m from the WRD boundary. Thus the overall impact for scenario 1 was low. |

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| | However, to avoid impacts developing at the site the storm water management infrastructure should be sufficiently maintained to prevent seepage of rainfall into the waste material and during construction the class D liner should be constructed to ensure the hydraulic conductivity is sufficiently reduced to ~0.25 of the regional soil hydraulic conductivity. Should these management measures be in place the impact rating would remain low.<br>In terms of the groundwater quality of for scenario 2, all of the contaminants simulated for the WRD showed limited concentrations entering the groundwater environment and the resultant contaminant plume did not migrate further than 100 m from the WRD boundary. Thus the overall impact for scenario 2 was low.<br>However, to avoid impacts developing at the site the storm water management infrastructure should be sufficiently maintained to prevent seepage of rainfall into the waste material. Should these management measures be in place the impact rating would remain low.<br>During the closure phase groundwater levels will recover towards their original state. The probability of decant occurring at the site is low, however should decant occur it would be at the north western corner of the main pit. There are no mitigation measures for groundwater level rebound and the impact would be low. The groundwater levels are expected to recover to their original state within 50 years. In order to avoid decant occurring the open pit area should be backfilled using suitably graded materials to mimic the natural groundwater environment as far as possible.<br>In terms of groundwater quality during the closure phase, the stockpile areas should be cleared and vegetated during the closure phase, while the waste rock dump slopes should be vegetated and graded to allow runoff and prevent infiltration of rainwater to the material. The overall impact rating for these features is low.<br><br>Groundwater Management Plan<br>The simulated groundwater inflows into the mine workings are minimal and could be sufficiently controlled using a sump pump where the water is evacuated from the pit and discharged, however the water quality of the pit inflow must comply with relevant license conditions or in-stream water quality guidelines before it would be suitable for discharge into the environment. A dedicated in-pit sump should be included in the mine planning and should extend 5-10 m ahead of mining, with a capacity of 500 m3 to allow for direct rainfall and groundwater inflows. The water should be discharged away from the pit in a manner that is safe for mining activities, as well as the environment, as soon as possible to avoid potential water-rock interactions that may cause a deterioration in water quality.<br><br>Alternatively, two (2) of the nine (9) monitoring boreholes to be installed at the site could be constructed to act as dedicated dewatering points for the pit area. The boreholes would be selected based on the results of a geophysical survey and aquifer testing process to ensure connectivity of the boreholes to the pit.<br>Groundwater Monitoring should be undertaken to SABS and DWS requirements according to the given schedule. In terms of the presented monitoring network, a total of 9 new boreholes are recommended to be drilled, Table 28 shows the proposed locations of the boreholes to be added to the monitoring network and Figure 12 shows the proposed monitoring network in the Stormwater management plan as Annexure B.<br>The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources (if any). They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents).<br>Once a pollution indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sample position. The parameters should be revised |

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| | after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH decreases.<br>Laboratory analysis techniques will comply with SABS guidelines. The groundwater monitoring database will be updated on a monthly basis as information becomes available. The database should be used to analyse the information and evaluate trends noted.<br>An annual compliance report should be compiled and submitted to the authorities for evaluation and comment. This report should be submitted annually for the construction, operational and decommissioning phases as well as for two years after mining ceases.<br>The mine must develop a monitoring response protocol. This protocol will describe procedures in the event that groundwater monitoring information indicates that action is required. |
| Noise and Vibration Environmental Impact Assessment by BJ B van der Merwe from dBAcoustics<br>09 September 2016<br>**Appendix G** | The prevailing ambient noise levels are different throughout the study area and the arithmetic average for the study area was calculated at 31.4dBA during the day and 28.1dBA during the night for the winter. The prevailing ambient noise level for the study area during the summer is slightly higher due to increased insect activities and is 35.0dBA during the day and 32.9dBA during the night. There are mine activities in the vicinity of the proposed mine with a railway corridor where trains use the railway line on a regular basis during the day and the night. This creates a finite type noise increase with a maximum noise level of 68.7dBA at 250m from the railway activities. The mine activities were audible at MP's 1, 2, 10, 12, 14, 15 and 17 at the time of the noise survey. The aircraft activities in and around the Ronny's airstrip and traffic along the existing gravel road (R385) also create a noise increase at times.<br>The noise impact during the construction phase, which will take place during daytime periods only, will be insignificant. The noise regime will change during the operational phase where the noise intrusion will be more noticeable during the night time periods in the winter periods at noise receptors A to D. This is based on a noise intrusion level of 5.0dBA and not the benchmark noise intrusion of 7.0dBA before a noise disturbance is created. The noise increase will therefore be noticeable at some of the residential areas but will not contravene the Noise Control Regulations.<br>Noise mitigatory measures must be in place to comply with the Noise Control Regulations.<br>There will be a shift in the immediate noise levels of the proposed activities on a temporary basis during the construction phase and a permanent basis during the operational phase and the communities will have to be briefed and informed of this during the public participation process.<br>Regular feed-back to the community during the operational phase of the project of the baseline noise and ground vibration monitoring must take place. A system whereby complaints are recorded and investigated must be made available.<br>It will be important to implement an Integrated Environmental Management plan (IEM) which is a continuous process that ensures that the environmental impacts which can be introduced by mechanised activities during the construction phase and during the operational phase process (such as noise and vibration) are avoided or mitigated throughout the project life cycle from design to the operational phase of the project (DEAT, 2004).<br>The basic elements of the Environmental Management System will be to<br>• List the potential environmental impacts;<br>• Set of operational procedures for monitoring, controlling and reducing impacts;<br>• Recording the results and respond to complaints timeously;<br>• Procedure for internal environmental noise and/or vibration audits.<br>The possible noise intrusion from the blasting and mine activities can however be controlled by |

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| | means of approved acoustic screening measures, state of the art equipment, proper noise management principles and compliance to the Local Noise By-laws, and the International Finance Corporation's Environmental Health and Safety Guidelines. The proposed noise and vibration management plan must be in place during the construction and operational phases so as to identify any noise increase on a pro-active basis and to address the problem accordingly. |
| Social Impact Assessment (SIA) Report by Ingrid Snyman from Batho Earth<br>October 2016<br>**Appendix H** | In order to ensure that negative impacts are minimised and positives are enhanced, the following is recommended:<br>• Implement the mitigation measures as proposed in this report.<br>• As job creation is one of the most pressing socio-economic needs in the local community, PMG Mining through the development of Paling Mine should focus on SMME development and related local job creation, whilst considering the limitations of the available local skills.<br>• PMG Mining should assist their employees to find suitable housing in the towns surrounding the mining area to limit additional impacts on the provision of services and infrastructure by the TLM.<br>• Assistance in terms of skills development for those that would be employed during the start-up and construction phases of the project, as well as for permanent employees during the operational phase of the project would be necessary. Education is critical to sustain the socio-economic development of the community members living in the area. Continued support for training and capacity building thus remain important.<br>• Possible SMME links to the mine should be pursued to maximise local business benefits;<br>• The establishment of a management and monitoring committee to deal with increased social pressure on the local area, as well as increased pressure on the infrastructure and services provision is recommended. Such a committee should not only consist of representatives of PMG Mining, but all the mining companies operating in the area together with representatives from the Tsantsabane Local Municipality.<br>• The development and execution of the Social and Labour Plan should be done in consultation with the Tsantsabane Local Municipality.<br>• The applicant should enter into negotiations with Assmang regarding the future of the game farm and possible change of ownership of the farm Paling.<br>• Paling Mine should communicate and present their involvement in the community (goodwill, social responsibility, capacity building programmes, skills development, general development support and so forth) to obtain community support.<br>• Ensuring continued contact and communication between Paling Mine, the Tsantsabane Local Municipality, and local community leaders, as well as nearby landowners is critical, especially during the start-up and construction phase, but should also continue for the life of mine. |
| A Report on the Historical Archaeological investigations and relocation of known and unknown Historical burials dating to the late 19th and 20th century on the Farm Paling 434, Hay magisterial district, near Postmasburg in the Northern Cape Province by AJ Pelser Report AE01246P by AJ Pelser July 2012 | It is possible to say that the archaeological and historical investigation, exhumation and relocation of the historical graves located on the remainder of Paling 434, in the Hay district of the Northern Cape, near Postmasburg, was completed successfully. Over and above the 8 graves initially identified (one turned out not to be), 6 previously unknown graves were investigated and exhumed. These were relocated to and reburied in the municipal cemetery in Postmasburg.<br><br>Four of the graves had formal headstones and dressing making their identification easy. These graves blong to the Van der Merwe (3 graves) and Voges (1 grave) families. The dates of death are between 1894 and 1904 and include 2 adults and 2 children (both youngh infants Van der Merwe Children). It is not sure to whom the other unknown graves belong, but it is possible that some of those inside the fenced-in formal section could be those of either Van der Merwe or Voges family |

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| **Appendix I** | members, while thos on the outside of the fence might be those of workers who labored on the farm at the time and prior to the 1920's /30's when mining commenced on Paling. With the discovery of the previously unknown graves during the site clearance there is of course the possibility that many similar sites could still be located in the mining area. The vegetation in the area is extremely dense and visibility is very limited. It is therefor possible that sites could have been missed during initial assessments and once site clearance for the purpose of mining related activities commence that more sites will be identified. During the exhumation process, a local resident and individual who have worked on the farm indicated that there is a fairly big graveyard situated not far from here.<br><br>ASSMANG officials did visit the site, but due to time constraints we were unable to visit and confirm the status of the site. It is rumoured to contain more than 100 graves.<br><br>It is recommended that this site be located and assessed during the archaeological excavation work on the historical homestead and midden site in order to determine if this site falls within the mining rights area and then the way forward will have to be determined. It should also be mentioned that there is always the possibility of the accidental uncovering of sites, features or objects during mining activities due to the subterranean nature of archaeological or historical sites. This will include human skeletal remains from unmarked graves. When these discoveries are made a specialist should be called in to investigate. |
| A Report on an Archaeological Impact Assessment (AIA) for Proposed mining operations on the Remainder of the farm Paling 434, Hay magisterial District, Northern Cape by AJ Pelser & AC Vollenhoven May 2010<br>**Appendix J** | It can be stated that the Archaeological Impact Assessment (AIA), as part of the larger HIA, of the area was conducted successfully. Seven sites, dating from the Stone Age (MSA/LSA) and the more recent historical period, was identified. Dense vegetation made archaeological visibility difficult, and more sites might be present. This includes unmarked and low stone packed graves. Two sites, namely Site 3 (historical graves) and Site 7 (possible farmstead related to Site 3) is deemed as of medium to high significance and because it will be impacted on negatively by the development, a number of mitigation measures will have to be implemented before the mining activities can continue. The following mitigation measures are recommended:<br>1. Site 3 (Historical graves): Exhumation and relocation of graves. This will include the cleaning of the area to ensure detailed documentation of the graves, background archival research on the history of the graves, mapping the site, social consultation to try and identify possible descendants, and the physical exhumation and relocation. For this an undertaker, in conjunction with the archaeologists, will have to be employed and relevant permits has to be obtained. **This exercise was already completed in 2012**<br><br>2. Site 7 (possible historical farmstead site related to the graves): Cleaning the area and detailed assessment of the area. This will aim at locating the possible farmstead ruins. Mapping the site and possible archaeological excavations to obtain cultural material for interpretation and dating purposes. A permit from SAHRA will have to be obtained.<br><br>3. Site 6 MSA/LSA open-air site: The site should be sampled through mapping and recording of Stone Age material, as well as surface collection of representative material. A SAHRA permit will be required. It is also recommended that, during this work the area be surveyed for the existence of remaining underground specularite mining evidence and that these sites be recorded as well. The cave indicated on the 1881 diagram of the farm should also be located, although currently it is outside the mining area.<br>From a Cultural Heritage point of view there would be no objection to the development should the mitigation measures be implemented. |

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| Heritage Impact assessment Report : Proposed Manganese and Iron Ore Mining Right application in respect of the remainder of the Farm Paling 434, Hay Registration division Northern Cape Province by Dr RC Jong in association with Mr AJ Pelser 31 March 2010<br>**Appendix K** | It can be stated that the Archaeological Impact Assessment (AIA), as part of the larger HIA, of the area was conducted successfully. Seven sites, dating from the Stone Age (MSA/LSA) and the more recent historical period, was identified. Dense vegetation made archaeological visibility difficult, and more sites might be present. This includes unmarked and low stone packed graves. Two sites, namely Site 3 (historical graves) and Site 7 (possible farmstead related to Site 3) is deemed as of medium to high significance and because it will be impacted on negatively by the development, a number of mitigation measures will have to be implemented before the mining activities can continue. The following mitigation measures are recommended:<br>1. Site 3 (Historical graves): Exhumation and relocation of graves. This will include the cleaning of the area to ensure detailed documentation of the graves, background archival research on the history of the graves, mapping the site, social consultation to try and identify possible descendants, and the physical exhumation and relocation. For this an undertaker, in conjunction with the archaeologists, will have to be employed and relevant permits has to be obtained<br>2. Site 7 (possible historical farmstead site related to the graves): Cleaning the area and detailed assessment of the area. This will aim at locating the possible farmstead ruins. Mapping the site and possible archaeological excavations to obtain cultural material for interpretation and dating purposes. A permit from SAHRA will have to be obtained.<br>3. Site 6 MSA/LSA open-air site: The site should be sampled through mapping and recording of Stone Age material, as well as surface collection of representative material. A SAHRA permit will be required. It is also recommended that, during this work the area be surveyed for the existence of remaining underground specularite mining evidence and that these sites be recorded as well. The cave indicated on the 1881 diagram of the farm should also be located, although currently it is outside the mining area.<br><br>From a Cultural Heritage point of view there would be no objection to the development should the mitigation measures be implemented.<br><br>Finally, it should be noted that the subterranean presence of archaeological and/or historical sites, features or artifacts are always a distinct possibility. Care should therefore be taken during any development activities that if any of these are accidentally discovered, a qualified archaeologist be called in to investigate. Because of the dense grass cover, visibility was difficult. Any features, objects or sites could therefore have been missed. This includes low, stone-packed, graves. |
| A report on the Archaeological investigation of stone age finds on the farm Paling 434 Hay magisterial district near Postmasburg in the Northern Cape Province Cecember 2012/January 2013<br>**Appendix L** | It is possible to say that the recommended archaeological mitigation (selective sampling and mapping) of Stone Age material from site 2823AA002 was conducted successfully. In total 114 tools were collected from the site and expertly analyzed by Prof. Marlize Lombard (the Principal Investigator for the project).<br><br>Based on the expert analysis of the material from this open-air Stone Age site it is possible to conclude that Stone Age presence and activity in the area could stretch as far back as nearly 1.5 million years BP, although most of the material belongs to the final Later Stone Age phases, dating to between as recently as 100 years to 4000 years BP. This is confirmed to some extent by material recovered from site 2823AA0003 (the historical site excavated [See AE Report AE01257P]) by Pelser in December 2012, as well as the archaeological research conducted by Beaumont et.al at Doornfontein close to this area during the late 1960's.<br><br>Finally, this and other open-air surface sites should not be seen in isolation, but should be interpreted in conjunction with for instance the sites researched by others previously. The cave indicated on the 1881 map of Paling (more than likely the location |

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| | of the sites mentioned by Beaumont and Boshier in their 1974 publication on their work at Doornfontein) would be related to these sites and would have been utilized by the same groups or individuals that left behind their tools close to the outcrops and streams in the area. The sampling of the Stone Age material during the 2012 fieldwork, and the information obtained as a result, complements the earlier archaeological work done in the region and provides further evidence on the Stone Age archaeology of the area. However, further archaeological research on the specularite mining in the area and on Paling should be considered seriously as part of a more detailed and regional Stone Age Archaeological Research program. |
| Water Balance Report by<br>Irene Lea Environmental & Hydrogeology<br>Report No iLEH-PGM POS 06-16<br>OCTOBER 2016<br>**Appendix M** | The following actions are recommended to manage the water balance for the project:<br>• All dams, sumps and pipelines that form part of the water management system must be inspected on a daily basis to determine the available storage volume as well as to detect leaks or overflows.<br>• If non-compliances are identified, these should be rectified immediately.<br>• Flow meters should be fitted on the boreholes that will be used for potable groundwater abstraction. The volume of groundwater abstracted per day must be recorded and used to update and manage the water balance.<br>• The volume of groundwater abstracted per day from the potable supply boreholes must be adjusted if the capacity of the clean water tanks is reached. This should be controlled with an overflow valve that automatically cuts the pump when the tanks are full.<br>• Groundwater levels should be measured monthly in the boreholes used for groundwater abstraction. This information must be used to establish whether the boreholes are pumped at sustainable rates. If a decline in groundwater levels is observed, the pumping strategy must be adjusted, or the alternative water resource (the Sedibeng pipeline) must be triggered.<br>• Flow meters should also be installed on pipelines that deliver water to and from the four mine dams to obtain accurate information for the water balance.<br>• The volume of groundwater seepage from the pits that is available to the mine water balance must be closely monitored to<br>• The quality of groundwater abstracted as well as the depth to groundwater level must be monitored on a quarterly basis to ensure fitness of use.<br>• The quality of water in the four mine dams must be monitored on a quarterly basis. This information should be used to confirm the fitness of use of water for dust suppression and other uses at the operations.<br>• The water quality information should be used to construct a salt balance for the operations.<br>• Rainfall must be measured daily on site.<br>• The operations should re-use dirty water as far as possible to limit the intake of clean water.<br>The re-use of grey water from the offices and oil separator are examples.<br>• The mine water balance must be updated on an annual basis or if the process units presented in this report changes to ensure that it reflects mine water management accurately and is used as part of the operations' mine water management toolkit. Early planning and quick adaption of the mine water management strategy will be key in ensuring that water is used optimally at the operations. |

**(iii) Description of aspects to be assessed by specialists:**

Most specialist studies are needed in order to investigate the potential environmental impacts associated with the development / mining activities, while other more technical specialists are needed to provide strategies and technical specifications for infrastructure that could potentially alleviate impact the environment.

The baseline environment had already been determined by a site visit, specialist studies and a desktop study. Additional Information will also be obtained should there be any concerns from local communities/ neighbours.

**(iv) Proposed method of assessing the environmental aspects including the proposed method of assessing alternatives:**

The receiving environment will be determined using a combination of on-site observations, spatial information, project description, site layout and previous studies currently available to the EAP. Based on the EAPs knowledge and experience, the receiving environment will include geological features, topography, land use, archaeological and historical sites, surface water, groundwater, terrestrial ecology, air quality, noise, etc.

The identification of potential impacts of the development / mining activity will be based on the legal requirements; the nature of the proposed activity; the nature of the receiving environment; and issues raised during the public participation process. Considering the factors listed above and based on the EAPs knowledge and experience, environmental impacts that could potentially result from the development / mining activities include impacts on air quality, noise, fauna, flora, ground water, terrestrial ecology, heritage resources, socio-economy, aquatic environments, visuals, storm water and erosion.

The consideration of alternatives is a critical component of the EIA process, where an appropriate range of alternatives require consideration whilst achieving the desired objective of the proposed project. To ensure that the proposed project enables sustainable development / mining, a number of feasible options will be explored. The various alternatives in terms of land use, project infrastructure, mining method and proceeding without the developments/ mining operation will be assessed in terms of logistical practicality, environmental acceptability, and economic feasibility. Alternatives for the locality of the development / mining operation will however not form part of this consideration, as the location of the mining site is determined by the geological location of the mineral resource and already disturbed developed areas.

**(v) The proposed method of assessing duration significance:**

The lifetime of the impact will be measured in the context of the lifetime of the proposed phase or activity.

| Weight | Duration of Impact | Explanation of Duration |
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| 1 | Very Short | Less than 1 year |
| 2 | Short | 1 to 5 years |

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| 3 | Medium | 6 to 15 years |
| 4 | Long term (Life of project) | 16 to 50 years |
| 5 | Very Long term | Longer than 50 years |
| 6 | Permanent | Permanent |

- **Short term**
  The impact will either disappear with mitigation or will be mitigated through natural process in a short time period.
- **Medium term**
  The impact will last up to the end of the development / mining period, where after it will be entirely negated.
- **Long term**
  The impact will continue or last for the entire operational life of the mine but will be mitigated by direct human action or by natural processes thereafter.
- **Permanent**
  The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

**(vi) The stages at which the Competent Authority will be consulted:**

Consultation with the Competent Authority will take place throughout the application process, however more specifically; consultation will take place before submission of the Section 102 (two meetings was attended to with the DMRE) as well as the Scoping Report and again before submission of the EIA/EMPR Report.

**(vii) Particulars of the public participation process with regard to the Impact Assessment process that will conducted:**

**1. Steps to be taken to notify interested and affected parties:**
(These steps must include the steps that will be taken to ensure consultation with the affected parties identified in (h)(ii) herein.)

During the Environmental Impact Assessment Phase, the following will be applicable:

- The draft EIAR will be made available for public review for 30 days. Registered I&APs will be notified of the availability of the draft EIAR. The report will be made available electronically via a downloadable link.
- Copies of the EIAR will be submitted to the stakeholders (SAHRA and the Local Municipality), and government departments (DMRE and DWS) for review.
- A hard copy of the report/s be made available at the Postmasburg Public Library.

All comments received during the environmental impact assessment phase will be included as an Appendix in the Final EIAr to be submitted to the DMRE.

**2. Details of the engagement process to be followed:**
(Describe the process to be undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings and record of such consultation will be required in the EIA at a later stage.)

**The consultation process as described by NEMA for Environmental Authorisation was followed and is still in process. The following steps were already taken:**

The following procedures will be followed:

- An advert will be placed with site notices at the site and at two public places to inform any parties about the application.
  The Scoping Report, EIA and EMP documents will be sent to all registered IAPs and will be made available in public libraries.
- An IAP register will be compiled and regular and ongoing follow-up sessions will be held with the IAPs to monitor those issues raised during the IAP process and that are deemed to be affected by the private siding crossing and roads on the development / mining operation.
- Records will be kept of the complaints and the mitigation measures implemented.

**3. Description of the information to be provided to Interested and Affected Parties:**

(Information to be provided must include the initial site plan and sufficient detail of the intended operation and the typical impacts of each activity, to enable them to assess what impact the activities will have on them or on the use of their land.)

The following information will be provided to IAPs:

- The site plan;
- List of activities to be authorised;
- Scale and extent of activities to be authorised;
- Typical impacts of activities to be authorised;
- The duration of the activity

The following information will be requested from the IAPs:

- To provide information on how they consider that the proposed activities will impact on them or their socio-economic conditions;
- To provide written responses stating their suggestions to mitigate the anticipated impacts of each activity;
- To provide information on current land uses and their location within the area under consideration;
- To provide information on the location of environmental features on site to make proposals as to how and to what standard the impacts on site can be remedied. They will be requested to make written proposals.
- To mitigate the potential impacts on their socio-economic conditions to make proposals as to how the potential impacts on their infrastructure can be managed, avoided or remedied).

Identified interested and/or affected parties were notified of the Amendment application on the Environmental Management Programme (Environmental Authorisation) for the executed existing Mining Right as follows:

- Notices were placed at the Library in Postmasburg, Jimbo's Café and at the site PMG Bishop operational mine as well as at the Paling mine site.
- Notification letters were sent to all identified interested and / or affected parties on 27 June 2023. Attached to each of these letters was a Scoping Report Document, containing information relating to the proposed Section 102 application to add the private siding, railway crossing, service roads and new access road to the existing Environmental Authorisation.
- A newspaper advert will be placed in the 'Kathu Gazette' local newspaper on the 30 June 2023.

Proof of notification is attached as Appendix '3'.

**(viii) Description of the tasks that will be undertaken during the environmental impact assessment process:**

A description of the tasks that would be undertaken during the EIA phase is provided below in Table 6. A preliminary schedule for the EIA phase that aligns with regulatory timeframes is included below.

| Phase | EAP activity | Opportunities for Consultation and Participation | | Schedule |
|---|---|---|---|---|
| | | Competent Authorities | I & APs | |
| Scoping phase | Compile Scoping Report | | | June 2023 |
| | Distribute Scoping Report | DMRE | Review of Scoping Report (30 days), Comments to EAP | 27 June 2023 |
| | I & AP consultations | | | 30 days |
| | Collate and respond to comments and finalise Scoping Report | | | 27 July 2023 |
| Specialist studies | EAP to manage specialist activities and receive inputs for EIA | | | |
| EIA Phase | Compile EIA report | | | |
| | Distribute EIA for review | Provide copy to DMRE for records | Review EIA (30 days). Comments to EAP | |
| | I & AP consultations | | Consultation with I & AP's | |
| | Collate and respond to comments and finalise EIA report | | | |
| Competent authority review and decision making | EIA report to DMRE (106 days from acceptance of Scoping Report). | DMRE Acknowledge Receipt of EIA (10 days) | | |
| | | DMRE Review (107 days) | | |
| | | Environmental Authorization Granted / Refused | | |
| Decision | Notify registered I & APs of decision (within 14 days of date of decision) | | | |
| Appeal Phase | EAP to provide information on appeal process as and when required. | Consultation during processing of appeal if relevant. | Submit appeal in terms of National appeal Regulations, 2014 | 90-day process |

**Determining environmental attributes**

The receiving environment will be determined using a combination of on-site observations, spatial information, project description, site layout and previous studies currently available to the EAP. Based on the EAPs knowledge and experience, the receiving environment will include geological features, topography, land use, archaeological and historical sites, surface water, groundwater, terrestrial ecology, air quality, noise, etc.

**Identification of impacts and risks**

The identification of potential impacts of the development / mining activity will be based on the legal requirements; the nature of the proposed activity; the nature of the receiving environment; and issues raised during the public participation process.
Considering the factors listed above and based on the EAPs knowledge and experience, environmental impacts that could potentially result from the development / mining activities include impacts on air quality, noise, fauna, flora, ground water, surface water, terrestrial ecology, heritage resources, socio-economy, aquatic environments, visuals, stormwater and erosion.

**Consideration of alternatives**

The consideration of alternatives is a critical component of the EIA process, where an appropriate range of alternatives require consideration whilst achieving the desired objective of the development / mining project. In order to ensure that the proposed project enables sustainable development / mining, a number of feasible options will be explored. The various alternatives in terms of land use, project infrastructure, mining method and proceeding without the mining operation will be assessed in terms of logistical practicality, environmental acceptability and economic feasibility.
Alternatives for the locality of the development / mining operation will however not form part of this consideration, as the location of the mining site is determined by the geological location of the mineral resource.

**Process to assess and rank impacts**

Before any assessment can made the following evaluation criteria need to be described.

***Table 7: Explanation of PROBABILITY of impact occurrence***

| Weight | Probability of Impact Occurrence | Explanation of Probability |
|---|---|---|
| 1 | Very Low | <20% sure of particular fact or likelihood of impact occurring |
| 2 | Low | 20 – 39% sure of particular fact or likelihood of impact occurring |
| 3 | Moderate | 40 – 59% sure of particular fact or likelihood of impact occurring |
| 4 | High | 60 – 79% sure of particular fact or likelihood of impact occurring |
| 5 | Very High | 80 – 99% sure of particular fact or likelihood of impact occurring |
| 6 | Definite | 100% sure of particular fact or likelihood of impact occurring |

***Table 8: Explanation of EXTENT of impact***

| Weight | Extent of Impact | Explanation of Extent |
|---|---|---|
| 1 | Site Specific | Direct and Indirect impacts limited to site of impact only |
| 2 | Surrounding Area | Direct and Indirect impacts affecting environmental elements within 2 km of site |
| 3 | Local Municipality | Direct and Indirect impacts affecting environmental elements within the Postmasburg area |
| 4 | Regional/District | Direct and Indirect impacts affecting environmental elements within District (ZF-Mgcawu District) |
| 5 | Provincial | Direct and Indirect impacts affecting environmental elements in the Northern Cape Province |

***Table 9: Explanation of DURATION of impact***

| Weight | Duration of Impact | Explanation of Duration |
|---|---|---|
| 1 | Very Short | Less than 1 year |
| 2 | Short | 1 to 5 years |
| 3 | Medium | 6 to 15 years |
| 4 | Long term (Life of project) | 16 to 50 years |
| 5 | Very Long term | Longer than 50 years |
| 6 | Permanent | Permanent |

***Table 10: Explanation of SEVERITY of the impact***

| Weight | Impact Severity | Explanation of Severity |
|---|---|---|
| 1 | No Impact | There will be no impact at all – not even a very low impact on the system or any of its parts. |
| 2 | Very Low | Impact would be negligible. In the cast of negative impacts, almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple. In the case of positive impacts alternative means would almost all likely to be better, if one or a number of ways, then this means of achieving the benefit. |
| 3 | Low | Impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and/or remedial activity would be either easily achieved or little would be required or both. In the case of positive impacts alternative means for achieving this benefit would be easier, cheaper, more effective, less time-consuming, or some combination of these. |
| 4 | Moderately Severe | Impact would be real but not substantial within the bounds of those which could occur. In the case of negative impacts, mitigation and/or remedial activity would be both feasible and fairly easily possible. In the case of positive impacts other means other means of covering these benefits would be about equal in cost and effort. |
| 5 | High Severance | Impacts of substantial order. In the case of negative impacts, mitigation and/or remedial activity would be feasible but difficult, expensive, time consuming or some combination of these. In the case of positive impacts other means of achieving this benefit would be feasible, but these would be more difficult, expensive, time-consuming or some combination of these. |

| | | |
|---|---|---|
| 6 | Very High Severity | Of the highest order possible within the bounds of impacts which could occur, in the case of negative impacts, there would be no possible mitigation and/or remedial activity to offset the impact at the spatial or time scale for which was predicted. In the case of positive impacts there is no real alternative to achieving the benefit. |

**Methodology used in determining and ranking the nature, severity, consequences, extent, duration and probability of potential environmental impacts and risks**

The criteria used to assess the significance of the impacts are shown in the table below. The limits were defined in relation to development / mining characteristics. Those for probability, intensity/severity and significance are subjective, based on rule-of-thumb and experience. Natural and existing mitigation measures were considered. These natural mitigation measures were defined as natural conditions, conditions inherent in the project design and existing management measures, which alleviate impacts. The significance of the impacts was calculated by using the following formula:

(Severity + Extent + Duration) x Probability weighting

For the impact assessment, the different project activities and associated infrastructure were identified and considered in order to identify and analyse the various possible impacts.

***Table 11***

| SIGNIFICANCE | | | | |
|---|---|---|---|---|
| **Colour Code** | **Significance rating** | **Rating** | **Negative Impact** | **Positive Impact** |
| | Very low | 3 -16 | Acceptable/Not serious | Marginally Positive |
| | Low | 17 - 22 | Acceptable/Not serious | Marginally Positive |
| | Medium-Low | 23 -33 | Acceptable/Not desirable | Moderately Positive |
| | Medium | 34 - 48 | Generally undesirable | Beneficial |
| | Medium-High | 49 - 56 | Generally unacceptable | Important |
| | High | 57 - 70 | Not Acceptable | Important |
| | Very High | 90 - 102 | Totally unacceptable | Critically Important |

**Significance of impacts is defined as follows:**

**Very Low** - Impact would be negligible. Almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple.

**Low** - Impact would have little real effect. Mitigation and/or remedial activity would be either easily achieved or little would be required or both.

**Medium Low**- Impact would be real but not substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be both feasible and fairly easily possible.

**Medium** - Impact would be real but not substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be feasible and possible.

**Medium High**- Impact would be real but could be substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be both feasible and possible but may be difficult and or costly.

**High** - Impacts of substantial order. Mitigation and/or remedial activity would be feasible but difficult, expensive, time consuming or some combination of these.

**Very High** - Of the highest order possible within the bounds of impacts which could occur. There would be no possible mitigation and/or remedial activity to offset the impact at the spatial or time scale for which was predicted.

**(ix) 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:**

Refer to Table 4 & 5 for the mitigation measures.

**(x) Other information required by the Competent Authority:**

**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:-**

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:

**a. Impact on the socio-economic conditions of any directly affected person:**

(Provide the results of investigation, assessment and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected parson including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as Appendix '7' and confirm that the applicable mitigation is reflected in 2.5.3, 2.11.6 and 2.12 herein.)

Construction time for the railway line will be 15 months with 10 permanent and 30 temporary jobs while construction is ongoing.

A public participation process will be undertaken which will include consultation with all adjacent landowners as the developer is the landowner of the farm as well as all other identified and registered Interested and affected parties.

The socio-economic conditions of the local community could be affected in two ways:

- Negative impacts to the welfare of the local farm residents and workers through general nuisance, dust generation, damages to properties and any associated potential safety risks.
- Positive impacts through job creation and local business opportunities.
- The consultation with interested and affected parties is on-going and any issues, concerns or comments will be considered and included in the EIA report and control measures will be presented in the EMP report.

A specialist company has been appointed to conduct a study of the socio-economic impact of the project. The findings of this report will be included in the EIA/EMPR document.

**b. Impact on any national estate referred to in Section 3(2) of the National Heritage Resources Act:**

(Provide the results of investigation, assessment and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in Section 3(2) of the National Heritage Resources Act, 1999 (Act 25 of 1999) with the exception of the national estate contemplated in Section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix '8' and confirm that the applicable mitigation is reflected in 2.5.3, 2.11.6 and 2.12 herein.)

Several ARCHAEOLOGICAL studies were conducted by various specialists. Herewith a summary of the studies that were conducted:

- Pelser, A.J., Lombard, M,. 2013. A Report on the Archaeological Investigation of Stone Age Finds on the Farm Paling 434 Hay

Magisterial District, Near the Postmasburg in the Northern Cape (Appendix 2013B; L);

- Pelser, A.J., Lombard, M., 2013. A Report on the Historical-Archaeological Excavations of Features Dating to the Late 19th/ Early 20th Century on the Farm Paling 434 Hay Magisterial District, Near Postmasburg in the Norhtern Cape (Appendix 2013A: N);
- Pelser, A.J., 2012. A Report on the Historical – Archaeological Investigation and Relocation of known and unknown Burials dating to the Late 19th/ Early 20th Century on the Farm Paling 343 Hay Magisterial District, Near Postmasburg in the Northern Cape (Appendix 2012: I);
- Pelser, A.J., Van Vollenhoven, A.C., 2010. A Report on an Archaeological Impact Assessment (AIA) for proposed mining operations on the Remainder of the Farm Paling 434, Hay Magisterial District Northern Cape (Appendix 2010B J);
- Pelser, A.J., 2010. Heritage impact Assessment Report: Proposed Managanese and Iron Ore Mining Right Application, in respect of the Remainder of the Farm Paling 434, Hay Magisterial District, Northern Cape Province (Appendix 2010A:K)..

Appendix 2010A **K**
This Heritage Impact of Assessment was conducted in lieu of the application for the Mining Right.

The purpose of the Heritage Impact Assessment is to identify and assess features of heritage significance, identify possible impacts and propose management measures to mitigate negative impacts. This information must enable the relevant heritage authority to approve the proposed development as required in terms of Section 38 of the National Heritage Act 25 of 1999.

**The Terms of Reference:**

- To identify and map heritage resources that may be affected directly and indirectly'
- To assess the cultural significance of these heritage resources;
- To assess the impact of the mining on the heritage resources;
- To assess the benefits of conserving these heritage resources in relationship in the socio-economic benefits of the development;
- To provide the public with an opportunity to comment on the heritage aspects of the proposed mining;
- To consider alternatives if heritage resources will be affected in a negative manner;
- To determine methods to mitigate impacts before, during and after construction activities.

The Heritage Impact Assessment (HIA) was conducted as follows:

- Desktop study;
- Field survey in May 2010;
- Verbal information from the former farm owner.

Limitations in the HIA were:

- Unpredictability of buried archaeological remains;
- The occurrence of ancient specularite mine workings came to light during further desktop research after the completion of the field work;
- No historical aerial images were available at the time the field work took place.

Heritage Impacts are categorised as:

- Neutral (no impact);
- Direct or physical impacts;
- Indirect impacts;
- Cumulative impacts.

The impacts can be managed through one or a combination of the following measures:

- Mitigation;
- Avoidance;
- Compensation;
- Enhancement;
- Rehabilitation;
- Interpretation;
- Memorialisation;
- No action;
- Relocation; and
- Alternatives.

**Findings and impact management recommendations**

It was founded that the operations for the mining and iron deposits may impact upon a number heritage resources associated with the site's farming and mining industry. Some of them are of medium to high local significance and should be sampled (Stone Age artefacts), documented (ruin of small structure), preserved (air compressor plant) or relocated (cemetery) before any mining operations can commence. It was further concluded that the nature and significance of what has been found is not of such importance that the proposed mining area should be changed or that an alternative mining area should be considered.

The proposed mining activity is a direct and historical continuation of the mining of the farm's manganese deposits that began in the 1920s and ended in the 1980s.

There are no compelling reasons to delay or prevent the proposed amendment, provided that the recommended mitigation measures are applied as listed below:

- Should any further graves be disturbed, exposed or uncovered during site preparations, these should be immediately reported to an accredited archaeologist, Burial remains should not be disturbed or removed until inspected by an archaeologist;
- The cemetery may be relocated by an archaeologist in accordance with a NHRA Section 36 permit application;
- The ruin should be documented before destruction;
- The archaeologist site P-6 should be sampled for any further artefacts.;
- The homestead area should be cleared and the midden should be excavated before destruction;
- The air compressor plant should be preserved and fenced off with some form of interpretation;
- The sampling of P-6, excavation of P-7 and exhumation of P-3 should be planned and implemented to run concurrent with a search for evidence of specularite mining activities please refer to Figure 21 in study for the location of the sites;
- If significant specularite mining sites are found, one of them should be sampled for any evidence of artefacts, animal bones and other forms of human use of the area, subject to a SAHRA section 35 permit application;
- It is suggested that the new main entrance to the mine may be located at the old weigh-bridge (P-8) which could be a new focal point.

Appendix 2010B: **J**
Archaetnos CC was requested by Cultmatrix Heritage Consultants on behalf of Kai Batla (the then EAP) to conduct an Archaeological Impact Assessment on the remainded of the farm Paling 434.

A number of sites of cultural (archaeological and historical) heritage significance were found in the area, dating to the Stone Age and more recent Historical period. Some of the historical sites are related to past mining activities on Paling. The report gives a discussion of the sites and also gives an indication of the methodology followed. It also indicates how to deal with any archaeological material that may be unearthed during future development acitivites.

The sites are of low to high significance. Mitigation measures to minimise the impact of the development on these sites are put forward in this report. In the event that the mitigation measures have been implemented the development can continue.

**The Terms of Reference:**

- Identify all objects, occurrences and structures of an archaeological or historical nature located in the area of the proposed development.
- Assess the significance of the cultural resources in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value;
- Describe the possible impact of the proposed development on these cultural remains, according to a standard set of conventions;
- Propose suitable mitigation measures to minimise possible negative impacts on the cultural resources;
- Review applicable legislative requirements.

**Conditions and assumptions that have a bearing on the survey and the report:**

- Cultural resources are all non-physical and physical man-made occurrences, as well as natural occurrences associated with human activity;
- The significance of the sites, structures and artefacts is determined by means of their historical, social aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive and the evaluation of any site is done with reference to any number of these aspects;
- Cultural significance is site-specific and relates to the content and context of the site. Sites regarded as having low cultural significance have already been recorded in full and require no further mitigation. Sites with medium cultural significance may or may not require mitigation depending on other factors such as the significance of impact on the site. Sites with a high cultural significance require further mitigations;
- The latitude and longitude of any archaeological or historical site or feature, is to be treated as sensitive information by the developer and should not be disclosed to members of the public;
- All recommendations are made with full cognisanse of the relevant legislation;

- It has to be mentioned that it is almost impossible to locate all the cultural resources in a given area, as it will be very time consuming. Developers should however note that the report should make it clear how to handle any other finds that might be found;
- In this particular case certain areas had a thick grass cover which made archaeological visibility difficult.

**Conclusions and recommendations**

The Archaeological Impact Assessment as part of the Heritage Impact Assessment of the area was conducted successfully. Seven sites, dating from the Stone Age and the more recent historical period, was identified. Dense vegetation made archaeological visibility difficult, and more sites might be present. This includes unmarked and low stone packed graves. Two sites (Site3 – historical graves and Site 7 – farmstead related to Site 3) are deemed as of medium to high significance and because it will be impacted on negatively by the development, a number of mitigation measures will have to be implemented before the mining activities can continue. Mitigation measures that were recommended:

- Site 3 (Historical graves) – Exhumation and relocation of graves. This was completed in 2012;
- Site 7 (possible historical farmstead site related to the graves) – cleaning the area and detailed assessment of the area. A permit from SAHRA will have to be obtained;
- Site 6 (MSA/LSA open-air site: The site should be sampled through mapping and recording of Stone Age material, as well as surface collection of representative material. A SAHRA permit will be required.

From a Cultural Heritage point of view there would be no objection to the development should be the mitigation measures be implemented.

Finally, it should be noted that the subterranean presence of archaeological and/or historical sites, features or artefacts are always a distinct possibility.

Appendix 2012: **I**

In 2010 (Appendix 2010A), an assessment was conducted, whereby a graveyard with eight graves that were identified. It was recommended that the graves be exhumed and relocated after all required legal procedures and processes had been followed. In 2010 a permit was granted under number BG/10/09/003/87 by

SAHRA. Due to the application for the mining right which was not granted at that stage, the projected was halted. The project was only restarted in the beginning of 2012 after the expiry of the permit and an application was made for the renewal of the permit and the work on the graves was undertaken during June 2012.

Initially eight identifiable graves were found in the fenced-in cemetery located close to old manganese mine trenches. Four of these had headstones with legible inscriptions. Some possible other graves inside of and just outside the fenced-off graveyard were also investigated. This was done to ensure that no possible previously unknown graves are left behind at the site and to minimise the liability of PMG. As a result 5 graves with remains were discovered just outside the cemetery.

**The aims of the investigation were:**

- To conduct archival and historical research that focused on obtaining information on the grave site and the individuals buried there;
- The detailed investigation of all burials on the site, including the unknown ones. The investigation included the producing of a basic map of the site indicating the position of each grave;
- To conduct social consultation. This included the placing of notices and advertisements in local and other newspapers, as well as radio announcements and consultation with local residents. No family or descendants responded or could be traced through this process;
- To submit a final report on the results of the archival/ historical research and the physical investigation and relocation of the burials.

**Conclusions and Recommendations**

It was concluded that the archaeological and historical investigation, exhumation and relocation of the historical graves located on the remainder of Paling 434 was completed successfully.

Over and above the eight graves initially identified (one turned out not be a grave), six previously unknown graves were also identified just outside the fenced in cemetery. Thirteen burials were investigated and exhumed. These were relocated to and reburied in the municipal cemetery in Postmasburg.

Four of the graves were identifiable, however it is unsure of whom the other graves belonged to. However it is possible to say that the graves that were fenced in belonged to the identifiable families and the graves that were not fenced in, to labourers on the farm.

With the discovery of previously unknown graves during the site clearance there is a possibility that many similar sites could still be located in the mining area. The vegetation in the area is extremely dense and visibility is very limited. It is therefore possible that sites could have been missed during initial assessments and once site clearance for the purpose of mining related activities commence that more sites will be identified.

There was an indication that there is a grave site with more than hundred graves, it was however not confirmed.

It is recommended that the site be located and assessed during the archaeological excavation work on the historical homestead and midden site in order to determine if this site falls within the mining right areas and then the way forward will have to be determined. It should also be mentioned that there is always the possibility of the accidental uncovering of sites, features or objects during mining activities due to subterranean nature of archaeological or historical sites. This will include human skeletal remains from unmarked graves. When these discoveries are made a specialist should be called in to investigate.

It was concluded that mining operation can commence in the area where the site was located.

Appendix 2013A: **N**
The report focuses on the historical-archaeological excavations near the location of the old homestead on the scatters of historical material. Three excavations were carried out, with two on possible midden areas and one on a stone-packed feature.

The aims of the report were:

- To conduct archival and historical research that focused on obtaining information on the history of the farm and area;
- The recovery of cultural material from both the surface of the site, as well as in the excavations, that could assist with the dating and interpretation of the site;
- To submit a final report on the results of the archival/ historical research and the archaeological investigations to the client and SAHRA.

The methodology that was followed:

- Background archival and historical research – Historical research was undertaken in order to place the site and features within a more clearly identified time-period and set of historical events;
- Mapping and photography – A basic map of the site was produced using a hand-help GPS device. Individual locations of concentrations of cultural material, stone-packed features and the various excavations were plotted. All the features, excavations and individual objects were also photographically documented please refer to Figure 21 in the study;
- Archaeological Excavations – Three excavations were measured out and conducted. Two of these were on concentrations of cultural material, while a third was on a stone-packed feature. All the material recovered from these were analysed and recorded as part of the research process. Cultural material scattered across the surface of the site was also sampled, with the focus being on the collection of identifiable objects, as well as decorated porcelain and other material with maker's names and numbers.

**Conclusions and Recommendations:**

The historical-archaeological excavations of the late 19th/ early 20th century on the site located on the remainder of Paling 434 were completed successfully. It was concluded that the site is going to be impacted on by the proposed manganese mining and therefore the investigations were necessitated.

During the excavations a relatively large amount of Stone Age material was also recovered, as well as from the surface of the site. Based on the expert analysis of these artefacts, dating most of them to the final Later (ceramic) Stone Age, however it is within reason that these artifices could be associated with the European farming phase of settlement here. The best explanation at this stage is that Khoi communities were present here prior to European farmers arriving and that they used to provide labour to these farmers during this time-period.

Further evidence for presence of local communities is the stone packed circular features located on the site. One of these were investigated and both historical material and final Later Stone Age objects were recovered. Most of the so-called European objects were possible to be dated to the late 19th/ early 20th century. This

coincides with the known historical facts placing European farmers and others in the area and on the farm Paling by at least 1881 when the farm was first surveyed. Earlier Stone Age presence in the area is clear, with Middle Stone Age material found on the site and in the wider area, while Early Stone Age material is also present at other locations on Paling.

The archaeological investigation of the site can therefore be declared as successfully completed. When mining operations commence on the farm it should be very clearly noted that more cultural material and features could be uncovered as a result and that such finds should be reported to an archaeologists/ heritage specialist to investigate. The presence of unmarked graves should also be considered.

Appendix 2013B: **L**
The report discusses the results of the Stone Age archaeological investigations on the farm Paling 434, also including an expert analysis of the material is included.

**The aims of the report are:**

- To conduct background Stone Age archaeological research that focused on obtaining information on the Stone Age prehistory of the area, as well as previous Stone Age research conducted on Paling in order to put the sites in an archaeological context;
- The mapping and sampling of representative Stone Age material for analytical purposes in order to provide a date and range for Stone Age presence and activities in the area;
- To submit a final report on the results of the background research and the fieldwork to SAHRA and the client.

**The methodology of the assessment:**

- Background archaeological research – Various searches were consulted for information on the prehistory of the area, as well as n previous research on known Stone Age on Paling and the larger area;
- Mapping and Photographing – Mapping was done using a hand-held GPS device. Individual tools and larger scatters/ concentrations of material were mapped in this fashion, while photographic documentation was also done in the field;
- Sampling of Stone Age material – This was done by walking over the sites that will be impacted by the mining

operations in future. The focus of the sampling was to collect representative materials.

- Expert Analysis – The material collected was analysed and an export report was provided.

**Conclusions and Recommendations:**

Based on the expert analysis of the material (of the 114 tools that were collected) from the open-air Stone Age site it is possible to conclude that Stone Age presence and activity in the area could stretch as far back as nearly 1.5 million years BP, although most of the material belongs to the final Later Stone Age phases, dating to between as recently as 100 years to 4000 years BP. This is confirmed by material recovered by A.J. Pelser (Appendix 2013A: **N**), as well as research conducted in th 1960s by Beaumont et al, at Doornfontein close to this area (as making reference in the said report).

The open air-site identified and other open-air surface sites should not be seen in isolation, but should be interpreted in conjunction with for instance the sites researched by other previously. The cave indicated on the 1881 map of Paling would be related to these sites and would have been utilised by the same groups or individuals that left behind their tools close to the outcrops and streams in the area. The sampling of the Stone Age material during the 2012 fieldwork, and the information obtained as a result, complements the earlier archaeological of the area. However, further archaeological research on the specularite mining in the area and on Paling should be considered seriously as part of a more detailed and regional Stone Age Archaeological Research program.

## (xi) Other matters required in terms of Sections 24(4)(a) and (b) of the Act:

(The EAP managing the application must provide the Competent Authority with details, written proof of an investigation as required by Section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as Appendix '9'.)

There are no viable alternatives as PMG Mining has a Mining right over the property and over which the resources has been proven through drilling activities. There is also an existing TFR over the property from which the siding will be constructed for the transport of the product to the harbour.

**(xii) Undertaking regarding correctness of information:**

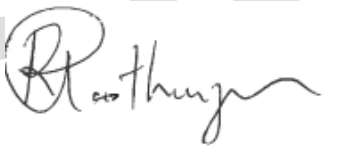
I, RH Oosthuizen, ID number 7004180037082, herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected Parties has been correctly recorded in the report.

Signature of EAP

Date: 27 June 2023

**(xiii) Undertaking regarding level of agreement:**

I, RH Oosthuizen, ID number 7004180037082, herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with Interested and Affected Parties and stakeholders has been correctly recorded and reported herein.



Signature of EAP

Date: 27 June 2023

- **END -**