Technical Report AS-R-2013-08-15

EIA Report as part of the Environmental Impact Assessment process for the proposed construction and operation of Lesego Platinum Mine and associated infrastructure located on the farms Koppieskraal 475 KS, Spelonk 478 KS, Dal Josaphat 461 KS, Olifantspoort 479 KS, Eerste Regt 502 KS, Zaaikloof 480 KS, Stofpoort 481 KS and Government Ground 503 KS, Limpopo Province

August 2013

Prepared for: **Lesego Platinum Mining (Pty) Ltd**

Document version 1.0 – Draft

AGES
Purpose with Passion

Proudly Supporting
TOUCHING AFRICA

Technical report: AS-R-2013-08-15

Prepared by

AGES

Purpose with Passion

Technical Report: AS-R-2013-08-15

EIA Report as part of the Environmental Impact Assessment process for the proposed construction and operation of Lesego Platinum Mine and associated infrastructure located on the farms Koppieskraal 475 KS, Spelonk 478 KS, Dal Josaphat 461 KS, Olifantspoort 479 KS, Eerste Regt 502 KS, Zaaikloof 480 KS, Stofpoort 481 KS and Government Ground 503 KS, Limpopo Province

August 2013

Conducted on behalf of:

Lesego Platinum Mining (Pty) Ltd

Compiled by:

M Grobler (Pr.Sci.Nat; BSc Hons. Conservation Ecology)
C Smith (BHCS Hons. Archaeology)

GAUTENG PROVINCE: Block E, The Village Office Park, 309 Glenwood Road, Faerie Glen, Postnet no 74, Private Bag X07, Arcadia, 0007 Tel: +27-12 751 2160 Fax: +27 (0) 86 607 2406 www.ages-group.com

REPORT DISTRIBUTION LIST

Name	Institution
I&APs	Refer to APPENDIX A 8
Ms. Melinda Rodgers	Limpopo Department of Economic Development, Environment & Tourism
Richard Montjoie	Lesego Platinum Mining (Pty) Ltd

DOCUMENT HISTORY

Report no	Date	Version	Status
AS-R-2013-08-15	15 August 2013	1.0	Draft for comments

DOCUMENT REVIEWED BY

Responsible person	Date	Position	Signature
M Grobler	6 August 2013	BSc Hons – Pr.Sci.Nat Director	

Executive Summary

1. Introduction

Africa Geo-Environmental Services (Pty) Ltd (AGES), was appointed by Lesego Platinum Mining (Pty) Ltd to facilitate the Scoping and Environmental Impact Assessment (EIA) Process in accordance with the National Environmental Management Act, (Act 107 of 1998) for the proposed mining activities on the farms Koppieskraal 475 KS, Spelonk 478 KS, Dal Josaphat 461 KS, Olifantspoort 479 KS, Eerste Regt 502 KS, Government Ground 503 KS, Zaaikloof 480 KS and Stofpoort 481 KS, Limpopo Province.

The proposed site is located next to the Phosiri dome, also known as the Zaaikloof or Fortdraai dome, in the Limpopo Province of South Africa and is approximately 240 km north east of Johannesburg and 65 km North west of Burgersfort. The proposed site is located between the local settlements of Mphahlele and Ga-Mankopane, near Lebowakgomo in the Limpopo Province. The proposed site covers an area of roughly 73 km², measuring approximately 11 km from south to north as well as east to west. General coordinates for the underground mine are:

Latitude: S -24°23'14.61"

Longitude: E 29°44'14.44"

2. Approach and Legal Framework

Lesego Platinum Mining (Pty)(Ltd submitted the environmental authorisation application in terms of section 24 of the National Environmental Management Act (NEMA) 10th of April 2012 to the Limpopo Department of Economic Development, Environment and Tourism (LEDET). Acknowledgement of receipt of the application was received from LEDET on the 26th of April 2012 and the reference number 12/1/9/2-C17 was subsequently issued.

A draft Scoping Report (SR) was compiled and submitted to the registered Interested and Affected Parties (I&APs) for review (4 January 2013 till 12 February 2013), thereafter it was submitted to the LEDET (4th of January 2013). The department acknowledged receipt of the draft Scoping Report on the 25th of January 2013. The final Scoping Report was submitted to the I&APs for review (13 March 2013 till 26 April 2013), and thereafter submitted to LEDET (13 March 2013). Additional copies of the final SR were submitted to LEDET on the 9th of April 2013. The department responded to the application by accepting the Scoping Report on 20th of May 2013 (see APPENDIX B). Thereafter AGES was instructed to facilitate the Specialist Studies and Environmental Impact Assessment Phase.

The following permitting and or license requirements are applicable to the proposed project:

- Water Use License

As is set out herein above, various water uses associated with the project will require water use licensing in terms of section 22 of the National Water Act (NWA). Section 21 of the NWA contains those water uses that are to be registered and licensed in accordance with the legal obligations contained in the NWA. These uses are in the process of being applied for through an application for an Integrated Water Use Licence (IWUL) by AGES.

- Atmospheric Emissions Licence

Currently there are no listed activities that require registration/permitting according to National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004) for the proposed mine.

- Noise Legislation

Noise measurements were carried out in accordance with South African National Standards - Code of practice, SANS 10103:2008, The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication and as required by the regulations of the Department of Water and Environmental Affairs (previously DEAT). No. R. 154. Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989). Govt. Gaz. No. 13717, 10 January 1992, i.e. Gauteng province, Department of Agriculture, Conservation and Environment, Notice 5479 of 1999. Noise control regulations, 1999, Provincial gazette extraordinary, 20 August 1999. No further permitting relating to noise will be conducted, but the noise impacts have been assessed and mitigated for.

- Waste Permit - NEMWA

The waste management activities as listed in GN 718 of 3 July 2009 which may be applicable to the proposed mining operations and for which a waste management license is required have been assessed. The waste application is being conducted as part of the EIA submitted to LEDET.

- Heritage Permit – Section 36 of NHRA

A permit in terms of the NHRA will be required for the alteration or demolishment of structures which are older than 60 years. Some historic homestead and graves occur on site, therefore should this site be developed, the appropriate permitting process by a qualified archaeologist must be conducted as highlighted above.

- Protected Tree Removal – Section 15 of NFA

It is expected that the project will involve the cutting, disturbing, damaging or destroying of protected trees declared in terms of section 12 of the NFA, therefore a licence in terms of section 15 of the NFA might be required as part of the EIA. However the presence of these trees must be verified after receipt of the Record of Decision (ROD) in order to confirm their presence.

Supporting Studies

Various specialist studies have been conducted in support of the Environmental Authorization requirements that assisted in the compilation of this Report, these included:

- Ecological Assessment (AGES)
- Heritage Impact Assessment (AGES)
- Geohydrological and Surface Water Impact Assessment (AGES)
- Wetland Delineation and Aquatic Assessment (SAS)
- Soils and land use capability (Terrasoil)
- Noise Impact Assessment (Menco)
- Air Quality Impact Assessment (Airshed)
- Social Impact Assessment (Ptersa)
- Economic Impact Assessment (Strategy4Good)
- Health Impact Assessment (Envirosim)
- Visual Impact Assessment (Newtown Landscape Architects)

- Traffic Impact Assessment (Havenga Transportation Engineers)
- Stormwater Management Plan & Floodline Delineation (AES)
- Mine Closure and Rehabilitation plan (AGES)

3. Project Description

The proposed project will involve platinum mining activities and related infrastructure. The resource battery limit of the identified platinum resources is below 350 m below ground surface. The ore body underlying the site consists of Merensky as well as UG2 reefs within the Bushveld Igneous Complex. Roughly 200 ktpm Merensky reef and 100 ktpm UG2 reef will be mined with 50 ktpm development waste.

The ore body's orientation and depth dictates that the initial primary access would be via a twin vertical shaft system from surface that would service sub decline systems developed for each reef horizon. Continued future access for the later stages of the life of mine would be facilitated by an additional vertical and sub decline network. The two vertical shafts from surface consists of a main shaft of 11 m diameter (Number 1 Shaft) sunk to depth of 1700 m and a ventilation shaft of 9 m diameter (Number 2 shaft), sunk to a depth of 1650 m. The mineral resources included in this study are extensive, giving an overall life of mine in excess of 60 years. Envisaged infrastructure will comprise of the following:

- A tailings disposal facility (TDF);
- A processing plant and associated infrastructure;
- Offices and workshops;
- Water management and distribution infrastructure;
- A 132 kV electricity lines;
- Diesel storage facilities;
- Sewage treatment plant;
- Water treatment plant;
- Haul and access roads and bridges
- Perimeter and internal fencing;
- Waste rock dumps; and
- Topsoil stockpiles.

Water supply: The average make-up water use would be 10 150 m^3/d (117.5 ℓ/s) for mining, plant and potable water requirements. In the first phase of an exploration exercise, 10 boreholes were identified, drilled and tested to form the basis of the Phase 1 water supply network to the mine. The total sustainable makeup water from 7 boreholes is 38.3 l/s (3.3 Ml/day) and there is 5 l/s (432 Kl/d) available from BH LWSBH2 for potable water. This quantity of water will satisfy approximately 33% of the requirement for the peak consumption at the mine which is only required after 2024, but is sufficient for the construction and ramp up phases. It is recommended that the exploration process to confirm and develop a source to fulfil in the total demand of the mine should continue. In addition, cognisance should be taken of surface water developments in the area, as well as water from underground ingress from fissures.

4. Public Participation

The public consultation was conducted as per the NEMA requirements. Specific focus was paid to residents in close proximity to the development (adjacent land owners), tribal authorities (Mphahlele, Baroka Ba Nkwana and Nchabaleng), local authorities (municipalities), and the relevant governmental institutions. Preliminary key issues include:

- Ecological Impact
    - Guarantee of rehabilitation of the area after mining
- Groundwater Impact
- Surface water Impact
    - Impact of contaminated water on the Olifants River
    - Control of contaminated water
- Air Pollution
- Heritage Impact
    - Impact on graves and old buildings
    - Respect for cultural sites
    - Preservation of graves
- Socio-economic impacts
    - Communication and interaction with local community

  - Job creation, social investment, health, safety and security
  - Outsourcing of non-core business to local community
  - Skill training for local community
  - Sustainable development projects
  - Request for assistance with community projects
  - Access to the Social Labour Plan (SLP)
- Change of land use

The key issues have been assessed and mitigation measures proposed as part of this EIR.

5. Baseline description of the affected environment

- The site is situated along the eastern slopes of the Phosiri dome, which rises approximately 950 m above mean sea level (mamsl) reaching a maximum height of 1,112 mamsl. The regional topography of the study area can generally be classified as low mountainous terrain often forming deep valleys and a gorge where the Olifants River cuts through the mountainous area.

- The agricultural potential is classified as low due to soil and climate constraints and is utilised mainly for extensive grazing purposes.

- The proposed site falls within the Savanna biome which is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). According to Mucina & Rutherford (2005) the site is further classified as Ohrigstad Mountain Bushveld as well as Sekhukhune Plains Bushveld. Five red data species potentially occur in the study area, however, only one red data species was found to occur in the study area during the survey, namely *Adenia fruticosa.* The following protected tree species potentially occur in the area, namely *Combretum imberbe, Boscia albitrunca, Sclerocarya birrea*.

- Red data faunal species which might potentially occur on site, has a low probability of occurrence, due to degraded natural areas caused by crop cultivation and associated human activities. The degraded areas and eroded thicket found on site earmarked for development is not suitable for red data fauna species and only supports general fauna such as birds, small antelope and rodent species (Henning; 2011). None of the red data species which potentially occur within the area were found within the footprint of the mining development site during the ecological survey.

- The site falls within the Eastern Bankenveld and the Bushveld Basin Aquatic Ecoregion, which can be considered to contain high aquatic biodiversity and a sensitive aquatic community (Van Staden; 2011). The wetland ecosystem type is Central Bushveld. Data obtained from the aquatic ecological survey indicated that the aquatic ecology of the area is considered to be in a fair ecological state; however the Olifants River system has limited diversity, due to a lack of habitat caused by severe erosion.
- The study area is located within the Olifants Water Management Area and falls within the Middle Olifants sub-water management unit. The site falls mainly within the Quaternary surface water catchment B52E, with parts of the site situated within B52D and B52B quaternary surface water catchments. The major perennial system occurring on site is the Olifants River, which transects the site mainly in a north easterly direction. Other surface water features on site includes the Mohlaletsi and Pelangwe Rivers, which are perennial tributaries of the Olifants River. Due to the mountainous terrain on certain areas of the site, there are also numerous non-perennial drainage lines flowing after good rains.
- Three types of wetland systems were identified for the site; namely the larger perennial system (Olifants River), smaller perennial systems (e.g. Pelangwe and Mohlaletsi Rivers) and non-perennial systems. These wetland areas and associated riparian vegetation are severely disturbed due to anthropogenic impacts, most notably over-grazing. Wetlands are ecologically important as they serve as water sponges which assist in purifying water, and act as buffers to control flooding during high rainfall events. Therefore, these areas have a high conservation status and should be conserved, with no development being allowed in these areas.
- For hydrogeological purposes, the geophysical data indicated sixteen potential drilling positions to be explored by drilling, of which four targets were drilled to a depth of 80 m as site characterisation boreholes, with the additional purpose of being used as ground water monitoring boreholes once mining activities commence. Samples taken from drilled boreholes were sent for analysis, which indicated that the overall quality of these water sources is poor. The geophysical

study indicated the study area has groundwater potential, which should be investigated in more detail during the EIA phase.

- The site characterisation drilling executed on the footprint of the TDF indicated high yielding boreholes i.e. 5 – 20 ℓ/s of poor water quality. According to Parsons (1995) and DWA (1998), this constitutes a minor aquifer. A detailed water monitoring programme should be implemented to measure and mitigate any potential negative influences on the environment due to the proposed mining activities and associated infrastructure.

- The mine should be designed with mine dewatering as a mitigation measure, with the mine design based on an effective dewatering design that allows for pre-depressurization (below 1 bar or 10 m head) of aquifer zones, regardless of the flow rate. The mine water inflow should also be mitigated with cover drilling in order to allow the pressure head in permeable or fracture zones to drop before development through these zones take place or an approach of sealing (grouting etc.) of fractures could be adopted. Although packer testing was conducted, additional deep double packer testing should be conducted at mining depths to assess the possible discrete flows associated with the mine dewatering.

- The study area has a rural character in terms of the background ambient sound levels. Increased noise levels are directly linked with the various activities associated with the construction of the proposed mine and related infrastructure, as well as the operational phase of the activity.

- The site is situated within a rural area utilised for subsistence farming and rural settlements. The proposed Project will result in changes in the baseline environment that will cause visual impacts such as depreciation of the landscape character, the views of the visually valuable northern mountainous area being obscured by Project components, the negative effects of the mining activities on air quality that contribute cumulatively to visibility and the altering of the sense of place of the area (Young; 2012).

- The nearest sensitive receptors (in terms of human settlements) to the proposed Lesego Platinum Mine site are Mabokotswane, Malogeng, Dal Josaphat, Phosiri, Ga-Nkoana and Apel. Without mitigation in place the proposed Lesego Platinum Mine operations are likely to result in high PM2.5, PM10 GLCs outside the mine boundary and at the settlements nearby and slightly elevated NO2 and DPM GLCs and dust fallout outside the mine boundary and at the settlements nearby.

With mitigation, the PM2.5, PM10 impacts reduce significantly but still do not comply with the NAAQS at some of the sensitive receptors and off-site. It is likely that if the suggested additional mitigation measures be implemented there will be compliance off-site and at all sensitive receptors.

- Family cemeteries as well as possible unmarked graves were identified within study area 1, where the tailings disposal facility is proposed, as well as study area 3, where the plant is proposed. During the follow-up assessment, which covered the larger footprint of the tailings disposal facility and incorporated both study area 1 and study area 3, an additional 26 graves were identified on the property. Although the various ruined homesteads identified across the site are of low significance, a demolishment permit will still have to be obtained from the relevant heritage resources authority before such homesteads can be demolished.
- There are a number of different groups in the social environment that may be affected by the proposed mining activities:
  - Adjacent landowners
  - People in surrounding towns and settlements
  - Municipalities and technical groups
- Only 21.4% of Lepelle-Nkumpi Local Municipality's population is employed with 15.6% without any work. Fetakgomo Local Municipality's population has an unemployment figure of 19.8% with 12.4% being employed.

- The mining industry is a large contributor to employment within the area, with approximately a third of employed individuals within Fetakgomo Local Municipality being employed within the mining and quarrying sector.

Sensitive landscapes

Sensitive features that have been identified through the related specialist studies include:

- Archaeological features;

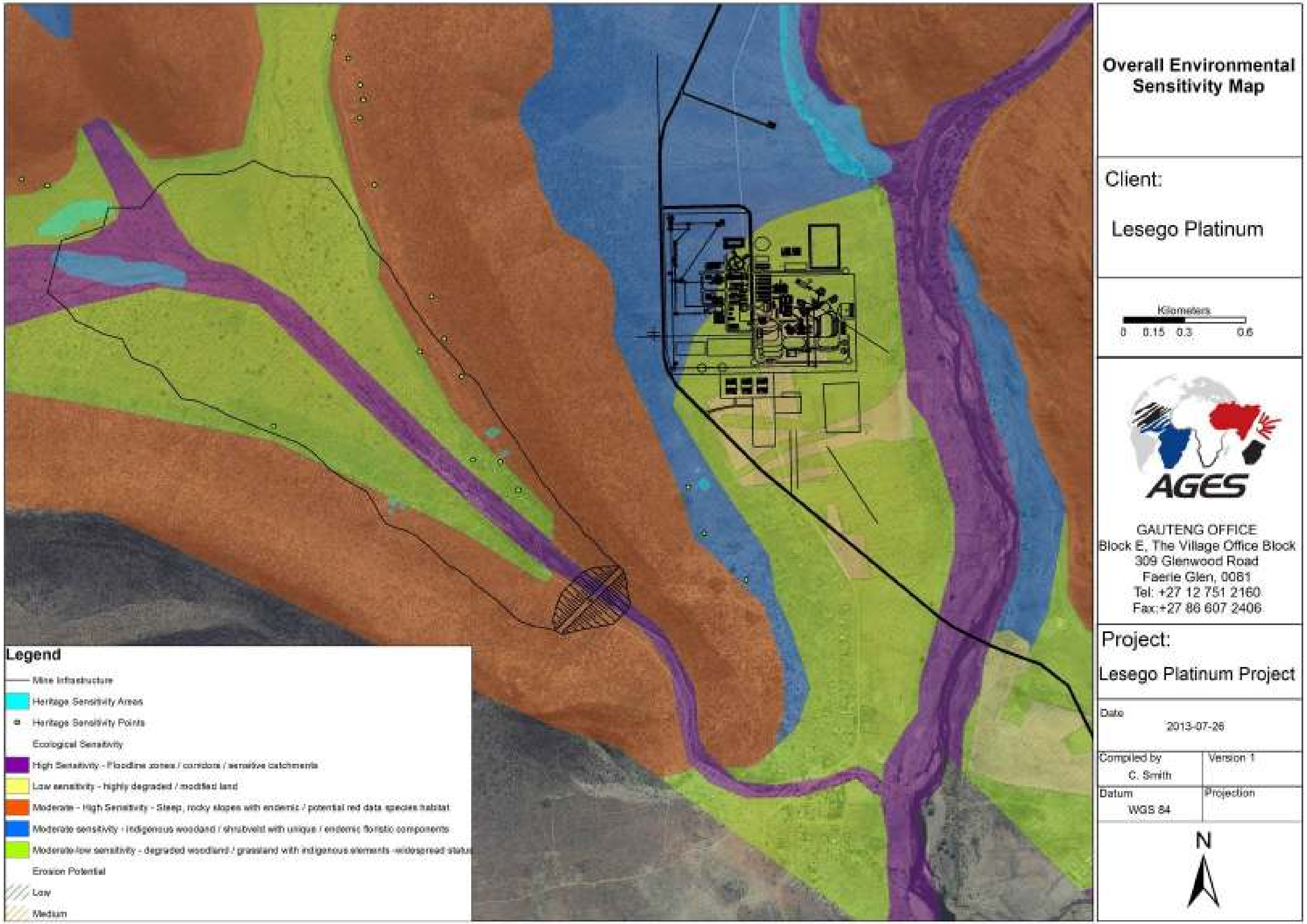
- Local Communities;

- Soil and Land use Potential zones

- Ecological Sensitive areas; and

- Surface Water features.

These sensitive landscapes are illustrated below.


Overall Environmental Sensitivity Map
Client:
Lesego Platinum
Kilometers
0 0.15 0.3 0.6
AGES
GAUTENG OFFICE
Block E, The Village Office Block
309 Glenwood Road
Faerie Glen, 0081
Tel: +27 12 751 2160
Fax:+27 86 607 2406
Project:
Lesego Platinum Project
Date
2013-07-26
Compiled by
C. Smith
Version 1
Datum
WGS 84
Projection
N
Legend
Mine Infrastructure
Heritage Sensitivity Areas
Heritage Sensitivity Points
Ecological Sensitivity
High Sensitivity - Floodline zones / corridors / sensitive catchments
Low sensitivity - highly degraded / modified land
Moderate - High Sensitivity - Steep, rocky slopes with endemic / potential red data species habitat
Moderate sensitivity - indigenous woodland / shrubveld with unique / endemic floristic components
Moderate-low sensitivity - degraded woodland / grassland with indigenous elements -widespread
Erosion Potential
Low
Medium

6. Alternatives

In the case of the proposed development, possible alternatives were identified through discussions with authorities, discussions with I & AP's (focus group meetings), reviewing of existing environmental data, specialist inputs/studies and the design team. Alternatives relevant to this development can be categorized into the following:

- **Location alternatives**
  - Location of tailings disposal facility; and
  - Location of shaft/vent.
- **Layout alternatives**
  - Layout of Waste Rock Dumps
  - Layout of the Plant
- **Service alternatives**
  - Water provision;
  - Energy alternatives;
  - Access alternatives; and
  - Waste disposal.
- **Technology Alternatives**
  - TDF Construction Alternatives
- The "no-go" alternative
  - Assessed per environmental aspect/area

7. Impact Assessment

This report provides a detailed assessment of the predicted environmental impacts on specific components of the social and biophysical environment as a result of the proposed project.

Ecological Impact

The proposed site for the development does not occur in a unique vegetation entity on the lower lying plains in relation to the larger surrounding landscape, although the vegetation associated with the mountainous areas and the Olifants River are sensitive entities that provide valuable habitat features for a large variety of flora and fauna. Extensive efforts have been made to optimize the placement of infrastructural elements as to ensure that the impact on the ecosystem functioning will be minimal, further supported by rehabilitation measures that must be implemented correctly through the development of a rehabilitation plan for the site.

Provided that the proposed mining area is consistent with the sensitivity map and take all the mitigation measures into consideration stipulated in the Ecological Assessment Report and the EMP (to be submitted with the EIR and EMPr), the planned mining development can be supported. Permits for the removal of protected tree species will need to be applied for before construction commences and after the ROD has been issued. Only one red data species was found during the survey, namely Adenia fruticosa. As the layout plan would not impede into the species' habitat, no further action is necessary, however financial allowance has been made for an Environmental Control Officer and Biodiversity monitoring in order to verify this on-site.

Aquatic Impact

The water quality in this segment of the Olifants River is generally considered adequate for supporting the aquatic ecology of the area. From the results of the aquatic assessment it is evident that most of the impacts can be considered to be of moderate significance prior to mitigation with only the impact on instream flow and impact on rare and endemic species being low. After mitigation, all impacts can be considered negligible since all the envisaged impacts are deemed to be relatively easily mitigated to levels which are acceptable. It is however of importance to note that the envisaged reduction on impacts is dependent on good levels of mitigation being undertaken in line with best practice protocols. It is recommended that the mine implement an aquatic biodiversity offset through the construction of a fishway at the Lebalelo off take weir in order to improve the continuity of the Olifants River in this area. This will significantly aid in minimising impacts on the aquatic ecology of the area and will offset some of the potential impacts that the mine may have on the Olifants River system.

Based on the findings it is the opinion of the aquatic ecologist that from an aquatic ecological point of view that the proposed mining project be considered favourably provided that the mitigatory measures as presented in the aquatic assessment are adhered to.

Wetland Impact

Three types of wetland systems, namely the larger perennial system (Olifants River), smaller perennial systems (e.g. Pelangwe and Mohlaletsi Rivers) and numerous non-perennial systems, were identified within the mine lease area. The Olifants River is the major perennial system located within the subject property. All systems have been fragmented by current and historic community development and agricultural activities.

The Olifants River had a moderately high ecological function and service provision and is one of the major and important riparian systems in the area. And therefore has a very high conservation value. The smaller perennial systems have an intermediate ecological function and service provision, and are important in terms of flood attenuation by reducing floods and damages from floods. The non-perennial systems have a moderately low ecological function and service provision.

After conclusion of the wetland biodiversity assessment, it is the opinion of the wetland ecologists that the proposed mine development be considered favourably, provided that the recommendations as contained in the wetland assessment are adhered to. The riparian zones have been adequately protected through the exclusion of development within the floodlines.

Soil and Land use

The soils found on the site are predominantly sandy and susceptible to erosion. The land use is limited to mainly extensive grazing and subsistence agriculture due to climatic and soil constraints. The main risks in the area are related to erosion and the negative impact on subsistence agriculture. The agricultural potential of this area is very low due to the shallow soils as well as the generally low and erratic nature of the rainfall in the area. Post mining agricultural potential depends to a very large extent on the rehabilitation.

Water Impact

- Site Characterisation

A hydrocensus within a radius of 5 km from the site was conducted during May 2011 and an updated hydrocensus within a radius of 10 km during May 2012. 51 sites were recorded, of which 26 boreholes are located within the communities surrounding the proposed project area. A total of 35% of the 51 boreholes recorded during the hydrocensus are in use, the remaining 65% of boreholes are not in use. The average water level measured during the hydrocensus was 9.47 mbgl with a minimum measured in BH 9 of 1.53 mbgl and a maximum of 27.69 mbgl in H01-2722.

Seven water supply exploration boreholes were drilled as initial investigation to evaluate the groundwater resources of the regional area as a viable water supply option. Two groundwater types were identified in the project area. A sulphate rich type to the west of the Olifants River and a relatively sulphate poor type to the east of the Olifants river. As such, two baselines were developed for the project area. Both baselines were classed as dangerous for domestic usage.

Isotope analyses concluded that based on chemical results a clear difference exists between the Olifants River and groundwater. No inflow of river water occurred into the groundwater abstracted during the pump testing. This may however change with time if abstraction continues and river water enters the aquifer.

- Environmental Site Water Balance

An environmental site water balance was compiled. The average make-up water use would be 10 352 m^3/d (119.8 ℓ/s) for mining, plant and potable water requirements, which represents 1.04 m^3/ton milled. The potable component would be 615 m^3/d, and the drinking water component would be 15 m^3/d.

- Groundwater Balance

A groundwater balance concluded that sufficient recharge to groundwater regime exists therefore making it a viable option for future expansion.

- Groundwater Flow Modelling

A numerical groundwater flow model was developed for the sub catchment using the modelling package Feflow 5.4. The model domain measured 728.88 km^2 in surface area. The groundwater flow direction shows that the hydraulic gradient is from the topographical high in the south towards the Crocodile River in the North West.

A conservative approach based on the precautionary principle was followed in the simulations. The dykes were assumed to be permeable and the faults younger than the dykes. This results in a larger radius of influence; however, once data becomes available, the model should be updated and re-calibrated accordingly

- Mine Dewatering

Simulated mine dewatering reaches a maximum of 85 ℓ/s (7344 m^3/d). Evaporation losses in the underground mine can significantly reduce this volume by up to 50 %.

- Contaminant Transport

The contaminant transport was simulated with the combined mine dewatering and water supply to model maximum impacts.

The maximum sulphate parameter simulated during the geochemical assessment possibly leaching from the TDF is 2400 mg/ℓ. Both point sources i.e. the TDF and WRD were simulated to increase linearly from the baseline concentrations of 1000 mg/ℓ for sulphates to the maximum full assigned i.e. 2400 mgℓ/

The underground mine acts as a sink in the numerical flow model and induces a hydraulic head gradient towards the underground mine. This will cause seepage to travel along this head gradient towards the underground mine. The weathered aquifer could act completely different with hydraulic gradients in the opposite direction. Thus shallow and deep boreholes should be drilled around the WRD to assess the potential for seepage in all directions.

- Waste rock dump and leachate characterisation

Groundwater and leachate mixing was modelled in order to determine the effect the leachate may have on the composition and quality of groundwater. The modelling results indicated that the groundwater composition after mixing of the leachate with the groundwater to the east of the Olifants River was only marginally affected. Elevated sulphate, calcium, chromium and aluminium concentrations above baseline values are an indicator that these elements may be potential contaminants on the system and must be monitored. The groundwater to the west of the Olifants river is of such poor quality that the addition of the leachate in a 1:10 ratio caused dilution and hence improvement of the water quality.

Model uncertainties were evaluated and of most significance is the control sulphide minerals have on the system. An increase in sulphur of less than 1 wt. % S cannot effectively be buffered through silicate weathering in this system. The resultant leachate will be of acidic nature opposed to a neutral/alkali composition. Low pH values will allow for the mobilisation of metals which may potentially further degrade surface and groundwater systems.

Stormwater Management

This study and all supporting clean and dirty water management structures was designed in accordance with section 6 of the GN704 and costed for accordingly.

Further hereto, continuous ground and surface water monitoring would ensure the sustained water management on-site during and post operations.

Air Quality Impact

Without mitigation in place the proposed operations are likely to result in high PM2.5, PM10 GLCs outside the mine boundary and at the settlements nearby and slightly elevated NO2 and DPM GLCs and dust fallout outside the mine boundary and at the settlements nearby. With mitigation, the PM2.5, PM10 impacts reduce significantly but still do not comply with the NAAQS at some of the sensitive receptors and off-site.

The reason for this is that the annual baseline concentration used in determining the cumulative concentrations is high and exceeds the NAAQS. The baseline concentration used was obtained from model results and is for Limpopo which is more than 50 km away from the site. This means the concentration may not be representative of the baseline ambient PM10 concentrations on site. Baseline air quality monitoring should be conducted to establish an accurate ambient baseline for the project area. This could reduce the modelled PM10 concentrations and the possible air quality impact.

It is likely that if the suggested recommendations are implemented that there will be compliance off-site and at all sensitive receptors.

Heritage Impact

Stone Age material dating to all periods of the Stone Age occurs within the study area. Of the identified sites, only SA01 will be impacted upon by the proposed mining development.

A large number of sites dating to the Earlier and Later Iron Age occur within the project boundary. These sites range from medium to high heritage priority. The mining development does not adversely or positively affect the heritage resources at these sites and therefore the impact is considered to be none.

Sites dating to the Historical / Colonial Period in the project site relate to ruined farmsteads, stone wall enclosures and middens. The sites are generally of medium-low significance due to poor preservation. Site HP06 is located close to or within the proposed mine development margins and may potentially be damaged or lost.

Twenty-six graves were identified in the project area. Small cemeteries and graves in the study area outside of proposed mine development zones are of heritage priority and carries high significance ratings. However, since the sites are away from the proposed mine, the impact by the proposed activity is considered to be none. A number of burials and cemeteries will be directly impacted upon by the construction of the TDF and WRD and will need to be fenced off or relocated.

A careful watching brief monitoring process is recommended for all stages of construction and infrastructure development, as well as a Phase 2 Archaeological Impact Assessment and Palaeontological Impact Assessment

Social Impact

The proposed Lesego Mine will be situated in an area that is in dire need of economic development. It is an area of little economic opportunity, high levels of unemployment and severe poverty. The mine will change this environment dramatically. It is undeniable that this change will cause major social impacts, both positive and negative. During the life of mine the mine will provide an entire generation with new opportunities to escape the poverty cycle.

The nature and scale of the potential positive impacts associated with the mine is significant, and if managed and mitigated correctly, it would assist the government towards achieving some of the Millennium Development Goals, especially in the Limpopo Province.

Although there will be negative social impacts, it can be mitigated. In the light of the findings of the SIA and the potential positive impacts associated with the mine, it is recommended that the mine proceed. It is also proposed to conduct a Socio-economic assessment as part of the Mining Right Application in order to better determine the economic benefits of the proposed project.

Health Impact

Based on the estimated increase in the personal risks associated with exposure to criteria pollutants, it is concluded that the increase in risk of all health endpoints assessed increases significantly at the Nkotokwane receptor location, if exposure should occur as modelled. This increase is shown to occur irrespective of the access route alternative. Other receptor locations also indicate increase in the personal risk of mortality associated with particulate and NO_2 exposure, but the increases are not significant. Mitigation of dust emissions significantly reduces the estimated risks associated with particulates for the Nkotokwane receptor location, for both the north and south routes.

Based on the modelled air pollutant concentrations and the results presented above it can be concluded that the northern access route is preferable to the southern access as the potential for health effects associated with the northern route is less significant.

Exposure to DPM was evaluated for both access route alternatives, assuming long-term chronic exposure. The hazard quotients calculated indicate that for either alternative the probability of non-cancer health effects occurring at any of the receptor locations as a result of DPM exposure is low.

It was concluded that the potential for health effects associated with potential contamination of groundwater would have insignificant effect on human health risks in the study area. It has to be noted that the assessment of contaminants in groundwater was based on simple dilution factors that illustrate the effect the addition of contaminates in leachate from only one source may have on concentrations in groundwater.

Visual Impact

The visual impact of the proposed mine development will be intrusive to the area and this is mainly due to the fact that the dominant land use in the area is rural residential and the mine will not blend into this environment. The Plant, TDF and Waste Rock Dumps will be positioned within the valley area to the northeast of the Phosiri Dome while the TDF is nestled in the valley created by the converging hills. The project structures are tall and this, together with the position of the structures, results in a high visibility for the proposed Project. The intensity of the visual impact of the proposed Project would be moderate for the construction and decommissioning phase but high for the operational phase.

The significance of the visual impact during the construction and operational phases will be high. The visual impact would be mitigated to moderate for the majority of the elements with some remaining high assuming that mitigation measures as described in this report and other specialist reports is adequately implemented. This is mainly due to the magnitude/ footprint of the proposed plant and TDF as well as the fact that the project will be in the foreground of the sensitive viewers.

Noise Impact

The noise assessment indicated that there is a noise impact of negligible significance during the construction and daytime operational phase, and a noise impact of low significance at night during the operational phase. Mitigation measures were proposed that would reduce the noise levels as experienced by the closest noise-sensitive developments, with the magnitude of the reduction depending on the selection of the mitigation measures.

Traffic Impact

There are currently no surfaced roads up to the proposed surface infrastructure of the site. In order to obtain access to the mine, new roads will have to be constructed and sections of existing roads upgraded. At this stage there is still uncertainty about where the product will go, and two road transport options were modelled in the traffic assessment: one taking product to the Anglo Platinum Smelter close to Polokwane and the other to a smelter in Rustenburg.

The product that will be transported will be in a concentred form and 8 to 10 x 30-ton truck loads are expected per day, 5 days per week. The traffic assessment concluded that there is capacity to accommodate the additional 8 to 10 truck trips per day during the week. Furthermore, from a traffic flow point of view the proposed mine can be supported.

Floodline Impact

All mine infrastructures are situated outside the 1:100 year floodline and designed in accordance with GN 704 in terms of the required clean and dirty water management structures.

Mine Closure & Rehabilitation

Based on the calculations of the financial provision for closure for the mining operation proposed for the Lesego Platinum Mine Project, the following conclusions can be made:

- Immediate Closure Liability
  - In the event of an immediate ‘lights-out’ closure event at the end of the first year of operations, the total financial provision required to successfully rehabilitate the mine is R 22 383m;
- Life-of-Mine Closure Liability
  - Final LOM closure liability, without any progressive rehabilitation actions is estimated to be R 215 756m;

- R 10 664m of the final LOM liability is to be planned for during the operational phase of the mine at a rate of R0.62 per ton of material processed; and
- R 205 091m will be required for the rehabilitation, closure and aftercare in the case of successful progressive rehabilitation during the operational phase.

Economic Impact

8. Cumulative Impacts

The anticipated impacts resulting from the construction and operation of the mine could potentially result in cumulative effects in the following areas:

- Air quality;
- Visual impact;
- Ecological Impact; and
- Social impact.

9. Closing Statement

The cumulative impacts will be further assessed as part of the EIR/EMPR phase in order to integrate the specialist findings with the views from the extended public participation process to follow.

The findings of the specialist studies undertaken within this EIA provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that provided that the recommended mitigation and management measures are implemented there are no environmental fatal flaws that should prevent the proposed project from proceeding.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA and EMP will form part of the contract with the contractors appointed to construct and maintain the proposed plant and associated infrastructure. The EIA and EMP would be used to ensure compliance with environmental specifications and management measures. The implementation of this EIA and EMP for key cycle phases (i.e. construction and operation) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

8. Way Forward

1. Draft EIR and EMPr published. This draft EIR and the EMPr will be circulated to registered interested and affected parties for comment for a period of 30 days. Notifications of the availability of the reports and the venues at which the full EIR will be available for reviewing will distributed to all registered interested and affected parties.

2. Comments Report. Comments on the Draft EIR and EMPr will be synthesised by the project team into a comments report, which will be appended to the final Report.

3. Revise draft EIR and EMPr. This draft report will be updated by addressing and responding to the issues raised during the review period by I&APs. Responses from the proponent to key issues will also be included.

4. Final EIR and EMPR. The revised final report will be published with the various specialist reports appended. This will be submitted to the Limpopo Department of Environment and Economic Development (LEDET) and made available for review by I&APs.

LIST OF ABBREVIATIONS

Abbreviation	Description
AES	AGES Engineering Services
AGES	Africa Geo-Environmental Services (Pty) Ltd
ARC	Agricultural Research Council
BPEO	Best Practicable Environmental Option
CS	Community Survey
DFS	Definitive Feasibility Study
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (Act 73 of 1989)
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMPR	Environmental Management Programme
FAII	Fish Assemblage Integrity Index
FTE	Full Time Equivalent
GNR	Government Notice Regulation
LEDET	Limpopo Department of Economic Development, Environment & Tourism
I&APs	Interested and Affected Parties
IDP	Integrated Development Programme
IEM	Integrated Environmental Management
IHAS	Invertebrate Habitat Assessment System
IHIA	Intermediate Habitat Integrity Assessment
ISCW	Institute for Soil, Climate and Water
IWUL	Integrated Water Use License
IWULA	Integrated Water Use License Application
LOM	Life of Mine
MAMSL	Meter Above Mean Sea Level
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
MRA	Mining Right Application
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008)
NEMAQA	National Environmental Management: Air Quality Act, 39 of 2004

NHRA	National Heritage Resources Act (Act 25 of 1999)
NFA	National Forest Act (Act 84 of 1998)
NWA	National Water Act (Act 36 of 1998)
PAIA	Promotion of Access to Information Act (Act 2 of 2000)
PAJA	Promotion of Administrative Justice Act (Act 3 of 2000)
PES	Present Ecological State
PGMs	Platinum-Group Metals
PFS	Pre-Feasibility Study
PM2.5	Inhalable Particulate Matter
PM10	Thoracic Particulate Matter
PPP	Public Participation Process
RAL	Roads Agency Limpopo
ROM	Run of Mine
RVI	Riparian Vegetation Index
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
SASS	South African Scoring System
TDF	Tailings Dam Facility
TPA	Tons Per Annum
TSP	Total Suspended Particulates

LIST OF DEFINITIONS

Environmental Assessment Practitioner (EAP)	Means the individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the Regulations.
Environmental Control Officer (ECO)	Means a suitably environmentally qualified official designated to oversee the protection of the environment which could potentially be affected by the development.
Environmental Impact Assessment (EIA)	Means the independent investigation conducted and EIA report compiled by AGES in compliance with environmental and mining legal requirements.
Environmental Site Officer (ESO)	means a qualified independent environmental manager to be appointed by the owner prior to commencement of the works on the site, to oversee the implementation of the Construction EMP and this agreement until the completion of the works on the site.
Ephemeral drainage	Means an area of land where water drains away for brief, transient periods following an influx of moisture such as from localized snowmelt or heavy precipitation.
Footprint	It is the area that will be covered by infrastructure. Anything outside the footprint will be left as is.
Fulltime Time Equivalent man-year or FTE jobs	Employment impacts are calculated in terms of the Full Time Equivalent employment positions, which is the same as a FTE job or one-man year of work. This does not directly translate into the headcount of people employed or into the new job opportunities. In general, one FTE man-year is equal to one person working 40 hours per week for about 50 weeks per year; however it could vary depending on the industry.
Interested and Affected Parties	Means an Interested and Affected Party contemplated in section 24(4)(d) of the National Environmental Management Act and which in terms of that section includes:- a) any person, group of persons or organisation interested in or affected by an activity,

	b) any organ of state that may have jurisdiction over any aspect of the activity.
Land Tenure right	Means any leasehold, deed of grant, quitrent or any other right to the occupation of land created by or under any law and, in relation to tribal land, include any right to the occupation of such land under the indigenous law or customs of the tribe in question.
Mining area	Means the area for which the right to mine is granted (also see *Site*).
Public Participation Process	Means a process by which potential interested and affected parties are given opportunity to comment on, or raise issues relevant to the application.
Site	Means the remaining extent of the farms Koppieskraal 475 KS, Spelonk 478 KS, Sal Josaphat 461 KS, Olifantspoort 479 KS, Eerste Regt 502 KS, Government Ground 503 KS, Zaaikloof 480 KS and Stofpoort 481 KS, Limpopo Province. The proposed footprint area is approximately 73 km² in extent.
Sense of place:	Defining oneself in terms of a given piece of land. It is the manner in which humans relate or feel about the environments in which they live.
Social license to operate:	The acceptance and belief by society, and specifically local communities, in the value creation of activities.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1 PROJECT BACKGROUND

Africa Geo-Environmental Services (Pty) Ltd (AGES), was appointed by Lesego Platinum Mining (Pty) Ltd to facilitate the Scoping and Environmental Impact Assessment (EIA) Process as contemplated in the National Environmental Management Act (Act 107 of 1998) read with the Environmental Impact Assessment Regulations of 2010 (Government Notice R543 of 2010); for the proposed mining activities on the farms Koppieskraal 475 KS, Spelonk 478 KS, Dal Josaphat 461 KS, Olifantspoort 479 KS, Eerste Regt 502 KS, Government Ground 503 KS, Zaaikloof 480 KS and Stofpoort 481 KS, Limpopo Province.

The resource battery limit of the identified platinum resources is 700m below ground surface. The orebody underlying the site consists of Merensky as well as UG2 reefs, Lesego Platinum Mining intend developing these into a platinum mine.

The proposed site is located next to the Phosiri dome, also known as the Zaaikloof or Fortdraai dome, in the Limpopo Province of South Africa and is approximately 240 km north east of Johannesburg and 65 km North west of Burgersfort. The proposed site is located between the local settlements of Mphahlele and Ga-Mankopane, near Lebowakgomo in the Limpopo Province. The proposed site covers an area of roughly 73 km², measuring approximately 11 km from south to north as well as east to west. General coordinates for the underground mine are:

Latitude: S -24°23'14.61"

Longitude: E 29°44'14.44"

1.1 Terms of reference

To ensure that all requirements and processes in terms of the Acts mentioned under Section 2 are complied with the following tasks need to be conducted:

Scoping: Initial investigation, communication, assessment and consideration of the application, identification of the potential environmental impacts of the proposed development and reasonable and feasible alternatives and the preparation and submission of a Scoping Report.

Environmental Impact Assessment: Further investigation of environmental impacts identified during the Scoping Phase and submission of an EIA Report (EIR) and Environmental Management Programme (EMPr).

IWULA Application: Application for an integrated Water Use License Application with supporting studies.

Permitting and Licensing: Additional to the EIA, EMPR and IWUL, other permits and licenses are also required and detailed under Section 2.2.

1.2 Details of the applicant

Details of the Applicant	
Full name of the applicant:	Lesego Platinum Mining (Pty) Ltd
Contact person:	Mr. Richard Montjoie
Physical address:	Isle of Houghton Old Trafford No.4 Cnr Boundary and Carse O'Gowrie Road Houghton
Postal address:	Suite 201 Private Bag X30500 Houghton South Africa
Telephone number:	+27 (0)11 484 5005
Fax number:	+27 (0)11 484 5004
Email address	rmontjoie@umbono.co.za

1.3 Details of the environmental assessment practitioner

As per the requirements of the National Environmental Management Act (Act No. 107 of 1998), (NEMA) as amended and the Environmental Impact Assessment Regulations of 2006, the following information is pertinent with regards to the Environmental Assessment Practitioner (EAP) that has conducted the EIA for the proposed development:

The expertise and qualification of the project team are indicated below (Refer to Table 1-1):

Table 1-1 Details of the Project Team

EAP	Qualifications	Years' experience
Mr. Michael Grobler	BSc. Hons. Conservation Ecology (Pr.Sci.Nat) (US)	8.5 years
Ms. C Smith	BHSC Hons. Archaeology	4 years

Table 1-2 Details of the EAP

Environmental Assessment Practitioner	
Full name:	AGES (Pty) Ltd
Contact person:	Michael Grobler
Postal Address	Postnet 74, P/Bag X07, Arcadia, 0007 Pretoria
Telephone number:	012 751 2160
Fax number:	086 607 2406
Email:	mgrobler@ages-group.com

1.4 Regional Setting – Location of the Activity

The proposed site is located next to the Phosiri dome, also known as the Zaaikloof or Fortdraai dome, in the Limpopo Province of South Africa and is approximately 240 km north east of Johannesburg and 65 km north west of Burgersfort. The site is intersected by the Olifants River, leaving the farms scattered to the east and west of the river. The following coordinates serve as the centre point of the site:

Latitude: S - 24°23'14.61"

Longitude: E 29°44'14.44"

1.5 Magisterial District and Local municipality

The proposed development falls under the jurisdiction of the Lepelle-Nkumpi Local Municipality which is located in the Capricorn District Municipality and the Fetakgomo Local Municipality which is located in the Greater Sekhukune District Municipality.

1.6 Surface Rights

A full list of freehold surface rights covered by the prospecting right area was prepared and the surface right owners identified, as required by the Mineral and Petroleum Resources Development Act, 2002 (MPRDA). The surface ownership of the farms that make the Phosiri Project is represented in Table 1-3 below:

Table 1-3 Summary of surface right owners and title deed numbers

FARM NAME	SURFACE RIGHT OWNER	TITLE DEED NUMBER

Dal Josaphat 461KS	Frank Maisela	T4570/1961
Spelonk 478KS	Bakgaga Ba-Mphahlele Tribe	T30950/1994
Koppieskraal 475KS	Bakgaga Ba-Mphahlele Tribe	T31323/1994
Olifantspoort 479KS	Government of Lebowa	T10551/1913
Eerste Regt 502KS	Government of Lebowa	T7982/1911
Government Ground 503KS	Government of Lebowa	T26672/1988
Zaaikloof 480 KS	Government of Lebowa	T1761/1915
Stofpoort 481 KS	Suid-Afrikaans Ontwikkelingstrust	T37/1892

The land registered in the name of the Government of Lebowa is occupied as follows:

- the farm Olifantspoort 479KS:is occupied by the Bakgaga Ba-Mphahlele Tribe;
- the farms Eerste Regt 502KS: is occupied by the Tau-Mankotsana and Baroka Ba-Nkwana communities;
- Government Ground 503 KS: is occupied by the Tau-Mankotsana community;

The Tau-Mankotsana Community has submitted Land Claims for the farms Eerste Regt 502KS and Government Ground 503KS and are reportedly lawfully residing on these properties. A land claim has also been registered on the farm Olifantspoort 479KS, but this claim is still being researched by the Commission for Restitution of Land Rights.

Lesego has engaged with the owners, residents and other interested parties described above and has established collective community forums and committees that meet regularly to discuss the development of the Phosiri Project. These forums are useful in addressing immediate community issues and concerns as well as identifying areas where sustainable community involvement can be introduced.

1.7 Mineral Rights

The mineral title to the properties Dal Josaphat 461KS, Koppieskraal 475KS, Spelonk 478KS and Olifantspoort 479KS (Lesego Farms) are held under Prospecting Right 228/2006 issued to Lesego. Government Ground 503KS, is jointly held by Bolotola Investment Holdings (Pty) Limited and Dyondisani Women in Mining and Minerals (Pty) Limited, by virtue of a Prospecting Right. In accordance with a cooperation agreement Lesego has earned a 25% interest in the Prospecting Right to Government Ground 503KS. Eerste Regt 502KS is held under a Prospecting Right issued to Sweet Sensation which consists of Khumo Mining and Investments (Pty) Limited (50%), Lesego (45%) and Sekoko Resources (5%). This arrangement provides a beneficial 45% interest in deposits found on Eerste Regt 502KS to Lesego. A summary of the mineral right holdings is presented in Table 1-4 below.

Table 1-4 Legal Title Information for Phosiri Project Prospecting Rights

Licence Ownership	Farm Name	Mineral Right	Type of Licence	Date of Issue	Expiry Date	Licence Numbers	Area (Ha)
Lesego Platinum Mining Limited **(Lesego Farms)**	Dal Josaphat 461KS Koppieskraal 475KS Spelonk 478KS Olifantspoort 479KS	Unspecified (All minerals)	New Order Prospecting Right	16th May 2006	15th May 2011 (Renewal application submitted February 2011)	228/2006	3,312.6
Dyondisani-Bolotola Mining Resources (Pty) Limited **(Government Ground)**	Government Ground 503 KS and others (Note: The following farms are included in this prospecting right, but do	All minerals		8th Feb 2006	7th Feb 2011 (Renewal application submitted February 2011)	107/2006	240.4

	not form part of the Phosiri Project: Hoogste Punt 290KT and Soupiana 325 KT)						
Sweet Sensation 79 (Pty) Limited **(Eerste Regt Farm)**	Eerste Regt 502KS	PGE's and associated minerals		21st Nov 2006	20th Nov 2011 (renewal application submitted August 2011)	83/2008	2,545.0

The existing Lesego mineral right holdings do not include the farms Stofpoort 481 KS and Zaaikloof 480 KS, which are the location for the proposed Tailings Dam Facility, and is in the process of being amended to include these farms by Section 102 of the MPRDA.

All three of the Phosiri Prospecting Rights were executed on behalf of the Minister of Minerals and Energy by the Regional Manager (or acting Regional Manager) acting under power of attorney stated to have been granted to him or her by the Deputy Director-General in terms of powers delegated to the Deputy Director-General by the Minister on 12th May 2004 in terms of s103(1) of the MPRDA.

The holder of a prospecting right must commence with prospecting operations within 120 days from the date on which the prospecting right becomes effective, (or such later date, as authorised in writing by the Minister), failing which it automatically lapses. The holder must furnish the Regional Manager with all prospecting results and information, as well as the general evaluation of the geological, geophysical and borehole data, in respect of an abandoned area, in so far as it applies to the mineral found in respect of the right. Lesego has complied with these requirements for the duration of the right.

The Prospecting Right renewal over the farm Eerste Regt was executed on 28 November 2012, and the renewed right is valid until 27 November 2015. The prospecting right renewal over the Lesego farms was executed on 1 August 2012, and the renewed right is valid until 31 July 2015. A properly completed renewal application was submitted to the DMR for the Government Ground prospecting right prior to the respective expiry dates. This renewal is still being processed by the DMR, but because the renewal application was submitted timeously, it is not in threat.

Lesego commenced prospecting operations within the required 120 days from the date on which the prospecting right became effective, and Lesego has furnished the Regional Manager with all prospecting results and information as required by the MPRDA and is up to date with the payment of prospecting fees.

1.8 Servitudes

There do not appear to be any registered servitudes which would prevent the company from conducting its exploration and development work in respect of the Phosiri Project, given that the company operates in a responsible manner, in accordance with acceptable town planning and legal practices. The main servitudes crossing the prospecting title area are the Olifants River, Eskom, Water and Sewerage reticulation.

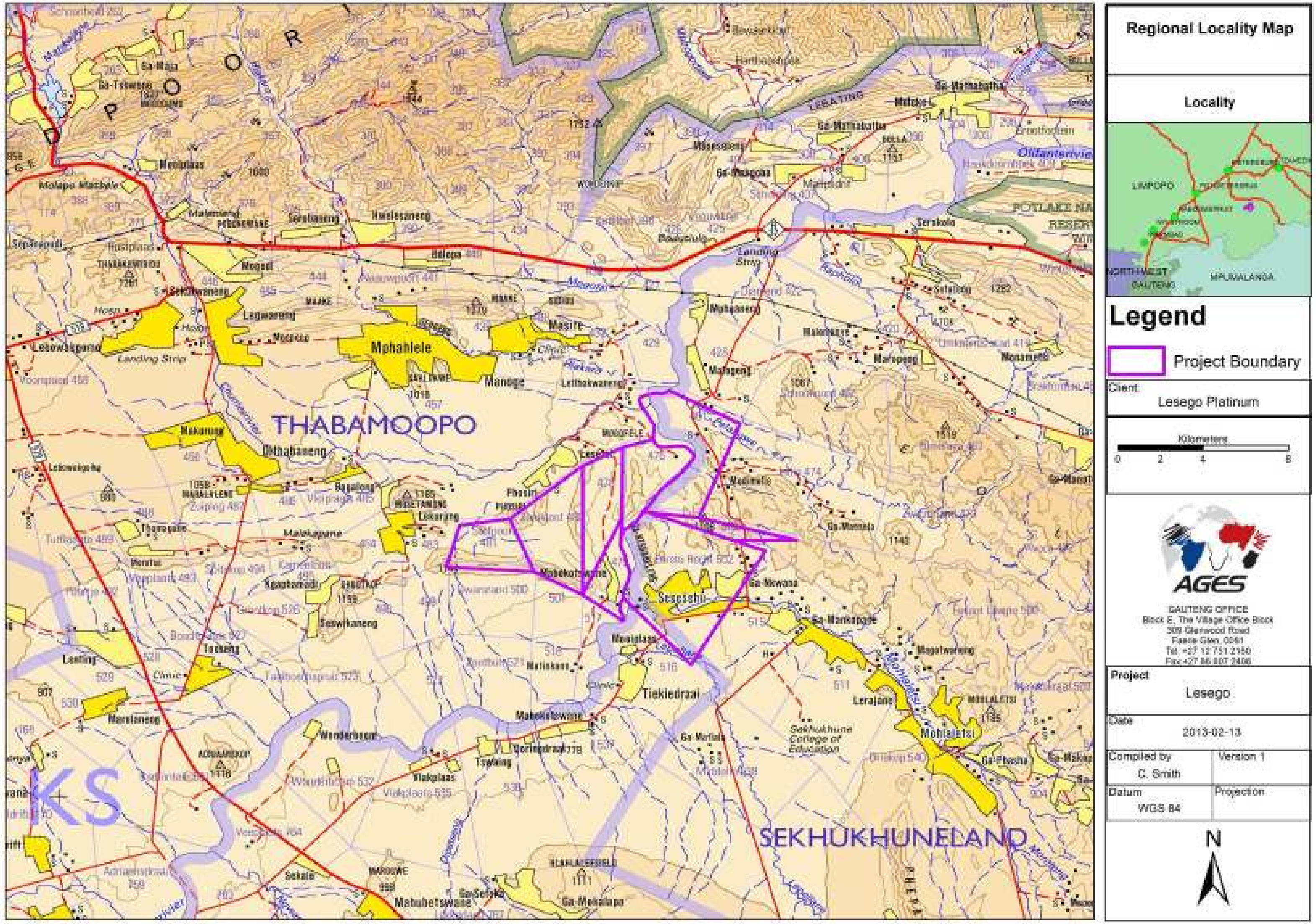


Figure 1-1 **Locality Map**

2 LEGAL FRAMEWORK

This document constitutes the Environmental Impact Report prepared in support of an environmental authorisation application in terms of section 24 of the NEMA and as contemplated in regulation 27(f) and 28 of the EIA Regulations. In addition to the statutory provisions in the NEMA more fully referred to herein below, other legislation and guidelines that have been considered in the preparation of the EIA Report includes relevant legislation on all levels including the constitutional, national, provincial and local level. A brief summary of the legislation which are relevant to the proposed mining development are outlined below. Note that other legislative requirements may be relevant to the proposed mining development. As such, the list provided below is not intended to be definitive or exhaustive and serves to highlight key mining and environmental legislation and obligations only.

2.1 The Constitution of the Republic of South Africa (Act 108 of 1996)

Section 2 of the Constitution of the Republic of South Africa (Act 108 of 1996) (CA) states that: "This Constitution is the supreme law of the Republic; law or conduct inconsistent with it is invalid, and the obligations imposed by it must be fulfilled." Section 24 of the CA, states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

- prevent pollution and ecological degradation;
- promote conservation; and
- secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Section 24 guarantees the protection of the environment through reasonable legislative (and other measures) and such legislation is continuously in the process of being promulgated. Section 33(1) concerns administrative justice which includes the constitutional right to administrative action that is lawful, reasonable and procedurally fair.

The mining right application and Environmental Impact Assessment Report will be accordingly prepared, submitted and considered within the constitutional framework set by inter alia section 24 and 33 of the Constitution.

2.2 The Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000)

The purpose of the Promotion of Administrative Justice Act (PAJA) is principally to give effect to the constitutional right to administrative action that is lawful, reasonable and procedurally fair; and to the right to written reasons for administrative action as contemplated in section 33 of the Constitution; and to provide for matters incidental thereto.

Administrative law governs the relationships between public bodies, and between public and private bodies and/or individuals. Because so many activities which affect the environment require authorisation from a public body, and environmental conflicts usually arise from the exercise of administrative decision-making powers, administrative law principles are of particular relevance to environmental law generally, and specifically in the context of the mining right application process requirements provided for in the MPRDA and the environmental authorisation requirements stipulated by the provisions of section 24 of the NEMA read with its subordinate legislation regulating environmental impact assessment (or EIA).

2.3 The Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)

Closely linked to the notion of administrative justice is the right of access to information. Without access to information, a person may be unable to determine whether or not his or her right to just administrative action (or to an environment not harmful to human health or well-being or, for that matter, any other Constitutional right) has been infringed. The purpose of the Promotion of Access to Information Act ("PAIA") is to give effect to the Constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights, and to provide for matters connected therewith.

In addition to providing access to information, cognisance should be taken that PAIA also makes provision for the refusal of access to information that is deemed to be of a sensitive, confidential or classified nature. This is captured under Chapter 4 of part 2 and 3 of PAIA.

2.4 The National Environmental Management Act (107 of 1998) and the Environmental Impact Assessment Regulations, 2010

The overarching principle of the National Environmental Management Act 1998 (Act 107 of 1998) (NEMA) is sustainable development. It defines sustainability as meaning the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure the development serves present and future generations.

Section 2 of NEMA (Act no 107 of 1989) provides for National Environmental Management Principles. These principles include:

- Environmental management must place people and their needs at the forefront of its concern.
- Development must be socially, environmentally and economically sustainable.
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated.
- Environmental justice must be pursued.
- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued.
- Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
- The participation of all Interested and Affected Parties (I&APs) in environmental governance must be promoted.
- Decisions must take into account the interests, needs and values of all I&APs.
- The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.
- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.
- The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
- The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

The Environmental Impact Assessment (EIA) process to be undertaken in respect of the authorization process of the proposed mining operations is in compliance with the

MPRDA, as well as the NEMA read with the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R543, 544, 545 and 546 of 2010). The proposed development involves 'listed activities', as identified in terms of the NEMA and in terms of section 24(1), the potential consequences for or impacts on the environment of *inter alia* listed activities must be considered, investigated, assessed and reported on to the competent authority or the Minister of Minerals and Energy (now the Minster of Mineral Resources and the Minister of Energy Affairs, respectively) , as the case may be, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA.

As stated above, an environmental authorisation application in terms of section 24 of the NEMA has been submitted to the LEDET for consideration (Application submitted to LEDET and accepted on the 26th of April 2012, with reference number assigned: 12/1/9/2-C17). The activities below as listed in GNR 544, 545 and 546 of 2010 were identified as being applicable to the proposed mining operations, and were included in the documentation submitted to the LEDET.

Relevant Legislation	**Description**
GNR 544, Item 9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
GNR 544, Item 10	The construction of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.
GNR 544, Item 11	The construction of: (i) canals;

	(ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size; (ix) slipways exceeding 50 square metres in size; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of watercourse, excluding where such construction will occur behind the development setback line.
GNR 544, Item 13	The construction of facilities or infrastructure for the storage, or 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 metres.
GNR 544, Item 18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from: (i) a watercourse; (ii) the sea; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater - but excluding where such infilling, depositing, dredging, excavation, removal or moving; (a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or (b) occurs behind the development setback line.
GNR 544, Item 22	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres, or

	(iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.
GNR 544, Item 37	The expansion of facilities or infrastructure for the bulk transportation of water, sewage or storm water where: (a) the facility or infrastructure is expanded by more than 1000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more – excluding where such expansion: (i) relates to transportation of water, sewage or storm water within a road reserve; or (ii) where such expansion will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
GNR 544, Item 41	The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more.
GNR 544, Item 47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre - (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres - excluding widening or lengthening occurring inside urban areas.
GNR 545, Item 15	Physical alteration of undeveloped vacant or derelict land for residential retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or (ii) agriculture or afforestation where activity 16 in this Schedule will apply.
GNR 545, Item 19	The construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.
List 3 due to: (a) In Limpopo - i. All areas outside urban areas. iii. Outside urban areas, in: (bb) Sensitive areas as identified in an environmental	

	management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.
GNR 546, Item 2	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres.
GNR 546, Item 4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres.
GNR 546, Item 10	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.
GNR 546, Item 14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.
GNR 546, Item 16	The construction of: (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.
GNR 546; Item 19	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.

The draft Scoping Report was distributed for public review on the 4th of January 2013 for a period of 30 days (4 January 2013 to 4 February 2013) as part of the environmental impact assessment process.

2.5 Limpopo Environmental Management Act (Act 7 of 2003) (LEMA)

The objectives of the LEMA include to manage and protect the environment in the Limpopo Province and to secure ecologically sustainable development and responsible use of the Province's natural resources. The LEMA must be interpreted and applied in accordance with the national management principles as set out in Section 2 of the NEMA (Act 107 of 1998).

Environmental advisory bodies are outlined in the legislations, together with outlines pertaining to the different types of protected areas and how these should be managed. Chapters 4 – 8 of the legislation discuss the wild and exotic fauna species of the province, professional hunting, aquatic systems, invertebrates and indigenous plants as well as recommended management systems. The Act places a prohibition on the collection, movement and sale of certain such resources. The Act furthermore stipulates that no person shall import, export or convey endangered species of wild fauna and flora into, out of and between Provinces or National Boundaries. The legislation also deals with the preservation of caves and cave formations, limited development areas, mountain catchment areas and environmental pollution.

The provisions of this legislation will be heeded throughout the proposed mining operations and have been considered in the compilation of the accompanying EMP.

2.6 Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002)

Previously South African mineral rights were owned either by the State or the private sector. This dual ownership system represented an entry barrier to potential new investors. The current Government's objective is for all mineral rights to be vested in the State, with due regard to constitutional ownership rights and security of tenure. The MPRDA was passed in order to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources, and to provide for matters connected therewith. The Preamble to the MPRDA *inter alia* affirms the State's obligation to:

- protect the environment for the benefit of present and future generations;
- ensure ecologically sustainable development of mineral and petroleum
- resources; and
- promote economic and social development.

The aforesaid preamble affirms the general right to an environment provided for in section 24 of the Constitution (as set out hereinabove).

The objects of the MPRDA, as set out in section 2 thereof serve as a guide to the interpretation of the Act. The objects of the MPRDA are as follows:

- recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic;
- give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources;
- promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa;
- substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources;

- promote economic growth and mineral and petroleum resources development in the Republic;
- promote employment and advance the social and economic welfare of all South Africans;
- provide for security of tenure in respect of prospecting, exploration, mining and production operations;
- give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating.

The national environmental management principles provided for in section 2 of the NEMA apply to all prospecting and mining operations and any matter relating to such operation. These principles apply throughout the Republic to the actions of all organs of state including *inter alia* the Department of Mineral Resources (previously known as the Department of Minerals and Energy), that may significantly affect the environment.

Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations.

Section 38 of the MPRDA states that the holder of *inter alia*, a prospecting right, mining right or mining permit:

- Must at all times give effect to the general objectives of integrated environmental management laid down in Chapter 5 of NEMA;

- Must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment as contemplated in section 24(7) of NEMA;

- Must manage all environmental impacts –

    - In accordance with an environmental management plan or approved environmental management programme, where appropriate, and

- As an integral part of the prospecting or mining operations, unless the Minister directs otherwise.
- Must as far as reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and
- Is responsible for any environmental damage, pollution or ecological degradation as a result of prospecting or mining operations and which may occur inside and outside the boundaries of the area to which such right, permit or permission relates.

2.7 National Water Act (Act No 36 of 1998) [NWA]

In terms of the NWA, the national government, acting through the Minister of Water and Environmental Affairs (previously the Minister of Water Affairs and Forestry), is the public trustee of South Africa's water resources, and must ensure that water is protected, used, development, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons (section 3(1)).

In terms of the NWA a person may only use water without a license under certain circumstances. All other use, provided that such use qualify as a use listed in section 21 of the Act, require a water use license. A person may only use water **without a license** if such water use is permissible under Schedule 1 (generally domestic type use) if that water use constitutes a continuation of an existing lawful water use (water uses being undertaken prior to the commencement of the NWA, generally in terms of the Water Act of 1956), or if that water use is permissible in terms of a general authorisation issued under section 39 (general authorisations allow for the use of certain section 21 uses provided that the criteria and thresholds described in the general authorisation is met). Permissible water use furthermore includes water use authorised **by a license** issued in terms of the NWA.

Section 21 of the NWA indicates that "water use" includes:

- taking water from a water resource (section 21(a));
- storing water (section 21(b));
- impeding or diverting the flow of water in a water course (section 21(c));

- engaging in a stream flow reduction activity contemplated in section 36 (section 21(d));
- engaging in a controlled activity which has either been declared as such or is identified in section 37(1) (section 21(e));
- discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit (section 21(f));
- disposing of waste in a manner which may detrimentally impact on a water resource (section 21(g);
- disposing in any manner of water which contains waste from, or which has heated in, any industrial or power generation process (section 21 (h));
- altering the bed, banks, course or characteristics of a water course (section 21(i));
- 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 (section 21(j)); and
- using water for recreational purposes (section 21(k)).

In addition to the above and in terms of section 26 of the NWA, Regulations on the Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources were published in GN R. 704 of 4 June 1999 (GN R. 704). The aforesaid GN R. 704 provides for *inter alia* the capacity requirements of clean and dirty water systems (regulation 6), the protection of water resources by a person in control of a mine (regulation 7), security and addition measures (regulation 8) and temporary or permanent cessation of a mine or activity (regulation 9).

The statutory requirements of the NWA and GN R. 704 have been considered as far as they may be applicable to the proposed mining operations. Insofar as the undertaking of section 21 water uses is concerned, it is anticipated that application for registration and water use licensing will be undertaken. Of particular relevance within the context of waste disposal and water use and management the applicable water uses will be identified and included in the EIR and EMPR.

Table 2-1 Water use license application

Section	Description	Definition
21 (a)	Taking water from a resource.	A water resource includes a river, stream, dam, spring, aquifer, wetland, lake and a pan. Abstracting water from an off-channel dam having no catchments (for example a balancing dam), a canal, or a pipeline is not taking of water from a resource. The Minister may, however, require a person to

		have a license to take water from a government water work.
21 (b)	Storing of water	Storing Water (NOTE: Every dam with a wall more than 5m high or which is capable of storing more than 50000 m^3 needs to be classified and may need dam safety licenses to construct).
21 (c)	Impeding or diverting the flow of water.	Causing an obstruction to the flow of water in a watercourse, or diverting some or all of the flow in or from a watercourse.
21 (e)	Engaging in a controlled activity identified as such in Section 37(1) or declared under Section 38(1)	Usage of water containing waste for dust suppression
21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource. This includes the Tailings Disposal Facility, sludge, process water, Solid waste dumps such as the Storm Water Dams	Disposal of waste that takes place in/on site facilities, such as slurry dams, return water dams, storm water containment dams, oxidation ponds and disposal into evaporation ponds.
21 (i)	Altering the bed, banks, course or characteristics of a watercourse	Building/upgrading a bridge over the Olifants river
21(j)	Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity (if applicable) or for the safety of people.	

Please note that it is anticipated that the IWULA will be submitted to the DWA (Department of Water Affairs) in due course.

2.8 The National Heritage Resources Act (Act 25 of 1999) (NHRA)

The NHRA established the South African Heritage Resources Agency (SAHRA) as well as provincial heritage resources agencies. In terms of the NHRA, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.

No person may damage, disfigure, alter, subdivide or in any other way develop any part of a protected area unless, at least 60 days prior to the initiation of such changes, he/she/it has consulted with the relevant heritage resources authority. Section 34 of the NHRA provides for the protection of immovable property by providing for a prohibition on altering or demolishing any structure or part of any structure, which is older than 60 years, without a permit issued by the relevant provincial heritage resources authority. Accordingly, should the proposed activities, prospecting or mining activities or the closure and rehabilitation of mined land involve the altering or demolishing of any structure or part of any structure, which is older than 60 years, a permit issued by the relevant provincial heritage resources authority is required.

No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite; trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

No person may, without a permit issued by SAHRA or a provincial heritage resources authority destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves; 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 formal cemetery administered by a local authority; or bring onto or use at the burial ground or grave referred to above any excavation equipment or any equipment which assists in the detection or recovery of metals.

Section 38 of the NHRA states that any person who intends to undertake developments categorised in Section 38 of the NHRA must at the very earliest stages of initiating such development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. By way of example, the developments referred to in Section 38 of the NHRA include:

- the construction of a road, wall, power-line, pipeline, canal or other similar form of linear development or barrier exceeding 300 metres in length;
- the construction of a bridge or similar structure exceeding 50 metres in length;

- any development or other activity which will change the character of a site as specified in the regulations;
- any other category of development provided for in regulations by SAHRA or the provincial heritage resources authority.

However, the abovementioned provisions are subject to the exclusion that section 38 does not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act 73 of 1989 (now presumably the NEMA in view of the repeal of the listed activities under the ECA): Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.

Based on the archaeological findings on site the NHRA and the associated permitting process will be applicable to this project and is in process of being completed.

2.9 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management Biodiversity Act (Act No. 10 of 2004) (NEMBA) aims to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith.

The NEMBA provides for the publishing of various lists of species and ecosystems by the Minister of Environmental Affairs and Tourism (now the Minister of Water and Environmental Affairs) as well as by a Member of the Executive Council responsible for the conservation of biodiversity of a province in relation to which certain activities may not be undertaken without a permit. In terms of Section 57 of the NEMBA, no person may carry out any restricted activity involving any species which has been identified by the Minister as "critically endangered species", "endangered species", "vulnerable species" or "protected species" without a permit. The NEMBA defines "restricted activity" in relation to such identified species so as to include, but not limited to, "hunting, catching, capturing, killing, gathering, collecting, plucking, picking parts of, cutting, chopping off, uprooting, damaging, destroying, having in possession, exercising physical control over, moving or translocating".

The Minister has made regulations in terms of section 97 of the NEMBA with regards to Threatened and Protected Species which came into effect on 1 June 2007. Furthermore, the Minister published lists of critically endangered, endangered, vulnerable and protected species in terms of section 56(1) of the NEMBA.

2.10 National Forests Act (Act 84 of 1998)

The project may involve the cutting, disturbing, damaging or destroying of any protected trees declared in terms of section 12 of the National Forest Act (NFA) (Act 84 of 1998). Should the presence of these trees on site be confirmed after receipt of the Record of Decision (ROD), a licence in terms of section 15 of the NFA will be required.

2.11 National Veld and Forest Fire Act (Act 101 of 1998)

The applicant should provide fire breaks in accordance with Chapter 4 of the National Veld and Forest Fire Act (Act 101 of 1998) and should consider amongst other the following:

- Fire rating
- Consultation of adjoining owners and the fire protection association (if any)
- be present at such burning or have an agent attend.

The fire break should be:

- wide and long enough to prevent to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land;
- it does not cause soil erosion; and is reasonably free of inflammable material capable of carrying a veldfire across it.

2.12 National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004) (NEMAQA)

The National Environmental Management Air Quality Act (Act 39 of 2004) (NEMAQA) came into power on the 1st of April 2010. Additionally the Minimum Emission Standards Notice 964 also came into effect on the 23 November 2012. This Notice provides a list of activities that may cause atmospheric emissions which have or may have a significant detrimental effect on the environment as well as the minimum emission standards ("MES") for these activities as contemplated in section 21 of NEMAQA.

The effect of the commencement of the NEMAQA and the listed activities, listed in GN 964 is that an atmospheric emission licence (AEL) is now required for conducting these listed activities.

Currently there are no listed activities that require NEMAQA registration/permitting for the proposed mine.

2.13 National Environmental Management: Waste Act (Act 59 of 2008) ("NEMWA")

The NEMWA commenced on 1 July 2009 and as a result of its commencement the relevant provisions in the Environment Conservation Act 73 of 1989 (ECA) in respect of waste management, were repealed.

The NEMWA sets out to reform the law regulating waste management and deals with waste management and control more comprehensively than was dealt with in the ECA. It also introduces new and distinct concepts never before canvassed within the realm of waste management in South Africa, such as the concept of contaminated land and extended producer responsibility. It also provides for more elaborate definitions to assist in the interpretation of the Act.

Section 19 of the NEMWA provides for listed waste management activities and states in terms of section 19(1), the Minister may publish a list of waste management activities that have, or are likely to have a detrimental effect on the environment. Such a list was published in GN 718 of 3 July 2009 (GN 718).

In accordance with section 19(3), the Schedule to GN 718 provides that a waste management licence is required for those activities listed therein prior to the commencement, undertaking or conducting of same. In addition, GN 718 differentiates between Category A and Category B waste management activities. Category A waste management activities are those which require the conducting of a basic assessment process as stipulated in the EIA Regulations, 2010 promulgated in terms of the NEMA as part of the waste management licence application and Category B waste management activities are those that require the conducting of a scoping and environmental impact assessment process stipulated in the EIA Regulations, 2010 as part of the waste management licence application.

Section 20 of the NEMWA pertains to the consequences of listing waste management activities and states that no person my commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards for that activity as determined by the Minister or in accordance with a waste management licence issued in respect of that activity, if a licence is required.

In terms of the current statutory framework with regards to waste management, a waste management licence is required for those waste management activities identified in the Schedule to GN 718. Certain of the waste management activities listed in the Schedule are governed by specific thresholds. Where any process or activity falls below or outside the thresholds stipulated, a waste management licence is not required.

2.14 Mine Health and Safety Act, 1996 (Act No 29 of 1996)

Chapter 4 of the Regulations of the Mine Health and Safety Act, 1996 will be applicable if explosives are stored on site. The regulations include:

- Security in respect of explosives
- Receipt, storage, issuing, transportation and destruction of explosives
- General precautionary measures when blasting.

2.15 Guidelines

2.15.1 The Olifants Letaba Catchment Environmental Management Framework (OLEMF)

The Olifants Letaba Catchment Environmental Management Framework assists in identifying development opportunities, constraints and priorities within the Olifants Letaba Catchment. The OLEMF also serves to identify environmental attributes within geographical areas, which are designed to provide inputs to the national and provincial system currently being developed. A number of activities are also identified as requiring environmental authorisation if located in one or more specified geographical areas.

Furthermore, the OLEMF makes provision for the exclusion of activities for which environmental authorisation is normally required in specific geographical areas. In addition, the OLEMF identifies a number of activities to be excluded from authorisation in built up areas as identified in the EMF. The draft Environmental Management Framework (EMF) also identifies environmental management zones within the Olifants Letaba catchment. As can be seen from the Figure 2-1, the study area falls within Zone D – Rural Sekhukhune/Platinum Mining Focus Area.

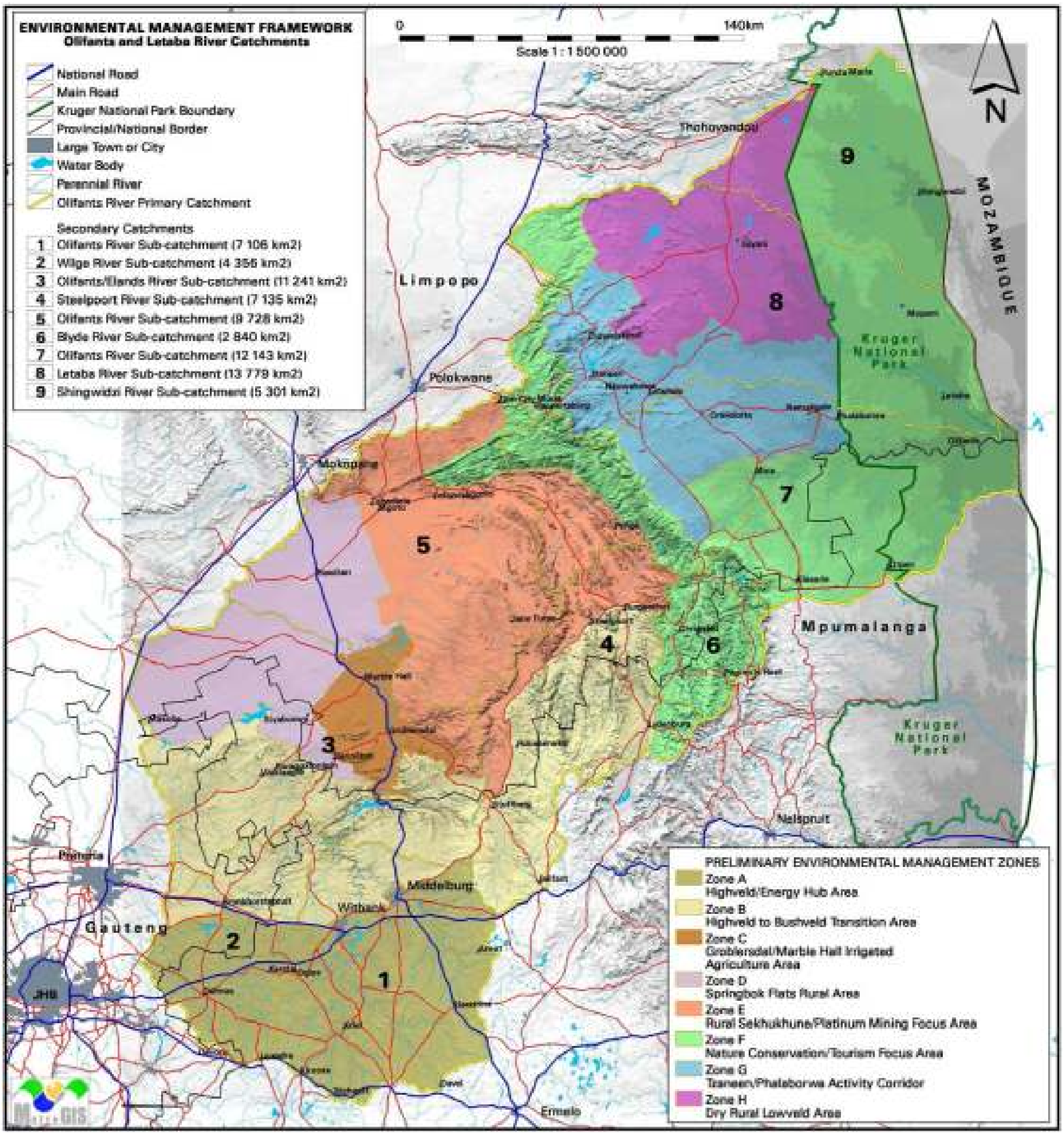


Figure 2-1 Preliminary Environmental Management Zones in the Olifants Letaba Catchment

2.16 Permitting and License Requirements

The following permitting and or license requirements are applicable to the proposed project:

2.16.1 Water Use Licenses

As is set out herein above, various water uses associated with the project will require water use licensing in terms of section 22 of the NWA. Section 21 of the NWA contains those water uses that are to be registered and licensed in accordance with the legal obligations contained in the NWA. These uses are in the process of being applied for through an application for an Integrated Water Use Licence (IWUL) by AGES. The list of water uses requiring licencing is included in Table 2-1.

A site visit was conducted with Mr Adam Ramalisa from the Department of Water Affairs on the 25^{th} of May 2012. All aspects of the mining development and along going concerns were discussed. Feedback from the Department indicates that they were satisfied with the application meeting and await submission of the IWULA report before commencing with the evaluation process.

2.16.2 Atmospheric Emissions Licence

Currently there are no listed activities that require registration/permitting according to National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004) for the proposed mine.

2.16.3 Noise Legislation

Noise measurements were carried out in accordance with South African National Standards - Code of practice, SANS 10103:2008; The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication and as required by the regulations of the Department of Water and Environmental Affairs (previously DEAT), No. R. 154. Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989); Govt. Gaz. No. 13717, 10 January 1992, i.e. Gauteng province, Department of Agriculture, Conservation and Environment, Notice 5479 of 1999; Noise control regulations, 1999, Provincial gazette extraordinary, 20 August 1999. No further permitting relating to noise will be conducted, but the noise impacts have been assessed and mitigated for.

2.16.4 Waste Permit - NEMWA

The waste management activities as listed in GN 718 of 3 July 2009 which may be applicable to the proposed mining operations and for which a waste management license is required have been assessed. The list of waste management activities are tabled below.

Category A of GN 718: The activities listed under Category A are equivalent to those that require a basic assessment process as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act. 1998 (Act No. 107 of 1998)	Storage of Waste	**1.** The storage, including the temporary storage of general waste at a facility that has the capacity to store in excess of $100m^3$ of general waste at any one time, excluding the storage of waste in lagoons. **2.** The storage including the temporary storage of hazardous waste at a facility that has the capacity to store in excess of $35m^3$ of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons.
Category A of GN 718: The activities listed under Category A are equivalent to those that require a basic assessment process as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act. 1998 (Act No. 107 of 1998)	Disposal of Waste	**15.** The disposal of general waste to land covering an area of more than $50m^2$ but less than $200m^2$ and with a total capacity not exceeding 25 000 tons. **16.** The disposal of domestic waste generated on premises in areas not serviced by the municipal service where the waste disposed does not exceed 500kg per month.
Category A of GN 718: The activities listed under Category A are equivalent to those that require a basic assessment process as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act. 1998 (Act No. 107 of 1998)	Construction of facilities and associated infrastructure	**18.** The construction of facilities for activities listed in Category A of this Schedule (not in isolation to associated activity).
Category B of GN 718: The activities listed under Category B are equivalent to	Storage of sewage in lagoons	**1.** The storage including the temporary storage of hazardous waste in lagoons.

those that require a Scoping and EIA process as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act. 1998 (Act No. 107 of 1998)		
Category B of GN 718: The activities listed under Category B are equivalent to those that require a Scoping and EIA process as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act. 1998 (Act No. 107 of 1998)	Treatment of sewage and wastewater	**7.** The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic metres or more.
Category B of GN 718: The activities listed under Category B are equivalent to those that require a Scoping and EIA process as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act. 1998 (Act No. 107 of 1998)	Disposal of waste	**10.** The disposal of general waste to land covering an area in excess of 200m².
Category B of GN 718: The activities listed under Category B are equivalent to those that require a Scoping and EIA process as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act. 1998 (Act No. 107 of 1998)	Construction of facilities and associated infrastructure	**11.** The construction of facilities for activities listed in Category B of this Schedule (not in isolation to associated activity).

The waste application is being conducted as part of the EIA submitted to LEDET.

2.16.5 Heritage Permit – Section 36 of NHRA

A permit in terms of the NHRA will be required for the alteration or demolishment of structures which are older than 60 years. Some historic homestead and graves occur on site, therefore should these sites be developed, the appropriate permitting process by a qualified archaeologist must be conducted as highlighted above. The consultation with SAHRA has been initiated by Mr. Neels Kruger from AGES and will be completed prior to mitigation of any heritage remains.

2.16.6 Protected Tree Removal – Section 15 of NFA

It is expected that the project will involve the cutting, disturbing, damaging or destroying of protected trees declared in terms of section 12 of the NFA, therefore a licence in terms of section 15 of the NFA might be required. However the presence of these trees must be verified in order to confirm their presence.

3 APPROACH TO THE PROJECT

3.1 Scoping Study

Lesego Platinum Mining (Pty) Ltd submitted the environmental authorisation application in terms of section 24 of the National Environmental Management Act (NEMA) on the 10th of April 2012 to the Limpopo Department of Economic Development, Environment and Tourism (LEDET). Acknowledgement of receipt of the application was received from LEDET on the 26th of April 2012 and the reference number 12/1/9/2-C17 was subsequently issued.

A draft Scoping Report (SR) was compiled and submitted to the registered Interested and Affected Parties (I&APs) for review (4 January 2013 till 12 February 2013), thereafter it was submitted to the LEDET (4th of January 2013). The department acknowledged receipt of the draft Scoping Report on the 25th of January 2013. The final Scoping Report was submitted to the I&APs for review (13 March 2013 till 26 April 2013), and thereafter submitted to LEDET (13 March 2013). Additional copies of the final SR were submitted to LEDET on the 9th of April 2013. The department responded to the application by accepting the Scoping Report on 20th of May 2013 (see APPENDIX B). Thereafter AGES was instructed to facilitate the Specialist Studies and Environmental Impact Assessment Phase.

3.2 Environmental Methodology

The general approach to this study has been guided by the principles of Integrated Environmental Management (IEM). In accordance with the Integrated Environmental Management Guidelines (DEAT, 2004), an open, transparent approach, which encourages accountable decision-making, has been adopted. The study has also been guided by the requirements of the NEMA (Act 107 of 1998) as stipulated in Section 2.4. (Also refer to Figure 3-1).

3.3 Public participation

The principles of NEMA read with the EIA Regulations govern public participation with interested and affected parties (I&APs). These principles include the provision of sufficient and transparent information to I&APs on an ongoing basis, to allow them to submit comments on the proposed development. The public participation process forms an integral part of the environmental authorization processes and feasibility process and should be conducted during the planning and design stages of any project prior to implementation. The comments received and issues raised during the Scoping Phase of the Lesego Platinum Mine Project have been incorporated into the Issues and Response report (APPENDIX A 8) and will be utilized in order to identify, assess and mitigate the proposed identified impacts as part of the EIA phase.

The aim of public participation is to achieve the following:

- Provides for public input and facilitate negotiated outcomes; and
- Provide up-front indication of issues that may prevent project continuation or can cause costly delays at a later stage.

Public Participation is a process leading to informed decision-making through joint effort by:

- The proponent;
- Technical experts;
- Governmental authorities; and
- Interested and Affected Parties.

3.3.1 Identification of Interested and Affected Parties

Key stakeholders, who included the following sectors, were directly informed of the proposed development by means of registered post, fax and/or email (proof of notification included in APPENDIX A):

- The owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site;
- The owners and occupiers of land within 100 m of the boundary of the site or alternative site who are or may be directly affected by the activity;

- Mphahlele Tribal Authority;
- Baroka Ba Nkwana Traditional Authority;
- Tau-Mankotsana Traditional Authority (Nchabaleng);
- Limpopo Department of Economic Development, Environment and Tourism (LEDET)
- Department of Mineral Resources (Limpopo)
- Department of Water Affairs
- Department of Forestry and Fisheries (DAFF)
- Limpopo Department of Roads and Transport
- Department of Land Affairs
- Department of Rural Development and Land Reform: Limpopo
- Department of Cooperative Governance Human Settlements and Traditional Affairs (CoGHSTA)
- SANRAL (northern region)
- Limpopo Roads Agency (RAL)
- South African Heritage Resources Agency (SAHRA) (Limpopo)
- Regional Manager of Land Development for ESKOM
- Municipality Manager from the Sekhukune District Municipality
- Municipality Manager from the Fetakgomo Local Municipality
- Municipality Manager from the Capricorn District Municipality
- Municipality Manager from the Lepelle-Nkumpi Local Municipality
- ESKOM
- AGRI Limpopo

- Other mines in the area

The consultation process with I&APs is an ongoing process and included a notice to all I&APs and Background Information Document notifying I&APs of *inter alia* the environmental authorization application and providing an overview of the proposed mining operations and the associated infrastructure. The aforesaid notice referred to the applicable provisions of the NEMA read with the EIA Regulations (2010)

Details of the engagement process with I&APs followed during the course of the scoping phase, a summary of the issues raised and the date thereof as well as the EAP's response have been included in the Issues and Response Report attached to this Scoping Report in accordance with regulation 28(1)(h) of the EIA Regulations. In addition, copies of written comments received from I&APs are included in the Issues and Response Report attached hereto as contemplated in regulation 55 of the EIA Regulations. In addition to the above, the following notification methods as contemplated in the EIA Regulations, 2010 were used.

3.3.2 Site Notices

In order to inform surrounding communities and adjacent landowners of the proposed development, three notice boards (in accordance with regulation 54(2)(a) and 54(3) of the EIA Regulations were erected at the Mphahlele, Tau-Mankotsana and Baroka-Ba-Nkwana Tribal Authorities, as well as Gwara-Gwara School in Nkotokwane and the Bopedi Shopping Centre in Apel on the 17th of October 2012 (See APPENDIX A 7).

3.3.3 Advertisement

An advertisement, notifying the public of the proposed mining operations and the Environmental Impact Assessment process and inviting I&APs to register with and submit their comments to AGES was placed in the in both English and Sepedi in the Daily Sun on the 17th of October 2012 in accordance with regulation 54(2)(c) of the EIA Regulations of 2010. In addition an advertisement was placed in the Daily Sun on the 6th of August 2013, notifying the public that the draft EIR will be available for review from the 20th of August 2013 and inviting them to attend the public meetings (See APPENDIX A 7)

3.3.4 Interested and Affected Parties Consultation

Background Information Documents informing the I&APs of the project were hand delivered and were additionally distributed by means of registered mail, emails and faxes to I&APs during October 2012. See the attached proof of notification (APPENDIX A 3).

3.3.5 Focus Group Meetings

A focus group meeting was held with Mr. Mphahlele, Mr. Molaba and Ms. Sithole from the Mphahlele Tribal Authority on the 24th of October 2012 at Nkwe Platinum. The meeting minutes are included in APPENDIX A 9.

3.3.6 Raising of Issues for investigation by I&APs

I&AP's have had the first opportunity to raise issues either in writing, by telephone or email. All the issues raised by I&AP's during the scoping process have been captured in a Comment and Response Report (APPENDIX A 8) and I&AP's received letters acknowledging their contributions.

Preliminary key issues listed have been determined, these include:

- Ecological Impact
    - Guarantee of rehabilitation of the area after mining
- Groundwater Impact
- Surface water Impact
    - Impact of contaminated water on the Olifants River
    - Control of contaminated water
- Air Pollution
- Heritage Impact
    - Impact on graves and old buildings
    - Respect for cultural sites
    - Preservation of graves
- Socio-economic impacts
    - Communication and interaction with local community
    - Job creation, social investment, health, safety and security
    - Outsourcing of non-core business to local community

- Skill training for local community
- Sustainable development projects
- Request for assistance with community projects
- Access to the Social Labour Plan (SLP)

- Change of land use

The key issues have been assessed and mitigation measures proposed as part of this EIR.

3.3.7 Draft Scoping Report

The EIA Regulations specify that I&AP's must have an opportunity to verify that their issues have been captured. A period of 30 days (4 January 2013 till 4 February 2013) was made available for public comment on the Draft Scoping Report as part of the environmental impact assessment process. The availability of the Draft Scoping Report was announced via personal notification letters to all the registered I&AP's on the distribution list on the 4th of January 2013. The availability of the Draft Scoping Report for review was additionally advertised in the Daily Sun on the 4th of January 2013.

In addition, the Scoping Report was distributed for comment as follows:

- Published on the AGES website at www.ages-docs.co.za;
- Electronic copies on request; and
- Hard copies at the Mphahlele Tribal Authority Offices, Tau-Mankotsana Traditional Authority, Baroka Ba Nkwana Traditional Authority, as well as the Public Library in Apel. Hard copies were also provided to Mr. Maredi Mphahlele from the Mphahlele Tribal Authority.

3.3.8 Final Scoping Report

The Comments and Response Report and Scoping Report were updated after the draft review to incorporate the comments received and issues raised by I&APs. (APPENDIX A 8 hereto).The final Scoping Report was made available to I&APs (for 30 days from the 13th of March 2013 till the 26th of April 2013) and submitted to the LEDET.

3.3.9 Draft EIA Report

A period of 30 days will be made available for public comment on the draft EIA Report as part of the environmental impact assessment process. The availability of the draft EIA Report will be announced via personal notification letters to all the registered I&AP's on the distribution list.

In addition, the EIA Report will be distributed for comment as follows:

- Published on the AGES website at www.ages-docs.co.za
- Electronic and Hard copies on request

3.3.10 Draft EIA feedback Public meeting:

Public meetings are planned for the 20th and 21st of August 2013 at the Gwaragwara Combined School in Nkotokwane and at the Tau-Mankotsana Community Hall in Apel respectively; to provide I&APs with the opportunity to raise issues and comments and ask specific questions in the presence of the relevant consultants on the project. All the issues raised by I&APs during the public meetings will be captured in a Comments and Response Report that will be submitted as part of the Final EIR as contemplated in regulation 57(1) of the EIA Regulations (GNR 543 of 18 June 2010).

3.3.11 Final EIA Report

The Issues and Response report and draft EIA report will be updated after the draft review to incorporate the comments received and issues raised by I&APs. (APPENDIX A 8 hereto).The Final report will then again be submitted to I&AP's for review as well as the LEDET.

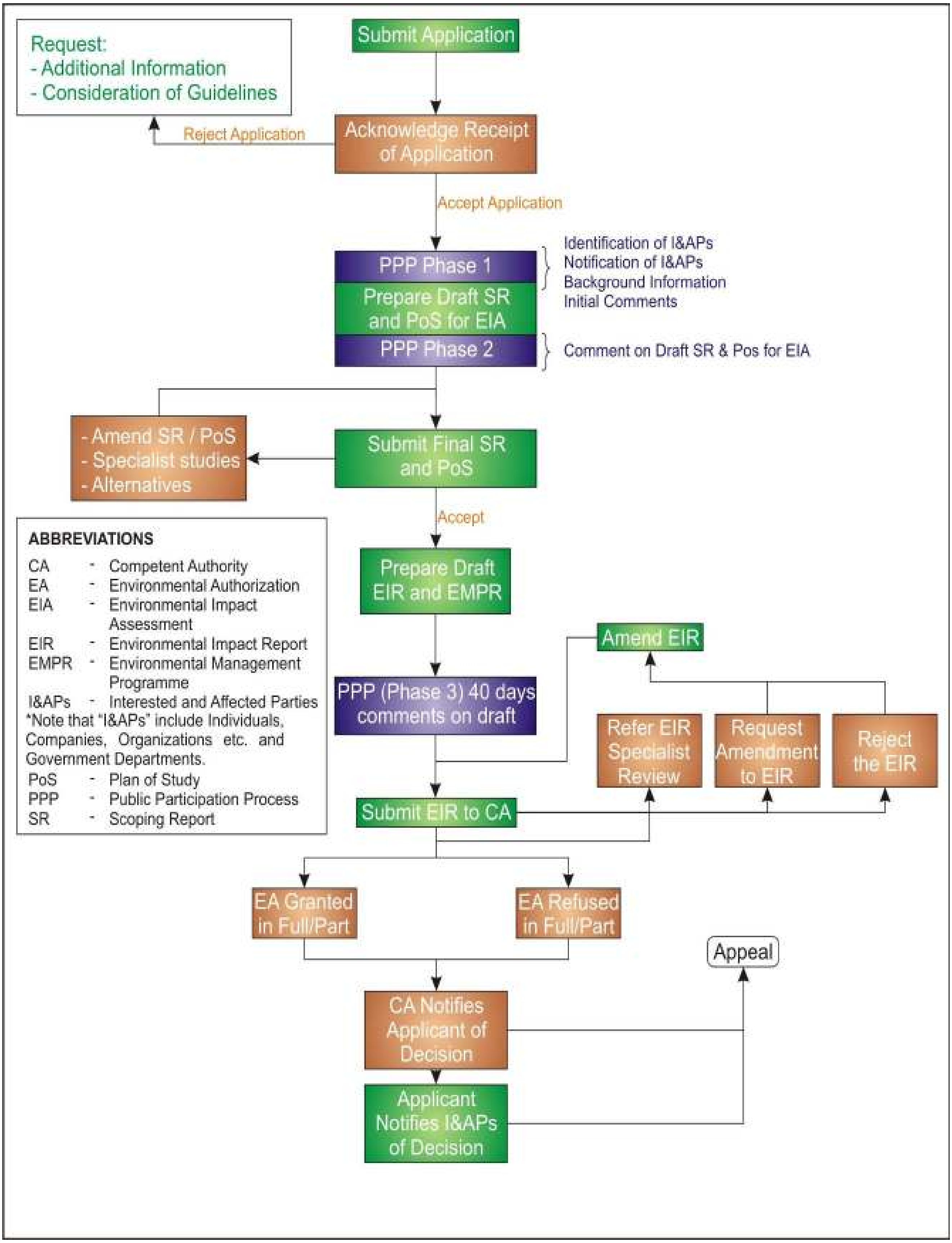


Figure 3-1 EIA Process according to NEMA (EIA Regulations 2010)

4 PROJECT DESCRIPTION

4.1 General

The Lesego Platinum site is located approximately 300 km northeast of Johannesburg in the Limpopo Province of the Republic of South Africa. Access from Johannesburg to the central portion of the site is via the national N1 highway to the town of Mokopane and then via a tarred road (R518) past Lebowakgomo and then onto the tarred R37 Polokwane – Burgersfort road to an intersection with a gravel road, north of the site.

The proposed project will involve platinum mining activities and related infrastructure. The resource battery limit of the identified platinum resources is below 350 m below ground surface. The orebody underlying the site consists of Merensky as well as UG2 reefs within the Bushveld Igneous Complex, which will be exploited via access from two vertical shafts. Ultimately the shaft system will go to a depth of 1700 m with one shaft to be used for man and material and the other for ventilation, with a decline being used to extract the full extent of the orebody to a depth of 2350 m.

The main infrastructure which will be positioned and constructed along with the twin shaft system includes a tailings disposal facility, a process plant, offices and workshops, water management and distribution infrastructure, a 132 kV bulk electricity line, sewage treatment plant, water treatment plant, haul and access roads, waste rock dumps and topsoil stock piles.

4.2 Mining Method

Roughly 200 ktpm Merensky reef and 100 ktpm UG2 reef will be mined with 50 ktpm development waste. The ore body's orientation and depth dictates that the initial primary access would be via a twin vertical shaft system from surface that would service sub decline systems developed for each reef horizon. Continued future access for the later stages of the life of mine would be facilitated by an additional vertical and sub decline network. The two vertical shafts from surface consists of a main shaft of 11 m diameter (Number 1 Shaft) sunk to depth of 1700 m and a ventilation shaft of 9 m diameter (Number 2 shaft), sunk to a depth of 1650 m.

The ventilation and main shafts are sunk from surface using conventional shaft sinking methods. The sinking process shall consist of a pre-sink to 140 m followed by construction and equipping of the sinking winders and stage. Simultaneous concrete lining of the shaft walls shall be done in conjunction with the drill, blast, support and cleaning operations. Main shaft will be sunk to a depth of 1700 m; this includes the loading level and the spillage winze configurations. The ventilation shaft however will only be sunk conventionally to a depth of 900 m once again taking into account the loading level and the spillage winze for the ventilation shaft loading arrangement. From a depth of 1600 m a raised bore shaft will be drilled to hole into the current ventilation shaft. Equipping of the shaft shall be performed in a “bottom-up” fashion following the completion of the shaft bottom excavations.

The Phase 3 resource is accessed by a four barrel cluster decline system on apparent dip developed from the main production level 1,600 m to access the shallow dip (22 – 7 degree) conventional mining section of the orebody from 1,600 m to 2,350 m. The four barrel decline cluster, with laterals spaced at regular intervals of 75 m are developed using trackless mechanised machinery. It is developed on apparent dip at 1:6 or 9.46 degrees with approximately 500 m conveyor legs. It intersects each of the production levels via a level ramp and material transfer point. The decline cluster system consists of one material declines developed 5.0m wide and 5.0 m high (for ingress and egress of material), a conveyor decline developed 5.5 m wide and 5.0 m high, a chairlift for ingress and egress of the men and a dedicated return airway. All services are carried in the material decline. The decline is also used for the transport of major mobile mining equipment and the transport of materials.

The sub decline clusters for each reef horizon will be placed 50m in the footwall of each reef and developed using trackless mining machinery to attain faster development rates. The mining method will be conventional breast stoping using scraper cleaning on the stope faces, strike and dip gullies. Ore will be processed at an onsite processing plant, and tailings will be disposed of at an on-site tailings disposal facility (TDF).

4.3 Life of Mine

The mineral resources included in this study are extensive, giving an overall life of mine in excess of 60 years. This is divided into three phases as follows; phase 1 (8 years), phase 2 (15 years) and phase 3 (37 years). As a result the mine is phased into three areas. The seam dip above 1,200 m depth is greater than 35 degrees and steepens to 89 degrees at the shallowest portion of the orebody (350 m depth).

Below 350 m the seams dip from approximately 89 degrees to 35 degrees. The mining area steeper than 35 degrees forms the Phase 1 production pipeline. It is located between 350 m and 1,200 m in the Merensky orebody and between 350 and 1,300 m in the UG2 orebody. The ore is exploited using a mechanised mining method. Below 1,200 m and 1,300 m the seam dip flattens to between 35 and 7 degrees. This portion of the orebody is exploited using a conventional breast mining method (Phase 2 and 3). A depth cut-off 1,600 m has been selected as the area forming the boundary for Phase 2 and 3. The selection of 1,600 m is based on the point at which the sub-decline system is developed on true dip and the main vertical shafts bottom is located. The decline system provides a sufficient capital footprint for the required 8 Merensky levels to be developed to ensure steady state production is achieved. The portion of the orebody below 1,600 mbc forms the “Phase 3” mining area. The “Phase 3” mining area is accessed with decline system. This is done to ensure the efficiency of personnel, rock and material transportation and the supply of sufficient ventilation.

4.4 Surface Infrastructure

The Lesego Platinum Mine is located within an area with existing mining activities, approximately 11 km north east and 22 km west of the proposed site. The infrastructure in the area is fairly poor (based on relevant specialist assessments), with major service backlogs, dispersed human settlements and high poverty levels.

The area is served by a number of provincial roads as well as the N1 national road linking it to Zimbabwe and the rest of South Africa. There is one commercial airport in the region (Polokwane International) as well as a number of private airstrips that are mainly used for tourism and private use.

The town of Lebowakgomo, which is located 20 km east-southeast of the site, as well as the villages of Phosiri, Mabokotswane, Malogeng, Pelangwe, India, Ga-Mankopane, Ga-Nkoana, Apel and Tiekiedraai will provide skilled and unskilled labour for future operations. All access roads are mainly existing gravel district roads and will need to be upgraded.

Envisaged infrastructure will comprise of the following:

A tailings disposal facility (TDF);

A processing plant and associated infrastructure;

Offices and workshops;

Water management and distribution infrastructure;

A 132 kV electricity lines;

Diesel storage facilities;

Sewage treatment plant;

Water treatment plant;

Haul and access roads and bridges

Perimeter and internal fencing;

Waste rock dumps; and

Topsoil stockpiles.

The proposed mine layout is indicated in Figure 4-1.

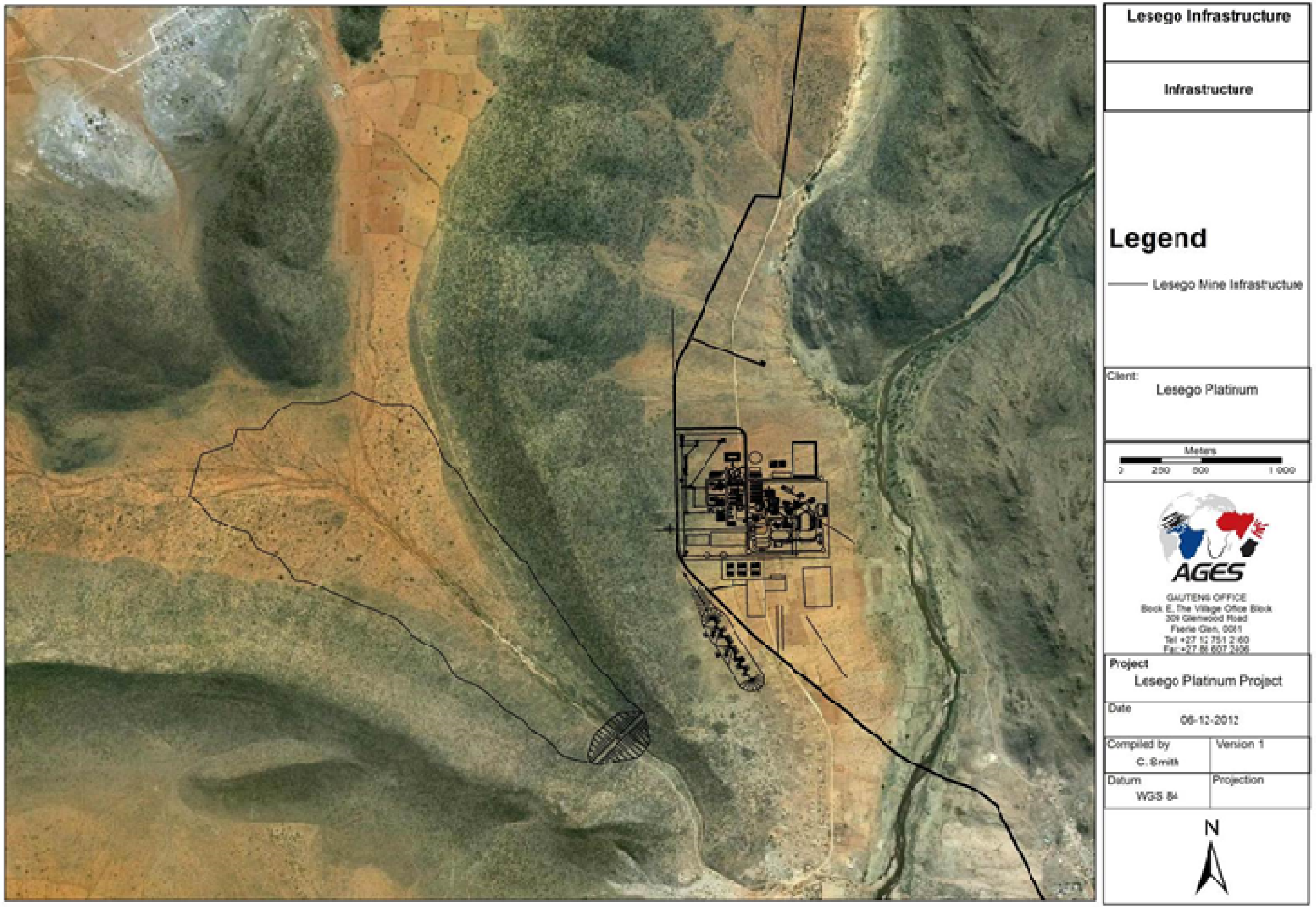


Figure 4-1 Mine infrastructure layout

4.5 Metallurgical Process

During the concentration process, ore is ground to liberate mineral particles. These are then recovered in the form of a concentrate by froth flotation. The ore mineralogy dictates both the fineness of grind required for liberation and the ideal flotation conditions. Very fine particles are difficult to recover, so two or even three milling and flotation stages may be used to minimise losses caused by over-grinding.

In Merensky processing a metallic concentrate rich in PGMs is sometimes produced in addition to the flotation concentrate. This concentrate can be sufficiently rich to by-pass the smelter and be sent straight to base metal removal.

In UG2 processing there are a number of options regarding by product chromite recovery and blending with the Merensky ore before milling. Chromite is recovered after primary milling, with the chromite crystals being liberated at their natural grain size. UG2 ores require finer grinding than Merensky ore for optimum PGM recovery, and blending of the two before milling therefore gives lower recoveries (Chamber of Mines, 2008).

The proposed process plant will consist of a standard MF2 circuit (i.e. mill/float followed mill/float of primary tailings) treating run of mine (ROM) ore crushed, by the primary crusher, to 80% passing 100mm, processing approximately 150 – 200 ktpm Merensky reef and 100 ktpm UG2 reef. The circuit will entail primary and secondary stage mills as well as flotation sections, which will generate primary and secondary concentrate. The generated concentrate will be filtered to 11 – 15% moisture from where it will be transported to a toll smelter.

4.6 Services and Infrastructure

4.6.1 Water Supply

Ages Engineering Services (Pty) Ltd (AES) was appointed by Africa Geo Environmental Engineering and Science (Pty) Ltd (AGES), acting on behalf of Lesego Platinum Mining (Pty) Ltd - Lesego Platinum Mine to perform a feasibility- and value engineering study on options to supply water to the mine planned and related infrastructure from the most viable option taken from the PFS. The following water supply options were assessed:

1. Surface Water Sources Considered

- Water sourced from existing **agricultural** allocations – to be pursued further – politically problematic;

- Net water saving through the clearing of **alien** vegetation – to be pursued further for possible community participation – cost very high;
- Water from the Waste Water Treatment processes upstream along Olifants River – to be pursued further but already part of Olifants River Reconciliation Study;
- Water available from a planned Flag Boshielo Mogalakwena Transfer Scheme – to be pursued further;
- Existing mines' **discharged water** (Atok Mine) – not viable;
- Water allocated from the proposed **De Hoop Dam** – not viable with current cost.

2. Groundwater Sources Considered

- Water sourced from groundwater (<30km radius) – to be pursued further
- Water sourced from **regional groundwater** (>30km radius) – to be pursued further

In the first phase of an exploration exercise, 10 boreholes were identified, drilled and tested to form the basis of the Phase 1 water supply network to the mine. The total sustainable makeup water from **7 boreholes is 38.3 l/s (3.3 Ml/day) and there is 5 l/s (432 Kl/d) available** from BH LWSBH2 for potable water. This quantity of water will satisfy **approximately 33% of the requirement for the peak consumption at the mine which is only required after 2024, but is sufficient for the construction and ramp up phases**. The proposed construction of the conveyance pipelines and equipping of the boreholes can be phased in accordance with the mining schedule of the mine.

The capital cost for the first phase (**43.3 l/s) amounts to R 21.41 million** (14% Vat excl.). The operational cost for this first phase amounts to **R 1.23 million per annum** (Vat excl.). The cost of water from the proposed development is **R 3.02 per cubic meter** excluding the cost of infrastructure and pumping from the return water dam to the plant. The proposed construction of the conveyance pipelines and equipping of the boreholes can be phased in accordance with the mining schedule of the mine.

It is recommended that the exploration process to confirm and develop a source to fulfil in the total demand of the mine should continue. In addition, cognisance should be taken of surface water developments in the area, as well as water from underground ingress from fissures.

Table 4-1 serves as a cost summary of the water supply options.

Table 4-1 Water Supply Options

COST SUMMARY TABLE				
OPTION/SCENARIO		**Flow (ML/d)**	**CAPEX (R mil)**	**URV (R/m³)**
1	Groundwater (< 30 km)	2–4 ML/d	R 116.8m – R 175.2m	R 8.24 – R 12.37
2	Agricultural	10 ML/d	R 356.3m – R 455.5m*	R 23.6 – R 31.5
3	Alien Vegetation	0.5 ML/d	R 94.1m – R 117.9m*	R 29.2 – R 38.4*
4	Mine discharged water (Atok)	2 ML/d	R 67.2m – R 100.7m*	R 7.10 – R 10.65*
5	Regional Groundwater (40 to 140 km)	5 ML/d	R 418.0m – R 627.0m	R 17.12 – R 25.68
6	De Hoop Dam	5 ML/d	R 334.8m – R 502.3m*	R 15.06 – R 22.59

Any costs associated with the procurement of water rights or property have been excluded

The groundwater supply development costs for phase 2 have been included in the geohydrological report for budgeting purposes (APPENDIX I).

4.6.2 Electricity

The proposed mining activities will require an estimated 6 MVA temporary supply and 118 MVA once in full operation. According to ESKOM the best option for the temporary 6 MVA electricity supply will be to construct a 3 km 33Kv line from the Strydkraal substation as this substation has the capacity to supply 6 MVA.

The 118 MVA required once in full operation will be obtained from the construction of a single 132 kV overhead Kingbird power line from Leseding 32 km away. The total cost involved for construction of the electricity supply infrastructure is approximately R236m. Energy alternatives were also considered and are discussed in more detail in section 7.

4.6.3 Roads

The proposed site is located approximately 5.5 km south of the R37 which serves as the main road between Burgersfort and Polokwane. The main road running in the area is the R37 which is situated approximately 5.5 km north of the proposed site. The R37 is a National Road managed by SANRAL and connects Polokwane and Burgersfort.

The proposed access road will consist of a single lane road for traffic in both directions. Each lane is to be 3.6 m wide with a 1.4 m yellow lane shoulder. The district roads proposed for the access are managed by the Limpopo Roads Agency (RAL) and any upgrade and access to it needs to be negotiated in conjunction with this authority. Other roads will include haul roads, which will form part of the internal road network.

There are currently no surfaced roads up to the proposed surface infrastructure of the mine site. South of the mine site, Roads D4199 and D4250 (D4191) end a few hundred metres east of the river. North of the mine site, Road D5010 is the only road from which access to the mine can be obtained.

Five alternative access roads were assessed and entail the following:

1) Access route 1 - this proposed access route that will entail access from an existing gravel district road serving the surrounding communities with access to the R37;

2) Access route 2 – the proposed route alignment follows that of an existing gravel road and transverse through several villages until it reaches the R579, close to Lebowakgomo;

3) Access route 3 – this proposed route leads in a northerly direction and transverse through several villages until it intersects with the R37;

4) Access route 4 – this route will exit the site into a northerly direction from where it will follow the alignment of route alternative 1 diverting north through Mashite and the mountain neck and intersecting with the R37; and

5) Access route 5 – this route will exit the site in a southern direction crossing the Olifants river with a bridge from where it will connect to the main Apel road.

It is proposed that both access route 2 and 5 be combined for access to the mine as this will provide the mine with access from the North and the South.

4.6.4 Water treatment plant

The water treatment plant will be a turnkey package. Some of the raw water as well as treated water from the sewage plant will be fed into the water treatment plant for further processing as per the staged water requirements. The water will be treated in two stages within the water treatment plant. Stage 1 of the treated water will be used or the concentrator plant requirements and Stage 2 will be used as make-up for potable water requirements.

The raw feed water will consist of dirty water returned from operations and of top-up water from the voids/old underground workings. Since the quality of the dirty water from the operations is unknown at this point, it is assumed that the quality will be similar to that of the water in the old underground workings.

Treatment methods for ensuring water meet SANS 241 Class I (potable water) can be categorised as follows:

- Chemical removal by precipitation of insoluble salts by chemical treatment.
- Flocculation, coagulation and settling of insoluble and large contaminates.
- Flocculation, coagulation and filtering of smaller insoluble contaminates.
- Chlorination or other suitable sterilisation.
- Ultra filtration to remove microscopic contaminates.
- Reverse osmosis to remove remaining undesirable dissolved contaminates.

4.6.5 Sewage treatment plant

An onsite sewage treatment facility will be constructed to treat sewage generated. The sewage treatment plant will be designed to process 700 m^3 per day. This would cater for both mining and plant personnel. All sewage drainage, feeding the sewage plant will be gravity fed. The position of the sewage plant is directly next to the water treatment plant and the storm water dam for easy local distribution of treated water.

4.6.6 Solid waste management facilities

All waste will be collected at the mine salvage yard where it will be sorted. Dedicated bays will be provided for different wastes. Recycling initiatives from the local communities will be investigated. Solid waste will be collected by a contractor and transferred to the closest registered waste facility. Oil will be stored in containers within a bunded area from where it will be collected and removed by an accredited contractor.

4.6.7 Blasting

The bulk emulsion will be stored on the surface in the Explosives Store prior to mixing underground with sensitizer. Anvex will be received at the off-loading bay on the surface. The Anvex will be logged into a register, before being transported underground by the explosives transporter.

Fuses and accessories will be delivered on a daily basis and transported underground to be combined with the Anvex for blasting purposes. An explosives disposal facility for the destruction of explosives has been provided for on the surface.

4.6.8 Storm water management

The proposed water management methodology at the mine should be based on the BPEO principle with responsible use and best practices. The impact of development on water quantity, quality and cost should be minimised. According to the GN 704 of 4 June 1999 clean and dirty water should be separated and process water recycled and re-used. The dirty water will be kept in a closed circuit and spillages minimised.

Note that the term “clean water” refers to water that has not been interfered with and “dirty water” is water that is handled in or precipitated on the mine operations. Dirty water is therefore not necessarily contaminated. The following water management aspects are included in the design of the mine infrastructure and waste facilities:

- Clean storm water will be diverted around the mine areas so that dirty and clean water are separated.
- No infrastructure will be located below the 1:50 year river flood line.
- Dirty water will be kept in closed circuit and be re-used in the mining processes.

Make-up process water will also be used in the following order:

- Return water from the tailings facility
- On-site storm water
- On site Sewerage Works

The requirement of regulation GN704 has been adhered to, especially the requirement for the storm water retention dams which should be designed to spill not more than once in fifty years.

Evaporation losses should be minimised, unless there is surplus water in the system (e.g. during storm events, the storm water dams could be used to evaporate surplus water) (De Lange, 2012). Refer to Figure 4-2 for the stormwater management infrastructure.

Figure 4-2 Conceptual Stormwater Infrastructure Map

4.7 Mine water balance

The environmental water balance was compiled to evaluate the total flows required for the plant, mining and change house. The purpose of the environmental water balance is for reporting to the environmental process, regulatory authorities and for the water use licensing components where water management principles and make-up water use requirements are highlighted.

As indicated by the environmental water balance, results are as follows:

- The average make-up water use would be 10 150 m3/d (117.5 ℓ/s) for mining, plant and potable water requirements, which represents 1.02 m3/ton milled. The potable component would be 98 m3/d, and the drinking water component would be 2.4 m3/d for Phase 1.

- For Phase 2, this will increase to 369 m^3/d potable component and the drinking water component would be 9 m^3/d, stormwater would be contained in stormwater containment dams that can manage 1:50 year flood events as required by GN 704.

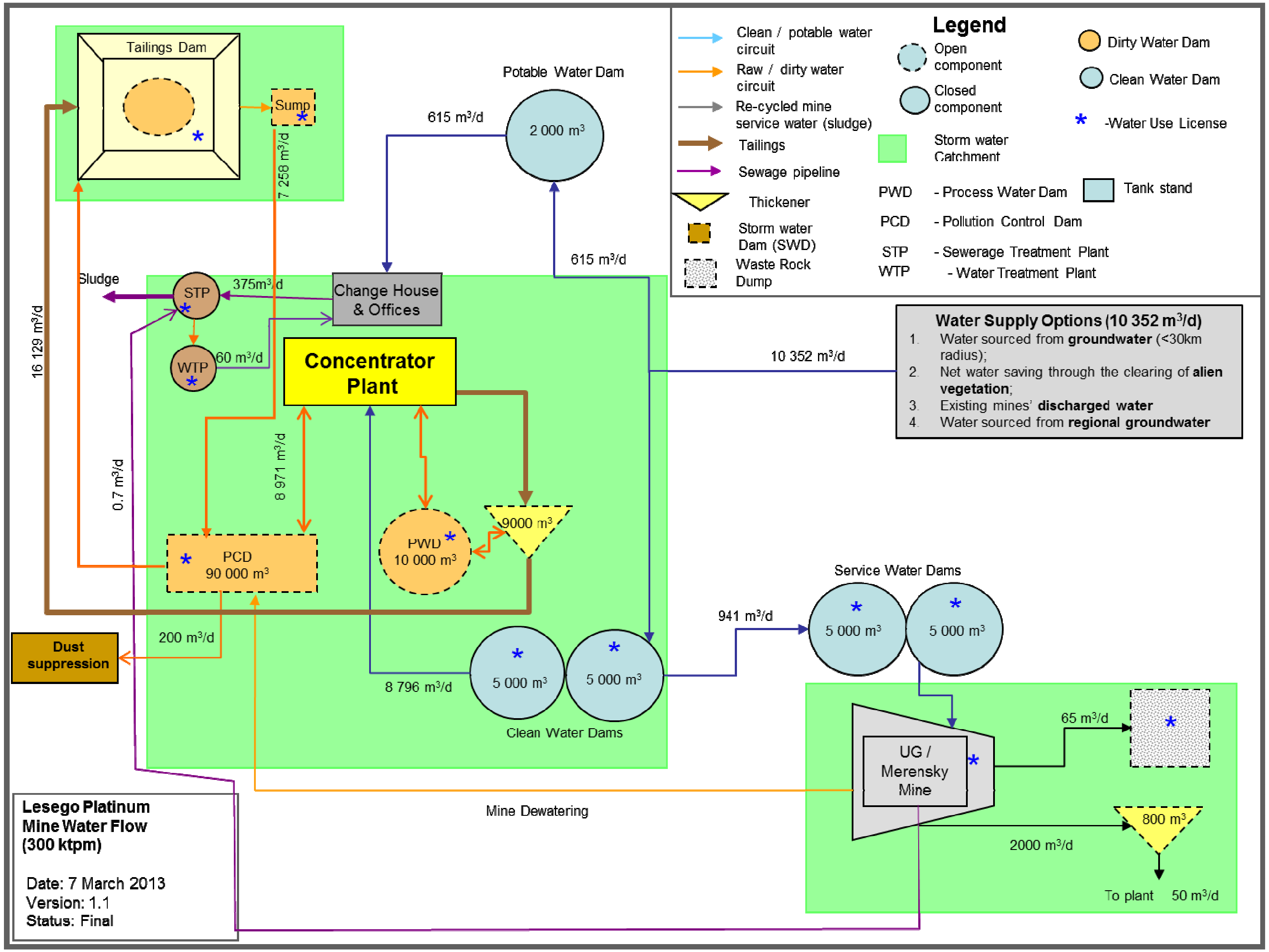


Figure 4-3 Mine Water Balance

4.8 Decommissioning and Closure

AGES has prepared a Mine Closure and Rehabilitation Plan and an Estimate of Financial Provision for the proposed Project (APPENDIX U).

The Key objectives of the report was to ensure that the closure of the proposed Lesego Platinum Mine is planned in such a way that it is in line with the Department of Mineral Resource (DMR) guidelines, as well as with generally accepted industry best practice principles. This will ensure that a positive legacy is left behind at closure that contributes to sustainable development. The Closure plan and integrated rehabilitation plan are discussed in more detail under section 14 of this report.

5 NEED AND DESIRIBILITY

5.1.1 Need

The Bushveld Igneous Complex, which extends for 400 kilometres in the Northern Province, contains the world's largest known deposits of platinum group metals (PGMs) - platinum, palladium, rhodium, ruthenium, iridium and osmium. The Bushveld Igneous Complex consists of the Merensky and UG2 Reefs as well as the Platreef in the northern extension. The Merensky Reef accounts for over 80% of the platinum mined in South Africa, with the highest PGM values being associated with the UG2 Reef which lies about 200 m to 300 m below the Merensky Reef.

The extraordinary physical properties of the platinum group make its metals almost indispensable in a wide range of industrial applications. Autocatalysts, which account for more than 40% of the total demand for platinum, are the major demand sector for PGMs. Around 38% of the world's platinum finds its way into jewellery, and the electrical and electronics industry accounts for 50% of the annual palladium and ruthenium demands. Growth is associated with PGMs playing a role in fighting viral, bacterial and parasitic infections in the future and even being used as diagnostic tools. The use of clean and efficient fuel cells in the future, in which platinum catalysts are used to convert the chemical energy of a fuel into electrical energy, has for some time been sees as the next new major demand sector for platinum (Chamber of Mines, 2008).

An expected increase in the demand for platinum and palladium is expected for the future due to stricter emissions legislation globally and a rise in the growth of vehicle production and sales. In addition, with global energy demand expected to grow by more than 60% by 2030, the security of energy supply has become a concern and has led to the diversification of energy sources. This has created new opportunities for PGMs in the development of fuel cell technology, which could lead to significant socio-economic development as it will result in job creation in terms of manufacturing, installation and maintenance, as well as skills development (Mining Weekly, 2012).

The benefits of the development of the Lesego Platinum Mine is apparent from the above, with the expected increase in demand for platinum-group metals (PGMs) on a global basis, especially for fuel cell technology, which not only provides an alternative clean and sustainable energy source but comes with a variety of socio-economic benefits. In addition to the global socio-economic benefits, the Lesego Platinum Mine will also provide the local communities with various benefits relating mainly to job creation and skills development. Unemployment in the site is high and mining is seen to hold major possibilities for the area.

Without the implementation of this project, the mentioned benefits would not be realised. The realization of the outcome the Mining Charter (2004), within the context of the MPRDA (2002), would therefore also not be reached and this has potentially significant negative impacts on national economic growth and social well-being. The Mining Charters main objectives, which the Lesego Platinum Project will assist to reach, are:

- to promote equitable access to South Africa's Mineral Resources for all South Africans;
- to substantially and meaningfully expand opportunities for historically disadvantaged South Africans (HDSAs);
- to utilize the existing skills base for the empowerment of HDSAs (Refer to the Social and Labour Plan (SLP) as part of the Mining Right);
- to expand the skills base of HDSAs to serve the community; (Refer to the SLP conducted according to the MPRDA);
- to promote employment and advance the social and economic welfare of mining communities and areas supplying mining labour; (Refer to the SLP as part of the Mining Right); and
- to promote beneficiation of South Africa's mineral commodities beyond mining and processing, including the production of consumer products.

5.1.2 Desirability

Limpopo has rich mineral resources, making mining a critical sector of the economy of the province, contributing 22% to its GDP. Unemployment in the region is high with an estimated 46% of the economically active population in the Capricorn District being unemployed. Mining is the smallest contributor to the economy of the district and accounts for only 0.6% and is the only sector that experienced a negative growth (-6.7%) in the last decade. Mining is seen to hold major possibilities for the district and presents a number of backward and forward linkage opportunities for the entire district.

The economy of the Sekhukhune District is a mixture of very negative features (such as the highest unemployment rate in Limpopo) and very positive opportunities (like the enormous mining potential within the area).The region is also characterised by a high level of male absenteeism, a weak economic base, poor infrastructure, major service backlogs, dispersed human settlements and high poverty levels. It is estimated that approximately 86% of the people in the Fetakgomo municipality live below the poverty line (Fetakgomo LM IDP).

The proposed Lesego Platinum Mine will create job opportunities in the region and provide the local workforce with skills development training. Lesego Platinum Mining is dedicated to employ people from the local communities and have developed a Social and Labour Plan (SLP) to this effect. The SLP focuses largely on human resource development activities, which will focus on equipping people from the local communities with skills that will make them desired employees during both the construction and operational phases of the project (Aucamp, 2011).

During the construction phase that will last for more than ten years, capital investment into the mine will generate a total of R37 586 million of new business sales that will translate into R13 697 million in GDP-R in 2013 prices. Employment created on-site will vary year-on-year but will average at about 1 493 FTE jobs per annum. A total of 71 939 FTE man-years will be created during construction. Of these, more than 70% will be created through production and consumption induced impacts. Households will earn R6 792 million (2013 prices) in income over the entire construction period, while government will collect an additional R837 million in 2013 prices in the form of income and payroll taxes.

During operations that will span from the period between 2019 and 2072, a total of 154 990 kt of ore will be mined that will generate sales to the value of R301 177 million in 2013 prices. Through the direct and multiplier effects, the mine will stimulate the creation of new business sales to the order of R406 741 million that will translate into R288 645 million of value added in 2013 prices. On average, R6 456 million of production output and associated R4 582 million of GDP-R will be created on an annual basis during the mine’s operation. This will in turn create and sustain 7 567 employment opportunities throughout the country, of which 4 141 jobs will be sustained at the mine itself. During the steady state production period, the number of people employed at the mine will average at 5 132 workers. The average annual income earned by all households benefiting from the mine’s operation directly or indirectly will equate to about R1 178 million in 2013 prices, most of which will be earned by households whose members will be working at the mine itself. In addition to the above, operations of the mine will increase export earnings for South Africa and boost government revenue to the value of R77 389 million in 2013 prices (Urban-Econ Development Economists; 2013).

It is clear from the above that the proposed Lesego Platinum Mine will have a significant positive effect on the national economy in terms of stimulation of domestic production, job creation, government revenue, and export earnings. The proposed project is also expected to bring a much needed rejuvenation to the local economies that face high unemployment and poor economic growth rates. The project has the ability to increase the size of the local economies by between 15 to 21% and reduce the combined unemployment rate from 25.4% to 17.6%. Furthermore, the project falls within the developmental priorities of the local municipalities that have identified the expansion of the mining sector as one of the means to develop the local economies and uplift its communities (Urban-Econ Development Economists; 2013).

In addition to the socio-economic benefits of the proposed platinum mine, the mine will also contribute to the ecology. The current ecosystem of the site is already impacted upon, and is degraded in some instances due to over-grazing and crop cultivation. The soils are also highly erodible due to these anthropogenic disturbances. The mining development will support rehabilitation of the broader project site and will thus assist the system to recover to an enhanced state compared to the current status quo.

6 BASELINE DESCRIPTION OF THE AFFECTED ENVIRONMENT

Section 39 (3) (a) of the MPRDA, read together with Regulation 50 (a) and 51 (a), and Section 28 and 31 of the NEMA Regulations (GNR.543) requires a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity; in order to determine remedial measures, and associated environmental management objectives.

6.1 Topography

The site is situated along the eastern slopes of the Phosiri dome, which rises approximately 950 m above mean sea level (mamsl) reaching a maximum height of 1,112 mamsl along the southern flank of the dome and a maximum of 992 mamsl on the eastern flank (Henning, 2011). The southern flank of the dome drops off sharply onto a wide flat grassy plain previously utilised for agricultural activities. The eastern flank of the dome drops at a similar gradient to an average elevation approximately 759 mamsl terminating in a low lying non perennial drainage plain, where after it abruptly rise again in the east to heights in excess of 900 mamsl.

The regional topography of the study area can generally be classified as low mountainous terrain throughout most parts of the central, eastern and western sections of the study area often forming deep valleys and a gorge where the Olifants River cuts through the mountainous area.

6.2 Climate

6.2.1 Temperature

Summers are characterised by high temperatures in summer months and temperatures dropping below zero in the winter. Mean monthly temperatures for the area ranges from 24.8°C for January and 12.4°C in July. The temperatures are generally very mild and stable with a minimum variance between maximum and minimum temperatures. Maximum daytime temperatures reach 36.6°C in October, while the coldest temperature recorded was 2.4°C in June.

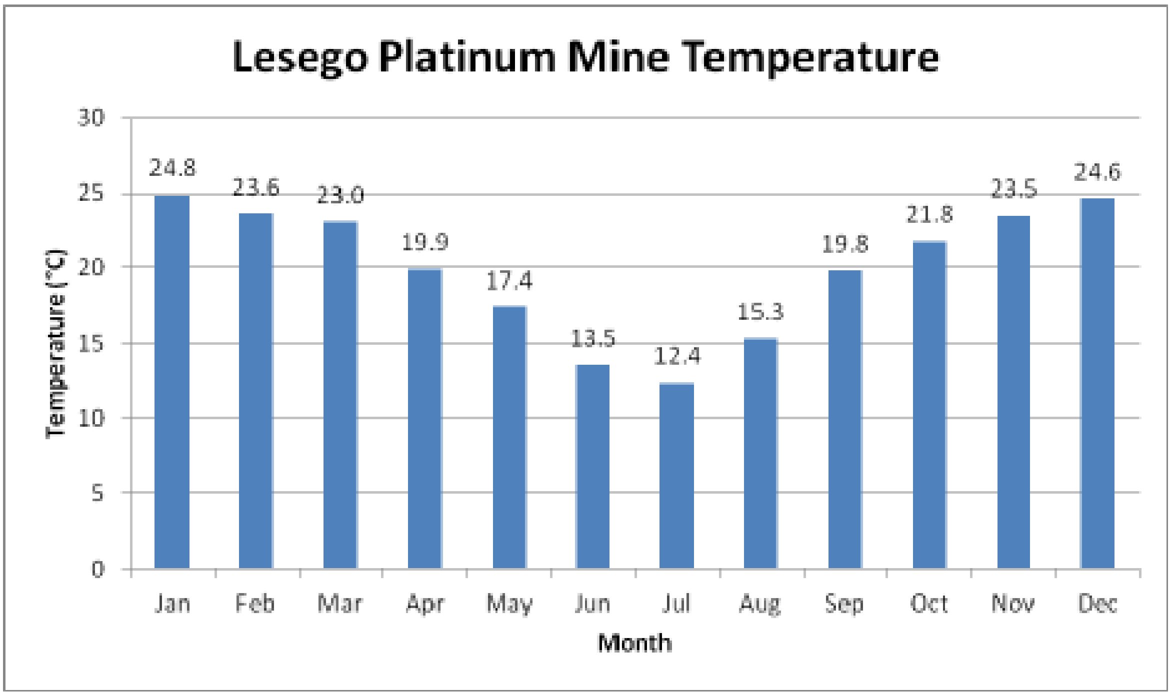


Figure 6-1 Mean monthly temperatures (South African Weather Bureau; 2012)

6.2.2 Rainfall

The site is located within the Limpopo Climatic Zone where the average annual rainfall varies from 478 mm to just over 738 mm. A mean annual rainfall figure of 537 mm was calculated for the five closest rainfall stations over approximately 97 years (see

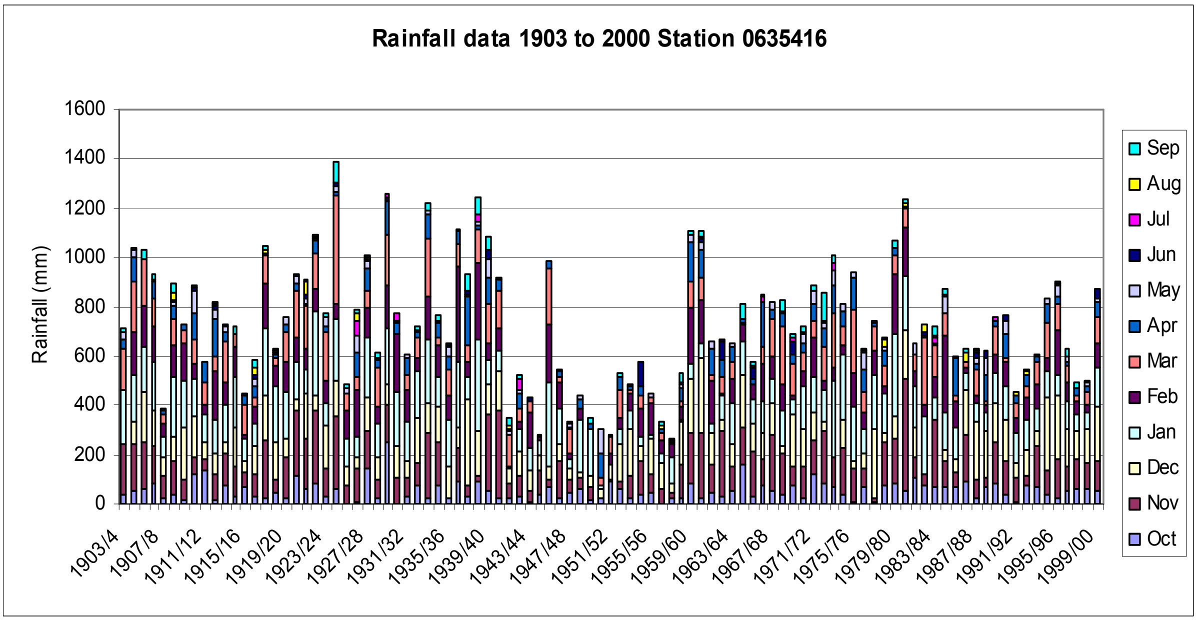


Figure 6-2 Average Rainfall data

Precipitation in the region is almost exclusively due to showers and thunderstorms. Precipitation occurs mainly in the summer months (November to March) with the peak of the rainy season in January. The highest rainfall occurs in January with an average monthly rainfall of 85 mm per month while the months with the lowest rainfall are June and July. Most of the rainfall results from thunderstorms occurring in the afternoon and early evenings and as a result rainfall events of short duration can be expected. The minimum rainfall for this period was recorded in 1935 at 228 mm with the maximum recorded during 1923 at 931.6 mm.

Rainfall data were obtained from weather station 0635416, which is situated just South of the proposed site. The data only represents the period from January 1903 to 2000 covering 97 years, as most of the weather stations in the area has insufficient data.

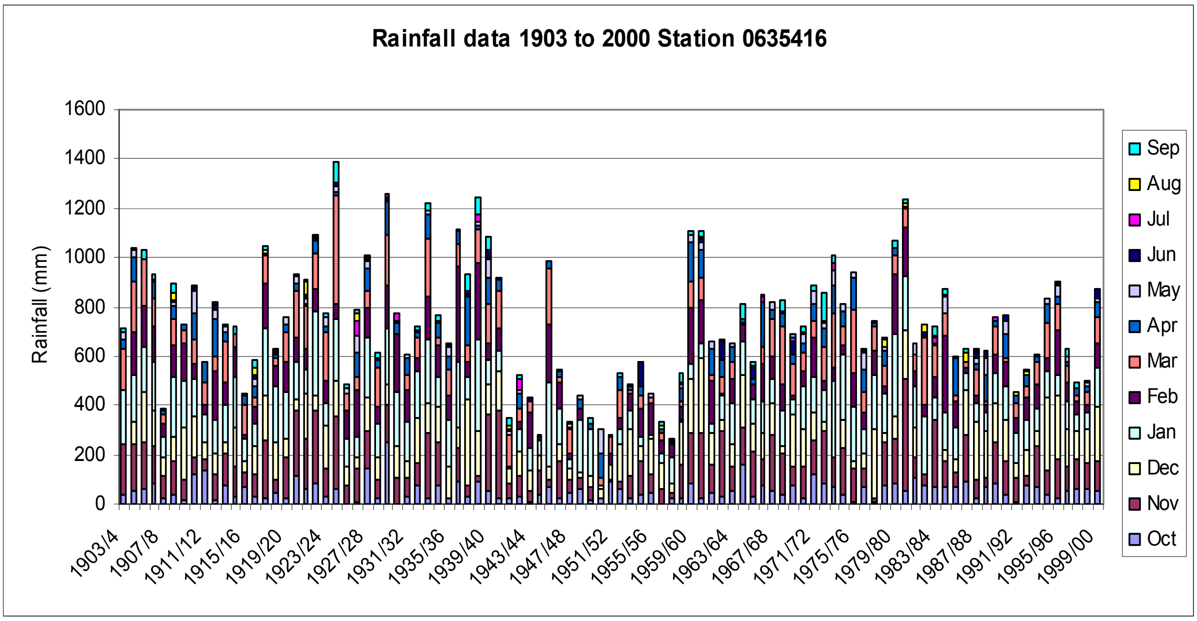


Figure 6-2 Average Rainfall data

6.2.3 Wind

Figure 6-3 indicates the average wind speed and direction for the last 4.5 years taken from the Sekhukune Nchabeleng weather station situated south of the site. The average wind speed measured in the area varies from 1m/s to 3m/s and 48.6% of the winds can be classified as calm. The main wind direction are winds blowing from a north eastern direction, with a very small percentage blowing from a western, south western and eastern direction. The figure below depicts the average wind rose for the period January 2009 to December 2011 for the proposed site. The dominant winds during the day are from a north-easterly and easterly direction. Night-times are characterised by an increase in calm conditions, typical of most river valleys, with winds from the north-easterly sector increasing whereas the frequency of winds from the easterly sector decrease.

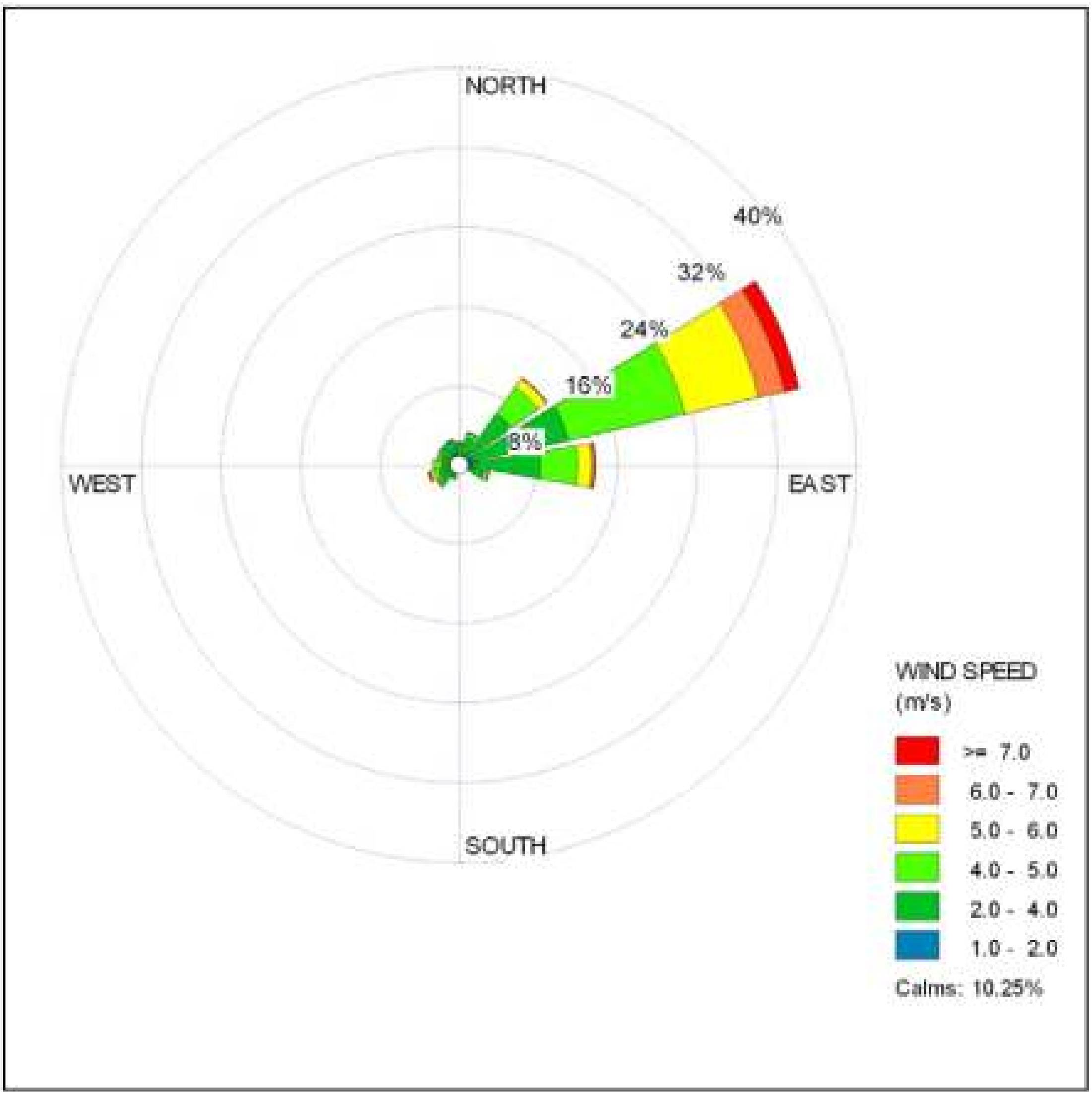


Figure 6-3 Project site wind rose (Liebenberg-Enslin and Gresse; 2012)

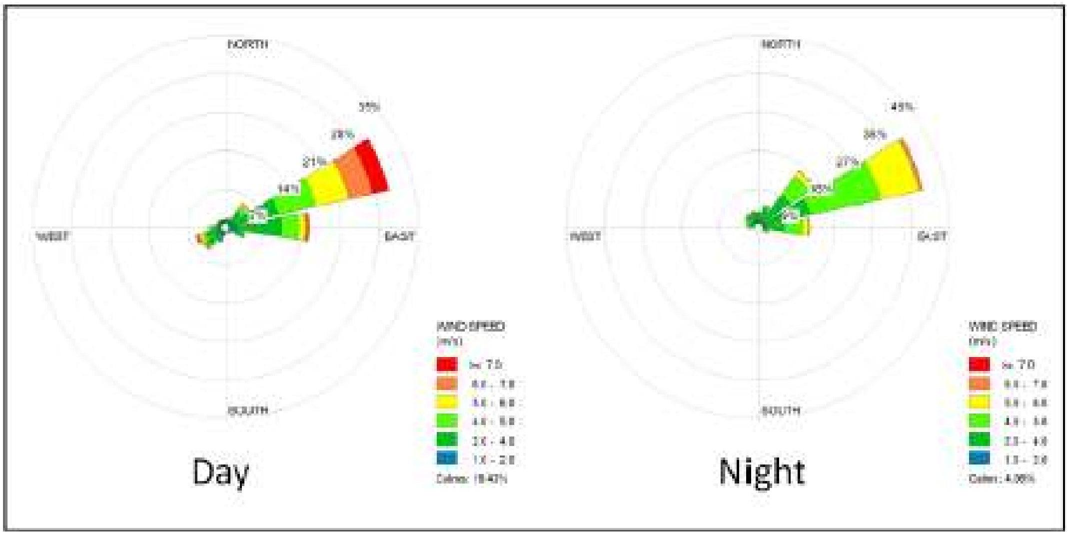


Figure 6-4 Day and night time wind roses for the site (Liebenberg-Enslin and Gresse; 2012)

6.3 Geology

The proposed site is located in the north-western sector of the eastern limb of the Bushveld Igneous Complex, as illustrated in Figure 6-5. The area overlays the Main Zone and Critical Zone mafic sequence of the Rustenburg Layered Suite. Merensky and UG2 reefs were identified and have been brought closer to surface by the Phosiri Dome structure, which consists of Transvaal Supergroup rocks. The geology identified on site is variable, consisting of gabbro, norite, hornfels, granite, quartzite and shale. (Uken, 1998)

The main rock types that prevail in the substrata underneath the proposed TDF comprise of hornfels, carbonaceous and calcareous shale, limestone and quartzite. The quartzite forms part of the Silverton formation in the Pretoria group of Vaalian age. The ridges and mountainous areas around the proposed TDF position consist of quartzite and sandstone with greywacke, arkose, orthoquartzite, micaceous siltstone and feldspathic sandstone. The formations mentioned form part of the Mackekaan and Magaliesberg formations, Pretoria Group. The remainder of the mine site area is mainly gabbro, norite, and anorthosite, which is from the Main Zone in the Rustenburg Layered Suite of the Bushveld Igneous Complex. The groundwater bearing strata types for this area would be the calcareous shale and sandstone and contact zones between the geology types (Meyer & Van Dyk; 2011).

.

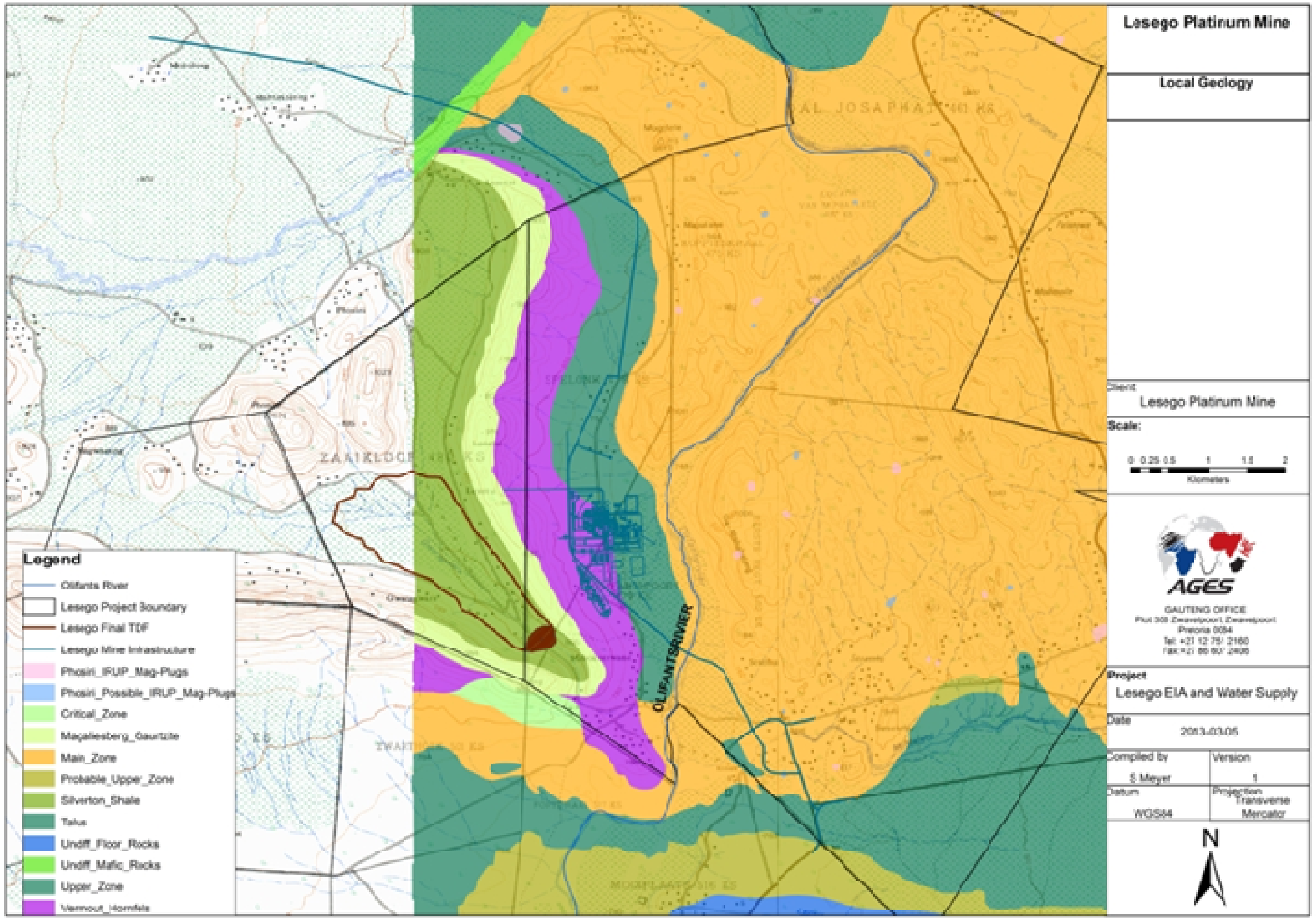


Figure 6-5 Geological Map

6.4 Soils & Land Capability

The soil, land use capability and agricultural potential survey were conducted by Dr. Van der Waals from Terra Soil and included three phases. Phase 1 included the collection of site specific land type data, which was obtained from the Institute for Soil Climate and Water (ISCW) as well as the Agricultural Research Council (ARC). Subsequently the soil data obtained was interpreted and classified. Phase 2 included aerial photo interpretation and land use mapping using the most recent aerial photographs taken from the site. Phase 3 included a site visit during which representative soils were augured and classified.

Five land types namely **Ae339, Db244, Ia175, Ib453** and **Ib454** were identified on site as indicated in Figure 6-6, due to the variable geology identified on site, consisting of gabbro, norite, hornfels, granite, quartzite, shale and limestone, the soils identified are also variable in terms of texture, colour and thickness. The agricultural potential associated with all five land types are classified as low due to soil and climate constraints and is utilised mainly for extensive grazing purposes(Van der Waals; 2011). Table 6-1 serves as a summary of the soil, land use and agricultural potential associated with each land type. Figure 6-9 illustrates which areas are susceptible to erosion.

Table 6-1 Soil, land use and agricultural potential of the land types identified

Land type	Soil	Land use capability	Agricultural potential
Ae339	Variable depth, mesotrophic red apedal (structure-less) with regular occurrences of rock outcrops and lime in the soil profiles. In drainage depressions structured soils occur.	Mainly extensive grazing due to climatic and soil constraints. The sandy soils are suitable to irrigation if subsoil restricting layers can be broken and if water is available.	Low in the natural state.
Db244	Variable depth, lime containing structured soils with regular occurrences of rock outcrops. In drainage depressions structured as well as pedologically young (characterised by signs of recent transport and deposition) soils occur.	Mainly extensive grazing due to climatic and soil constraints. The soils are susceptible to erosion and over grazing is a distinct and widespread risk.	Low due to soil and climate constraints.

Ia175	Shallow and variable depth, lime containing structured and apedal soils with regular occurrences of rock outcrops. In drainage depressions structured as well as pedologically young (characterised by signs of recent transport and deposition) soils occur. Soil erosion occurs in most drainage depressions.	Mainly extensive grazing due to climatic and soil constraints. The soils are susceptible to erosion and over grazing is a distinct and widespread risk.	Low due to soil and climate constraints.
Ib453	Shallow, lime containing structured and apedal soils with very regular occurrences of rock outcrops. In drainage depressions structured as well as pedologically young (characterised by signs of recent transport and deposition) soils occur. Soil erosion occurs in most drainage depressions.	Mainly extensive grazing due to climatic and soil constraints. The soils are susceptible to erosion and over grazing is a distinct and widespread risk.	Low due to soil and climate constraints.
Ib454	Shallow, eutrophic apedal soils with very regular occurrences of rock outcrops. In drainage depressions structured as well as pedologically young (characterised by signs of recent transport and deposition) soils occur. Soil erosion occurs in most drainage depressions.	Mainly extensive grazing due to climatic and soil constraints. The soils are susceptible to erosion and over grazing is a distinct and widespread risk.	Low due to soil and climate constraints.

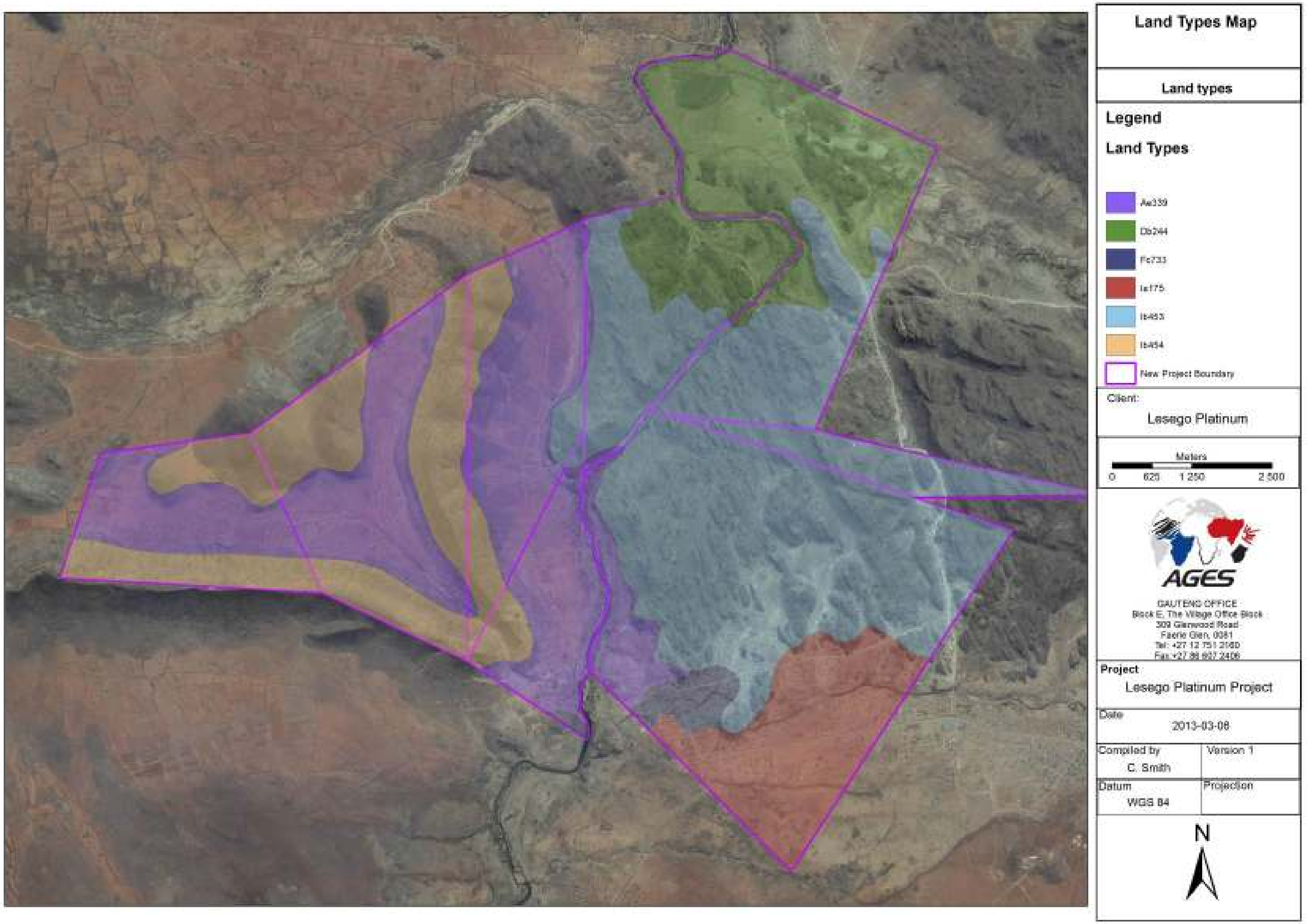


Figure 6-6 Land types

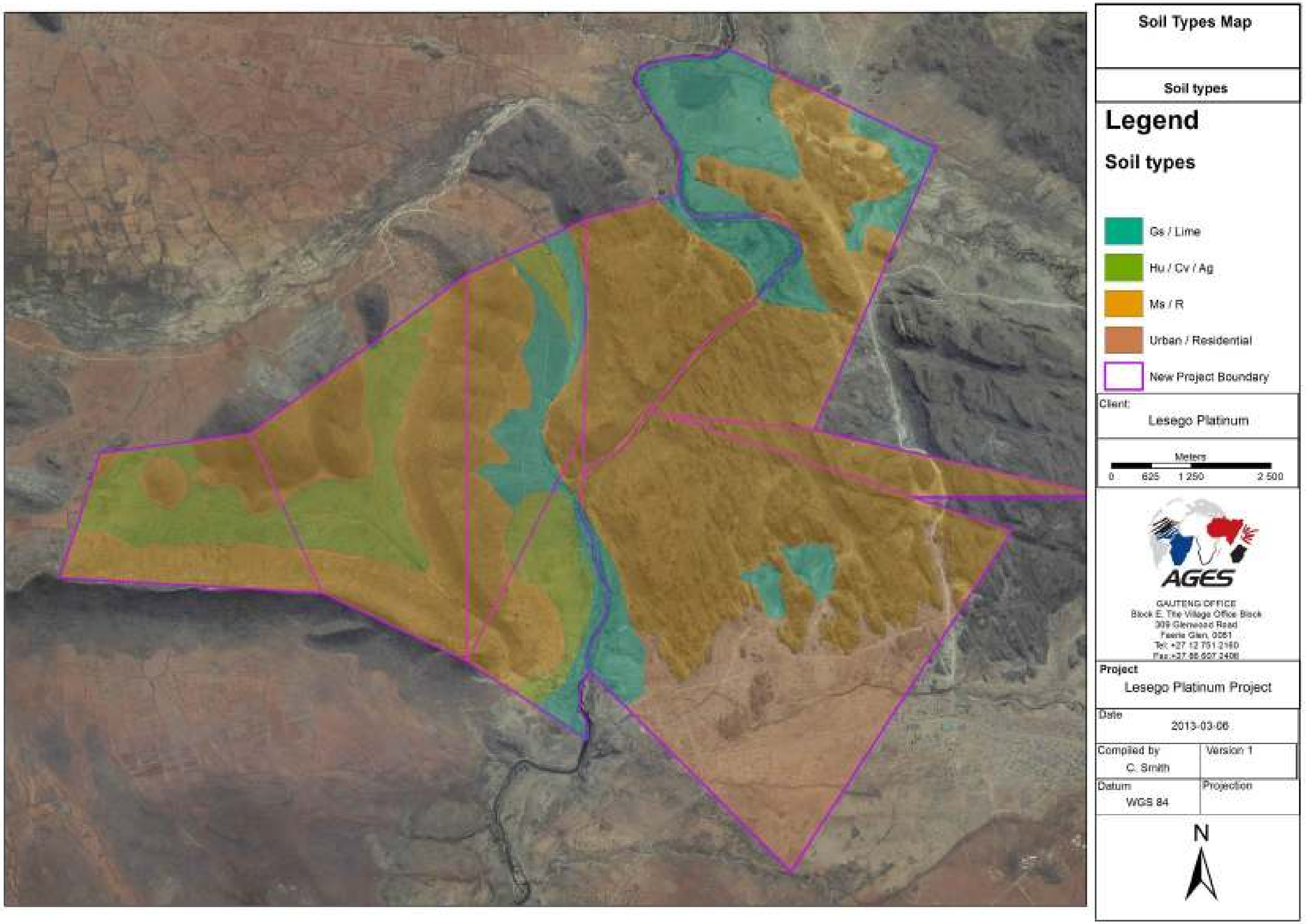


Figure 6-7 Soil types

6.5 Pre-Mining Capability

6.5.1 Agricultural Potential

The agricultural potential of the site is linked to the soil types in that the shallow soils are of low agricultural potential and the deeper soils are of medium to high agricultural potential. The deeper soils are being used for subsistence agriculture but suffer from a number of limitations that include low and erratic rainfall as well as inadequate fertiliser use.

Due to the limitations, it appears from the fields that the land users plant a range of crops that include maize, sorghum and pumpkins. The second restriction is access to fertilizers (from a funding perspective) and it is quite clear that yields are low and erratic. Nevertheless, the contribution the subsistence agriculture makes to localised food security cannot be ignored and should be included in the planning for mine infrastructure development (Van der Waals: 2012).

6.5.2 Land capability

The land capability of the study site is considered to be restricted to mainly extensive grazing due to climatic and soil constraints. The soils are susceptible to erosion and over grazing is a distinct and widespread risk. Sandy soils are suitable for irrigation if the subsoil restricting layers can be broken and if water is available.

The soils on the site can be used for rehabilitation post-mining and will, if adequately managed, support vegetation. Care should be taken to maintain the placed soils on level slopes as well as to place original topsoil material over original subsoil material. The reason being that the subsoils contain more lime and clay than the topsoils and that the former pose a larger erosion risk if placed at the surface (Van der Waals; 2012).

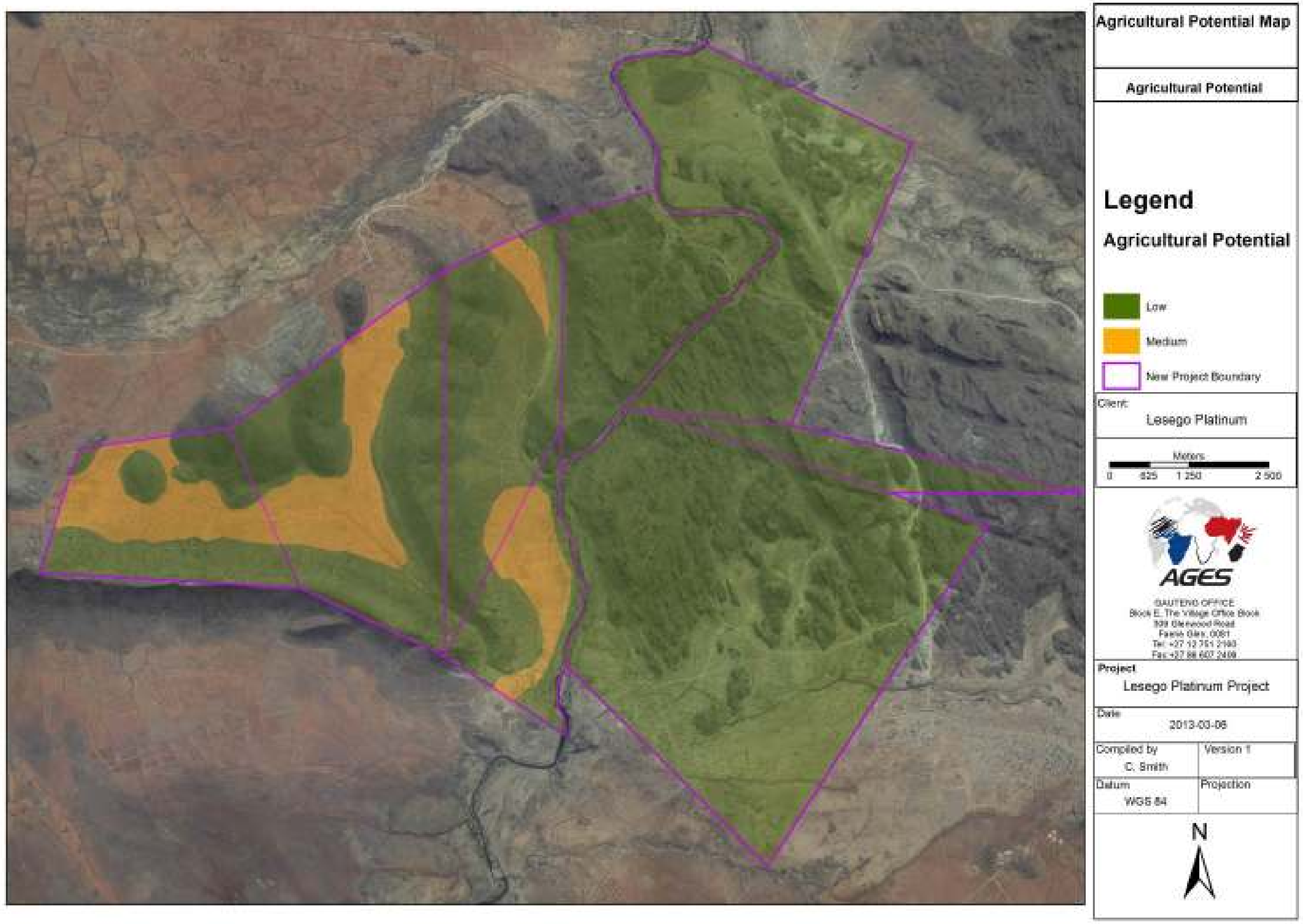


Figure 6-8 Agricultural potential

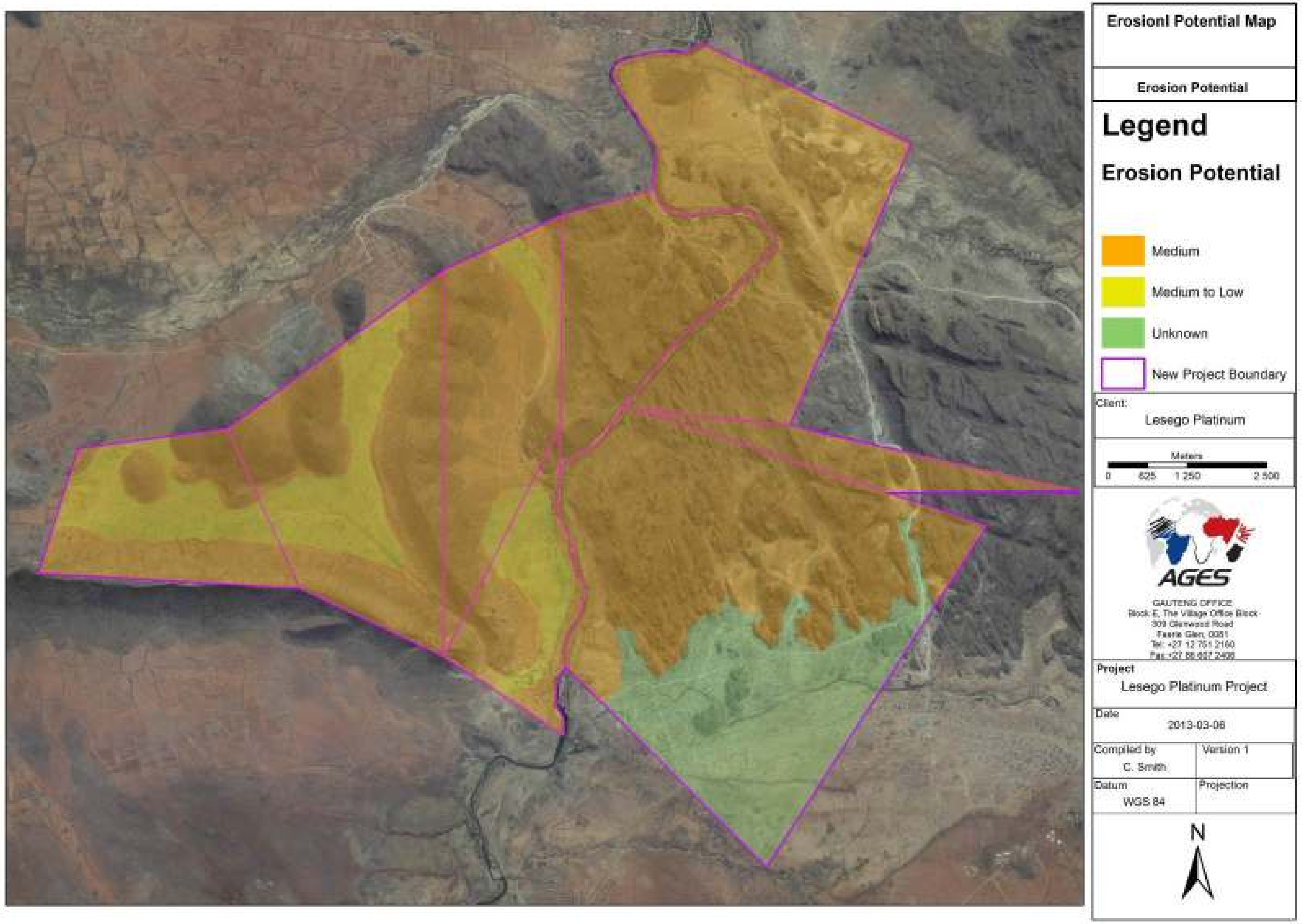


Figure 6-9 Erosion Potential

6.6 Natural Vegetation (Flora)

The proposed site falls within the Savanna biome which is also the largest biome in Southern Africa. The Savanna Biome is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). The site is characterised by moderate to steep rocky slopes and mountainous terrain as well low lying valleys and plains. According to Mucina & Rutherford (2005) the site is further classified as Ohrigstad Mountain Bushveld as well as Sekhukune Plains Bushveld.

Five main vegetation units were identified during the site visit and the findings associated with these vegetation units are summarised below (Henning; 2011). Please refer to **Error! Reference source not found.**.

- *Kirkia wilmsii - Commiphora marlothii - Acacia senegalensis* arid mountain bushveld – this vegetation unit is in a pristine state with slight disturbances observed in certain areas with a moderate to high sensitivity. The red data species *Adenia fruticosa* were identified in this vegetation unit which also provides suitable habitat for other red data species which has the potential to occur on site. Infrastructure should be excluded from this vegetation unit as far as possible, due to the presence of a unique diversity of plant species within this unit.
- Degraded woodland and grasslands associated with low-lying valleys – this vegetation unit comprises of old fields or cultivated land, degraded *Acacia tortilis* woodland or secondary old fields, and degraded woodland or grassland in and around villages. The vegetation unit is degraded severely as a result of over grazing and crop cultivation and has a low sensitivity. No red data species were found within this vegetation unit, due to the ecological degradation. Mining activities and infrastructure will be supported within these areas.
- Vegetation associated with the Olifants River and its main tributaries – this vegetation unit has a high sensitivity and consists of dense, tall riparian woodland/floodplains, which are restricted to the Olifants River as well as associated smaller drainage channels. Mining activities and infrastructure should be excluded from the drainage channels as far as possible, with the implementation of surrounded no-go buffer zones.
- *Acacia mellifera – Aloe cryptopoda – Euphorbia schinzii* shrubveld – this vegetation unit consists of slightly degraded open to denser shrubveld with a

moderate sensitivity and is characterised by woody low, open shrubveld with scattered tree species. Mining activities and infrastructure proposed in these areas should include specific mitigation and management measures, due to the high erodibility of these soils.

- *Salvadora australis – Acacia tortilis* woodland – this vegetation unit consists of open, overgrazed woodland with slight encroachment in some areas with a moderate sensitivity. As this vegetation unit hosts a unique species composition, mining activities and infrastructure within these areas will be supported, however this will be dependent on the implementation of specific mitigation measures.
- Five red data species potentially occur in the study area as indicated in the table below. However, only one red data species was found to occur in the study area during the survey, namely *Adenia* fruticosa (Henning; 2011).This red data species was found in the rocky habitats on site which have been allocated a moderate to high sensitivity. Please refer to Figure 6-12. As can be seen from the map, no infrastructure has been place in this moderate to highly sensitive area. *R*ocky habitats represent the most suitable habitat for most of the red data species described in the table below.

Table 6-2 List of red data plant species potentially found in the area

Species Name	IUCN Conservation status	Potential habitat	Potential occurrence in the area
Lydenburgia cassinoides	Near threatened	Rocky slopes, ravines	Medium, although none observed
Aneilema longirrhizum	Near threatened	Karroid low-lying areas	Low, due to degraded state of habitats
Euphorbia barnardii	Endangered	Rocky slopes / outcrops	Low, only isolated populations described in Sekhukuneland
Plectranthus porcatus	Vulnerable	Mountain slope. Well-drained, loam, stony soil.	Medium, although none observed
Adenia fruticosa subsp. fruticosa	Near threatened	Rocky slopes / outcrops	Confirmed

The National Forest Act (no.84 of 1998: National Forest Act, 1998) provides a list of protected tree species which may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by DWAF (or a delegated authority). The following protected tree species potentially occur in the area (Table 6-3 below) although these species only occur as individuals in their habitats. Should any of these protected trees be impacted by the mining layout plans a permit application should also be preliminary submitted to Department of Forestry to eradicate these individual trees:

Table 6-3 List of protected tree species found in the area

Tree Species	Habitat
Combretum imberbe	Floodplains along drainage channels
Boscia albitrunca	Deep sandy soils
Sclerocarya birrea	Sandy soils on plateaus and undulating plains

Table 6-4 Vegetation types of the study area

Vegetation type	Characteristics	Protection level	Ecological status	% Transformed	% Conserved	Biographically / endemic important taxa
Sekhukune Plains bushveld	• Mainly semi-arid plains and open valleys between chains of small hills and mountains. Short, open to closed thornveld with abundance of aloe species and other succulents. Heavily degraded and overexploited in some places. • Complex geology with mainly mafic and ultramafic intrusive rocks giving rise mainly to red apedal soils.	Poorly Protected	Vulnerable	25% transformed	2% conserved	• *Lydenburgia cassinoides* • *Nuxia gracilis* • *Amphiglossa triflora* • *Asparagus fourei* • *Hibiscus barnardi* • *Petaidium oblongifolium* • *Ortosiphon fruticosus* • *Rhus batophylla* • *Aspargus sekukuniensis* • *Aneilema longirrhizum* • *Chlorophytum cyperaceum* • *Piaranthus atrosanguineus*
Ohrigstad Mountain Bushveld	• Open to dense woody layer, with associated woody and herbaceous shrubs and closed to open grass layer. Moderate to steep slopes on mountain sides and sometimes deep incised valleys. Flat terrain in	Hardly protected	Least threatened	9% transformed	8% conserved	• *Petaidium oblongifolium* • *Encephalartos cupidus* • *Asparagus lynnetteae*

	few places. • Geology primarily on quartsite and shale, with chemical sediments of Chuniespoort Group, weathering to shallow rocky soils.					• *Rhoicissus laetans* • *Ceropegia distincta var.verruculosa*

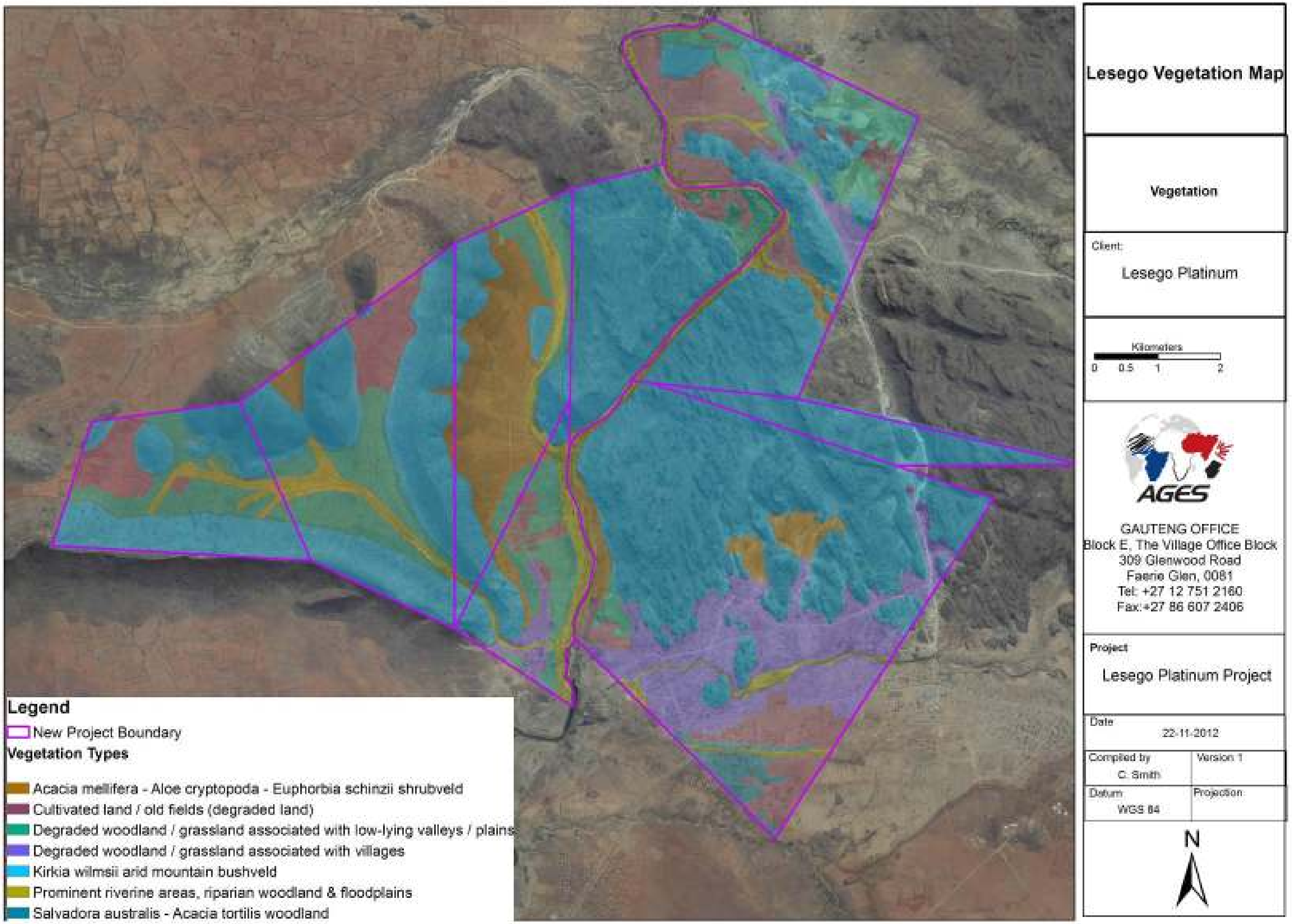


Figure 6-10 Vegetation Map

6.7 Animal Life (Fauna)

Red data faunal species which might potentially occur on site, has a low probability of occurrence, due to degraded natural areas caused by crop cultivation and associated human activities (Henning; 2011). The degraded areas and eroded thicket found on site is not suitable for red data fauna species and only supports general fauna such as birds, small antelope and rodent species (Henning; 2011). It is deemed that most fauna species will migrate to the mountainous areas where the disturbance is less. As mentioned in the previous section, mining activities and infrastructure should be excluded from the sensitive vegetation units identified, as these areas host a diverse range of species.

A survey was conducted during April 2011 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the area. According to the existing databases and field survey the following number of faunal species included in the IUCN red data lists can potentially be found on the proposed development site:

Table 6-5 Red data list of potential fauna for the study area

English Name	Conservation status	Probable habitat in area
BIRDS		
Cape Vulture	Vulnerable	Mountainous area / cliffs
Melodious Lark	Near threatened	Open grassland
Short clawed Lark	Near threatened	Microphyllous woodland
White-bellied Koran	Vulnerable	Open woodland
Lesser Kestrel	Vulnerable	Grasslands
Peregrine Falcon	Near threatened	Mountainous area
Yellowbilled Stork	Near threatened	Open water
Ayres' Eagle	Near threatened	Open woodland areas
Pallid Harrier	Near threatened	Marshy / Vlei areas
Corncrake	Vulnerable	Open grassland
Stanley's Bustard	Vulnerable	Open grassland / woodland
Lanner Falcon	Near threatened	Mountainous area
Black Stork	Near threatened	Open grassland / woodland

English Name	Conservation status	Probable habitat in area
Lappetfaced Vulture	Vulnerable	Dependent on carcasses
Old World Painted Snipe	Near threatened	Open water / dense riverine vegetation
Secretary bird	Near threatened	Open grassland / woodland
Martial Eagle	Vulnerable	Natural woodland
Grass Owl	Vulnerable	Closed grassland floodplains
Redbilled Oxpecker	Near threatened	Dependent on host species
Halfcollared Kingfisher	Near threatened	Ravine areas
Tawny Eagle	Vulnerable	Natural woodland
Whitebacked Night Heron	Vulnerable	Ravine areas
Pinkbacked Pelican	Vulnerable	Floodplain area
Marabou Stork	Near threatened	Natural woodland
Whitebacked Vulture	Vulnerable	Dependent on carcasses
African Marsh Harrier	Vulnerable	Wetland areas / open water
Greater Flamingo	Near threatened	Open water
Lesser Flamingo	Near threatened	Open water
African Finfoot	Vulnerable	Open water
MAMMALS		
South African Hedgehog	**Near threatened**	Savanna Bushveld
Brown Hyena	**Near threatened**	Savanna Bushveld
Serval	Near Threatened	Savanna Bushveld / tall grassland
Pangolin	Vulnerable	Savanna Bushveld
Rusty bat	Near threatened	Savanna, roosts in trees
Honey Badger	**Near threatened**	Savanna Bushveld
Temminck's Hairy Bat	Near Threatened	Savanna, roosts in trees / caves
Welwitsch's Hairy Bat	Near Threatened	Savanna, roosts in trees / caves
Rusty Bat	Near Threatened	Savanna, roosts in trees / caves
HERPETOFAUNA		

English Name	Conservation status	Probable habitat in area
Black File Snake	Protected	
Southern African Python	Vulnerable	Rocky terrain, floodplains & savanna woodland

None of the above red data species were found within the footprint of the mining development site during the April 2011 survey. The cumulative impact on faunal species resulting from the proposed mining activities and infrastructure can be rated as moderate, however with implementation of mitigation measures and management actions, this impact can be rendered low.

Mr. Vincent Egan, a herpetologist from the Biodiversity Management Directorate of LEDET conducted a site visit on the 4th of June 2013 as he expressed concern with regards to the impact on crocodiles in the Olifants River due to the mine development. No crocodiles had been observed previously during site visits conducted by the ecological and aquatic specialists. Mr. Egan informed AGES that the crocodiles were migrating into other areas and occurred more downstream from the development.

Mr. Egan further informed AGES that two zones had been identified by the directorate; a core area (Critical Biodiversity Area) where development should not happen and an area where impacts should be assessed and mitigated (Ecological Support Area) for where necessary. The mine development does not impact on the Critical Biodiversity Areas apart from the proposed bridge to be constructed over the Olifants River. However, Mr. Egan further stated that it could be argued that the bridge construction could benefit crocodiles if this would reduce crocodile-human conflict, even if the bridge is constructed in a core area. Management measures are provided in the EMP to manage potential impacts due to mine infrastructure located in the Ecological Support Areas. Please refer to map with zones indicated below:

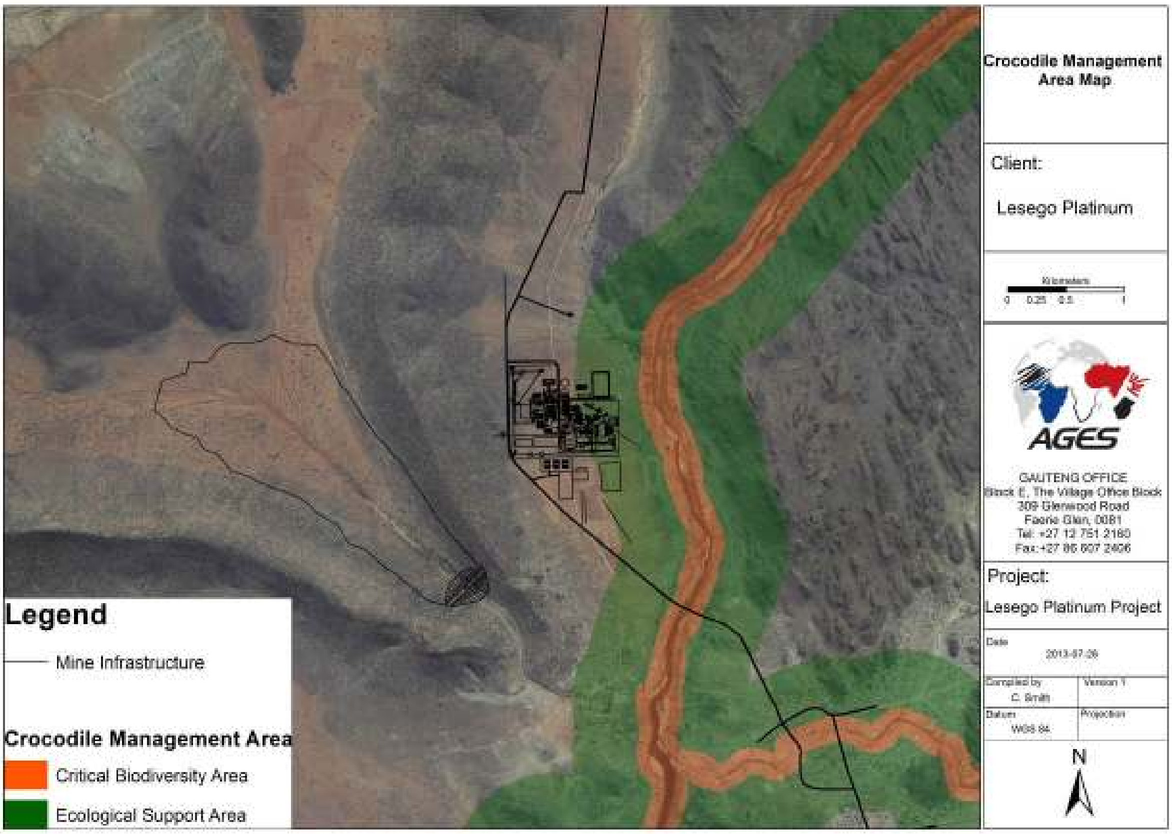


Figure 6-11 Crocodile Management Area Map

6.8 Aquatic Ecology

The site falls within the Eastern Bankenveld and the Bushveld Basin Aquatic Ecoregion, which can be considered to contain high aquatic biodiversity and a sensitive aquatic community (Van Staden; 2011). The wetland ecosystem type is Central Bushveld. Data obtained from the aquatic ecological survey indicated that the aquatic ecology of the area is considered to be in a fair ecological state; however the Olifants River system has limited diversity, due to a lack of habitat caused by severe erosion. The survey included the investigation of four sites, two sites situated up and downstream of the Olifants River respectively and two sites representing non perennial drainage channels only in flood after good rains (Van Staden; 2011). These sites provided a good representation of the aquatic ecological state on site.

The four identified sites were assessed using the following assessment methods (Van Staden; 2011):

- South African Scoring System version 5 (SASS5) – this index is an indication of the diversity of the macro-invertebrate communities present on site.

- Fish Assemblage Integrity Index (FAII) – this index is an indication of the diversity of fish species present on site.

- Riparian Vegetation Index (RVI) - the RVI is designed to give an indication of the Present Ecological State (PES) of the riparian zones, as well as their present functionality,

- Invertebrate Habitat Assessment System (IHAS) - this index determines the specific habitat suitability for aquatic macro-invertebrates,

- Intermediate Habitat Integrity Assessment (IHIA) - This method describes the Present Ecological State (PES) of both the instream and riparian habitats of the site,

- Biota specific water quality – this is an indication of the water quality and includes parameters such pH, electrical conductivity, dissolved oxygen concentration and temperature.

These various assessment methods were carried out in order to determine the present aquatic ecological state of the associated sites. Table 6-6 serves as a summary of the main findings reflected by the aquatic ecological assessment. Based on the above findings it is the opinion of the aquatic ecologist that from an aquatic ecological point of view that the proposed mining project be considered favourably provided that the provided mitigatory measures are adhered to.

Table 6-6 Summary of the aquatic ecological findings

Sites	Habitat suitability	Riparian vegetation	Invertebrate habitat integrity	Macro-invertebrate community integrity	Fish Assemblage Integrity Index	Water Quality
LP 1 (Olifants River upstream)	Overall habitat integrity can be regarded as being largely to extensively impaired, with severe riparian zone impacts.	Overall a very low diversity of indigenous species was encountered with significant habitat disruption.	Habitat conditions can be considered largely natural with few modifications, however habitat diversity and structure was inadequate for supporting a diverse aquatic macro-invertebrate community under higher flow conditions. During low flow conditions, the habitat can be considered adequate for supporting a diverse and sensitive aquatic macro-invertebrate community.	• The Macro-invertebrate community integrity can be considered as moderately impaired. • The system has a very broad variability in aquatic community integrity as a number of relatively sensitive aquatic macro-invertebrate species are present in the system. However, habitat limitations are likely to limit the diversity, abundance and sensitivity of the aquatic community to some degree.	• The fish assemblage integrity index can be considered as seriously impaired. • None of the species captured on site are listed as being endangered, vulnerable or rare according to the 1996 IUCN Red List (Skelton, 2001). • Most of the species observed have a relatively widespread distribution.	• The EC (Conductivity) values were well within the requirements of the Olifants River Ecological Water Requirements Assessment (OREWRA), and water quality in this segment of the Olifants River is generally considered adequate for supporting the aquatic ecology of the area. • pH levels are considered to be slightly alkaline in the Olifants River system; however no significant risk to the aquatic community is likely at this stage. • The Dissolved Oxygen (DO)

						levels are similar throughout the system and the changes are within the DWAF 1996 water quality guidelines for aquatic ecosystems. • A significant impact on the salt loads in the system is deemed likely to come from the areas upstream of the proposed mining area.
LP 2 (Olifants River downstream)	Overall habitat integrity can be regarded as being largely to extensively impaired, with severe riparian zone impacts.	Overall a very low diversity of indigenous species was encountered with significant habitat disruption.	Habitat conditions can be considered largely natural with few modifications, however habitat diversity and structure was inadequate for supporting a diverse aquatic macro-invertebrate community under higher flow conditions. During low flow conditions, the habitat can be considered adequate for	• The Macro-invertebrate community integrity can be considered as seriously modified. • The system has a very broad variability in aquatic community integrity as a number of relatively sensitive aquatic macro-invertebrate species are	• The fish assemblage integrity index can be considered as largely impaired. • None of the species captured on site are listed as being endangered, vulnerable or rare according to the 1996 IUCN Red List (Skelton, 2001). • Most of the	• The EC (Conductivity) values were well within the requirements of the Olifants River Ecological Water Requirements Assessment (OREWRA), and water quality in this segment of the Olifants River is generally considered adequate for supporting the aquatic ecology

			supporting a diverse and sensitive aquatic macro-invertebrate community.	present in the system. However, habitat limitations are likely to limit the diversity, abundance and sensitivity of the aquatic community to some degree.	species observed have a relatively widespread distribution.	of the area. • pH levels are considered to be slightly alkaline in the Olifants River system; however no significant risk to the aquatic community is likely at this stage. • The Dissolved Oxygen (DO) levels are similar throughout the system and the changes are within the DWAF 1996 water quality guidelines for aquatic ecosystems. • A significant impact on the salt loads in the system is deemed likely to come from the areas upstream of the proposed mining area.
LP 3 (Non perennial drainage)	Overall habitat integrity can be regarded as being moderately impaired.	Overall a very low diversity of indigenous species was encountered	Due to no water present at this site no data could be captured.	Due to no water present at this site no data could be captured.	Due to no water present at this site no data could be captured.	Due to no water present at this site no data could be captured.

	A loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. Habitat structure and diversity are inadequate for supporting a diverse and sensitive aquatic macro-invertebrate community.	with significant habitat disruption.				
LP 4 (Non perennial drainage)	Overall habitat integrity can be regarded as being moderately impaired. A loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. Habitat structure and diversity are inadequate for supporting a diverse and sensitive aquatic	Overall a very low diversity of indigenous species was encountered with significant habitat disruption.	Due to no water present at this site no data could be captured.	Due to no water present at this site no data could be captured.	Due to no water present at this site no data could be captured.	Due to no water present at this site no data could be captured.

	macro-invertebrate community.					

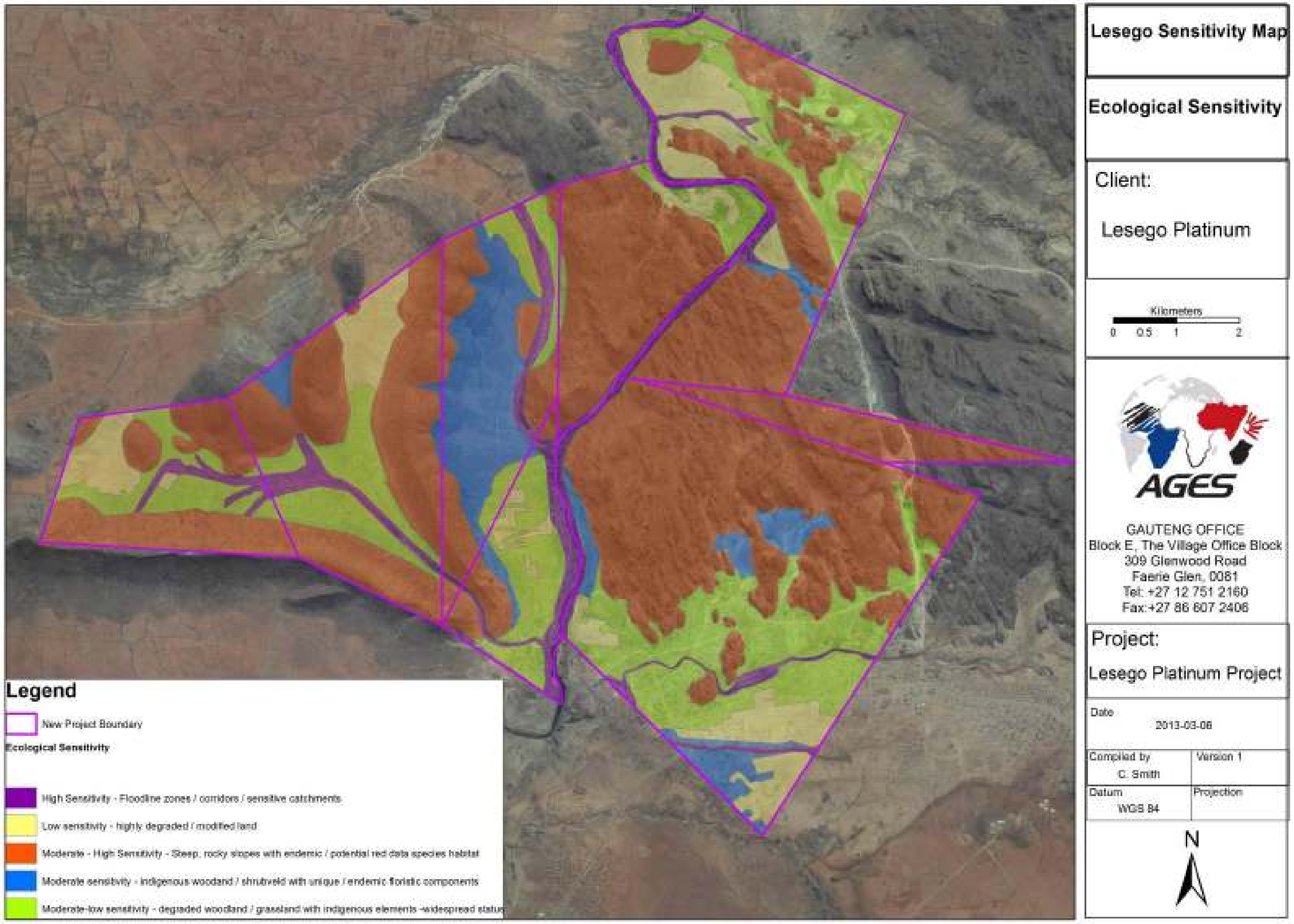


Figure 6-12 Ecological Sensitivity Map

6.9 Surface Water

The study area is located within the Olifants Water Management Area and falls within the Middle Olifants sub-water management unit. The site falls mainly within the Quaternary surface water catchment B52E, with parts of the site situated within B52D and B52B quaternary surface water catchments as illustrated by Figure 6-13.

The major perennial system occurring on site is the Olifants River, which transects the site mainly in a north easterly direction. The Olifants River joins with the Letaba River on the South African border to form the Rio Das Elephantes River, which flows through Mozambique, where it eventually discharges into the Indian Ocean.

Other surface water features on site includes the Mohlaletsi and Pelangwe Rivers, which are perennial tributaries of the Olifants River. Due to the mountainous terrain on certain areas of the site, there are also numerous non-perennial drainage lines flowing after good rains.

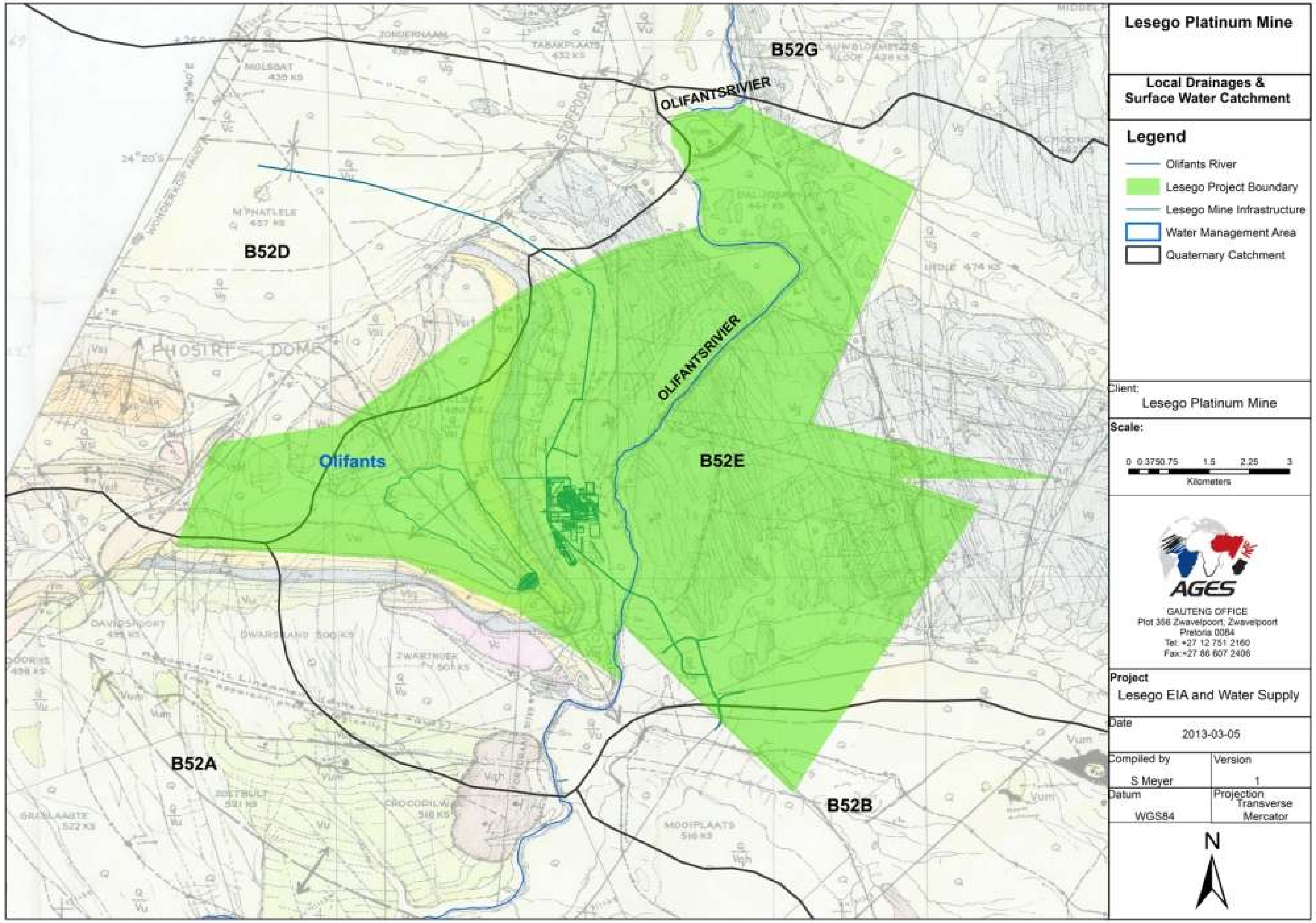


Figure 6-13 Catchment Map

6.10 Rivers

The study area is drained mainly by sheet wash with surface run-off draining into non-perennial streams that cut through the proposed development area. These non-perennial streams eventually drain into the Olifants River or one of its two main tributaries, namely the Mohlaletsi River in the south and the Pelangwe River in the north. The Mohlaletsi River crosses the southern portion of the site in a south-easterly direction and the Pelangwe River occurs in the north in a north-easterly direction. Both the Olifants River and the Pelangwe and Mohlaletsi Rivers are considered National Freshwater Ecosystem Priority Areas (NFEPA) Rivers; however the condition of the rivers is considered class D as they are largely modified. The non-perennial streams flowing along drainage channels occur only during and directly after heavy precipitation events, and may continue for a short period directly after a particularly good rainy season.

6.11 Floodlines

A feasibility level flood boundary determination was conducted in 2012. Several cross sections were surveyed along the Olifants River as well as the drainage line joining the river from the North. This study was based on findings made during the Pre-feasibility Study. The calculations were based on historical flow records and calculated flow was analysed.

The objectives of the floodline analysis was to carry out a rough estimate calculation of the 100 year flood line for the Lesego Mining site area calculated using a 2D approach and observed flow data from two nearby gauging stations. The results of the study are depicted in the figure below:

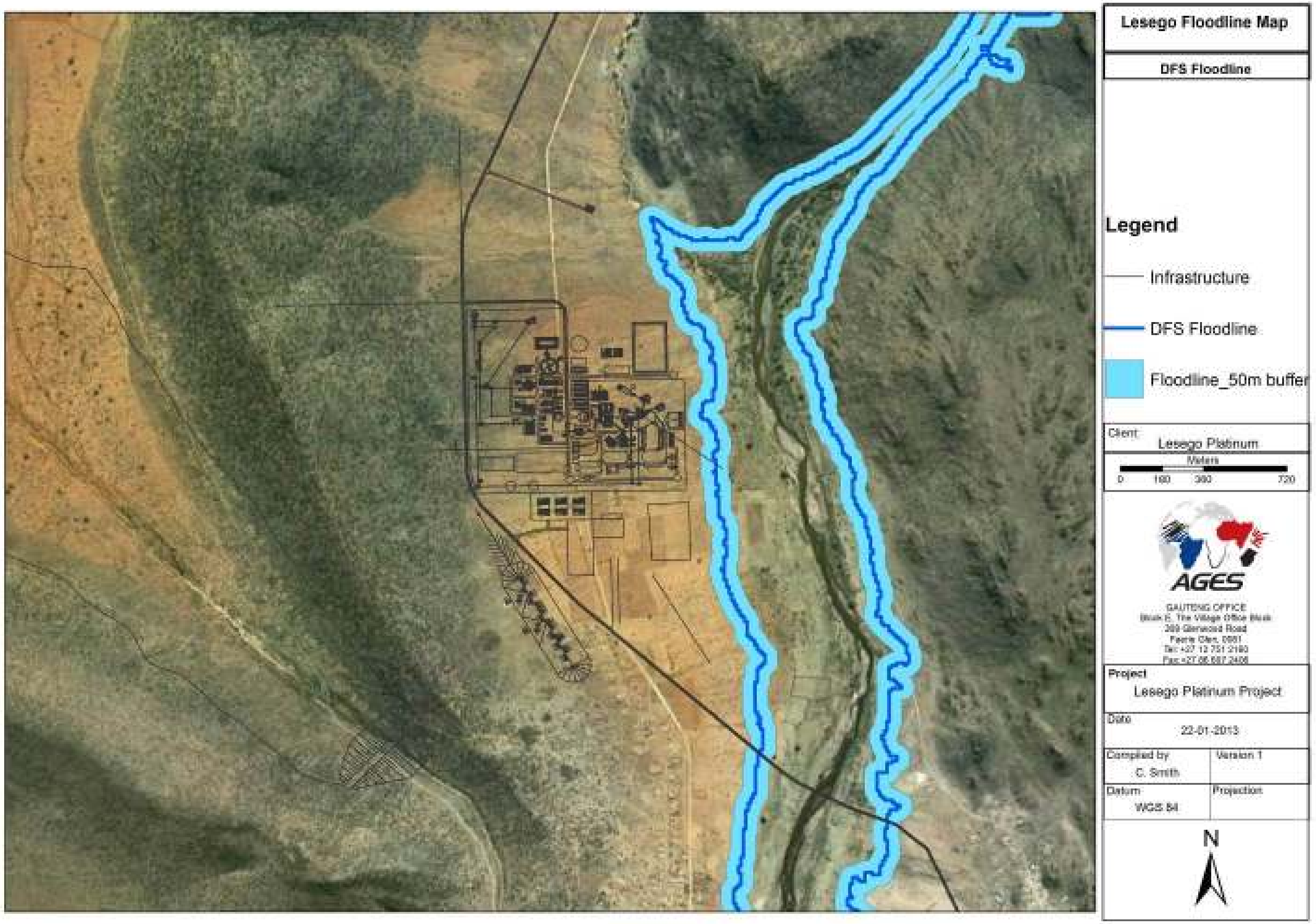


Figure 6-14 **DFS Floodline Map**

6.12 Wetlands

Wetland areas in the region are mainly found at the edges of dams, in catchments, and along rivers and streams. These wetland areas and associated riparian vegetation are severely disturbed due to anthropogenic impacts, most notably over-grazing. Wetlands are ecologically important as they serve as water sponges which assist in purifying water, and act as buffers to control flooding during high rainfall events. Therefore, these areas have a high conservation status and should be conserved, with no development being allowed in these areas.

Three types of wetland systems were identified for the site; namely the larger perennial system (Olifants River), smaller perennial systems (e.g. Pelangwe and Mohlaletsi Rivers) and non-perennial systems. The Olifants River is the major perennial system located within the project boundary. All of the above systems have been fragmented by current and historic community development and agricultural activities. Soil erosion along the Olifants River has caused severe transformation (alien vegetation) and caused incisions within certain areas. However, because it is classified as a NFEPA River and because of the instream ecological aspects, it still provides high ecological value and function to the environment and the surrounding communities.

The perennial (larger and smaller systems) and non-perennial systems are characterised by mostly unstable sandy substrates and very little vegetation growth within the perennial systems. These systems were classified as lower intermittent. The non-perennial systems contain almost no vegetation, with mostly sandy soils and mud as the substrates. The non-perennial drainage features were considered of little ecological value and function, while the smaller perennial drainage systems could still provide an ecological function (Van Staden; 2011).

The present ecological state (PES) as well as the Ecological Management Class (EMC) for the Olifants River was identified as Class C – moderately modified. The PES and EMC for the smaller perennial systems are both Class D – largely modified. The PES for the non-perennial systems was calculated as Class E – seriously modified, due to agriculture, grazing and sedimentation. The EMC for these systems is considered Class D – largely modified.

6.13 Hydrogeology

A groundwater assessment was conducted by AGES in order to identify the potential mine seepage and dewatering, environmental requirements and water supply options for the proposed new mine operations included as APPENDIX I.

As part of the baseline geohydrological assessment, a hydrocensus was conducted in order to determine the baseline conditions and applications prior to mining and to identify potentially receptors i.e. groundwater users in the vicinity of the proposed mine. The hydrocensus covered a radius of 5 km around the proposed site and during the survey 28 sites were recorded, of which 26 boreholes were located within the surrounding communities. 58% of the boreholes identified were in use, indicating the dependency of the local communities on groundwater resources.

The geophysical data indicated sixteen potential drilling positions to be explored by drilling, of which four targets were drilled to a depth of 80 m as site characterisation boreholes, with the additional purpose of being used as monitoring boreholes once mining activities commence. The borehole positions were positioned such to optimize the borehole applications for the monitoring program and to serve as seepage capturing positions once the mine is operational (Figure 6-15). Samples taken from drilled boreholes were sent for analysis, which indicated that the overall quality of these water sources is poor. The chemical constituents which are non-compliant in all or some of the boreholes are fluoride, nitrate, chloride, sulphate, sodium, potassium, calcium, magnesium, manganese and lead (Meyer & Van Dyk; 2011). The geophysical study indicated the study area has groundwater potential, which should be investigated in more detail during the EIA phase.

The magnetic study indicated that intrusive structures cover a large area of the valley floor and TDF, also confirming the existence of magnetic intrusive structures with some of these structures being highly conductive to such an extent that it is expected that they will most probably be water bearing.

The site characterisation drilling executed on the footprint of the TDF indicated high yielding boreholes i.e. 5 – 20 ℓ/s of poor water quality. According to Parsons (1995) and DWA (1998), this constitutes a minor aquifer. Core boreholes were also drilled during the exploration program at Lesego and the core borehole extending to depth of mining could supply valuable information regarding possible dewatering and associated volumes.

A detailed water monitoring programme should be implemented to measure and mitigate any potential negative influences on the environment due to the proposed mining activities and associated infrastructure. Groundwater monitoring boreholes need to be placed on un-weathered host rock as well as below the toe line of the TDF, in order to complete the information on the range of aquifer parameters.

The mine should be designed with mine dewatering as a mitigation measure, with the mine design based on an effective dewatering design that allows for pre-depressurization (below 1 bar or 10 m head) of aquifer zones, regardless of the flow rate. The mine water inflow should also be mitigated with cover drilling in order to allow the pressure head in permeable or fracture zones to drop before development through these zones take place or an approach of sealing (grouting etc.) of fractures could be adopted. Although packer testing was conducted, additional deep double packer testing should be conducted at mining depths to assess the possible discrete flows associated with the mine dewatering.

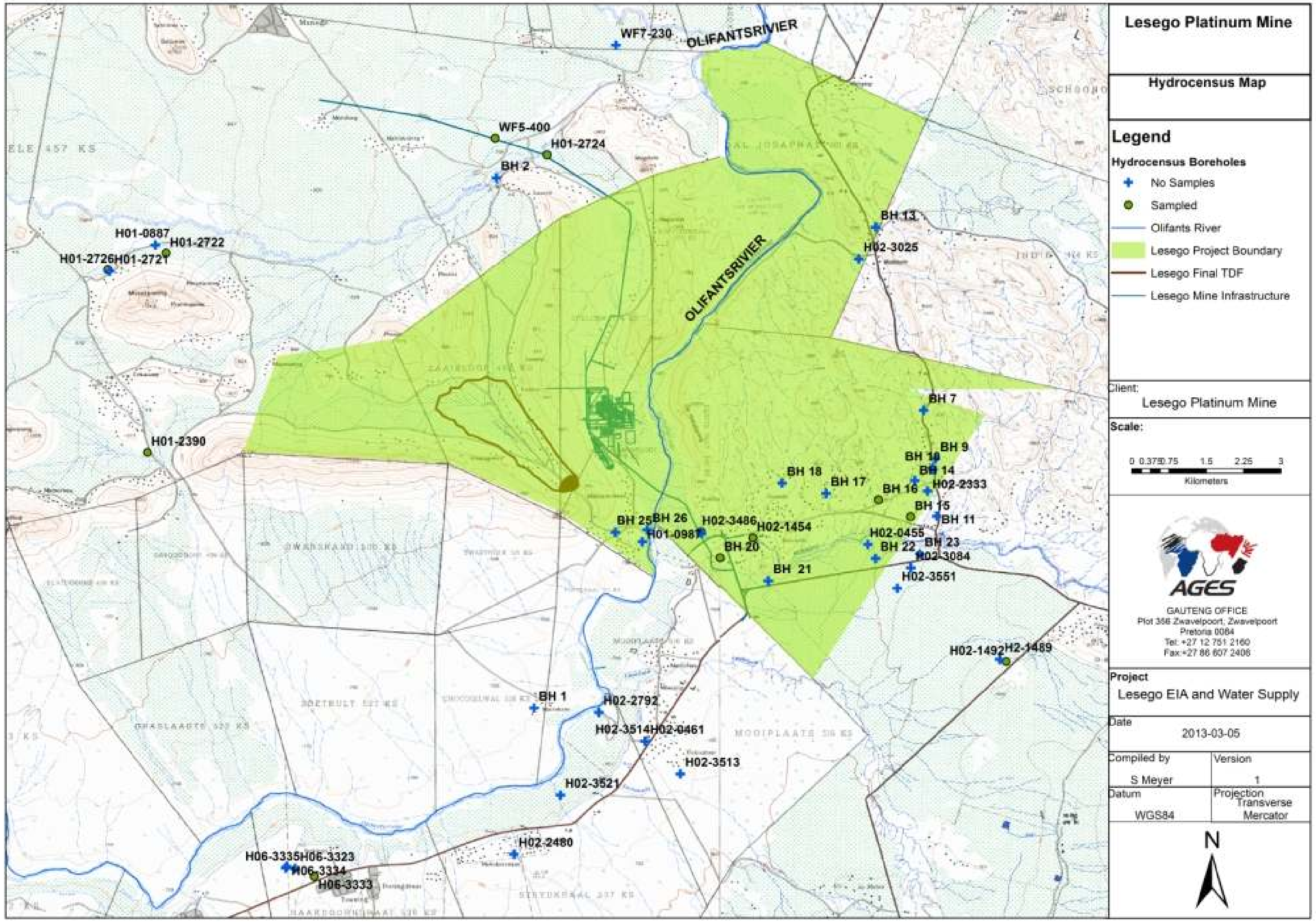


Figure 6-15 Hydrocensus map

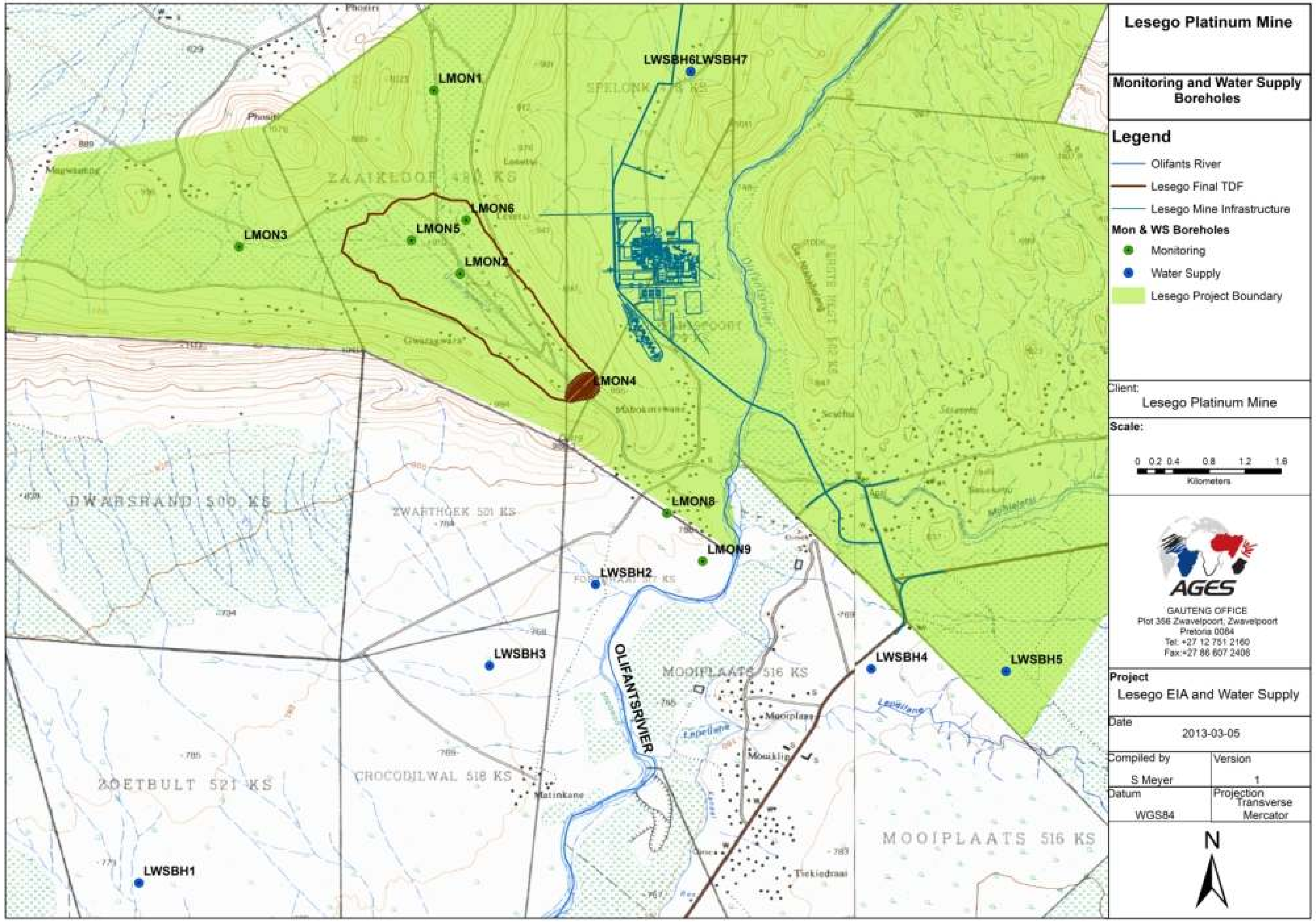


Figure 6-16 Position of drilled boreholes

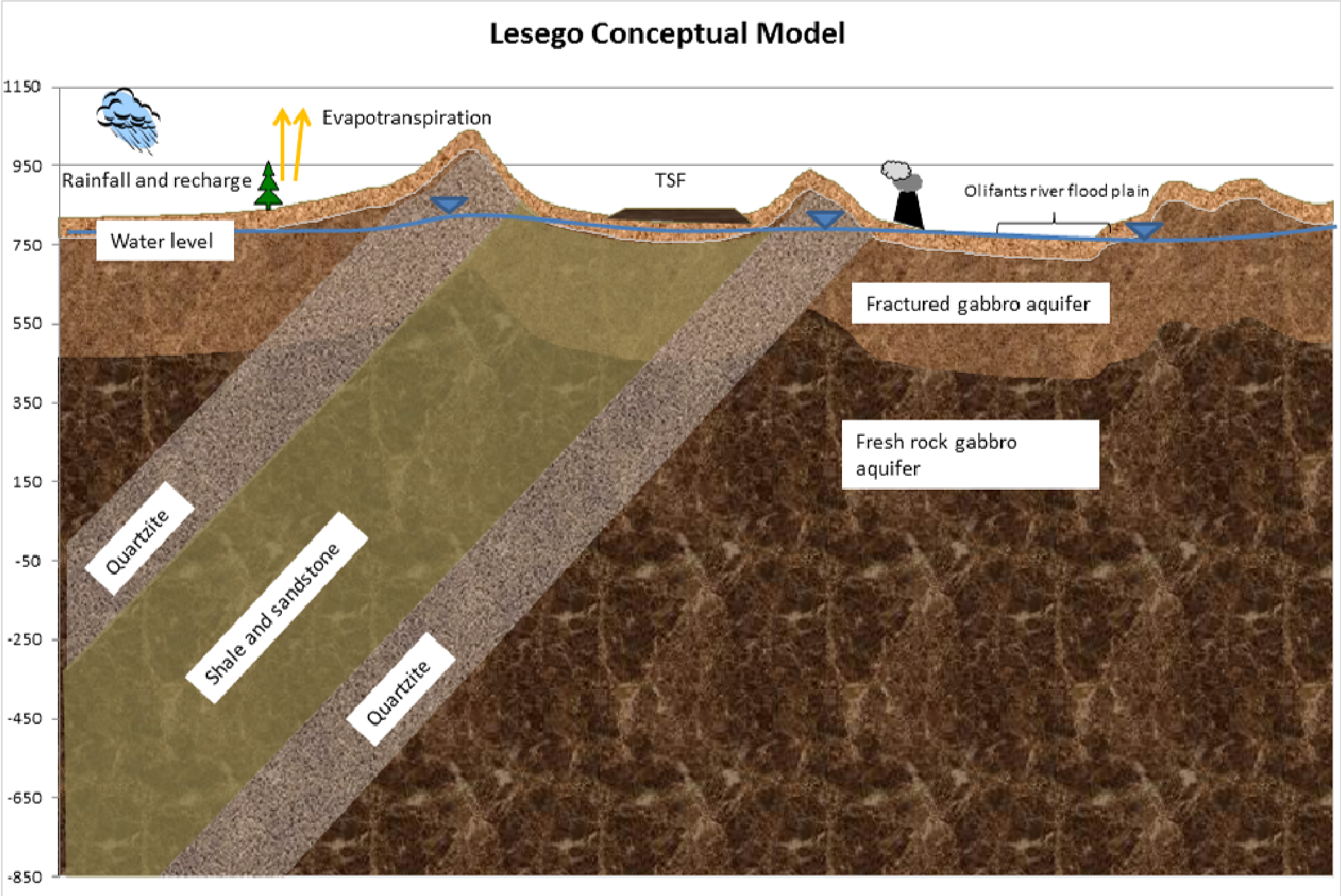


Figure 6-17 **Conceptual model for groundwater flow model purposes (Not to Scale – Accurate dips and thicknesses not displayed)**

6.14 Noise

The study area has a rural character in terms of the background ambient sound levels. Presently, the main noise source in the area is generated by traffic on the R37 situated approximately 12 km north of the site, as well as the district road running south towards Malogeng and Apel. Less prominent noise arises from sounds generated by activities associated with the local communities.

- Measurement point LBN01

The point is next to a gravel road. There were trees and shrubs within 5 meters from the measurement point. The road is used regularly, but no traffic passed the site during the first measurement. Birds and insects defined the ambient sound character. (De Jager, 2012).

- Measurement point LBN02

No trees and shrubs were located within 5 meters from the measurement point. The gravel road was approximately 175 meters from the measurement point, and traffic using the road was clearly audible. The measurement was collected without any traffic passing the area. The sound character was dominated by birds and insect sounds (De Jager, 2012).

- Measurement point LBN03

The point is next to a gravel road approximately 200 meters from the closest houses in the Nkotokwane community. A tree was located within 9 meters from the measurement point. The road was used regularly, but no traffic passed the site during the measurement. Birds and insects defined the ambient sound character, but there were a number of sounds in the area originating from cattle and goats (bells on the animals). Music was audible from the town for the duration of the measurement (peak at 60 Hz) (De Jager, 2012).

- Measurement point LBN04

This point is within the first few houses of the Nkotokwane community. The road is used regularly during the day, but the measurement was collected during a period when there was no traffic. The ambient sound character consisted of bird sounds, voices, music and a number of animals (bells, dogs) (De Jager, 2012).

- Existing Ambient Noisescape

Based on the data collected during the site visit acceptable rating level of the area in the vicinity of the proposed mining would correspond to the rural rating level.

- Potential Noise Sources from mining activities

Increased noise levels are directly linked with the various activities associated with the construction of the proposed mine and related infrastructure, as well as the operational phase of the activity.

- o Construction Phase

Construction activities generating noise during the construction phase will be as follows:

- Site establishment;
- Construction of access roads;
- Vegetation removal;
- Topsoil removal and the development of stockpile footprints;
- The removal of soft (using excavator) and hard material (drill and blast to remove very hard material) during the development of the shaft; and
- The establishment of infrastructure such as pollution control dam, offices/workshops, conveyor belt system, stockpile areas and plant (screen/milling/flotation etc.) area.

- o Operational Phase

The following noise generation activities will be modelled for the operational phase at the shaft:

- Operation of the ventilation fans;
- Operation of a number of pumps;
- Operation of the compressor house;
- Material management (Waste rock dump, ore stockpiles) – Waste rock dump only operational during the day);
- General noise at the workshop/wash bay; and
- The operation of the conveyor belt system together with material transfer points.

Plant activities will be assumed for 24 hours per day and would include at least:

- Ore receipt and primary crushing;
- Primary and secondary milling, grinding and cleaning;
- Flotation and concentrate thickening;
- Reagent mixing and distribution facilities; and
- Tailings thickening and disposal facilities.

6.15 Visual

The site is situated within a rural area utilised for subsistence farming and rural settlements. The area surrounding the mine is characterised by the Phosiri dome. The regional topography of the study area can generally be classified as low mountainous terrain throughout most parts of the central, eastern and western sections of the study area often forming deep valleys and a gorge where the Olifants River cuts through the mountainous area. Localised mining activities occur approximately 20 km to the west and 18 km north east of the site. Therefore, the character of the landscape is predominantly rural and somewhat agrarian, although the built environment within the study area is growing.

The following sensitive viewer groups have been identified using 1:50000 Topographical maps, aerial photographs and observations from the site visit.
The viewers have been identified as:

- The residents of the towns of Apel, Mooiplaas, Mooiklip, Tiekiedraai, Strydkraal, Doringdraai, Tswaing, Ga-Nchabeleng, Ga-Nkwana, Ga-Mankopane and Ga-modupi;
- The owners and employees of the various shops, local authorities and businesses in the study area;
- The travellers and tourists driving on the all-weather tarred road towards the local economic node of Apel.
- The local population live within the Project boundary;
- The workforce driving on local roads and the tarred road adjacent to the Project site;
- The residents and workforce of the outlying farms and residential stands in a 10km radius.

The sensitive viewers onto the site identified during the site visit are the following:

- The view from the homes of the residents of the towns of Apel, Mooiplaas, Mooiklip, Tiekiedraai, Strydkraal, Doringdraai, Tswaing, Ga-Nchabeleng, Ga-Nkwana, Ga-Mankopane and Ga-modupi;
- The view from the north near the towns of Phosiri, Lekurung and Lesetsi;
- The views from residential properties and homesteads in a 10km radius. For instance the settlement of Ga-Matlala and the Sekhukune College of Education;
- The views from local roads and the all-weather tarred road towards the local economic nodes of Apel and Ga-Mankopane.

The zone of potential influence extends chiefly to the south as the varied nature of the topography on site shields most views from the north.
The proposed Project is anticipated to have an impact on residents of Apel, Phosiri, Lekurung, Lesetsi, Mooiplaas, Mooiklip, Tiekiedraai, Strydkraal, Doringdraai, Tswaing, Ga-Nchabeleng, Ga-Nkwana, Ga-Mankopane, Ga-modupi and Ga-Matlala as well as on the

viewers with visual access to the site that travel on the tarred road adjacent to the Project site. The proposed Project will result in changes in the baseline environment that will cause visual impacts such as depreciation of the landscape character, the views of the visually valuable northern mountainous area being obscured by Project components, the negative effects of the mining activities on air quality that contribute cumulatively to visibility and the altering of the sense of place of the area (Young; 2012).

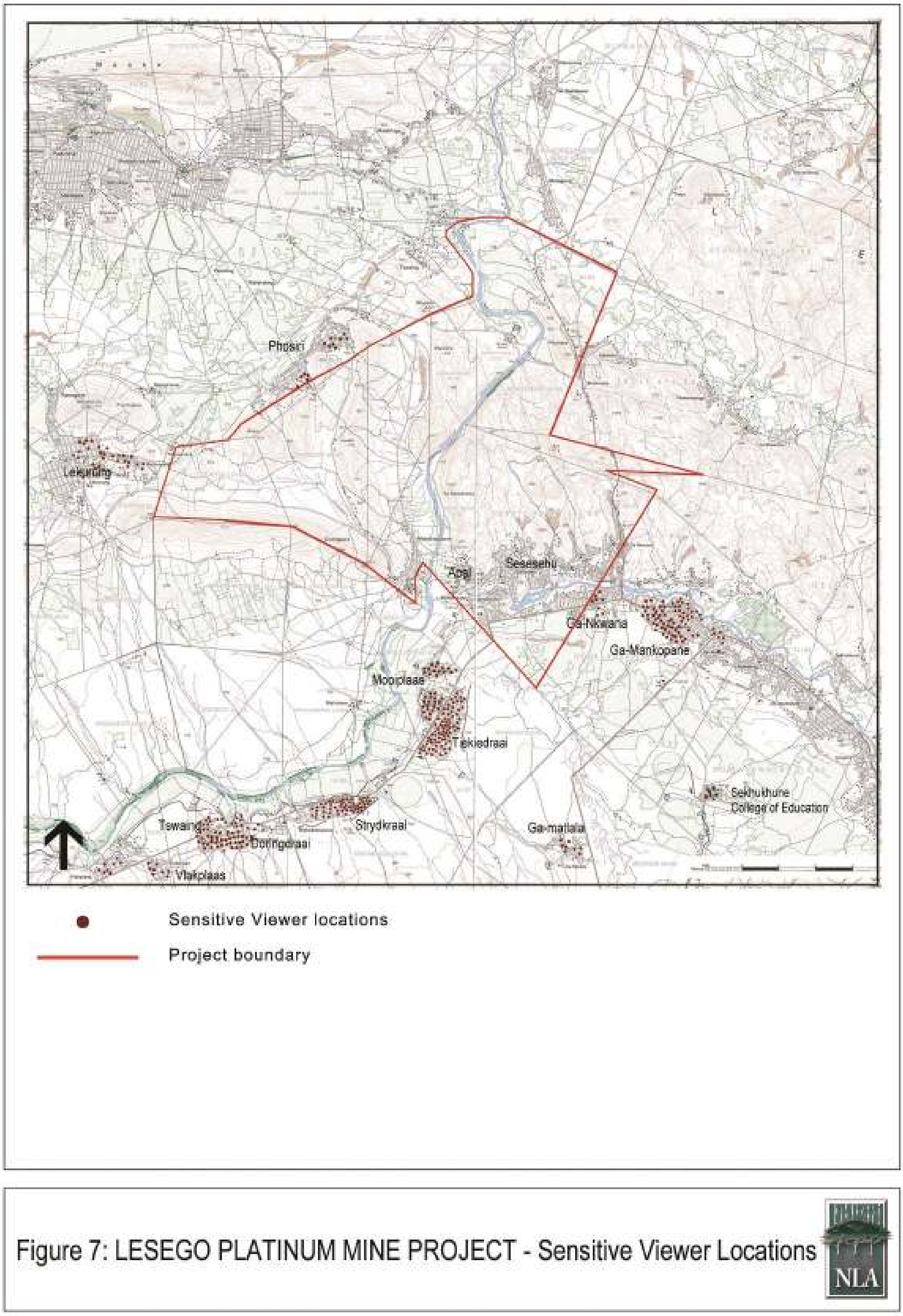


Figure 6-18 Sensitive Viewer Locality Map

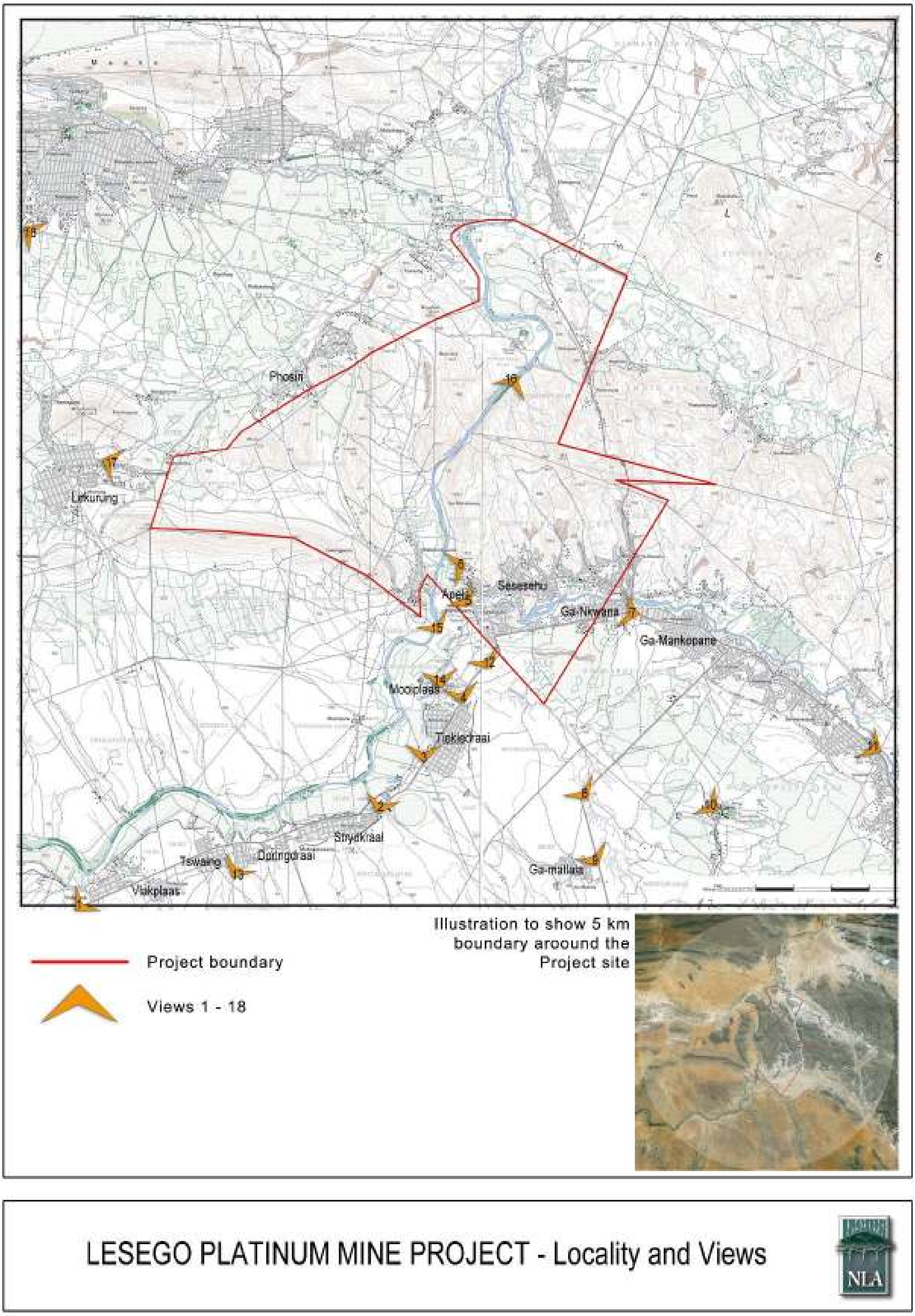


Figure 6-19 Sensitive view localities from where simulations were done

6.16 Roads And Transport

A traffic impact study was conducted by Corli Havenga Transport Engineers (APPENDIX O).

The proposed site is located approximately 5.5 km south of the R37 which serves as the main road between Burgersfort and Polokwane. The main road running in the area is the R37 which is situated approximately 5.5 km north of the proposed site. The R37 is a National Road managed by SANRAL and connects Polokwane and Burgersfort.

The proposed access road will consist of a single lane road for traffic in both directions. Each lane is to be 3.6 m wide with a 1.4 m yellow lane shoulder. The district roads proposed for the access are managed by the Limpopo Roads Agency (RAL) and any upgrade and access to it needs to be negotiated in conjunction with this authority. Other roads will include haul roads, which will form part of the internal road network.

Five alternative access roads were assessed and entail the following:

- Access route 1 - this proposed access route that will entail access from an existing gravel district road serving the surrounding communities with access to the R37. The route is approximately 30 km long, with the first 13km being a dirt road. The section over the Mountain range towards the South is surfaced up to where Apel's main road is intersected. Route 1 crosses the Olifants River and a bridge will have to be built to allow safe access across the river.
- Access route 2 – the proposed route alignment follows that of an existing gravel road and transverse through several villages until it reaches the R579, close to Lebowakgomo. The entire 22.9 km road section between the proposed Site and the R579 will have to be constructed. The route includes for the construction of a "small" bridge at the position of the existing low water bridge.
- Access route 3 – this proposed route leads in a northerly direction and transverse through several villages until it intersects with the R37. The entire 16.5 km road section between the proposed site and the R37 requires to be constructed. The build includes various sharp curves and vertical elevation changes with blind rises. This route crosses three watercourses for which the existing "low" water bridges will have to be upgraded to "small" load capable bridges
- Access route 4 – this route will exit the site into a northerly direction from where it will follow the alignment of route alternative 1 diverting north through Mashite and the mountain neck and intersecting with the R37. This 20km route follows the existing gravel road except for an existing 2km tar section road in Mashite, with a cross over bridge. Furthermore, the 6 km of road between the R37 and "Mashite"

is currently under construction and will be complete in the near future. The length of construction required for this route is 13.3km. The route includes the upgrade of the existing low water bridge.

- Access route 5 – this route will exit the site in a southern direction crossing the Olifants river with a bridge from where it will connect to the main Apel road. The length of this new road is 5 km.

Both access route 2 and 5 will be constructed as this will provide the mine with access from the North and the South.

Five possible routes where identified as indicated on the layout above.

- Route no 1 – Green
- Route no 2 – Blue
- Route no 3 – Yellow
- Route no 4 – Purple
- Route no 5 – Orange

6.17 Air Quality

Mining operations are sources of fugitive dust emissions, with particulate matter being the main pollutant of concern. Fugitive dust sources associated with mining activities include materials handling activities, dust-entrainment, crushing and screening activities and wind-blown dust from the tailings disposal facility and mine dumps. These pollution sources place pressure on the ambient air quality of the region. Existing mining activities are located approximately 11 km north east and 22 km west of the proposed site.

According to the Capricorn District Municipality (DM) Air Quality Management Plan of 2006, limited air quality monitoring data are available and mainly around major industrial and urban centres with few (if any) background sites (CDM, 2006). The air quality status for the Capricorn District Municipality is regarded as potentially poor due to mining and industrial activities. No measured or simulated PM10 or dust fallout data for the area around Lesego Platinum Mine are available. The main sources likely to contribute to fugitive dust emissions are the following:

- Surrounding mining activities (land clearing, materials handling, vehicle entrainment from haul roads, drilling and blasting);
- Emissions from paved and unpaved roads;
- Wind erosion of open areas;
- Domestic fuel combustion;
- Biomass burning;
- Vehicle tailpipe emissions; and
- Informal Refuse burning.

The nearest sensitive receptors (in terms of human settlements) to the proposed Lesego Platinum Mine site are Mabokotswane, Malogeng, Dal Josaphat, Phosiri, Ga-Nkoana and Apel. Without mitigation in place the proposed Lesego Platinum Mine operations are likely to result in high PM2.5, PM10 GLCs outside the mine boundary and at the settlements nearby and slightly elevated NO2 and DPM GLCs and dust fallout outside the mine boundary and at the settlements nearby. With mitigation, the PM2.5, PM10 impacts reduce significantly but still do not comply with the NAAQS at some of the sensitive receptors and off-site. It is likely that if the suggested additional mitigation measures be implemented there will be compliance off-site and at all sensitive receptors.

6.18 Sites of Archaeological and Cultural Interest

A Phase 1 Heritage Impact Assessment was done by Mr Neels Kruger from AGES during April 2011 and is attached as APPENDIX H. The study was conducted in order to determine the presence of heritage sites and artefacts and to compile adequate mitigation measures with regards to the cultural resources that may be required for the affected sites/features. A follow-up Heritage Impact Assessment was done in May of 2011 specifically on the footprint for the proposed Tailings Dam Facility. Heritage Assessments are a requirement of the National Heritage and Resources Act (Act 25 of 1999). The NHRA protects all structures and features older than 60 years, archaeological sites and graves in order to limit potential negative impacts as a result of development.

The methods by which archaeological sites were identified included a desktop study as well as historical archaeological studies conducted in the Steelpoort area, an aerial survey using the latest aerial photographs of the proposed site and field surveys. The field surveys focused mainly on three study areas which included the areas where mining infrastructure, like the tailings disposal facility, the plant and the shafts are planned. Figure 6-20 illustrates the sensitive archaeological sites and artefacts identified during the site surveys.

Early, Middle and Later Stone Age artefacts were identified across the major drainage lines in the survey areas, however not all the sites identified were of high significance. The Stone Age artefacts identified at the plant area located within study area 3 might provide significant research material and as a result has a medium to high significance rating. It is recommended that a limited phase 2 archaeological investigation be done on the Iron Age sites identified in study area 3 and a full phase 2 archaeological investigation on the Middle Stone Age structures identified, should these sites be impacted on by the proposed infrastructure.

Family cemeteries as well as possible unmarked graves were identified within study area 1, where the tailings disposal facility is proposed, as well as study area 3, where the plant is proposed (Also refer to APPENDIX H). During the follow-up assessment, which covered the larger footprint of the tailings disposal facility and incorporated both study area 1 and study area 3, an additional 26 graves were identified on the property. These graves include:

- 1 Grave belonging to the Mphahlele Family (Site BP1).
- 6 Graves belonging to the Ntsoane family (Site BP2).
- 3 Graves belonging to the Phaladi family (Site BP3).
- 1 Grave belonging to the Chaba family (Site BP5)
- 8 Graves belonging to the Mazwi family (Site BP6).
- 5 Graves belonging to the Maleka family (Site BP7).
- 2 Graves of unknown origin.

A conservation buffer zone of at least 50 m around all graves and cemeteries should be maintained at all times or be relocated. It is recommended that the locations and provenance of any additional graves be established in close consultation with local communities and possible relatives of individuals interred in the area. All cemeteries and burial places should be fenced off with access control. However, should any of the cemeteries or graves (or the proposed 50 m buffer zone around them) be impacted in any way by the planned Lesego Mining infrastructure, full grave relocations are recommended for graves to be impacted. Such measures should be undertaken by a qualified archaeologist, and in accordance with the Human Tissue Act (Act 65 of 1983 as amended), the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925), the National Heritage Resources Act (Act no. 25 of 1999) and any local and regional provisions, laws and by-laws pertaining to the cemetery. A full social consultation process should occur in conjunction with the mitigation of any burial place or cemetery. The exhumation, investigation and reburial of the burial place may only commence after SAHRA has issued relevant permits and permissions.

Although the various ruined homesteads identified across the site are of low significance, a demolishment permit will still have to be obtained from the relevant heritage resources authority before such homesteads can be demolished.

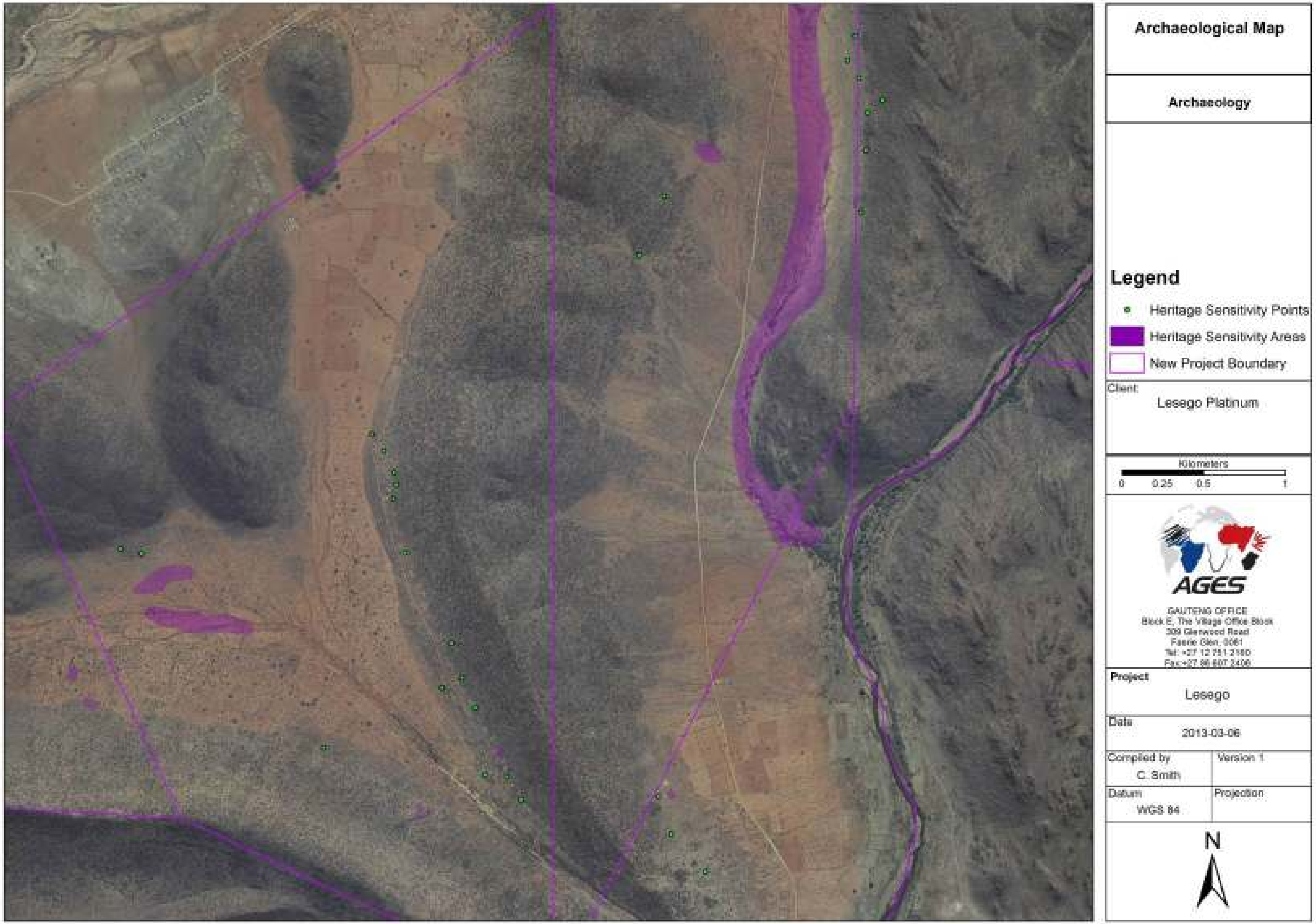


Figure 6-20 **Sites of archaeological and historical interest**

6.19 Socio Economic Environment

A Social Impact Assessment was conducted by PTERSA social scientists and is included in the appendices.

6.19.1 Description of the communities

Ptersa have compiled a SLP in preparation for the Mining Right Application (MRA) and Social Impact Assessment as part of the EIA process.

There are a number of different groups in the social environment that may be affected by the proposed mining activities:

- Adjacent landowners

The proposed development site borders various landowners ranging from land owned by local municipalities, communities, trusts, and private companies.

- People in surrounding towns and settlements

Surrounding towns include Lebowakgomo as well as the villages of Phosiri, Mabokotswane, Malogeng, Pelangwe, India, Mphahlele, Ga-Mankopane, Ga-Nkoana, Apel and Tiekiedraai. The proposed new mining development may positively affect these residents by creating employment opportunities.

- Municipalities and technical groups

The proposed development site is located in Limpopo Province, with a portion of the site falling within the jurisdiction of Sekhukune District Municipality and Fetakgomo Local Municipality and another portion within the jurisdiction of the Capricorn District Municipality and Lepelle-Nkumpi Local Municipality. The Municipalities can be affected in terms of infrastructure expectations as well as their Integrated Development Plans and Local Economic Development Initiatives.

6.19.2 Socio-Economic Description

The figures used for the socio-economic description were sourced from the Census 2011 that was released by STATS SA.

6.19.3 Population

Limpopo Province has an estimated population of 5 404 868 (Census, 2011). The approximate growth rate of 8.2% is based on STATS SA population estimates between 2001 and 2011 calculated on community level. Increasing housing and service backlogs are some of the challenges which must be addressed within the Province.

Fetakgomo Local Municipality is one of the local municipality's which has jurisdiction over the proposed site and has a population of approximately 93 795 people with an average household size of approximately 4 people per household (Census, 2011). Lepelle-Nkumpi Local Municipality is the other municipality with jurisdiction of the site and has an estimated population of 230 350 and an average household size of approximately 4 people per household. (Census, 2011).

Figure 6-21 provides an illustration of the population distribution within the applicable district as well as local municipalities.

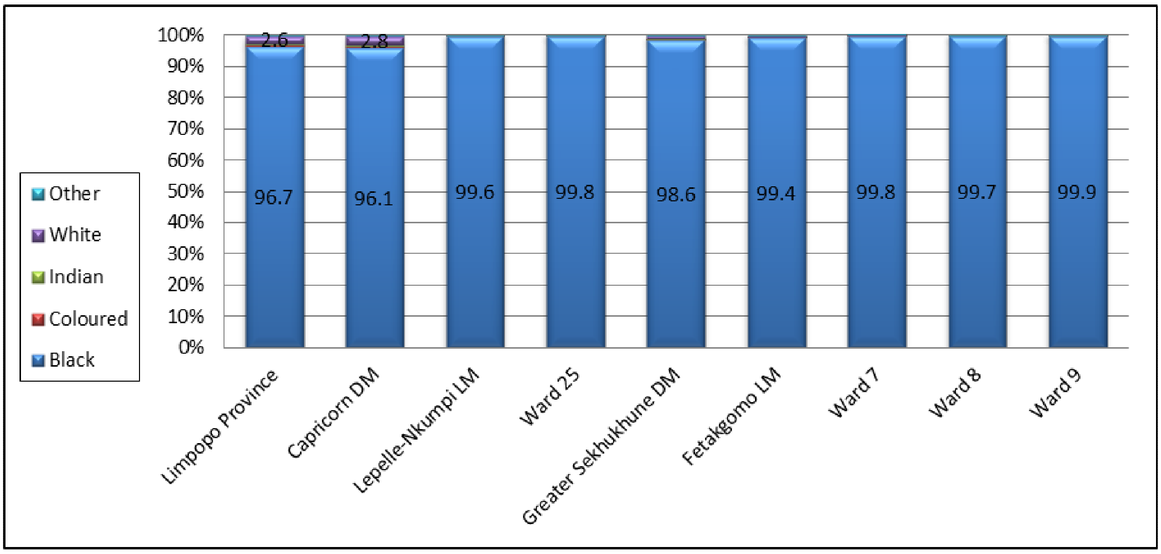


Figure 6-21 Population distribution (shown in percentage, source: Census 2011)

6.19.4 Age

Of the estimated 5 404 868 people residing in Limpopo Province, less than 50% are of a working age (between 19 and 65 years of age). Approximately 34% of the total population falls below the working age of 19 to 65. The age distribution of the area under investigation look very similar to the provincial profile on a district level, with a greater proportion of the population of the Greater Sekhukhune DM in the 0-14 year old age group.

Ward 25 of the Lepelle-Nkumpi LM and Ward 9 of the Fetakgomo LM have the highest proportion of people in the 0-14 year old age group, while Ward 7 and Ward 8 of the Fetakgomo LM have the highest proportion of people in the age group 50 years or older.

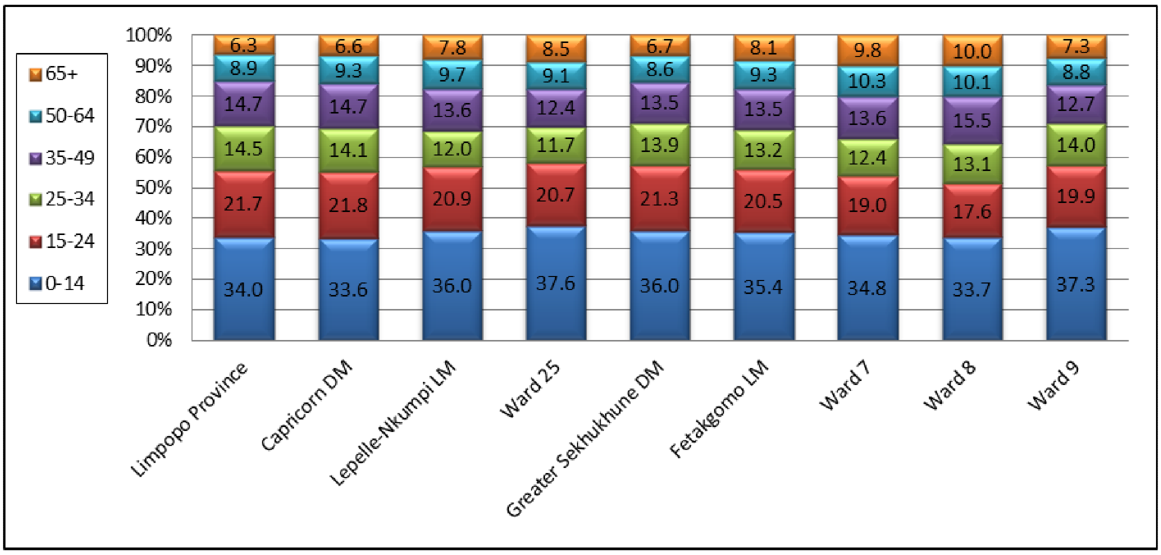


Figure 6-22 Age distribution (shown in percentage, source: Census 2011)

6.19.5 Gender

Fetakgomo Local Municipality has a gender distribution of 54.9% female and 45.1% male and the Lepelle-Nkumpi Local Municipality has a similar 54.5% female and 45.5% male distribution. The gender distribution bias towards females can most likely be ascribed to the migration of economically active males to other areas and provinces in search of employment opportunities.

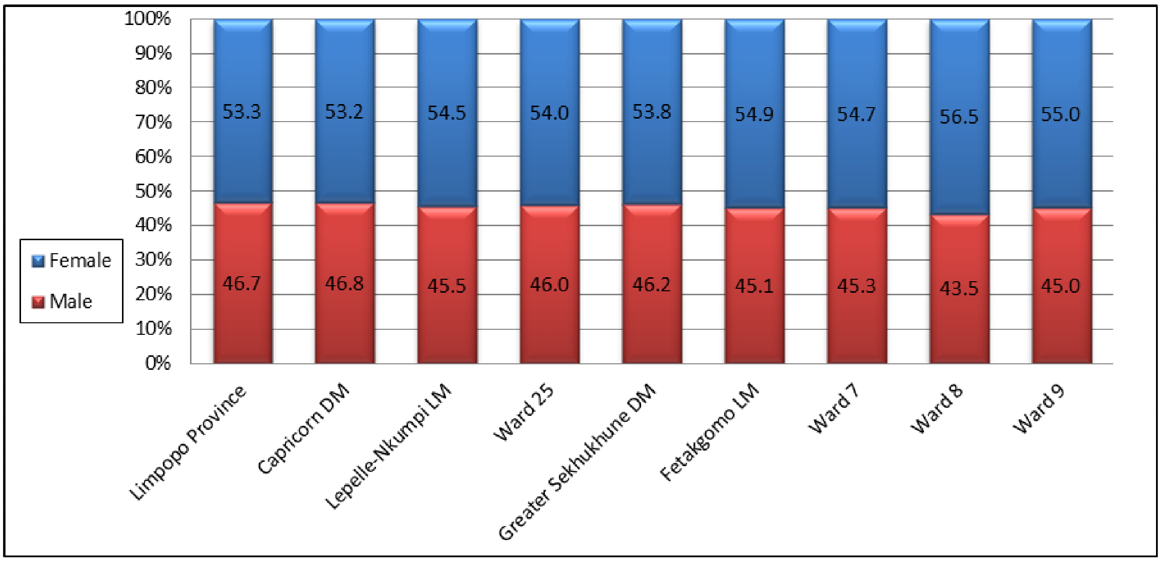


Figure 6-23 Gender distribution (shown in percentage, source: Census 2011)

6.19.6 Language

Sepedi is the dominant home language on ward level, with more than 90% of people speaking Sepedi at home. On provincial level the second and third most spoken home languages are Xitsonga and Tshivenda. In the Lepelle-Nkumpi Local Municipality IsiNdebele and Xitsonga also feature as home languages, suggesting that the Lepelle-

Nkumpi Local Municipality is culturally more diverse as home language often gives an indication of the cultural composition of an area. Home languages other than Sepedi do not really feature in the Fetakgomo Local Municipality; this suggests that the Fetakgomo Local Municipality is culturally more homogeneous.

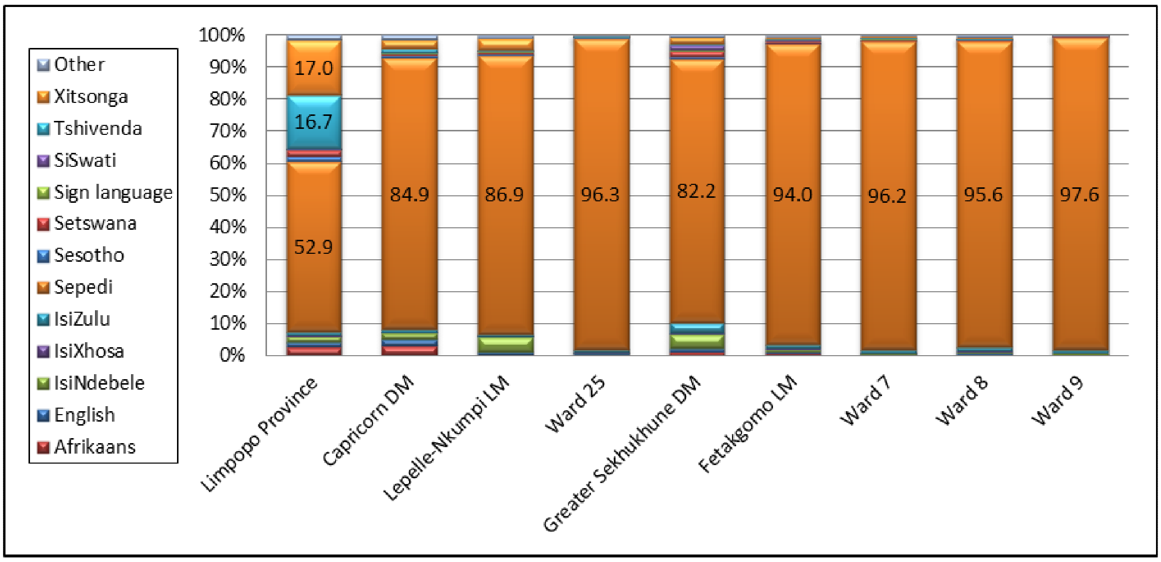


Figure 6-24 Language distribution (shown in percentage, source: Census 2011)

6.19.7 Education

The level of education of the people comprising the workforce in the area (as in the rest of the province) is considered poor. Approximately 29.8% of Lepelle-Nkumpi Local Municipality's population only received some kind of primary education or no schooling at all. Fetakgomo Local Municipality's education figures are also poor with 35% of the municipality's population having received some kind of primary education or no schooling at all. Only an average of 11.1% of the Lepelle-Nkumpi Local Municipality's received higher education, while in the Fetakgomo Local Municipality this figure is only 6.6%.

Figure 6-25 shows the education profiles for the areas under investigation for those aged 20 years or older. Almost a third of the population aged 20 years or older in Ward 25 of the Lepelle-Nkumpi Local Municipality have no schooling while almost a third of the population of Ward 8 of the Fetakgomo Local Municipality have completed Grade 12. Ward 8 has a proportionately more people with an education higher than Grade 12 than on provincial level.

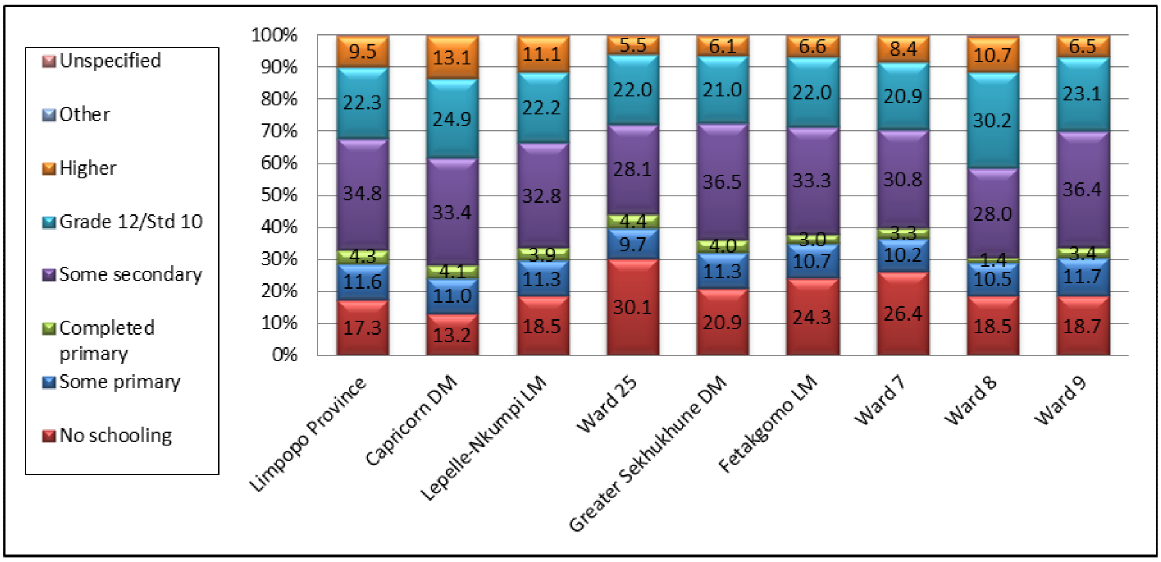


Figure 6-25 Level of education (shown in percentage, source: Census 2011)

6.19.8 Income

The high percentage of economical inactive individuals within Limpopo Province is reflected in the monthly income statistics. The household income profiles vary for the different areas under investigation on provincial, district and local level. In Ward 25 of the Lepelle-Nkumpi Local Municipality almost 90% of households have an annual household income of less than R38 201, compared to just over 70% in Ward 8 of the Fetakgomo Local Municipality. This indicates that greater levels of poverty can be expected in Ward 25 than in any of the other wards under investigation.

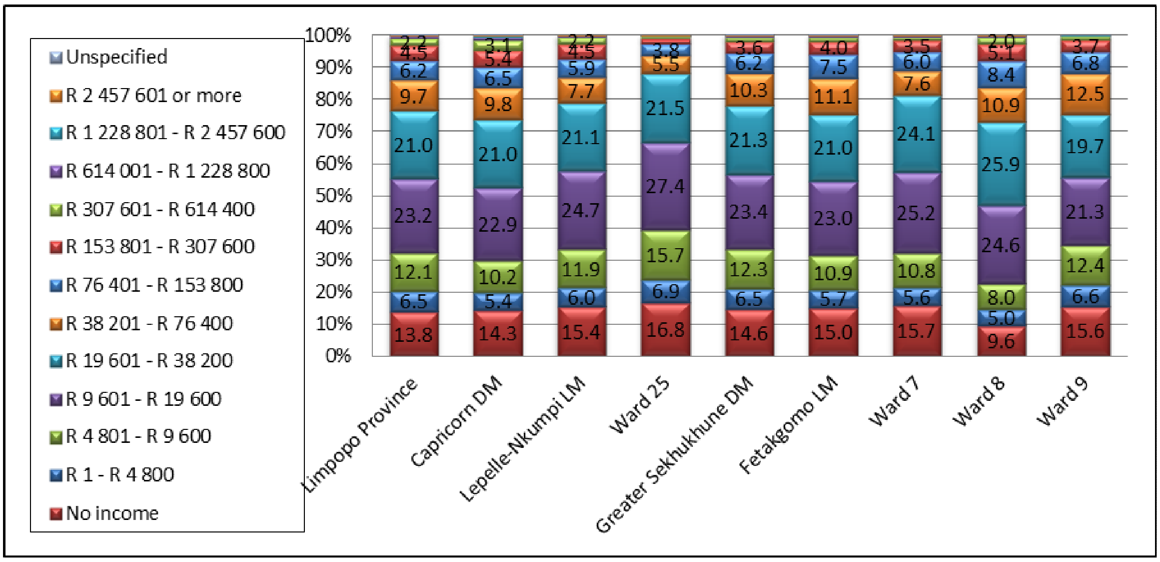


Figure 6-26 Monthly income (shown in percentage, source: Census 2011)

6.19.9 Employment

Only 21.2% of Lepelle-Nkumpi Local Municipality's population is employed with 19.7% without any work. Fetakgomo Local Municipality's population has an unemployment figure of 24.8% with 17.3% being employed.

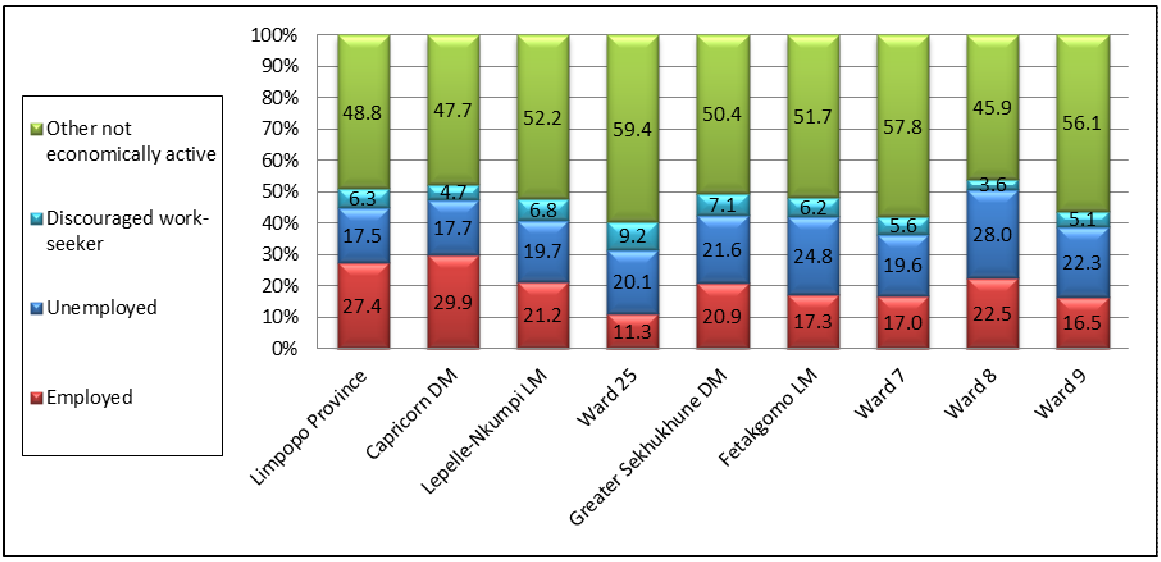


Figure 6-27 Labour status (those aged between 15 - 65 years, shown in percentage, source: Census 2011)

The majority of the employed people in the project area have indicated that they work in the formal sector. A fairly large proportion of people in Ward 9 of the Fetakgomo Local Municipality have indicated that they are employed in the informal sector. This suggests that there might be more opportunities for informal trade in Ward 9 and also that the people in Ward 9 might be more entrepreneurial than in the other areas.

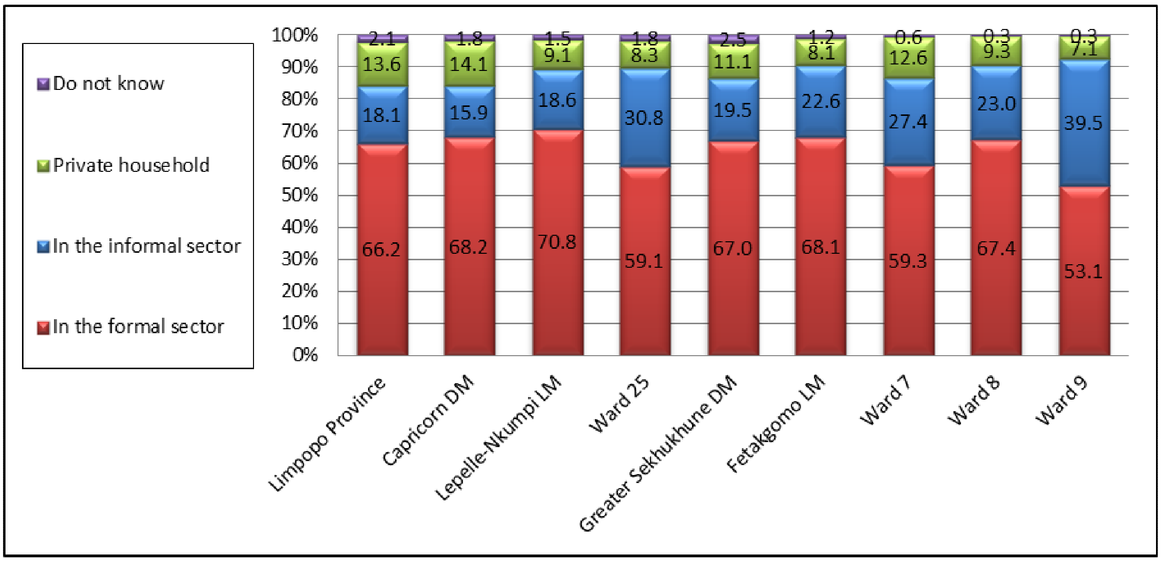


Figure 6-28 Employment sector (those aged between 15 - 65 years, shown in percentage, source: Census 2011)

6.19.10 Services

Access to piped water, electricity and sanitation services relate to the domain of Living Environment Deprivation as identified by Noble et al (2006). Most households on a provincial, district and local level get their water from a regional or local water scheme. On a district level, less than 80% of households get their water from a regional or local water scheme. On a ward level most of the households that do not get their water from a water scheme, get their water from a river or stream. This is followed by a dam/pool/ stagnant water in Ward 7 and Ward 9. Other water sources in Ward 9 include boreholes and water vendors. In Ward 8 other water sources include boreholes and water tankers. In Ward 25 households also get water from water tankers, water vendors and boreholes. This suggests that a relatively large proportion of households in the area are very dependent on surface water as a water source and where that does not suffice, water needs to be transported to them (Aucamp; 2012).

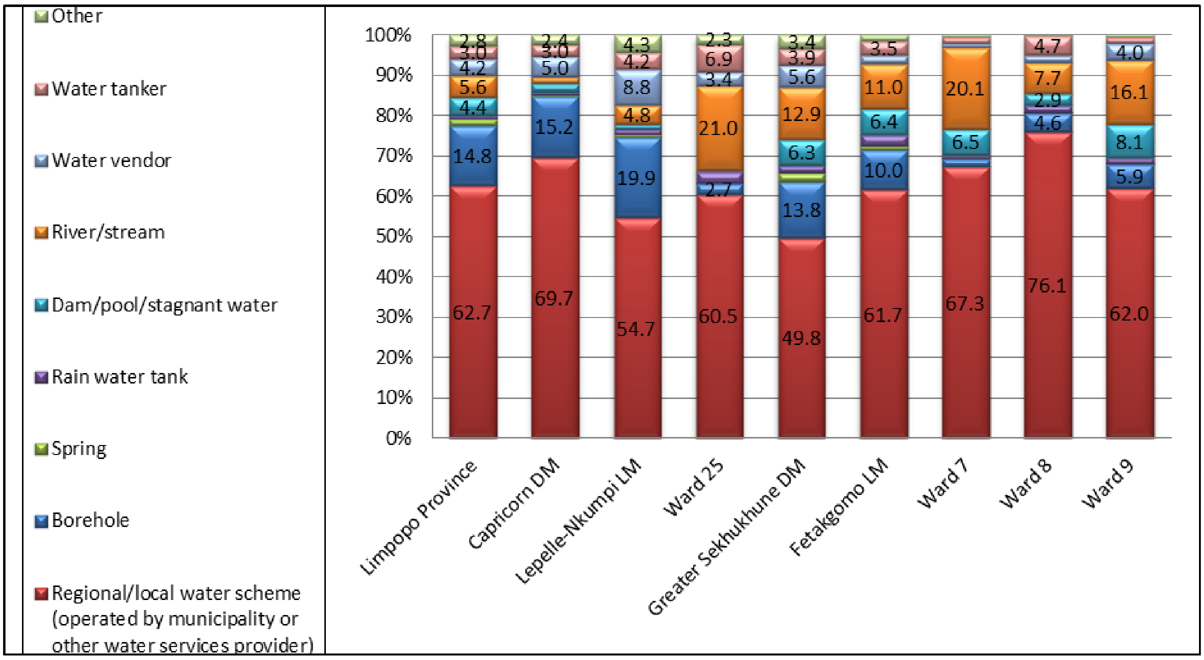


Figure 6-29 Water Source (shown in percentage, source: Census 2011)

Only a relatively small proportion of households on provincial, district and local level have access to piped water inside the dwelling. In the Greater Sekhukhune District Municipality and the Lepelle-Nkumpi Local Municipality almost a quarter of households have no access to water, indicating that many households in the area live in a deprived living environment. On a Ward level, Ward 8 of the Fetakgomo Local Municipality, more than 85% of households have access to piped water inside the dwelling or yard. Ward 9 is the most deprived with almost half of the households having access to piped water on a community stand less than 200m from the dwelling, while about a quarter have no access to piped water. In Ward 25 of the Lepelle-Nkumpi Local Municipality approximately 16% of households do not have access to piped water.

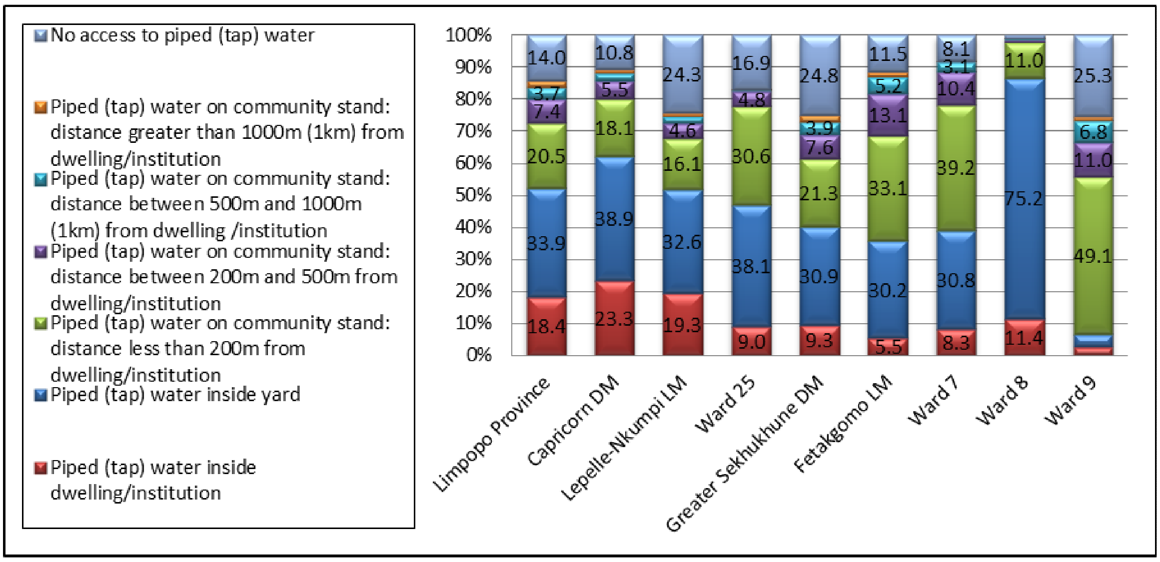


Figure 6-30 Piped water (shown in percentage, source: Census 2011)

According to RDP standards adequate sanitation means having a minimum of access to a ventilated pit latrine (VIP). In the Lepelle-Nkumpi Local Municipality approximately 18.4% have access to flush toilets connected to a sewerage system and 17.6% have access to pit toilets with ventilation. The Fetakgomo Local Municipality has approximately 22.5% pit toilets with ventilation with the majority of household in both municipalities having pit toilets without ventilation. This implies that very few households in these municipal areas have adequate sanitation facilities. About a third of the households in Ward 8 of the Lepelle-Nkumpi Local Municipality have access to pit toilets with ventilation, the highest incidence on ward level.

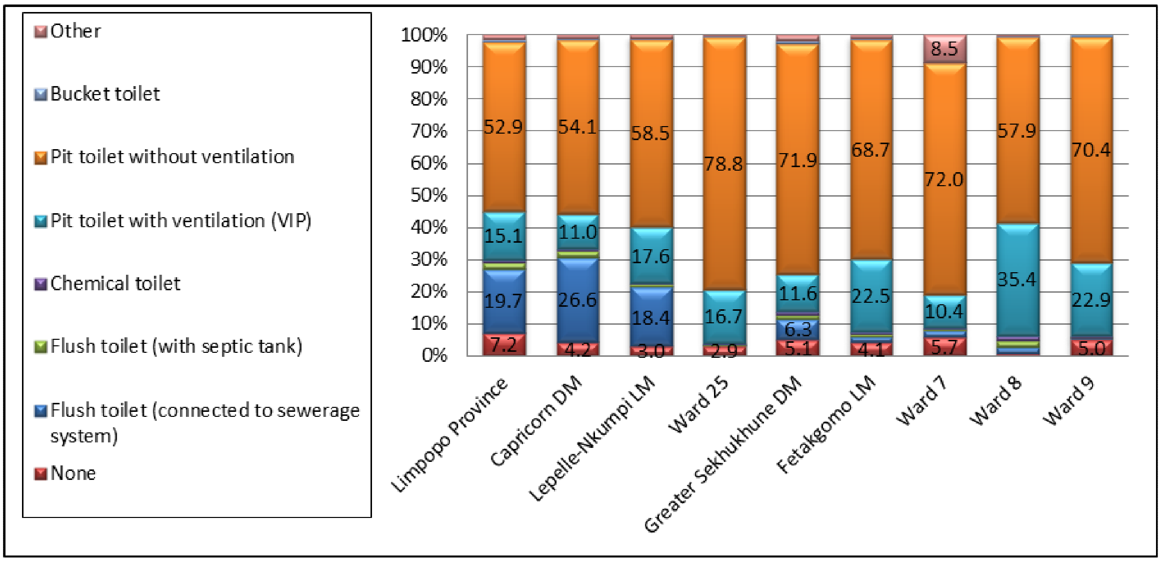


Figure 6-31 Sanitation (shown in percentage, source: Census 2011)

Electricity is seen as the preferred energy source for lighting (Noble et al, 2006). Even though electricity as energy source may be available, the choice of energy for cooking may depend on other factors such as cost. More than 85% of households on provincial, district and local level use electricity as energy source for lighting. The households that do not have access to electricity mainly use candles for lighting. The Lepelle-Nkumpi Local Municipality and Fetakgomo Local Municipality have the highest incidence of households using electricity as source of energy for lighting, with more than 90% indicating that they use electricity for lighting purposes. This is higher than on provincial level.

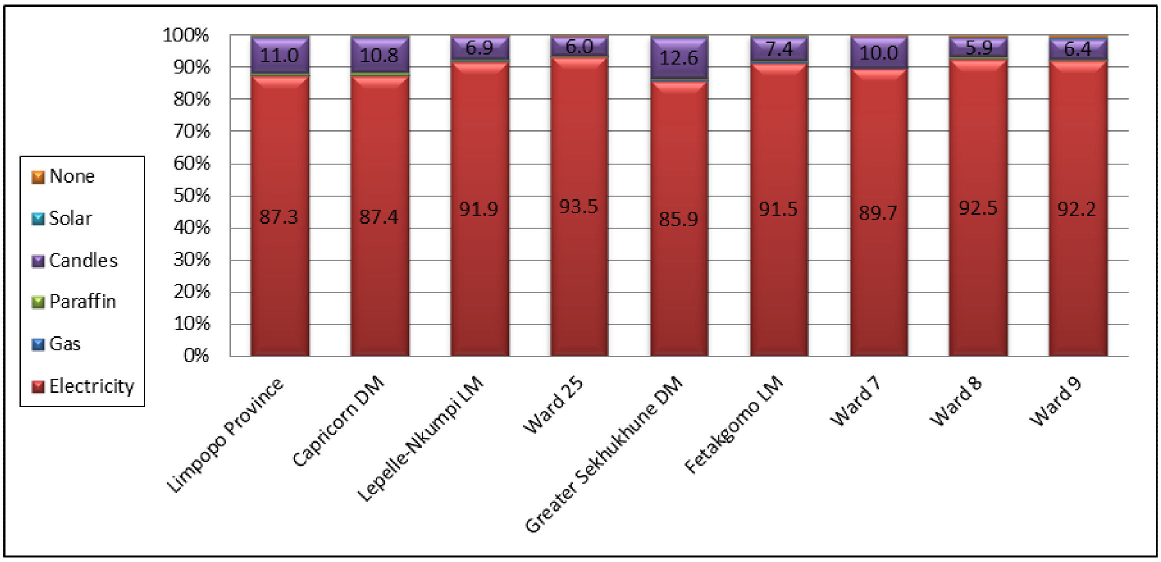


Figure 6-32 Energy source for lighting (shown in percentage, source: Census 2011)

The majority of households on a provincial, district and local level have indicated that they have their own refuse dumps, except in Ward 8 where about three quarters of the households have indicated that their refuse is removed by a local authority/private company at least once a week. Households with their own refuse dumps rely mostly on backyard dumping, burial and burning. These practices adversely impact on human health and the environment, specifically:

- air pollution from smoke;
- ground and surface water pollution;
- Disease from smoke inhalation; and
- fires destroying property.

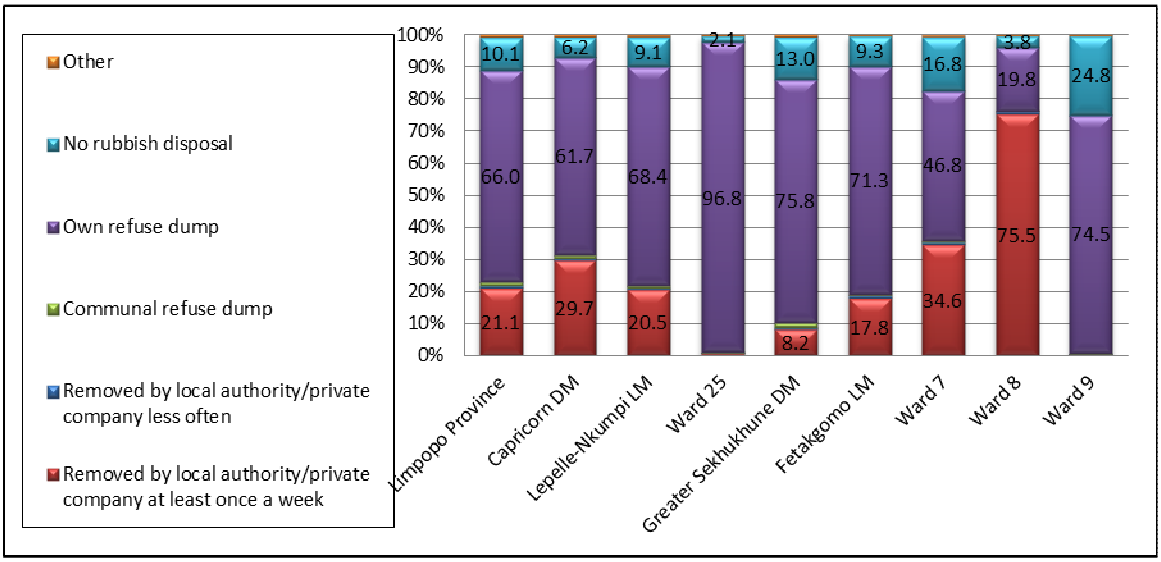


Figure 6-33 Refuse removal (shown in percentage, source: Census 2011)

6.19.11 Transport

The Community Survey for 2007 and Census 2011 did not release data on transport and therefore data from Census 2001 is used for indicative purposes. The majority of people in the Fetakgomo Local Municipality travel by foot. The profile for the Lepelle-Nkumpi Local Municipality is similar; however travel by taxi and car as passengers also features.

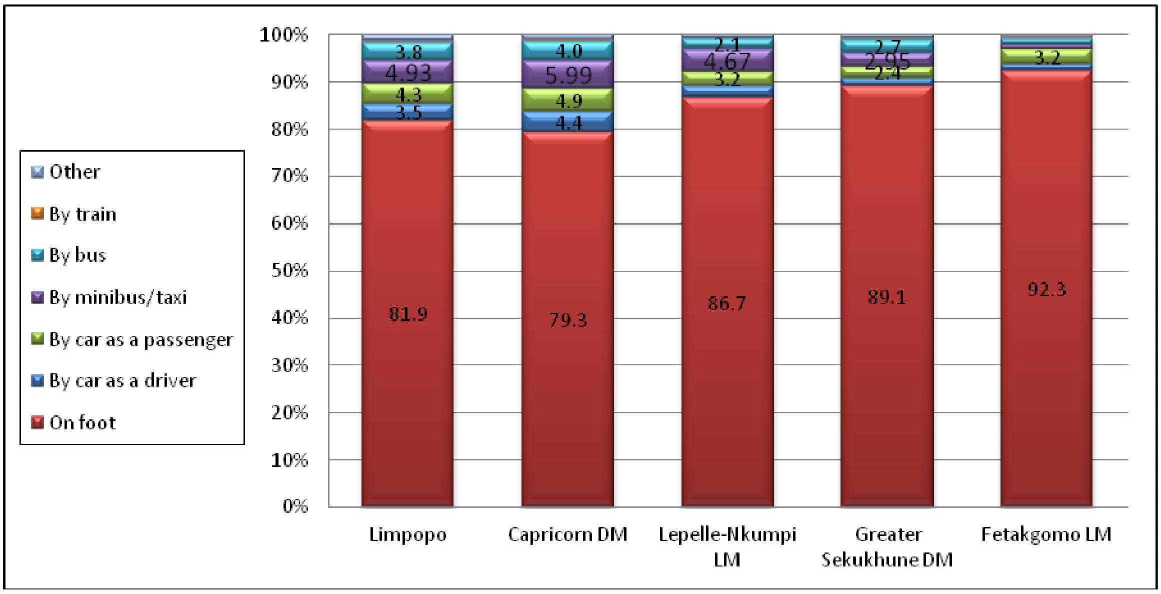


Figure 6-34 Mode of travel (shown in percentage, source: Census 2001)

6.19.12 Human Health

Various wastes and other effluents, typically generated and managed by mining operations, have the potential to either directly or indirectly impact on the health of communities living in the vicinity of the operations. Atmospheric and groundwater pathways were identified as issues of potential concern with regard to public health impacts in the areas surrounding the proposed Project. In recent years, evidence has shown that airborne particulate matter is the cause of a range of adverse health effects in humans ranging from decreases in pulmonary function reported in children to increased mortality reported in the elderly and in individuals with cardiopulmonary disease. This has led to particulate matter being identified by the USEPA as one of a set of six criteria air pollutants that require the setting of standards on a national level, in order to protect public health.

The reliance of the communities living in the vicinity of the proposed Project on groundwater resources, and the close proximity of some of the communities to the proposed operations may result in communities being exposed to contaminants present in the raw materials, ore or residues from the mining and mineral processing operations through the water pathway. The potential risks to public health, posed by particulate and gaseous emissions increases significantly at the Nkotokwane receptor location. Other receptor locations also indicate increase in the personal risk of mortality associated with particulate and gaseous emissions exposure, but the increases are not significant. The potential for contamination of groundwater associated with the proposed Project would have insignificant effects on human health risks in the study area.

6.19.13 Sensitive landscapes

In terms of the Department of Environmental Affairs and Tourism (DEAT) guidelines for Integrated Environmental Management (IEM), sensitive landscapes are a broad term applying to: Nature conservation or ecologically sensitive areas – indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, lakes, islands, lagoon, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species; Unstable physical environments, such as unstable soil and geo-technically unstable areas; Important nature reserves – river systems, groundwater systems, high potential agricultural land; Sites of special scientific interest; Sites of social significance or interest – including sites of archaeological, historic, cultural spiritual or religious importance and burial sites; and Green belts or public open space in municipal areas.

Sensitive landscapes in terms of the above definition are illustrated in Figure 6-35 below and include:

- Archaeological features,
- Local Communities,
- Soil and Land use Potential zones,
- Ecological Sensitive areas; and
- Surface Water features.

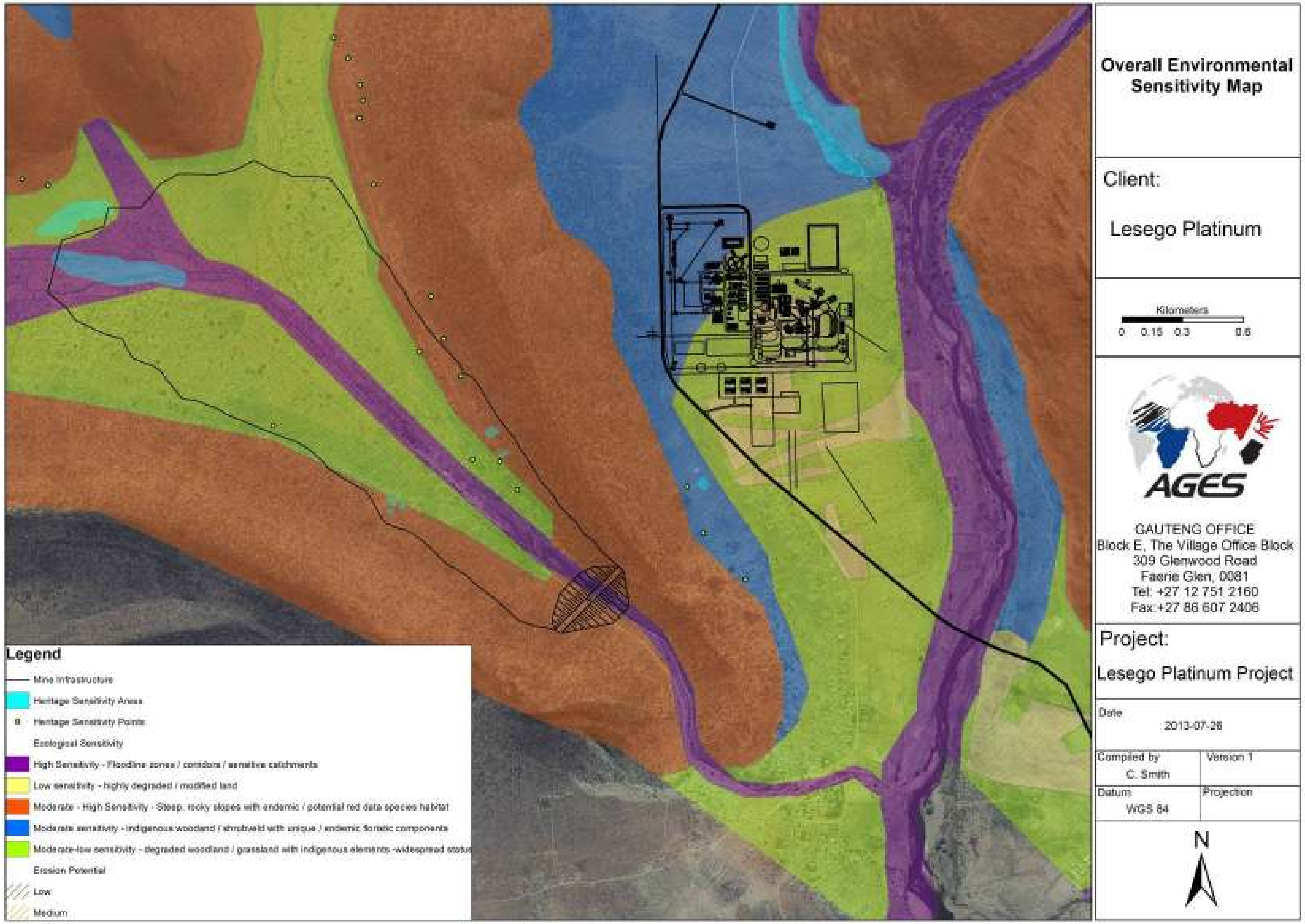


Figure 6-35 Overall Sensitivity Map

7 ALTERNATIVES

7.1 Process to assess alternatives

The IEM procedure requires that an environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, the EIA Regulations require that a number of possible proposals or alternatives for accomplishing the same objectives should be considered.

Various alternatives have been assessed throughout the project life cycle and work shopped by means of specialist, client and engineering team interactions.

In the case of the proposed development, possible alternatives were identified through discussions with authorities, discussions with I & AP's (focus group meetings), reviewing of existing environmental data, specialist inputs/studies and the design team. Alternatives relevant to this development can be categorized into the following:

- **Location alternatives**
    - Location of tailings disposal facility; and
    - Location of shaft/vent.
- **Layout alternatives**
    - Layout of Waste Rock Dumps
    - Layout of the Plant
- **Service alternatives**
    - Water provision;
    - Energy alternatives;
    - Access alternatives; and
    - Waste disposal.
- **Technology Alternatives**
    - TDF Construction Alternatives
- The "no-go" alternative

  - Assessed per environmental aspect/area

7.2 Tailings Disposal Facility location alternatives

a) Location alternative 1 evaluated for the Tailings Disposal Facility is situated within the Phosiri dome to the west of the site.

The advantages of location alternative 1 are:

- There are no major drainage lines crossing the proposed area and as a result the Department of Water Affairs will prefer location alternative 1 over location alternative 2. It is also deemed that costs associated with stormwater management will be lower for location alternative 1,
- The heritage impact assessment indicated that the archaeological artefacts identified in the area are of medium to low significance and as a result demolishment of such artefacts will not require the completion of a phase 2 heritage impact assessment,
- Preliminary investigations indicate that most of the area is not deemed sensitive from an environmental perspective,
- The largest part of the site is located on soils with low probability of erosion,
- From a visual impact point of view, location alternative 1 will have the lowest impact.

The disadvantages of location alternative 1 are:

- Parts of the Tailings Disposal Facility infringes into the ecological sensitive areas along the ridge,
- Graves in the area are of high heritage significance and therefore grave relocation permits will have to be obtained,
- The proposed Tailings Disposal Facility will be situated further away from the plant and shaft, with associated cost implications,
- The existing Lesego mineral right holdings do not include the proposed area and are in the process of being amended to include the farms Stofpoort 481 KS and Zaaikloof 480 KS.

b) Location alternative 2 evaluated for the Tailings Disposal Facility is situated in the north western portion of the site and is planned to be established along the eastern slopes of the Phosiri dome, stretching across the valley towards the rocky outcrops in the east.

The advantages of location alternative 2 are:

- The proposed Tailings Disposal Facility will be situated closer to the plant and shaft than location alternative 1. Thus this will have a lower cost implication than location alternative 1.

The disadvantages of location alternative 2 are:

- There is a major drainage line crossing the proposed site and as a result there are risks associated with the authorisation of the water use licence application. Location alternative 2 will also be associated with a higher cost implication regarding stormwater management,

- Large parts of the tailings disposal facility infringes into the ecological sensitive rocky outcrops,

- The heritage specialist identified various archaeological artefacts within the area with a high significance. As a result a phase 2 heritage impact assessment will have to be conducted and submitted to the South African Heritage Resources Agency prior to the commencement of construction activities. Graveyards were also identified within the proposed area, for which relocation permits will have to be obtained,

- The soils are moderately erosive,

- From a visual impact point of view location alternative 2 will have a much higher visual impact than location alternative 1.

7.3 Shaft/vent location alternatives

Three location alternatives were investigated for the proposed shaft/vent.

a) The preferred location alternative or Alternative 1 for the shaft/vent is situated more or less in the centre of the valley located east of the Phosiri dome.

The advantages of location alternative 1 are:

- The proposed location alternative is not situated within any drainage lines,
- The proposed location alternative is not situated within any ecological or archaeological sensitive areas,
- From a visual impact point of view, the proposed location alternative will have a moderate impact,

The disadvantages of proposed location alternative are:

- The area associated with the proposed alternative are characterised by moderately erosive soils.

b) Location alternative 2 investigated for the shaft/vent is situated north of the proposed location alternative, within the valley located east of the Phosiri dome.

The advantages of location alternative 2 are:

- Location alternative 2 is not situated within any drainage lines,
- Location alternative 2 is not situated within any ecological or archaeological sensitive areas,
- From a visual impact point of view, location alternative 1 will have the lowest visual impact.

The disadvantages of location alternative 2 are:

- The area associated with location alternative 2 is characterised by moderately erosive soils,
- As location alternative 1 is the furthest away from the TDF, the costs involved with regards to tailings will be high.

c) Location alternative 3 investigated for the shaft/vent is situated south of the proposed location alternative, within the valley located east of the Phosiri dome.

The advantages of location alternative 3 are:

- Location alternative 3 is not situated within any ecological or archaeological sensitive areas,

- The area associated with the location alternative 3 is characterised by soils with low probability of erosion,

The disadvantages of location alternative 3 are:

- Although location alternative 3 is not situated within any drainage lines, the proximity of the Olifants river flood line might cause impacts during an extreme flood event,
- From a visual impact point of view, location alternative 3 will have the highest visual impact.

7.4 Plant layout alternatives

Two layout alternatives were investigated for the proposed plant.

a) Layout 1 is associated with the proposed shaft/vent location and is situated more or less in the centre of the valley located east of the Phosiri dome.

The advantages of the proposed layout alternative are:

- The plant is not situated within any drainage lines,
- The location is economically optimized in relation to the position to the TDF and the shaft

The disadvantages of layout alternative 1 are:

- Layout alternative 1 is partially situated within the ecological sensitive area associated with the ridge,
- The area associated with alternative 1 is characterised by moderately erosive soils.

b) The preferred layout is similar to the location of Alternative 1 however it has been optimized in order not to infringe on the ecological sensitive areas.

The advantages of layout alternative 2 are:

- The advantages are similar to Alternative 1 but with the significant improvement of less of an ecological impact.

The disadvantages of layout alternative 2 are:

- The area associated with layout alternative 2 is characterised by moderately erosive soils.

7.5 Waste Rock Dump alternatives

Two location alternatives were investigated for the proposed waste rock dump.

a) Alternative 1 is situated south of the plant.

The advantages of the proposed location alternative are:

- The dump is not situated within any drainage lines at this location
- The dump is not situated within any ecological or archaeological sensitive areas,
- The location makes the most economical sense as the dump is located closest to the shaft thus ensuring the shortest transportation distances.
- The dump can be positioned to act as a noise barrier between the host community and the plant.

The disadvantages of this layout are:

- From a visual impact point of view, the proposed location will have a larger visual impact.
- The dump is in close proximity to the host community and will result in larger air quality, noise, and human health impacts.
- The area associated with the proposed alternative is characterised by moderately erosive soils.

b) Location alternative 2 is situated north of the preferred plant location:

The advantages of layout alternative 2 are:

- The waste rock dump is visually screened by the Plant.
- The dump is further away from the community and less air quality, noise and human health impacts are anticipated.

The disadvantages of layout alternative 2 are:

- As the dump for alternative 2 is the furthest away from the shaft, the costs involved with regards to transportation and capital expenditure will be higher than for Alternative 1.

Table 7-1 serves as a summary of the risks identified for the two location alternatives proposed for the tailings disposal facility as well as the three location alternatives proposed for the vent/shaft, the two location alternatives for the plant and the two waste rock dump alternatives.

7.6 Infrastructure Alternatives Summary

The following table summarises the various alternatives assessed according to the specific environmental aspects. Please refer to APPENDIX D 2 for the alternative layouts.

Table 7-1 Comparative summary of the impacts associated with the proposed infrastructure location and layout alternatives

Environmental Aspect	TDF Location Alternatives	Shaft/vent Location Alternatives	Plant Location Alternatives	Waste Rock Dump Alternatives
Drainage lines	Alt 2	Alt 3	N.A.	N.A.
Ecological impacts	Alt 1 / Alt 2	N.A.	Alt 1	N.A.
Heritage impacts	Alt 1 / Alt 2	N.A.	N.A.	N.A.
Erosion	Alt 2	Alt 1 / Alt 2	Alt 1 / Alt 2	Alt 1
Visual Impacts	Alt 2	Alt 3	Alt 1 / Alt 2	Alt 1
Cost implication	Alt 1	Alt 2	N.A.	Alt 2

7.7 Service Alternatives

7.7.1 Water Provision

The following water supply options were identified:

1) Water sourced from groundwater (<30 km radius);

2) Water sourced from existing agricultural allocations;

3) Net water saving through the clearing of alien vegetation;

4) Existing mines' discharged water (Atok Mine);

5) Water sourced from regional groundwater (>30 km radius); and

6) Water allocated from the proposed De Hoop Dam.

The surface water availability study showed that the Lesego Platinum Mining (Pty) Ltd Lesego project area is situated in an area with very little un-allocated surface water resources. Groundwater is therefore seen as a potential primary source of water for Lesego Mine. Detailed studies should be conducted to investigate possible water resources in the future which may include alien vegetation eradication, existing lawful uses (neighbouring mines, surface water and/or farmers) and groundwater resources.

7.7.2 Energy alternatives

Wind energy was considered as an energy alternative for the proposed project. The construction of a wind farm generating renewable energy could be considered using various funding models including 100% ownership or co-ownership. The option of embedded energy generation entails the generation of wind energy without ESKOM transmission facilities on site and should be considered as an alternative to ESKOM power.

The potential of bio energy as well as solar energy as alternative energy sources was also investigated. The combination of renewable energy sources such as wind, solar and bio energy in combination could offer cost effective energy generation in the future but at present the cost-benefit analysis is still in favour of conventional ESKOM supply. The large power requirements of the mine (in excess of 100 Mva) and the fact that power constitutes greater than 20% of the mine's operational expense mean that the high capital and operational cost associated with a renewable energy make it prohibitively expense.

7.7.3 Access alternatives

Five access alternatives were assessed. Two options were identified as being preferred going into the EIA based on distance and capital cost implications. These two alternatives entail the following:

a) Route option 2's alignment follows that of an existing gravel road and transverse through several villages until it reaches the R579, close to Lebowakgomo.

The advantages of route option 2 are:

- The route alignment stays clear of any rural settlement and the overall distance from the Base Point is the shortest.

The disadvantages of route option 2 are:

- Route 2's distance for new road construction is the longest of all the route options.

b) Access route 5 which exit the site in a southern direction crossing the Olifants River with a bridge from where it will connect to the main Apel road.

The advantages of route option 5 are:

- 54 km of route of option 5 are already constructed and as a result only an additional road of 5 km needs to be constructed.

The disadvantages of route option 5 are:

- Route 5 is the longest route from the base point; and
- A bridge will have to be constructed over the Olifants River. Preferred option: no new construction of bridges (excl Olifants River bridge).

Table 7-2 Summary of the impacts associated with the route alternatives

Associated impacts	Option 2	Option 5
Drainage lines	Alternative option: this option will traverse drainages and require bridge upgrades/construction.	Preferred option: no new construction of bridges (excl Olifants River bridge)
Ecological impacts	New roads and upgrades will add to impacts on ecology.	Preferred option as the impact on undeveloped land is limited.
Heritage impacts	Alternative: route to the north will pass identified archaeological remains that might be impacted upon.	Route option 5 will be situated well away from any archaeological sites.

Visual Impacts	Alternative: new construction and upgrades – creating additional visual impacts.	Preferred: 5 km of road construction, the rest will be existing roads.
Social & Safety	Similar impacts in terms of the additional traffic generated to travel through the surrounding communities.	Similar impacts in terms of the additional traffic generated to travel through the surrounding communities.
Cost implication	The cost involved for construction of Route option 2 is approximately R86.2m	The cost involved for construction of Route option 5 is approximately R81.2m

7.7.4 Waste Disposal

Sewage reticulation will be based on 150 ID PVC gravity sewer piping installed subsurface, with a minimum cover of 1m, minimum slope of 1:120 and with 1050dia pre-cast manholes at a spacing of no more than 90m and at every change in direction or slope where required. Manhole covers will be concrete filled, steel frame except where vehicular access is required – Type 2b heavy-duty manhole covers will be used in these instances. Bulk feeder lines will transport sewage to a common manhole at the lowest point from where it will be routed to a treatment facility. The position of the sewage plant is directly next to the water treatment plant and the storm water dam for easy local distribution of treated water.

Raw water as well as treated water from the sewage plant will report to the water treatment plant for further processing as per the staged water requirements. The water will be treated in two stages at the water treatment plant,

Stage 1 of the treated water will serve the purpose of the concentrator plant requirements and Stage 2 will be used as make up for potable water requirements.

Treatment methods for ensuring water meet SANS 241 Class I (potable water) can be categorised as follows:

- Chemical removal by precipitation of insoluble salts by chemical treatment.
- Flocculation, coagulation and settling of insoluble and large contaminates.
- Flocculation, coagulation and filtering of smaller insoluble contaminates.

- Chlorination or other suitable sterilisation.
- Ultra filtration to remove microscopic contaminates.
- Reverse osmosis to remove remaining undesirable dissolved contaminates.

A workable and effective system would most likely consist of an initial chemical treatment to precipitate out the easily removed ions and flocculate suspended solids.

The prepared water will then enter either circular conical based settlers or lamella plate settlers depending on volumes of treated water and available space on site.

The clarified water is then passed through a bank of multimedia filters that remove any remaining fine particulates. The media used in the filters vary depending on the exact composition of the water. Finally the water would be sterilised and softened depending on the final dissolved solids breakdown.

If the concentration of dissolved solids is still too high after treatment, a reverse Osmosis system would then be required to remove the remaining dissolved solids.

The raw feed water will consist of dirty water return from the operations and water from the voids/old underground workings. Since the dirty water quality from the operations is unknown at this stage, it is assumed that the quality will be similar to the water in the old underground workings.

In general it is assumed that the feed water quality is within SANS 241 - 2011 Class 1 limits. The turbidity, conductivity and total dissolved solid readings are generally high in this class. This is caused by the suspended solids and dissolved compounds in the water. Flocculation, filtration and ultra-filtration will be effective in the removal of suspended particles and insoluble contaminates. The dissolved solids causing high conductivity are generally easily precipitated by means of simple chemical treatment. It is therefore expected that reverse osmosis will not be required.

It must be noted that a reverse osmosis system could cost on an order of magnitude more than the conventional treatment options envisaged.

7.8 Tailings Dam Facility alternatives

Two technology or construction method alternatives were investigated for the proposed TDF's construction.

a) Valley-fill tailings deposition:

The advantages of the proposed deposition or construction alternative are:

- The whole footprint of the TDF site will be utilized thus resulting in a lower dump.
- The reduced footprint of the Valley-fill TDF will result in a reduced impact on sensitive archaeological areas and therefore less graves will need to be relocated.
- A lower dump will imply less wind exposure resulting in less of an air quality impact and therefore less of a human health impact.
- The lower dump will also result in less visual intrusion.
- The dump is not situated within any ecological sensitive areas.
- The valley fill makes the most economical sense as the deposition will take place by means of simple benches.
- Due to decreased exposed slopes, the rehabilitation costs are also expected to be less than conventional construction methods.
- The TDF will also suffice as a stormwater management facility during times of excess fissure water recovery from the underground mine. This water will be recoverable to the plant by means of the various drains and water recovery structures at the foot of the TDF.

The disadvantages of this deposition method are:

- There are sections of the TDF that would infringe on the moderate to high ecological zone but the cumulative benefits outweigh the limited ecological impact.

b) Conventional deposition has been assessed as alternative 2:

The advantages of the conventional alternative are:

- No advantages of conventional deposition have yet been determined.

The disadvantages of alternative 2 are:

- The construction method will result in higher visual, air quality and human health impacts.
- The closure costs will be extensively higher due to a greater amount of exposed slopes requiring rehabilitation.
- The construction and operation of a conventional TDF is more expensive.
- Water containment facilities need to be constructed additionally thus increasing the environmental footprint impact.
- The footprint of the conventional TDF will impact on sensitive archaeological heritage and would result in more grave relocations being necessary.

Alternative 1 or valley-fill tailings deposition is therefore the preferred option due to the advantages associated therewith.

7.9 Conclusion

Table 7-1 serves as a summary of the risks identified for the two location alternatives proposed for the tailings disposal facility as well as the three location alternatives proposed for the vent/shaft, and the two location alternative discussed for the plant and waste rock dump. Alternative 1 is the preferred option for the location of the TDF as it has fewer impacts than Alternative 2. The preferred location alternative for the shaft/vent is Alternative 1, while the preferred location alternative for the plant is Alternative 2. Even though Alternative 2 is further away from the community and therefore has a less visual impact, alternative 1 is still the preferred location option due to the cost implications associated with alternative 2. Alternative 1 or valley-fill tailings deposition is preferred due to the advantages associated therewith. It is proposed that both access route 2 and 5 be combined for access to the mine as this will provide the mine with access from the North and the South.

Based on the assessment of these alternatives it is proposed that the rest of this EIR will focus on assessing and presenting mitigation measures associated with the proposed layout and the technology alternatives stated above.

7.10 "No-go" Alternative

The assessment of the "no-go" alternative is a legal requirement according to NEMA and the EIA Regulations. In this scenario no development would take place. The environment would be left as is and the impact on the area and potential benefits would remain unchanged.

It is the opinion of the majority of specialists that in the event that the Lesego Platinum Mine and Concentrator Plant are not constructed that the status quo will be maintained. The no-go alternative will imply that virtually none of the identified impacts of proceeding with the project will be incurred. But some of the environmental aspects will continue to be impacted upon even though the mine is not developed due to existing impacts currently taking place. The current ecosystem of the site is already impacted upon, and is degraded in some instances due to over-grazing and crop cultivation. The soils are also highly erodible due to these anthropogenic disturbances. The mining development will support rehabilitation of the broader project site and will thus assist the system to recover to an enhanced state compared to the current status quo. The studies undertaken during the impact assessment phase has provided reference to the no-go alternative and this is outlined in the sections that follow.

An expected increase in the demand for platinum and palladium is expected for the future due to stricter emissions legislation globally and a rise in the growth of vehicle production and sales. In addition, with global energy demand expected to grow by more than 60% by 2030, the security of energy supply has become a concern and has led to the diversification of energy sources. This has created new opportunities for PGMs in the development of fuel cell technology, which could lead to significant socio-economic development as it will result in job creation in terms of manufacturing, installation and maintenance, as well as skills development (Mining Weekly, 2012). In addition to the global socio-economic benefits, the Lesego Platinum Mine will also provide the local communities with various benefits relating mainly to job creation and skills development. Unemployment in the site is high and mining is seen to hold major possibilities for the area.

Without the implementation of this project, the mentioned benefits would not be realised. The realization of the outcome the Mining Charter (2004), within the context of the MPRDA (2002), would therefore also not be reached and this has potentially significant negative impacts on national economic growth and social well-being. The Mining Charters main objectives, which the Lesego Platinum Project will assist to reach, are:

- to promote equitable access to South Africa's Mineral Resources for all South Africans;
- to substantially and meaningfully expand opportunities for historically disadvantaged South Africans (HDSAs);
- to utilize the existing skills base for the empowerment of HDSAs (Refer to the Social and Labour Plan (SLP) as part of the Mining Right);

- to expand the skills base of HDSAs to serve the community; (Refer to the SLP conducted according to the MPRDA);
- to promote employment and advance the social and economic welfare of mining communities and areas supplying mining labour; (Refer to the SLP as part of the Mining Right); and
- to promote beneficiation of South Africa's mineral commodities beyond mining and processing, including the production of consumer products.

The no-go alternative has been assessed against the following categories, *inter alia*:

- Groundwater Impacts
- Surface water Impacts
- Fauna and Flora Impacts
- Heritage Impacts
- Visual Impacts
- Air Quality Impacts
- Noise Impacts
- Traffic Impacts
- Socio Economic Impacts

8 ENVIRONMENTAL ASSESSMENT

NEMA Regulation 32(2)(l) requires a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.

The following section of the report provides a discussion on the findings of the specialist studies with regards to identified issues and impacts. Additional issues identified through the environmental assessment process are also discussed in this section.

The rest of this EIR will focus on assessing and mitigating the impacts associated with the alternatives as indicated and the final site layout.

8.1 Assessment of Impacts

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need.

The questions, issues and responses shown in (APPENDIX A 2) have been analysed using knowledge of the affected environment, available information and professional judgment, in order to identify key issues that require further assessment in the next phase of the environmental impact assessment – specialist studies and environmental impact assessment phase.

The reader should note that the classification of an issue as a key issue during the scoping phase does not necessarily imply that a significant impact will result. The significance of an impact can only be ascertained once a specialist study has been conducted.

Impact significance will be assessed by means of the specialist studies and impact assessment phase using the criteria listed below.

8.2 Identification of Key Issues

The key issues listed in the following section have been determined through the following avenues:

- Views of interested and affected parties;

- Legislation; and
- Professional understanding of the project team, environmental assessment practitioners and specialist consultants.

Preliminary significant issues for the proposed mining development and associated infrastructure are summarized below:

Key Impact	Section of report where addressed
Groundwater Impact • Anticipated pollution of groundwater resources due to TDF • Depletion of the underground aquifer • Excessive ingress of underground water Surface water Impact • Surface water pollution and subsequent decrease in water quality due to mining activities • Improved water quality due to proposed water treatment plant • Improved water quality monitoring	Section 11.1.5
Stormwater impacts on surface water resources	Section 11.1.5.2
Flooding • Flooding of mine infrastructure	Section 11.1.5.1; 11.1.5.2
Air quality impact • Dust from roads, TDF and crushing activities • PM10	Section 11.1.6
Land availability	Section 11.1.4.5
Noise pollution • Impact on surrounding community	Section 11.2.5
Biodiversity Impact • Impact on red data species • Impact on aquatic diversity • Habitat degradation and fragmentation	Section 11.1.1
Wetland Impact	Section 11.1.3
Land use and Land Capability • Loss of agricultural land • Increased soil erosion and sedimentation	Section 11.1.4
Visual Impact • Impact on surrounding community •	Section 11.2.4
Heritage Impact • Anticipated grave relocation	Section 11.2.1
Socio-economic • Jobs to be created • Social investment within surrounding communities • Safety and security	Section 11.2.2; 11.2.7

• Health	
Traffic Impact on roads	Section 11.2.6
Mine Closure • Mine rewatering and flooding	Section 11.1.5.7; 11.1.5.8

This EIA Report will assess the impacts of each of the activities as well as ascertain the cumulative impacts of the development. The EIA report will outline the necessary mitigation measures and delineate sensitive areas containing species of conservation importance and habitats integral to the maintenance of ecosystem function.

9 SPECIALIST STUDIES

As a result of the above-mentioned anticipated impacts, the specialist studies as listed below was undertaken during the EIA phase of the process. The specialist studies assist with the development of an understanding of the system processes and the potential positive and negative impacts of the proposed development on both the social and biophysical environments:

- Ecological Assessment (AGES)
- Heritage Impact Assessment (AGES)
- Geohydrological and Surface Water Impact Assessment (AGES)
- Wetland Delineation and Aquatic Assessment (SAS)
- Soils and land use capability (Terrasoil)
- Noise Impact Assessment (Menco)
- Air Quality Impact Assessment (Airshed)
- Social Impact Assessment (Ptersa)
- Economic Impact Assessment (Strategy4Good)
- Health Impact Assessment (Envirosim)
- Visual Impact Assessment (Newtown Landscape Architects)
- Traffic Impact Assessment (Havenga Transportation Engineers)
- Stormwater Management Plan & Floodline Delineation (AES)
- Mine Closure and Rehabilitation plan (AGES)

9.1 Assessment Methodology

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need. Assessment of impacts will be based on the Department of Environmental Affairs (previously the DEAT) (1998) Guideline Document: EIA Regulations. The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts will be determined through a synthesis of the criteria below:

Probability. This describes the likelihood of the impact actually occurring.

Improbable: The possibility of the impact occurring is very low, due to the circumstances, design or experience.

Probable: There is a probability that the impact will occur to the extent that provision must be made therefore.

Highly Probable: It is most likely that the impact will occur at some stage of the development.

Definite: The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.

Duration. The lifetime of the impact

Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.

Medium term: The impact will last up to the end of the phases, where after it will be negated.

Long term: The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.

Permanent: Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale. The physical and spatial size of the impact

Local: The impacted area extends only as far as the activity, e.g. footprint

Site: The impact could affect the whole, or a measurable portion of the above mentioned properties.

Regional: The impact could affect the area including the neighbouring residential areas.

Magnitude/ Severity. Does the impact destroy the environment, or alter its function.

Low: The impact alters the affected environment in such a way that natural processes are not affected.

Medium: The affected environment is altered, but functions and processes continue in a modified way.

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

Significance. This 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.

Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.

Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.

Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.

High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels;

and/or the cost of management intervention will be a significant factor in mitigation.

The following weights will be assigned to each attribute:

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude/Severity	Low	2
	Medium	6
	High	8
Significance	**Sum (Duration, Scale, Magnitude) x Probability**	
	Negligible	<20
	Low	<40
	Moderate	<60
	High	>60

The significance of each activity will be rated without mitigation measures and with mitigation measures for both construction, operational and closure phases of the Fluorspar Mine development.

10 IMPACT ASSESSMENT

Impacts on the identified key issues will be assessed according to the following structure:

- *Source of the impact*: will be identified (e.g. initial vegetation clearance on site, establishment of construction camp, passage of vehicles on dirt roads, etc.).

- A *Description of the impact* will describe the interaction between the activity and the environment, i.e. how and why the impact occurs and how the activity changes the environment.

- *Significance*: an explanation of the significance rating of the impact with and without mitigation, with reference to the impact assessment criteria will be provided. Impacts will be rated as highly significant, or of low significance. Fatal flaws will additionally be identified. There are no mitigation measures which can be implemented to manage a fatal flaw.

- *Mitigation:* The mitigation measures that can be implemented to eliminate or minimise negative impacts or result in the optimization of positive benefits must, wherever possible, will be expressed as practical actions.

11 ISSUES IDENTIFIED, SIGNIFICANCE AND PROPOSED MITIGATION MEASURES

The findings of the impact assessment have been consolidated in the sections below. The impacts have been classified as impacts on the biophysical environment and impacts on the socio-economic environment. The impacts are further classified in terms of the phase of the development in which they are likely to occur, namely the construction phase, the operational phase and the decommissioning phase (where applicable).

Cumulative impacts that can arise from one or more activities were also taken into account. A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

During their analysis, specialists were required to consider the impact significance without mitigation (WM) and with mitigation measures (WM) are implemented as well as cumulative impacts. The mitigation measures are also highlighted in this chapter and discussed in depth further in the specialist reports (see relevant Appendices at the end of the report).

Even though some impacts are perceived to be of high severity, it must be highlighted that the probability of these impacts occurring might be low and therefore the significance of the impact is reduced.

The significance of residual impacts is marked according to the following colour code for ease of reference:

Colour	Significance
High	Impact of high significance
Moderate	Impact of moderate significance
Low	Impact of low significance
Negligible	Impact Unknown or Negligible

11.1 BIOPHYSICAL ENVIRONMENT

11.1.1 Ecological Impact

The following section was completed with the assistance of the ecological assessment conducted by Dr. Buks Henning (APPENDIX G).

The proposed alternative has been largely influenced by the ecological sensitivities on-site. The ridges have been regarded as sensitive due to the following values and functionality:

- Potential red data flora habitat that forms part of the Sekhukuneland Centre of Plant Endemism
- Confirmed presence of red data species *Adenia fruticosa*
- Occurrence of protected tree species
- Shallow soils with high erosion potential
- Suitable habitat for red data list fauna, especially rocky areas with large boulders and ravines that create microhabitats

As is clear from Figure 6-35, these areas have been largely avoided through the optimized design and layout.

11.1.1.1 Direct Habitat Destruction

Impact Description

An underground mine such as proposed for the Project site will result in some loss of and damage to natural habitats, although not to the extent that an opencast pit will have. Other infrastructure (other than the actual mining area) that will cause destruction of natural vegetation in the area include offices, stores, permanent access roads and the areas used for lay-down of machinery, materials and soil removed during the construction process. Rehabilitation of some areas would be possible but there is likely to be long-term damage in large areas. Most habitat destruction will be caused during the construction phase, but some may also occur during the operational and decommissioning phases. The impact of the habitat destruction will be on the flora and fauna of the study area:

11.1.1.1.1 Destruction or loss of floral diversity or vegetation communities

The following major impacts of the mining development will potentially impact on the flora of the site:

- The clearance of vegetation during the constructional phase might lead to the loss of individual plant species or even isolated populations of a particular plant species of significance (indigenous / protected species endemic to the area, e.g. *Euphorbia barnardii*);
- The mining activities can impact on surrounding vegetation by dust and altered surface run-off patterns;
- The disturbance of the area could lead to an increase in the growth of alien vegetation;
- During the decommissioning and closure phases of the mine there should be no further impact on surrounding vegetation. The cleared areas will be re-vegetated; and
- After closure the vegetation composition will be different from the pre-mining condition considering the establishment of pioneer species on the rehabilitated areas.

11.1.1.1.2 Loss of faunal diversity through migration and decline in animal numbers

The following major impacts of the mining development will potentially impact on the faunal habitats of the site:

- Habitat loss and construction activities will force animals out of the construction area and animal numbers will decrease. In some cases isolated populations of threatened fauna might be totally removed from the area, although no such populations or knowledge thereof was found in the study area. This impact could also take place because of hunting and snaring of animals in natural areas not used for the mine or its infrastructure.

- Loss of threatened, “near-threatened” and conservation important taxa: The anticipated loss of the natural woodland will result in the local displacement of some fauna species;
- Changes in the community structure: It is expected that the faunal species composition will shift, due to an anticipated loss in habitat surface area. In addition, it is predicted that more generalist species (and a loss of functional guilds) will dominate the study area. Attempts to rehabilitate will attract taxa with unspecialized and generalist life-histories. It is predicted that such taxa will persist for many years before conditions become suitable for succession to progress.

Significance Rating

The impact has a definite probability and long term duration, leading to a moderate impact. The probability of occurrence has been rated as definite but the severity as medium due to the mine being an underground mine and thus having a smaller footprint than that of an opencast mining development. Mitigation measures would lower the significance of the activity to such an extent that it can be classified as low.

11.1.1.2 Light pollution

Impact Description

The negative effect of light pollution on invertebrates (especially insects) cannot be overstressed. Many species of flying insects (but also some non-flying insects) are attracted to artificial light, some over distances of a kilometre or more. Insects attracted to fixed external lights often circle the light until they eventually succumb to exhaustion or are killed by predators like bats, other insectivorous mammals or ants. Some insects may settle down on vegetation or other perching possibilities like walls near the light but they are often killed early the following morning by birds that quickly learn to utilize this ‘easy’ food source. Flying insects attracted to the lights of vehicles, are killed in large numbers by the moving vehicles.

The impact of artificial lighting on insect populations can be significant, resulting in the death of thousands of individuals every night and causing a substantial drain effect on the surrounding populations. This drain effect from the continual depletion of the populations within the zone around the lights will probably cause a significant decline in the population numbers and density of the affected species for a distance of several kilometres. It may also cause an unnatural 'positive' effect on the populations of predators and scavengers, like insectivorous mammals, ants and birds, utilising the food source. Given the vital role that insect species and other invertebrates play in ecosystem functioning, virtually every component of the surrounding ecosystem may be affected.

Lighting pollution will probably be severe during the construction phase, especially if strong lighting is needed for construction at night. During this phase there will also probably be an increased movement of vehicles.

During the operational phase the impact will continue (throughout the life of the project) and its impact will depends on the number and placement of external lights and mining activity during the night.

Significance Rating

The above mentioned impact has a regional extent as well as high severity. The probability of occurrence has been rated as definite, rendering this impact high. Mitigation measures proposed will however reduce the impact to moderate.

11.1.1.3 Habitat fragmentation

Impact Description

The construction of buildings, fences and roads will inevitably result in natural movement patterns being disrupted and, to a varying degree depending on how different species react to these barriers will result in the fragmentation of natural populations. The excavation of the area for mining will have a significant impact in fragmenting the habitats on the property. Such impacts would be short-term provided that proper rehabilitation methods are used after and during decommissioning.

Significance Rating

The above mentioned impact has a local extent as well as moderate severity. The probability of occurrence has been rated as definite, rendering this impact moderate. Mitigation measures proposed will however reduce the impact to low.

11.1.1.4 Road mortalities

Impact Description

Faunal road mortalities occur either by being crushed under the tyres of vehicles in the case of crawling species, or by colliding with the vehicle itself in the case of avifauna or flying invertebrates. The impact is intensified at night, especially for flying insects, as result of their attraction to the lights of vehicles.

Significance Rating

The above mentioned impact has a regional extent and a medium severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Mitigation measures proposed will however reduce the impact to low.

11.1.1.5 Spread and establishment of alien invasive species

Impact Description

Vehicles often transport many seeds and some may be of invader species, which may become established along the road, especially where the area is disturbed. Invasive invertebrate species (e.g. the Argentine ant, Linepithema humile) are also regularly dispersed by vehicles.

The construction phase almost certainly carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that colonies of species such as Argentine ants or the seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites.

Continued movement of personnel and vehicles on and off the site, as well as occasional delivery of materials required for maintenance, will result in a risk of importation of alien species throughout the life of the project.

Significance Rating

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as highly probable, rendering this impact high. Mitigation measures proposed will however reduce the impact to low.

11.1.1.6 Negative effect of human activities

Impact Description

An increase in human activity on the site and surrounding areas is anticipated. The risk of snaring, killing and hunting of certain faunal species is increased. Certain faunal species may be captured for selling to the pet trade. If staff compounds are erected for construction workers, the risk of pollution because of litter and inadequate sanitation and the introduction of invasive fauna and flora are increased. The presence of a large number of construction workers or regular workers during the operational phase on site over a protracted period will result in a greatly increased risk of uncontrolled fires arising from cooking fires, improperly disposed cigarettes etc.

Significance Rating

The above mentioned impact has a regional extent and a medium severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Mitigation measures proposed will however reduce the impact to low.

11.1.2 Aquatic Impact

The following section was completed with the assistance of the aquatic assessment conducted by Stephen van Staden (APPENDIX T)

11.1.2.1 Impacts on instream flow

Impact Description

Activities upstream of the proposed mine have a significant impact on the flow of the Olifants River at this point. Large volumes of water are abstracted from the Olifants River which impact on the stream flow conditions in the segment of the Olifants River surveyed during the aquatic assessment in June 2012. Based on all the water abstracted from the Olifants River in this area and areas upstream, the available water for allocation to users is at capacity and therefore the system can be considered to be under stress and any further abstractions form the river could lead to a significant increase in impact on the aquatic ecology of the system. The Lesego Platinum Mine has thus investigated other sources of water supply (Refer to Section 4.6.1).

Significance Rating

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as improbable, rendering this impact negligible.

11.1.2.2 Impacts due to sedimentation and loss of aquatic refugia

Impact Description

The riverine systems in the area naturally have stream beds comprising of deep alluvial soils. Impacts due to sedimentation can be significant and have the potential to affect the biodiversity and functioning of the system through reducing surface flows and also through the alteration of habitat characteristics in the system. During construction, operation and decommissioning there will be a disturbance of soils in the study area. Silting up of the aquatic resources within the study area and especially the immediate vicinity of mining activities or any disturbance of the surface areas may occur, thus impacting on the aquatic resources further downstream.

Significance Rating

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Within the project area management of erosion and sedimentation is considered to be relatively easily achievable and with mitigation the significance of the impact can be reduced to negligible levels.

11.1.2.3 Impacts on instream habitat

Impact Description

Impacts on instream habitat can be significant and has the potential to affect the biodiversity and functioning of the system. Disturbances caused by activities within the riparian zone, vegetation clearing and soil disturbance are the key activities which could lead to this impact. Specific issues can be impacts on taxa requiring a rocky substrate clear of sediment. Specific mention is made in this regard of fish species such as *Chiloglanis pretoriae* and *Labeobarbus marequensis* which have a requirement for rocky substrate as part of their biology and in particular foraging and breeding. With disturbance of the soils associated with the project, there is a risk of sedimentation of the aquatic resources occurring in the study area which in turn could affect the available habitat in the area. Direct disturbances of the riparian areas and the construction of the bridge across the river may also impact on the aquatic resources on the subject property.

Significance Rating

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Within the project area management of erosion and sedimentation is considered to be relatively easily achievable and direct impacts on the riparian zone and instream habitats can be well managed. Therefore with mitigation the significance of the impact can be reduced to negligible levels.

11.1.2.4 Impacts on instream migratory corridors

Impact Description

Both aquatic species, such as fish, as well as species with an affinity for riverine systems such as certain avifaunal species which may migrate along linear riverine features may be significantly affected by impacts on the aquatic resources within the area. The area has a relatively high importance for the migration of aquatic species, however, unless suitable mitigation measures are implemented, some impact on the migratory routes of fish and other species may occur as a result of activities associated with the proposed mining development.

Significance Rating

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Mitigation measures proposed will however reduce the impact to negligible levels.

11.1.2.5 Impacts on taxa sensitive to changes in water quality

Impact Description

Impacts on instream water quality can be significant and has the potential to affect the biodiversity and functioning of the system. Disturbances caused by vegetation clearing and soil disturbance, seepage of water from disturbed soil and exposed coal areas as well as any discharges which may take place from the colliery's process water are the key activities which could lead to this impact. The river systems in this area support taxa which are moderately susceptible to changes in water quality and water quality is already significantly impaired due to upstream impacts, with special mention of upstream coal mining activities. Any impacts on the system from the proposed mine will therefore be cumulative in nature and may become significant. Without any mitigation efforts any impacts which occur will occur for some distance downstream of the activity and can occur in perpetuity.

Significance Rating

The above mentioned impact has a regional extent and a medium severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Mitigation measures proposed will however reduce the impact to negligible levels.

11.1.2.6 Impacts due to canalisation and erosion

Impact Description

With the construction, operation and decommissioning of the mine and associated bridge and roadway, vegetation removal and exposed soils will result in erosion and canalisation of the river systems in the area. Excavations within riparian zones and drainage lines as well as disturbances caused by the bridge construction could lead to altered drainage patterns and the removal of vegetation and the disturbance of the soil could lead to erosion and incision of the stream banks.

Significance Rating

The above mentioned impact has a local extent and a low severity. The probability of occurrence has been rated as probable, rendering this impact negligible.

11.1.2.7 Impacts on rare and endemic species

Impact Description

The area has significant importance in terms of locally rare and endemic species conservation, with species such as *Micralestes acutidens* and *Synodontis zambezensis*. The activities of the proposed mine may impact on these species occurring in the study are as well as their specific habitat requirements, with regards to water quality and impacts due to sedimentation.

Significance Rating

The above mentioned impact's extent is limited to the site. The impact has a low severity. The probability of occurrence has been rated as probable, rendering this impact negligible. Due to the negligible nature of the impact no mitigation was recommended.

11.1.3 Wetland Impact

The following section was completed with the assistance of the wetland assessment conducted by Stephen van Staden (Refer to APPENDIX S).

Impact Description

The encroachment of infrastructure, construction or operational waste materials into wetland areas could occur and would affect the habitat integrity of these areas. Furthermore, decant and seepage from decommissioned mining areas may occur post-closure if rehabilitation is not effectively implemented. Due to the high importance of the larger and smaller perennial systems, mining activities could cause severe impacts on the water quality, eco-services and functionality of the system.

Significance Rating

- **Olifants River System**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as highly probable, rendering this impact high. Mitigation measures proposed will however reduce the impact to negligible levels.

- **Pelangwe and Mohlaletsi River Systems**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as probable, rendering this impact low. Mitigation measures proposed will however reduce the impact to negligible levels.

- **Non-perennial drainage lines**

The above mentioned impact has a regional extent and a medium severity. The probability of occurrence has been rated as probable, rendering this impact low. Mitigation measures proposed will however reduce the impact to negligible levels.

11.1.3.1 Seepage and runoff of dirty water

Impact Description

Seepage from facilities and general dirty water areas has the potential to contaminate the groundwater environment which in turn can affect water quality in surface water sources in the area.

Significance Rating

- **Olifants River System**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as highly probable, rendering this impact high. Mitigation measures proposed will however reduce the impact to negligible levels.

- **Pelangwe and Mohlaletsi River Systems**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as probable, rendering this impact low. Mitigation measures proposed will however reduce the impact to negligible levels.

- **Non-perennial drainage lines**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as probable, rendering this impact low. Mitigation measures proposed will however reduce the impact to negligible levels.

11.1.3.2 Vehicles entering sensitive areas

Impact Description

Vehicles entering wetland areas may impact upon sensitive wetland areas during construction, operation and rehabilitation, resulting in a loss of habitat.

Significance Rating

- **Olifants River System**

The above mentioned impact is limited to the site and has a high severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Mitigation measures proposed will however reduce the impact to negligible levels.

- **Pelangwe and Mohlaletsi River Systems**

The above mentioned impact is limited to site and has a high severity. The probability of occurrence has been rated as highly probable, rendering this impact moderate. Mitigation measures proposed will however reduce the impact to negligible levels.

- **Non-perennial drainage lines**

The above mentioned impact is limited to site and has a medium severity. The probability of occurrence has been rated as probable, rendering this impact low. Mitigation measures proposed will however reduce the impact to negligible levels.

11.1.3.3 Ineffective rehabilitation

Impact Description

Ineffective rehabilitation of wetland areas could cause siltation, erosion and changes in the hydrological functioning of these areas. Wetland habitat may remain transformed after decommissioning and closure.

Significance Rating

- **Olifants River System**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as highly probable, rendering this impact high. Mitigation measures proposed will however reduce the impact to low.

- **Pelangwe and Mohlaletsi River Systems**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as highly probable, rendering this impact high. Mitigation measures proposed will however reduce the impact to low.

- **Non-perennial drainage lines**

The above mentioned impact is limited to site and has a high severity. The probability of occurrence has been rated as probable, rendering this impact low. Mitigation measures proposed will however reduce the impact to negligible levels.

11.1.3.4 Loss of ecological services

Impact Description

Destruction of the wetland areas may lead to a loss of ecological service provision in terms of habitat provision, nutrient trapping, and flood control and water purification among others.

Significance Rating

- **Olifants River System**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as highly probable, rendering this impact high. Mitigation measures proposed will however reduce the impact to low.

- **Pelangwe and Mohlaletsi River Systems**

The above mentioned impact has a regional extent and a high severity. The probability of occurrence has been rated as highly probable, rendering this impact high. Mitigation measures proposed will however reduce the impact to low.

- **Non-perennial drainage lines**

The above mentioned impact is limited to site and has a high severity. The probability of occurrence has been rated as probable, rendering this impact low. Mitigation measures proposed will however reduce the impact to negligible levels.

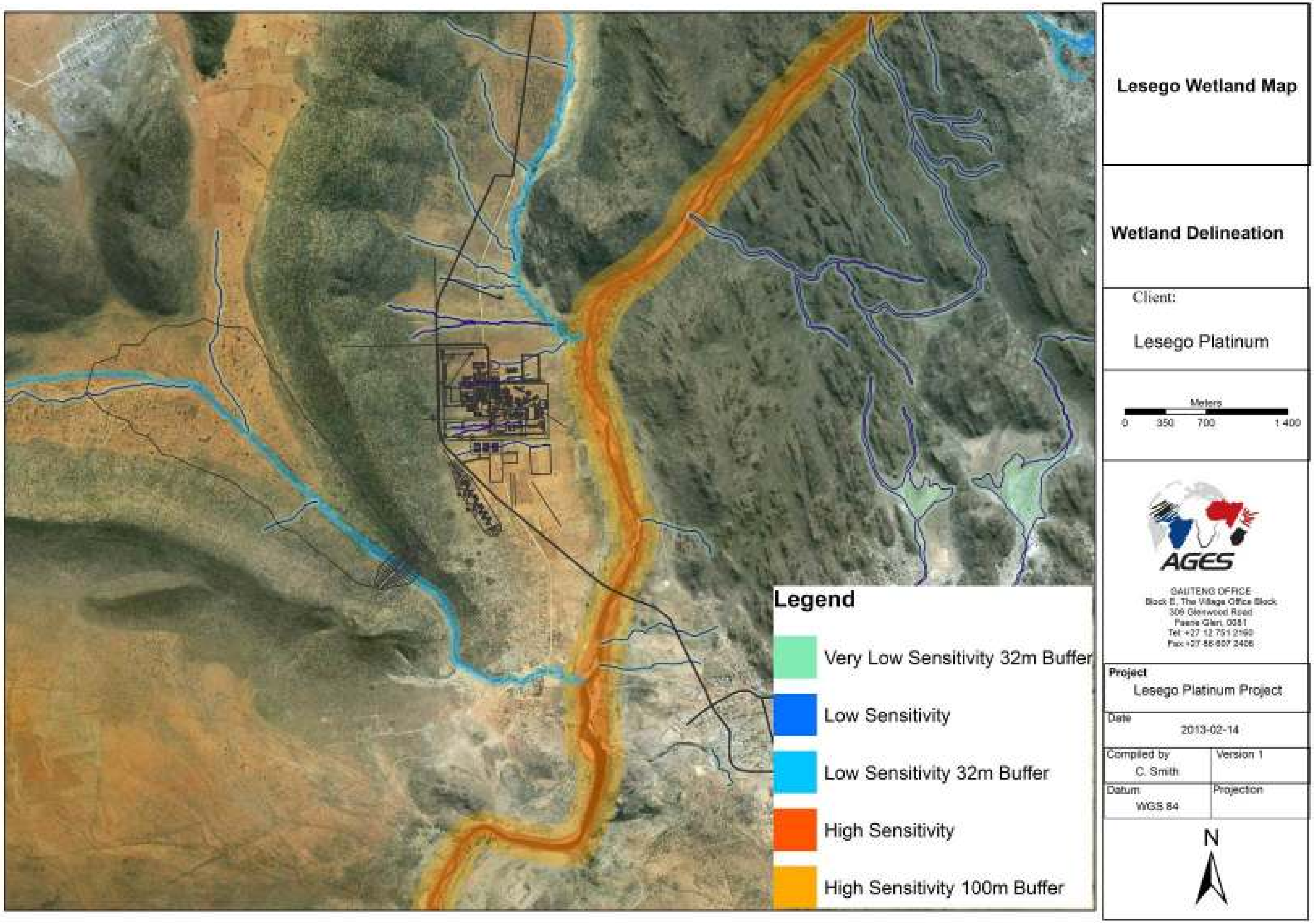


Figure 11-1 Wetland delineation

11.1.4 Soils and Land Capability Impact

The following section was completed with the assistance of the soils and land capability assessment conducted by Johan van der Waals (APPENDIX J).

11.1.4.1 Stripping of topsoil and subsoil material for shaft and construction areas

Impact Description

The expected impacts on the soils by the mining activities are dependent on the nature of the soils to be impacted. The mining area is limited to the shallow lime as well as sandy apedal soils (Refer to

Figure 6-7). The direct impacts will be the destruction of the soil forms through excavation and soil moving. Any soil material that is generated through these activities can essentially be regarded as construction material to be used during construction activities or during rehabilitation approaches.

Significance Rating

The above mentioned impact has a permanent duration and a medium severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the duration of the impact to medium term and the severity to low, thereby reducing this impact from moderate to low.

11.1.4.2 Construction of buildings and infrastructure

The impacts associated with the construction of buildings and infrastructure are the same as for stripping of topsoil discussed above.

11.1.4.3 Hydrocarbon spillages on site due to vehicle operation

Impact Description

Construction work of the magnitude contemplated for the proposed mine will always carry a substantial risk of soil pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. Impacts from vehicles, such as spillages of oil and hydrocarbons, should be prevented and mitigated.

Significance Rating

The duration of the above mentioned impact is medium term during construction and short term during operation. The severity for both phases is medium. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the probability of the impact to probable and the severity to low, thereby reducing this impact from moderate to negligible.

11.1.4.4 Stockpiling of soil material

Impact Description

The soil material is sandy and susceptible to erosion. This is especially relevant for deeper horizons as the Na and salt content increases with depth. It is therefore imperative that the maximum volume of usable soil/material has to be stripped in order to secure the maximal thickness of post-closure soils as well as soil material that can be used for capping of waste dumps. Machine operators have to be trained and informed regarding soil parameters to look for. During stripping of soils, operators will have to be supervised regarding their activities.

Significance Rating

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the probability of the impact to probable, the duration to medium term and the severity to low, thereby reducing this impact from moderate to negligible.

11.1.4.5 Land use alteration

Impact Description

The land use of the project area is mainly extensive grazing due to climatic and soil constraints. The soils are susceptible to erosion and over grazing is a distinct and widespread risk. The mining activities will impact on livestock grazing and small-scale subsistence farming activities which currently take place on the proposed project area, although mining activities also occur within the broader area. The mining operations will have a negative impact initially and will reduce the percentage of land available for livestock grazing and agricultural activities done by the local communities, but will recover after successful rehabilitation provides good grazing.

Significance Rating

The above mentioned impact has a permanent duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the duration to medium term and the severity to medium, thereby reducing this impact from high to moderate.

11.1.4.6 Erosion of soil on site due to human activities

Impact Description

Mining activities may result in widespread soil disturbance usually associated with accelerated soil erosion, particularly in areas receiving high rainfalls. Soil material is removed through the action of water or wind and transported further downslope or into streams, rivers and other water bodies. The erodibility of all the soils is high and this should be considered in all the mining related activities. The overall soil impacts of the mining development will depend on the area where the activities will take place. If the activities take place in the sloped areas the erodibility impacts will be high even though the soils are shallow. On the level terrain the impacts will be limited to areas with increased or concentrated stormwater flows. It is therefore imperative that all activities be planned and designed to minimise uncontrolled stormwater flows.

Significance Rating

The above mentioned impact has medium term duration during the construction and post-operational phases and long term duration during the operational phase. The severity has been rated as medium. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce probability of occurrence to probable and the severity to low, thereby reducing this impact from moderate to negligible.

11.1.4.7 Incorrect use of stockpiled soil material for rehabilitation purposes

Impact Description

The soils on the site can be used for rehabilitation post-mining and will, if adequately managed, support vegetation. Care should be taken to maintain the placed soils on level slopes as well as to place original topsoil material over original subsoil material. The reason being that the subsoils contain more lime and clay than the topsoils and that the former pose a larger erosion risk if placed at the surface. The availability of topsoil is a major consideration in revegetation, although it will need to be ameliorated with fertilisers, organic composts and lime. Topsoil needs to be used wisely to achieve successful revegetation. Topsoil set aside during the first stages of mining may need to be amended for use during rehabilitation.

Significance Rating

The above mentioned impact has a permanent duration and a medium severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity to low, thereby reducing this impact from moderate to low.

11.1.5 Geohydrological Impact

The following section was completed with the assistance of the specialist water study conducted by AGES (APPENDIX I).

11.1.5.1 Pollution of groundwater and surface water sources

Impact Description

During the construction and operational phases hydrocarbon and other chemical spillages in and around in the mining area as well as the maintenance area where vehicles are refuelled could account to groundwater pollution. An increase in the movement of construction vehicles may result in fuel spills that may also have a localised impact on the soil, especially during the construction and operational phases of the mine. Inadequate sanitary facilities and ablutions facilities can result in health risks and groundwater / surface water contamination. The use of explosives in the underground development may contribute to nitrates in the groundwater. Areas cleared of vegetation and impacted on by excavation may lead to sedimentation of stormwater channels. Flooding of construction camps will also contribute to surface water pollution.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for the various activities associated with groundwater and surface water pollution are detailed in Table 11-1.

11.1.5.2 Stormwater Management

Impact Description

Contamination of surface and groundwater quality due to contaminated stormwater run-off which originates from the proposed TDF and WRD as well as the process plant site. The stormwater management has however made provision for the diversion of upstream clean runoff and containment of the on-site stormwater for a 1:50 year event. No development of large scale infrastructure will take place in the 1:50 year flood lines without the necessary exemptions.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for stormwater management are detailed in Table 11-1.

11.1.5.3 Erosion and siltation

Impact Description

The construction of roads, pipelines and the buildings on the site may impact the amount of water that infiltrates the soil, through the removal of natural vegetation and the soil layer, this will result in increased erosion and silt loading of surface water bodies.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for the various activities associated with erosion and siltation are detailed in Table 11-1.

11.1.5.4 Water supply

Impact Description

Over abstraction from boreholes for water supply will lead to the lowering of groundwater levels and damage to the flow towards the aquifer, potentially decreasing the sustainability of the borehole.

The boreholes drilled within the TDF footprint recorded high tested yields, but from a sustainability point of view, these boreholes can't abstract more than what is recharged from precipitation on the TDF footprint. The catchment area associated with the TDF basin is calculated at approximately 12.383 km². Based upon MAP and a 3.5% recharge of MAP, roughly 856 m³/d or 10 ℓ/s is recharge in the TDF catchment, hence, for sustainable abstraction, no more than this volume could be cumulatively abstracted from LMON2, LMON3, LMON5 and LMON6.

When comparing the water supply with the water demand enough water is available to last approximately 6 years once mining started. Alternative and additional water supply resources should be investigated as soon as possible to ensure the entire mine make up water requirement is available.

The environmental water balance and make up water requirement is 10 352 m³/d and it is recommended that 11 Mℓ/d be developed to supply in the mine demand.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for the over abstraction from water supply boreholes are detailed in Table 11-1.

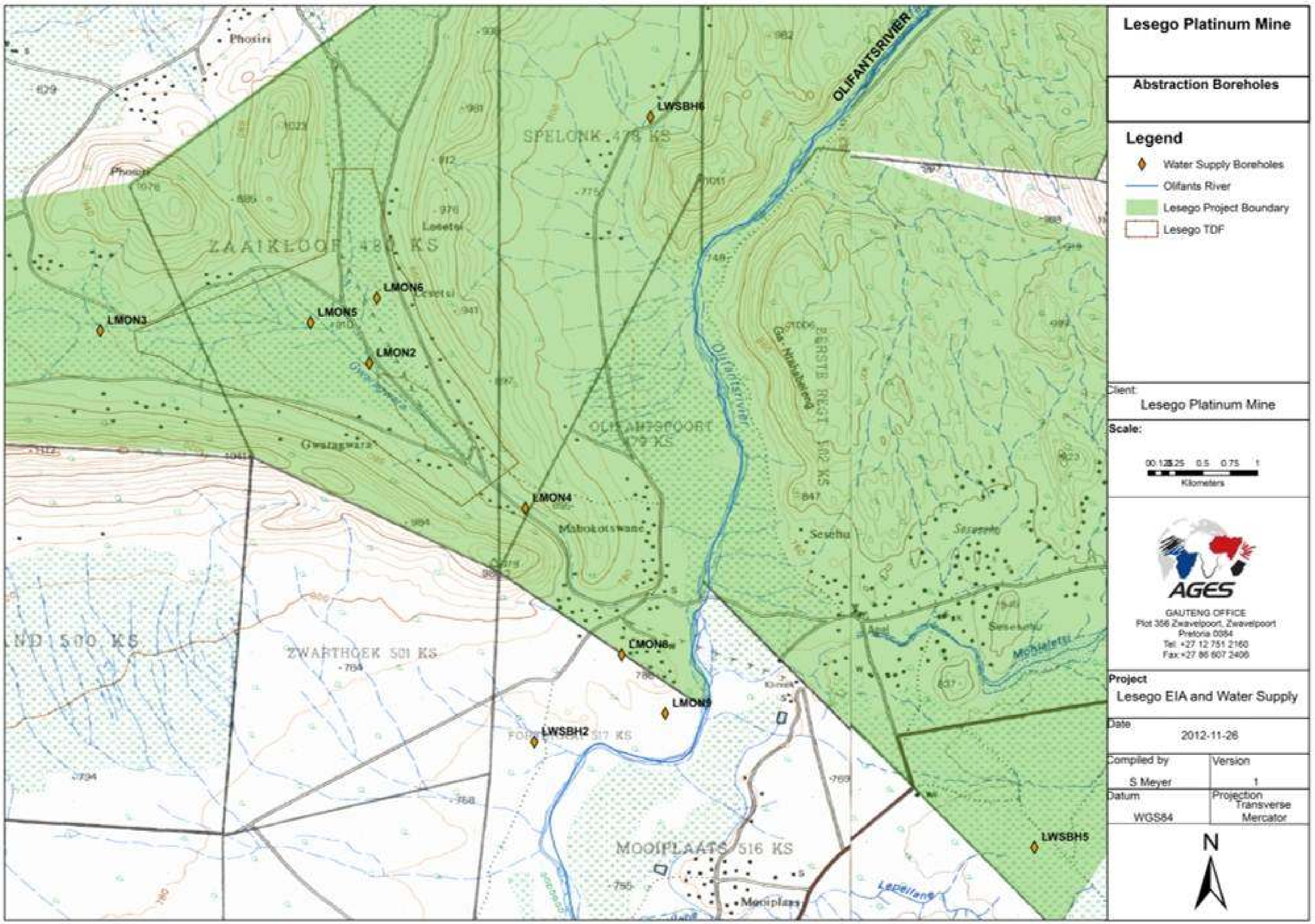


Figure 11-2 **Proposed Water Supply Boreholes**

11.1.5.5 Contaminant transport from TDF and WRD facilities

Impact Description

The contaminant transport was simulated with the combined mine dewatering and water supply to model maximum impacts (Figure 11-3).

The maximum sulphate parameter simulated during the geochemical assessment possibly leaching from the TDF is roughly 2000 mg/ℓ and nitrates were simulated from the WRD to a maximum concentration of 50 mg/ℓ. Both point sources were simulated to increase linearly from the baseline concentrations of 40 mg/ℓ for sulphates and 1 mg/ℓ for nitrates during LoM. Recharge of 0.001 m/d and 30% of MAP were assigned to the TDF and WRD respectively.

Possible groundwater seepage could occur from the TDF downstream at the neck of the Phosiri Dome along the lineament associated with this area, as well as from the WRD along the hydraulic head gradient of the groundwater regime below this facility. Inadequate seepage capturing from boreholes located within the TDF footprint due to low abstraction rates, and the destruction of the seepage capturing boreholes due to the rise of the tailings material could also impact on groundwater.

The underground mine could act as a sink in the numerical flow model and induce a hydraulic head gradient towards the underground mine. This will cause seepage to travel along this head gradient towards the underground mine.

The weathered aquifer could act completely different with hydraulic gradients in the opposite direction. Thus shallow and deep boreholes should be drilled on the around the WRD to assess the potential for seepage in all directions.

The contaminant transport map is shown in Figure 11-3. The simulated pollution plume associated with the TDF migrates towards the Olifants River as expected. The WRD plume shows little migration due to the position of this facility with regards to the radius of influence i.e. the facility is located within the ROI and hence shows little migration.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for the various activities associated with groundwater seepage are detailed in Table 11-1.

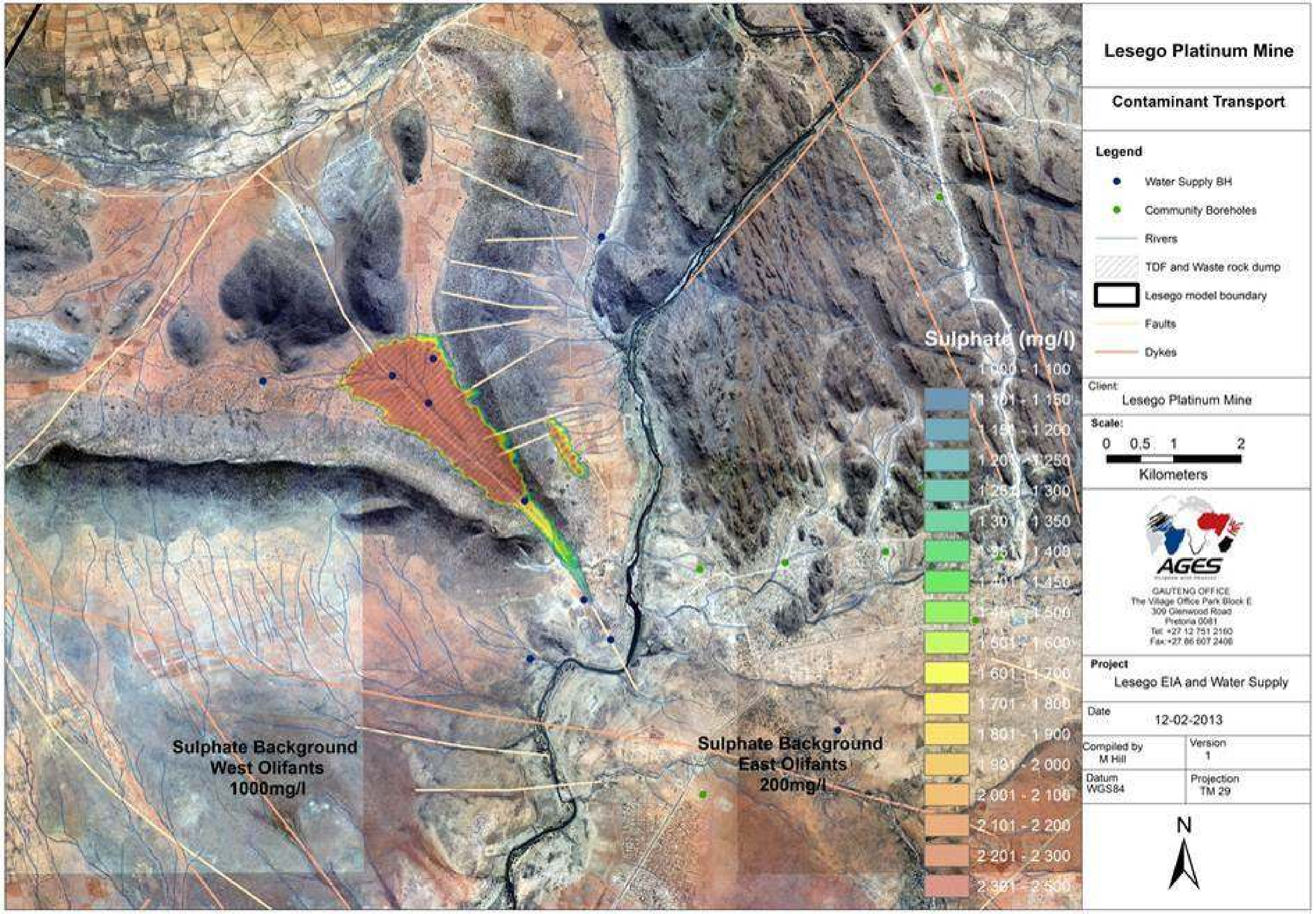


Figure 11-3 Contaminant Transport Map

11.1.5.6 Vandalism of water supply infrastructure

Impact Description

Vandalism of water supply infrastructure due to inadequate protection.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for the vandalism of water supply infrastructure is detailed in Table 11-1.

11.1.5.7 Mine dewatering

Impact Description

Mining was simulated and for the proposed underground mine to extend from a depth of 300 mbgl to roughly 1600 mbgl.

A radius of influence is associated with the mine dewatering during LoM which could impact neighbouring groundwater users. Mine dewatering is a function of time and hydraulic parameters, and thus the numerical flow modelling is a management tool that should be used for decision making. The simulation showed that the maximum mine dewatering due to the proposed Project is approximately 85 ℓ/s or 7344 m³/d (Figure 11-4). This will decrease as evaporation losses are applied to the underground mine workings i.e. up to 50% less could be expected.

Dewatering due to the proposed underground mining can result in a depletion of the groundwater in the aquifer. Dewatering can also lead to a possible inflow from the Olifants River into the underground mine. Water collected in the underground mine should be sampled and tested with hydrochemical and isotope finger printing monthly to verify the origin. If the origin is established to be from the Olifants River, the water should be treated to an acceptable quality and discharged back into the Olifants River. If it is confirmed that the water seepage into the underground mine is a diluted combination between surface water from the Olifants River and groundwater, then the dilution ratios should be calculated and the surface water quantities should be released back into the Olifants River. The groundwater component should be licensed and could be used in the mine circuit if the license is granted.

Significance Rating

A detailed breakdown of the impacts with and without mitigation from dewatering is detailed in Table 11-1.

11.1.5.8 Mine re-watering, radius of influence and seepage from TDF and WRD

Impact Description

During the post-operational phase, the TDF and WRD could generate a plume which is expected to migrate towards the Olifants River (Figure 11-3). In addition, the groundwater levels could take a substantial time to recover post operations and this should be confirmed with monitoring for at least 12 months post closure.

Based on community abstraction, the Radius of Influence (RoI) of existing water supply boreholes was calculated to evaluate the aerial effect of on-going abstraction. The maximum abstraction for the community boreholes is 432 m^3/d with a minimum of 6.05 m^3/d. Under MAP conditions these equate to an average radius of influence of 661 m with a minimum of 221 m and maximum of 1866 m. Under one in twenty year drought events the average RoI increases to a radius of 971 m with a minimum of 324 m and maximum of 2741 m.

Significance Rating

A detailed breakdown of the impacts with and without mitigation is detailed in Table 11-1.

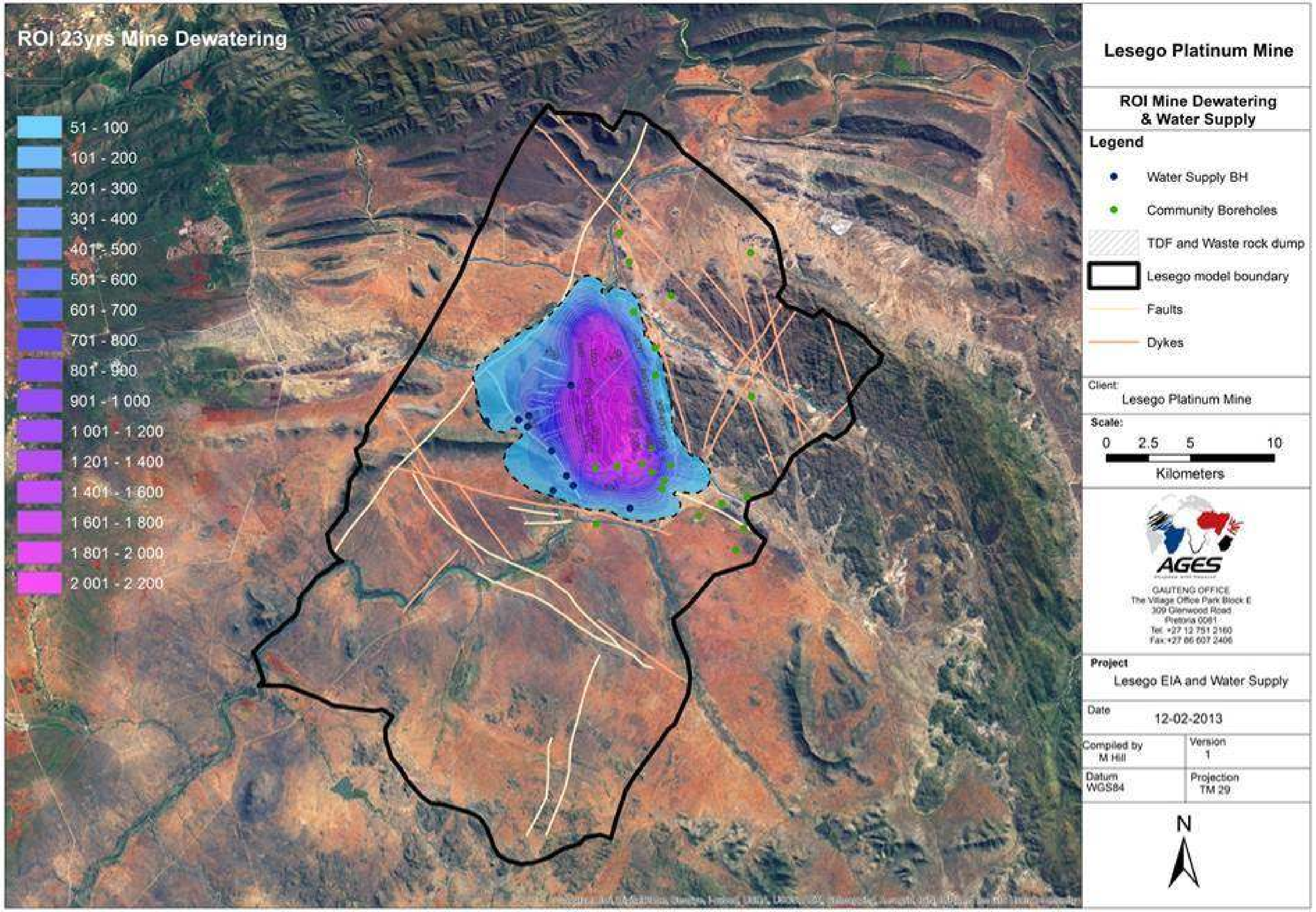


Figure 11-4 Radius of Influence

11.1.6 Air Quality Impact

The following section was completed with the assistance of the air quality impact assessment conducted by Airshed (APPENDIX L).

Please refer to APPENDIX E 2 for a more detailed impact assessment.

The following activities were assessed against the potential air quality impacts:

- Fugitive dust emissions (TSP, PM10) from construction activities
- Dust generation (TSP, PM10) from earthworks
- Dust generation (TSP, PM10) from site development activities
- Vehicle entrained dust and gaseous emissions
- Dust generation (TSP, PM10) and gaseous emissions from blasting
- Vehicle activity on unpaved haul roads
- Wind-blown dust from waste rock dumps, topsoil dump and TDF
- Handling of materials during operations
- Gaseous emissions from the ventilation shaft stack and primary and secondary crushers' baghouses
- The primary and secondary crushing or ore
- Sealing of shafts and inclines and associated infrastructure removal
- Recovering of materials from stockpiles
- Infrastructure removal at the processing plant
- Infrastructure removal including offices, workshops and housing
- Operation and movement of vehicles on unpaved roads
- Fugitive dust and gaseous emissions from possible blasting

From the above mentioned activities the following were regarded as the most significant activities, requiring specific mitigation measures:

- Vehicle activity on unpaved haul roads

Refer to APPENDIX W for management and mitigation measures.

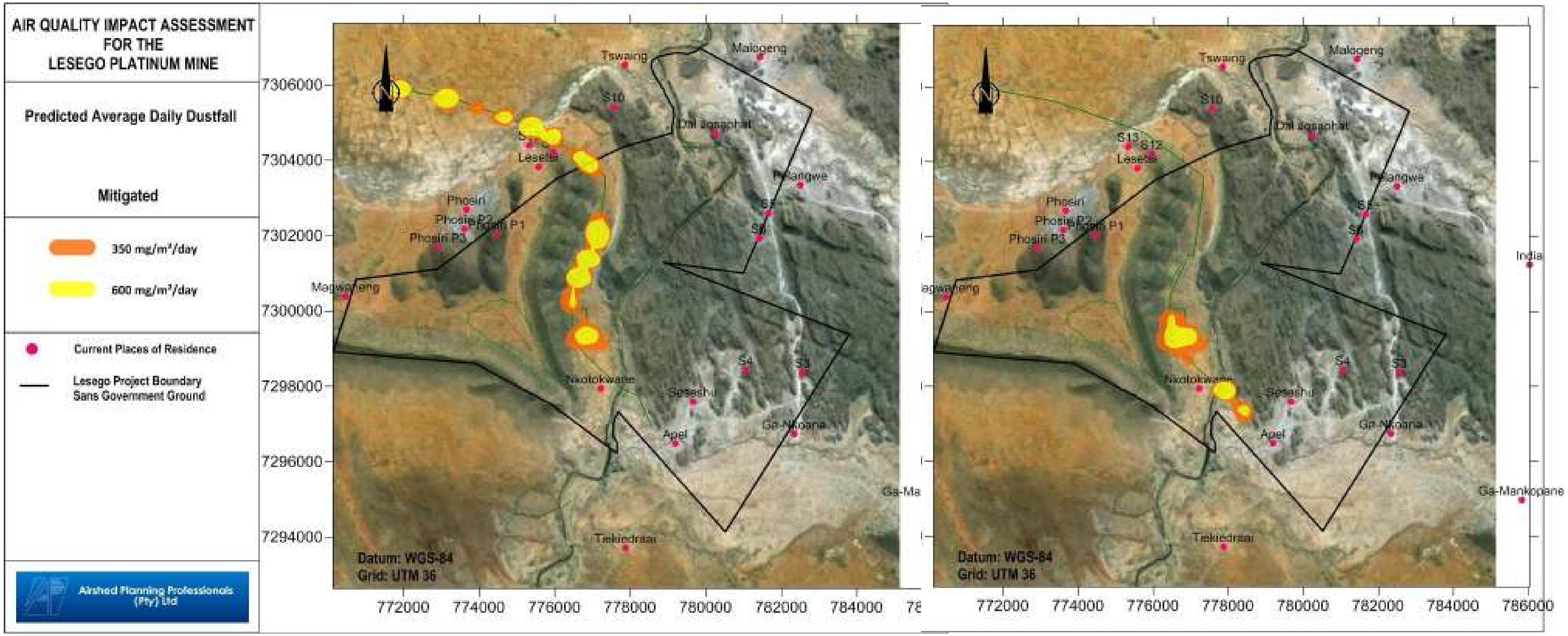


Figure 11-5 Scenario 1(left) and scenario 2 (right), predicted average daily mitigated dust fallout

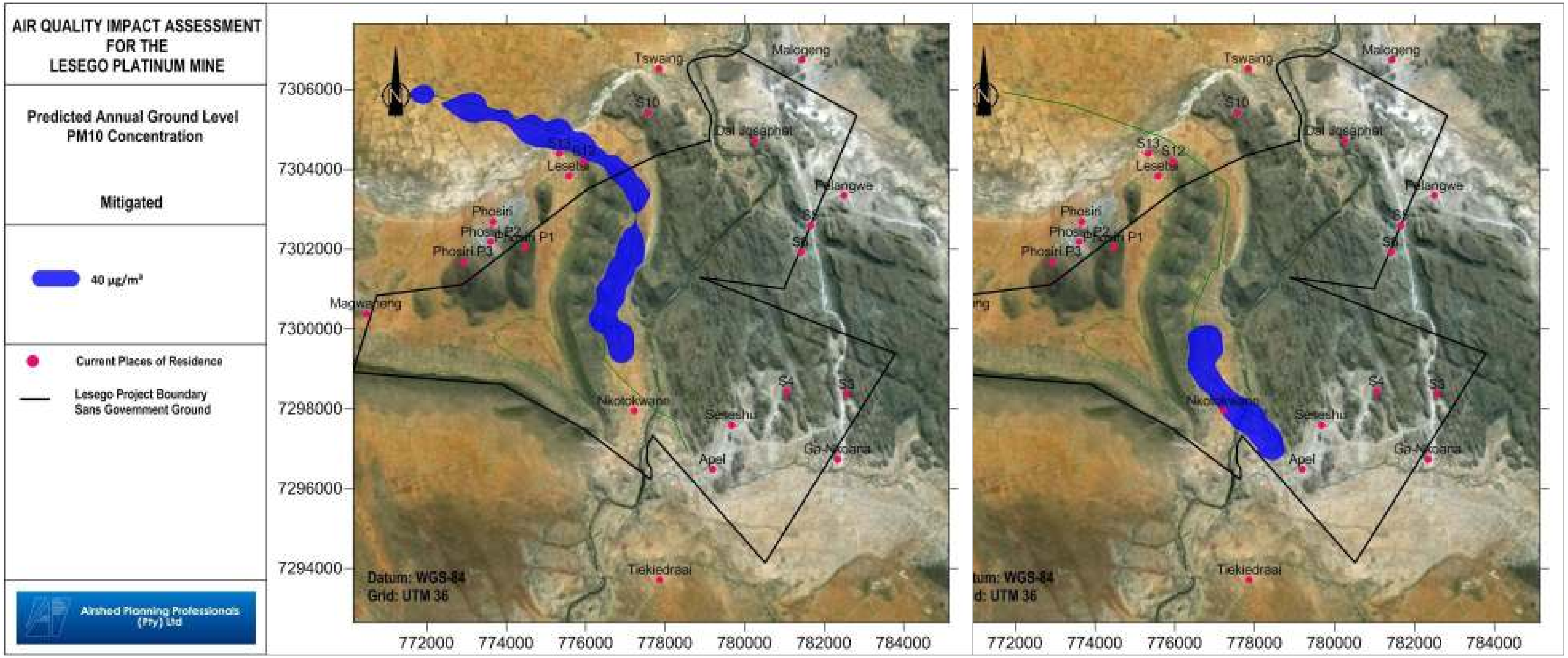


Figure 11-6 Mitigated Scenario 1(left) and scenario 2 (right), predicted area of exceedence of the annual average PM10 standard

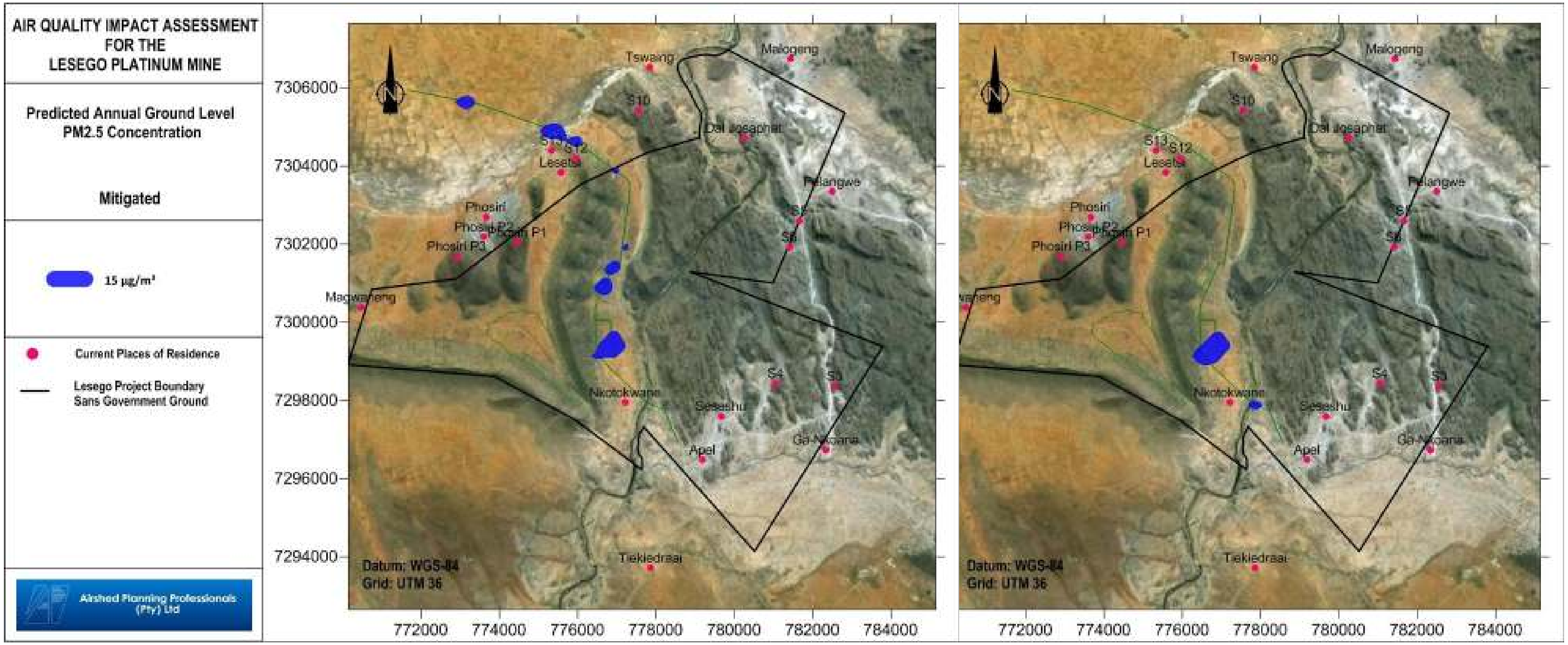


Figure 11-7 **Mitigated Scenario 1(left) and scenario 2 (right), predicted area of exceedence of the annual average PM2.5 standard**

11.2 SOCIO-ECONOMIC ENVIRONMENT

11.2.1 Heritage Impact

The following section was completed with the assistance of the archaeological impact assessment conducted by Nelius Kruger (APPENDIX H).

The impacts on heritage resources due to the proposed development can be divided into three main categories:

- No impact – the potential development does not adversely or positively affect the heritage resource
- Peripheral / Indirect – the heritage resource or its setting is located in proximity to the footprint or the potential development
- Destruction / Direct – the heritage resource or site is physically located within the footprint of the potential development

The impacted heritage resources are as follows:

- **Stone Age Lithic Scatters**

Stone Age material dating to all periods of the Stone Age occurs in the study area. MSA occurrences such as those located in Study Area 1 occur in open contexts and their original positions have probably been lost which implies a low significance for these artefacts. However, ESA and MSA material scatters in Study Area 3 occur in sealed and intact contexts which might provide significant research potential.

- **Early and Late Iron Age Sites**

A large number of sites dating to the Earlier and Later Iron Age occur - and have been studied in the Steelpoort area. In most cases earlier sites occur on the alluvial soils close to water sources and later sites are placed on mountain slopes where stone for the building of terraces and enclosures, was freely available. The Iron Age occurrences documented in the Lesego Mine Project Area are therefore not entirely unique, where the possible earlier Iron Age as well as the later Iron Age occupation sites are of significance.

- **Historical / Colonial Period Sites**

Sites dating to the Historical / Colonial Period in the Steelpoort can typically be related to early farming, mining and missionary activities. However, later sites occurring in the Lesego Mine Project Area, such as the numerous ruined farmsteads scattered across the landscape, are of recent age and their significance deemed low.

- **Graves**

Graves are generally protected and are of high significance. This applies to all cemeteries and burial places identified in the Lesego Mine Project Area. In addition, one should also consider that burial places functions as place of "Living Heritage". Here, "Living Heritage" can broadly refer to a place of cultural heritage and sacred nature; with cultural attributions that are not generally physically manifested. This said, due cognisance should be taken of the value and intrinsic symbolic power of cemeteries as site of "Living Heritage" in the Lesego area.

11.2.1.1 Heritage Resource – no impact

Impact Description

The following heritage sites will not be impacted upon as they occur outside the mine development layout. Please refer to Figure 11-8 for the location of these sites.

- Earlier and Later Iron Age sites in Study Area 3 at **Site IA02** and **Site IA03** are of high and medium heritage priority respectively as the sites might yield an understanding of the development and spread of the Iron Age Farmer Period in the larger landscape and in the Steelpoort.
- The large MSA scatters and additional ESA material along the drainage line in Study Area 3 at **Site SA03** and **Site SA04** is of heritage priority and carries a high significance rating. **Site SA02** occurs in Study Area 1 and is of low heritage priority.
- Two Later Iron Age occupation sites in Study Area 3 at **Site IA04** and **Site IA05** are of heritage priority and carry a high significance rating.
- The Iron Age walling and terracing in Study Area 1 at **Site IA01** is of medium heritage priority.
- A large number of poorly preserved brick, cement and stone foundation structures, stone wall enclosures and middens were recorded outside of mine infrastructure planning areas (**Site HP01, Site HP02, Site HP03, Site HP04, and Site HP05).** These sites are generally of medium-low significance due to the poor preservation of the sites.
- Small cemeteries and graves in the study area outside of proposed mine development zones (**Site BP01, Site BP02, Site BP03, Site BP09)** are of heritage priority and carries high significance ratings.

Significance Rating

As the potential development does not adversely or positively affect the heritage resource, the impact is considered to be none. Therefore the significance of the impact was not rated.

11.2.1.2 Heritage Resource – peripheral / indirect impact

Impact Description

- MSA scatters in Study Area 1 at **Site SA01** are of medium heritage priority. The impact on the sites by the proposed activity is considered to be peripheral and permanent in duration where in essence, the impact might result in the potential damage / loss of the site. The site is of limited significance and the direct impact on the heritage resource is expected to be high. However, the threshold of the impact can be limited to a low impact by the implementation of mitigation and monitoring measures for the site.
- A number of ruin homestead structures dating to the historical and recent time periods occur close to or within the proposed development margins of the Lesego mine tailings dam facility at **Site HP06**. These resources are also of medium-low significance due to their poor preservation and impacts on the sites are considered to be peripheral and of permanent duration where in essence, the impact will result the potential damage / loss of the sites. The sites are not of major significance and generally the direct impact on the heritage resource is expected to be high, where the threshold can be limited a low impact by the implementation of mitigation measures for the sites.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for the different heritage sites are detailed in Table 11-1.

11.2.1.3 Heritage Resource – destruction / direct impact

Impact Description

- A number of burials and cemeteries occur very close to, or within areas demarcated for development at Lesego (**Site BP04, Site BP05, Site BP06, Site BP07, Site BP08, Site BP10, Site BP11, and Site BP12).** At least 26 graves were identified within the larger proposed TDF area. As with other burials, the sites are of heritage priority and carry a high significance rating. As such, the impact on the sites by the proposed activity is considered to be of permanent duration where in essence, the impact will result in the potential damage / loss of the burials. Since the sites are of major significance, the direct impact on the heritage resource is expected to be very high and it is essential that the threshold be limited to a low impact by the implementation of mitigation measures for the sites.

Significance Rating

A detailed breakdown of the impacts with and without mitigation for the different heritage sites are detailed in Table 11-1.

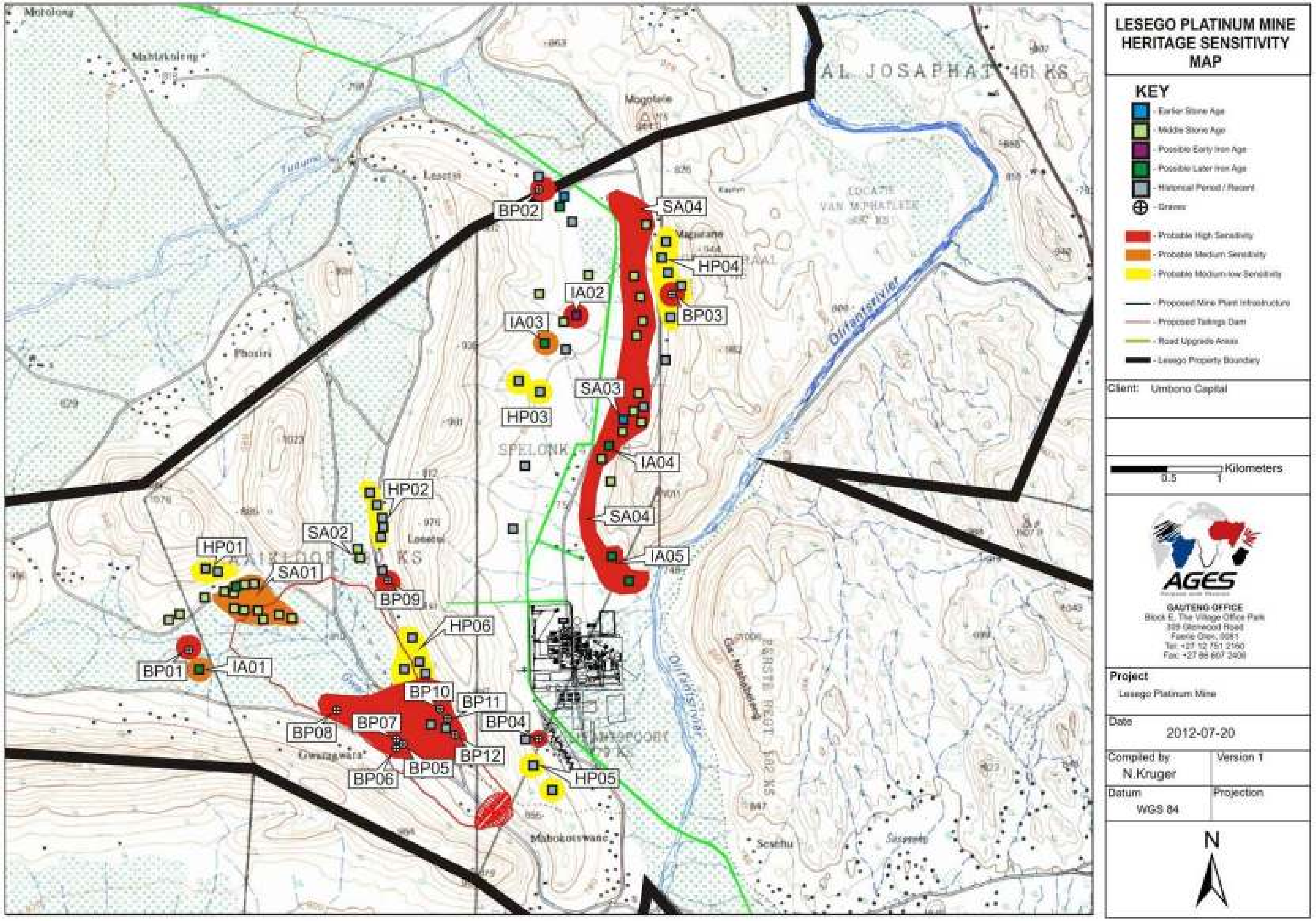


Figure 11-8 Heritage Sensitivity Map

11.2.2 Social Impacts

The following section was completed with the assistance of the social impact assessment conducted by Ptersa (APPENDIX M).

The following impacts were assessed in detail and provided in APPENDIX E 3.

- Spread of infectious diseases such as HIV and TB
- Pressure on existing health services
- Increase in traffic-related incidents
- Change in social fabric
- Tension between local residents and newcomers
- Formation of informal settlements
- Improvement in educational facilities
- Increase in crime rates
- Job creation
- Skills development
- Skills shortage
- Conflict about jobs and benefits
- Expectations of the community
- Services
- Transport infrastructure
- Housing
- Recreational facilities
- Loss of livelihoods
- Sense of place
- Failure of government to deliver essential services
- NGO's opposing the project
- NGO's working in partnership with the project

From the above mentioned activities the following were regarded as the most significant activities, requiring specific mitigation measures:

- Spread of infectious diseases such as HIV and TB

- Job creation
- Expectations of the community
- Services
- Transport infrastructure
- Housing
- Loss of livelihoods
- Sense of place
- Failure of government to deliver essential services
- NGO's working in partnership with the project

Refer to APPENDIX W for management and mitigation measures.

11.2.3 Health Impacts

The following section was completed with the assistance of the health impact assessment conducted by Envirosim (APPENDIX P).

11.2.3.1 Impact from criteria pollutants

Impact Description

Impact to human health associated with inhalation exposure to criteria pollutants (particulates, NO_2, SO_2 and CO).

Significance Rating

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from low to negligible.

11.2.3.2 Impact from DPM

Impact Description

Impact to human health as a result of inhalation exposure to diesel particulate matter (DPM).

Significance Rating

The above mentioned impact has long term duration and a low severity. The probability of occurrence has been rated as improbable. The impact can therefore be considered as negligible.

11.2.3.3 Impact from contaminants in water

Impact Description

Impact to human health as a result of ingestion exposure to contaminants in groundwater.

Significance Rating

The above mentioned impact has long term duration and a low severity. The probability of occurrence has been rated as improbable. The impact can therefore be considered as negligible.

11.2.4 Visual Impact

The following section was completed with the assistance of the visual impact assessment conducted by Newton Landscape Architects (APPENDIX N).

Views

The most important views onto the Lesego Platinum Mine Project site are the following:

- The view from the homes of the residents of the towns of Apel, Mooiplaas, Mooiklip, Tiekiedraai, Strydkraal, Doringdraai, Tswaing, Ga-Nchabeleng, Ga-Nkwana, Ga-Mankopane and Ga-modupi,;
- The view from the north near the towns of Phosiri, Lekurung and Lesetsi;
- The views from residential properties and homesteads in a 10km radius. For instance the settlement of Ga-Matlala and the Sekhukune College of Education;
- The views from local roads and the all-weather tarred road towards the local economic nodes of Apel and Ga-Mankopane.

Sensitive Viewer Locations

The sensitive viewers have been identified as:

- The residents of the towns of Apel, Mooiplaas, Mooiklip, Tiekiedraai, Strydkraal, Doringdraai, Tswaing, Ga-Nchabeleng, Ga-Nkwana, Ga-Mankopane and Ga-modupi,;
- The travellers and tourists driving on the all-weather tarred road towards the local economic node of Apel.
- The local population live within the Project boundary;
- The workforce driving on local roads and the tarred road adjacent to the Project site;

- The residents and workforce of the outlying farms and residential stands in a 10km radius.

The viewshed analysis conducted indicated that the project will be highly visible from approximately 40 - 50% of the 'zone of potential influence'. The residents directly around the plant (within 4 km) will have a clear view of the proposed mine. However, due to the surrounding mountains the viewers located to the far west and east, north, northwest and northeast will not have a full view towards the proposed mine for the greater part. The smaller koppies that are scattered throughout the site will also contribute to screening the views from behind these topographic features towards the proposed project. Thus the visibility will be high for residents that are located within 4 km from the proposed project. The visibility will decrease to moderate – low for residents located further than 4 km from the proposed project, and low for those shielded from views by topography.

Three visual simulations were compiled, simulating the expected visual impacts from key viewpoints and altered using computer simulation techniques to illustrate the physical nature of the proposed project in its final form within the context of the landscape setting. The resultant change to the landscape is then observable and an assessment of the anticipated visual intrusion can be made. Visual simulations were compiled from the viewpoint of residents from the towns of Apel, Ga-Matlala and Mooiplaas (Figure 11-10, Figure 11-11 and Figure 11-12)

11.2.4.1 Impact due to dust dispersal

Impact Description

During the construction phase vegetation will be removed to the extent of the project footprint and roads infrastructure. This will result in dust which will present a significant visual intrusion. During the operational phase, vehicular movement on access roads and rehabilitation activities may also contribute to dust dispersal during closure.

Significance Rating

The visual impact from dust dispersal during the construction, operational and decommissioning phases will be moderate. With mitigation, the visual impact will remain moderate during the operational and decommissioning phases but will be rendered low during the construction phase.

11.2.4.2 Physical visual impact

Impact Description

The physical impact of the construction and operation of the mining activities will disturb the proposed study site, because the site is to a great extent undeveloped and completely untouched by industrial development and because construction of the mine elements – the TDF in particular - will cause a significant change in the landscape fabric. The main disturbances would occur during the construction and operational phase especially where clearance of the site and mining operations would take place. After decommissioning and closure the proposed site will be rehabilitated.

Significance Rating

The visual impact during the construction phase will be moderate to high and during operational phases will be moderate to high. The visual impact would remain moderate to high assuming that mitigation measures as described in this report and other specialist reports are adequately implemented. This is mainly due to the magnitude/ footprint of the proposed plant and TDF as well as the fact that the project will be in the foreground of the sensitive viewers. During decommissioning the visual impact will be high to moderate but the implementation of the proposed mitigation will render the impact moderate to low.

11.2.4.3 Visual impact at night due to lighting

Impact Description

The potential visual impact of the proposed project after sunset will be significant for viewers that are located directly next to the proposed mining activities. This is especially true for residents whose homes are situated within the project boundary and those within a 4km radius. Light sources at night, particularly poorly directed security flood lighting, can increase the visual impact of a development significantly. Unobstructed light sources can cause a general glow in the area and will be visible from significantly longer distances than any structural features during daylight hours, for this reason, the project will have higher visibility at night than in the daytime.

Significance Rating

The visibility of the plant at night will be high for residents that are located within 4.0km from the proposed project. The visibility will decrease to moderate – low for residents located further than 4.0km from the proposed project, and low for those shielded from views by topography. During construction and operations the significance of the impact will be high. With mitigation, the impact will remain high during the construction phase but will be rendered moderate during operations. The impact is considered low during the decommissioning phase with and without mitigation,

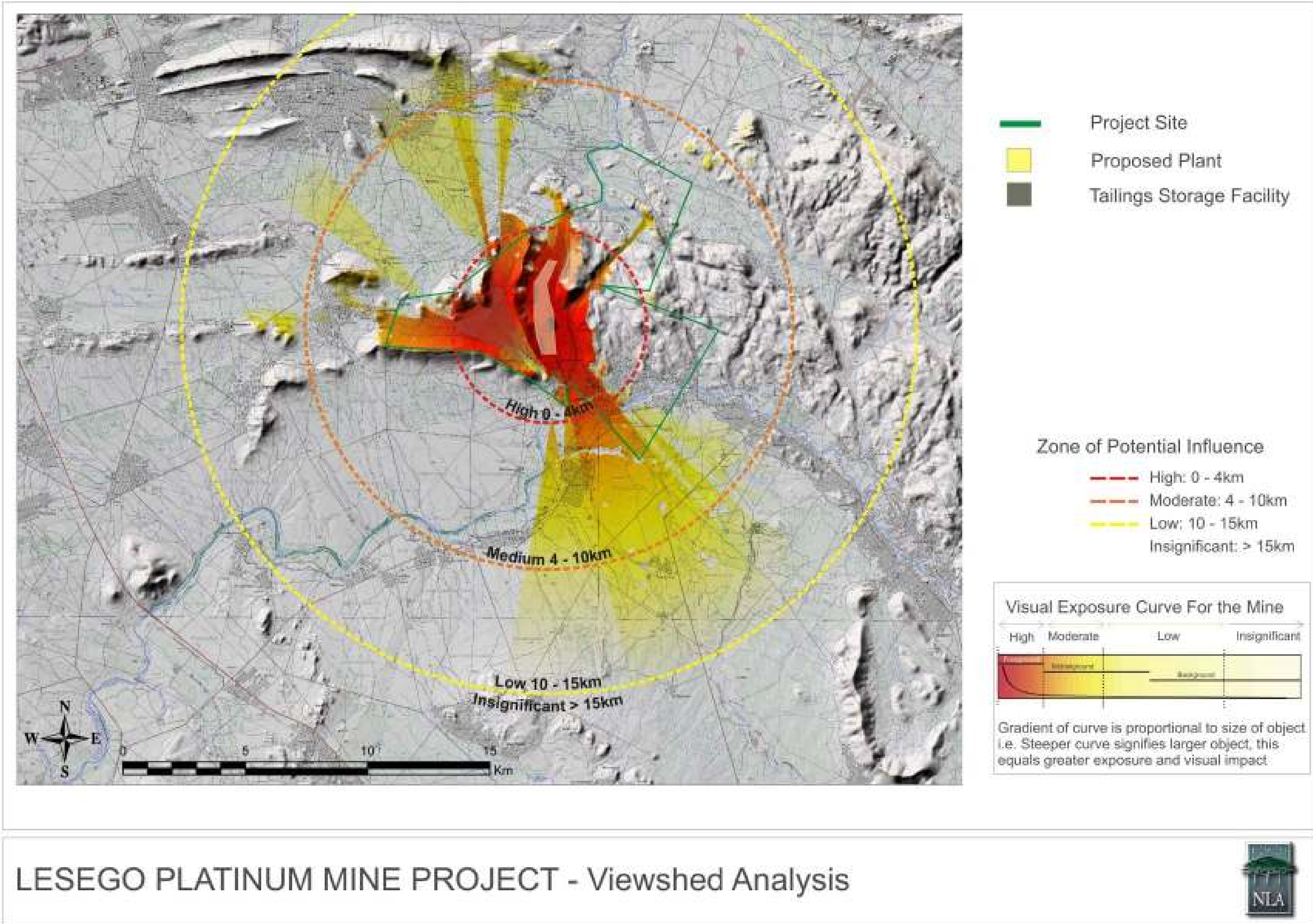


Figure 11-9 Viewshed Analysis

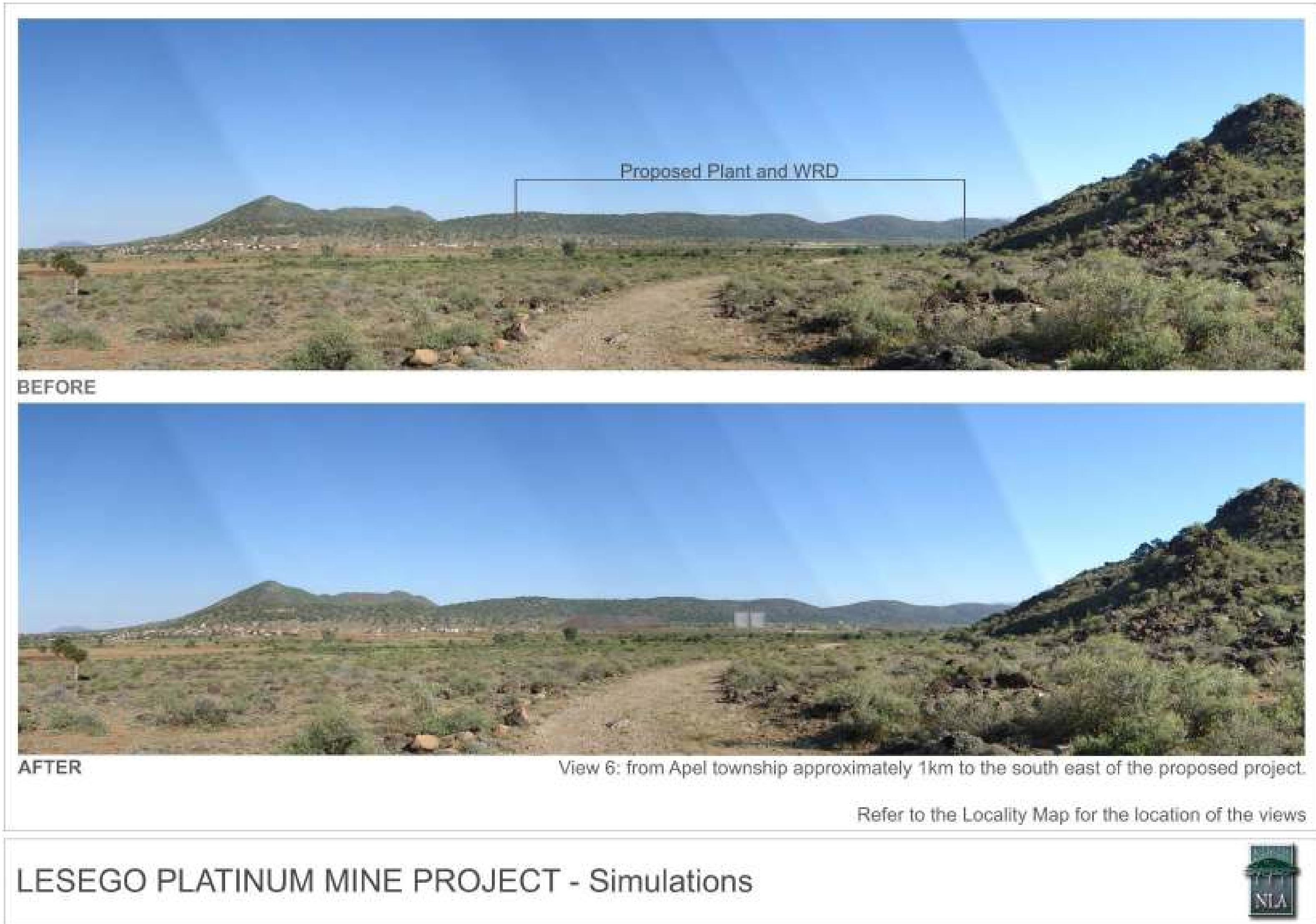


Figure 11-10 Visual Simulation from Apel township

Figure 11-11 Visual Simulation from Ga-Matlala

BEFORE

AFTER

View 12: from Mooiplaas township approximately 5km to the south east of the proposed project.

Refer to the Locality Map for the location of the views

LESEGO PLATINUM MINE PROJECT - Simulations

NLA

Figure 11-12 Visual Simulation from Mooiplaas

11.2.5 Noise Impact

The following section was completed with the assistance of the noise impact assessment conducted by Menco (APPENDIX K).

Impact Description

Noise from construction activities that might impact on potentially sensitive receptors will be mostly limited to daylight hours. It is unlikely that all construction activities would be taking place simultaneously, but a number of different construction activities will be taking place at the same time. A potential worst case scenario with all activities taking place simultaneously during wind-still conditions in good sound propagation conditions was assessed.

While the projected noise levels will be below the acceptable zone sound level (for a rural area), it will be higher than the existing ambient sound levels at times (measured between 36 and 47 dBA). Construction activities would therefore be audible at times (APPENDIX K).

Significance Rating

The above mentioned impact has short term duration and a low severity. The probability of occurrence has been rated as improbable. The impact can therefore be considered as negligible.

11.2.5.1 Daytime noise impact during operational phase

Impact Description

The projected noise levels due to the operation of the mine and plant would increase the ambient sound levels significantly in the area. Projected noise levels during the operational phase will be due to the following activities: Rock deposition during the day at the waste rock dump; Noises associated with the mining operations; Noises associated with the ventilation fans; Noises associated with the material handling/transfer and conveyor belt system; and Noises associated with the plant activities.

A worst case scenario was assessed, with all the activities taking place simultaneously.

Significance Rating

The above mentioned impact has long term duration and a high severity. However the probability of occurrence has been rated as improbable. The impact can therefore be considered as negligible.

11.2.5.2 Night-time noise impact during operational phase

Impact Description

The projected noise levels due to the operation of the mine and plant would increase the ambient sound levels significantly in the area. The projected noise impact would also be the highest at night-time, due to the lower rating level (35 dBA). As the ambient sound levels are lower at night, increased noises coupled with more stable atmospheric conditions creates situations where noise created at night can be heard over long distances.

The noise levels is still less than the levels recommended by the World Health Organization and International Finance Corporation of 45 dBA at night. The significance of the noise impact on the community is considered low, however mitigation will be required to ensure that this potential noise impact is managed and minimized (APPENDIX K).

Significance Rating

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as probable. The significance of the impact is therefore low.

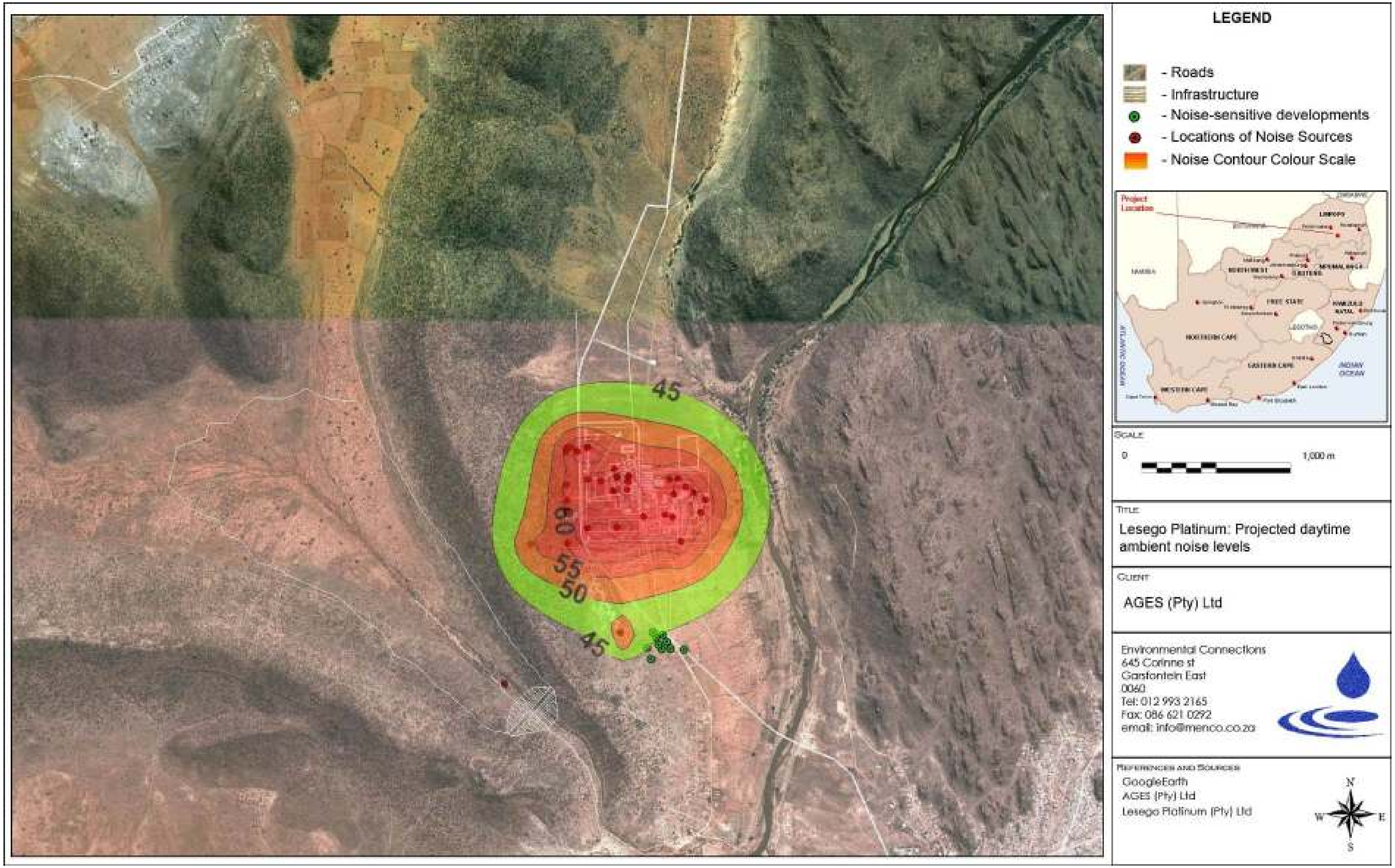


Figure 11-13 Daytime operations: Total Projected Noise Levels

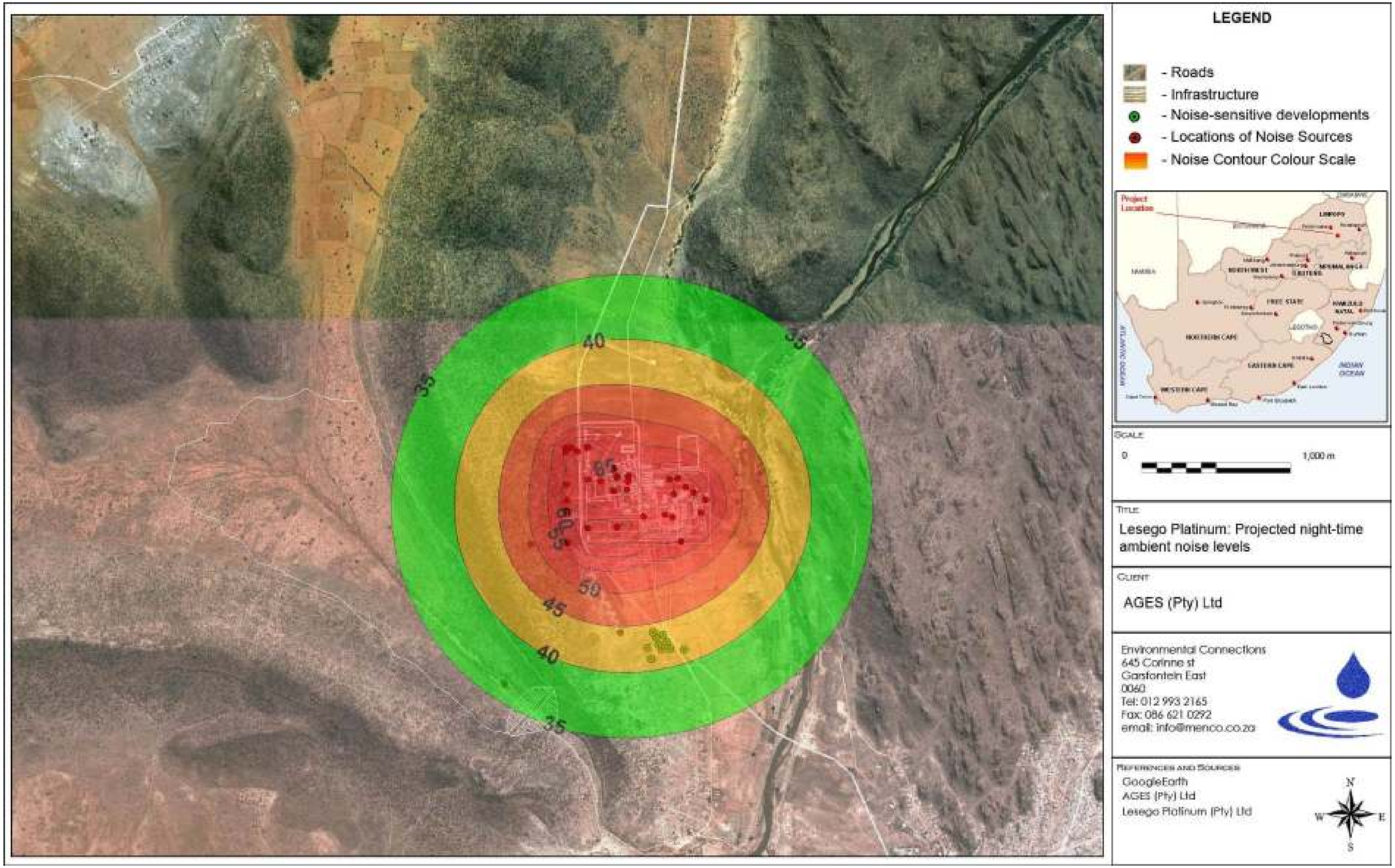


Figure 11-14 Night time operations: Total Projected Noise Levels

11.2.6 Traffic Impact

The following section was completed with the assistance of the traffic impact assessment conducted by C Havenga Transportation Engineers (APPENDIX O).

Impact Description

There are currently no surfaced roads up to the proposed surface infrastructure of the mine site. In order to obtain access to the mine, new roads will have to be constructed and sections of existing roads upgraded.

The increase in transport to and from the site during the construction and operational phases will have an impact on the current traffic situation in the area. The results of the capacity analyses indicate that some of the intersections to be used operate at an acceptable level of service for both peak hours, while others operate at acceptable levels during the morning peak hour but not during the afternoon peak hour. Traffic signals and intersection upgrades are proposed to support the development from a traffic flow point of view. The escalation in traffic flow could result in a significant impact should the specific mitigation measures and recommend access upgrades not be adhered to.

The construction of new access road and the upgrade of existing roads will result in impeded access. Furthermore, the use of construction vehicles on existing gravel roads could lead to deterioration in road quality. However, the construction of new access roads, upgrades to existing gravel roads and the construction of a bridge over the Olifants River will have a positive impact resulting in improved access and improved road quality.

Significance Rating

Please refer to Table 11-1 or the significance rating of the above mentioned impact.

11.2.7 Economic Impact

The following section was completed with the assistance of the economic impact assessment conducted by Urban-Econ (APPENDIX V).

11.2.7.1 Impact on balance payment

- **Construction Phase**

Impact Description

The proposed facility will cost R12 680.4 million to build, of which 93.9% will be spent within the country. Spending on imported goods will be limited and will amount to 6.1% of the total CAPEX. Procurement of imported goods will take place between 2017 and 2021. Spending on imported goods represents a leakage from the country. Any purchase of imported goods and services in South Africa is accounted in the Current Account under either “merchandise imports” of “payment for services”. The impact is due to the need to procure imported machinery for construction of the mine that is otherwise not technically or financially feasible to procure locally.

Significance Rating

Since the purchase of imported goods will be temporary and in most cases the trade deficit will be lower than 0.2%, the negative impact on the current account are expected to be low and are not envisaged to lead to changes in the monetary policy of the country.

- **Operational Phase**

Impact Description

In 2012, South Africa exported 210 859 kg of PGM to the value of R60 923 million in current prices. Thus export sales of PGMs contributed 8.7% to the total merchandise exports in 2012. The proposed Lesego Platinum Mine will produce a variety of mineral products, including PGMs, Copper, Gold, and Nickel. A total of 154 990 kt of ore will be mined during the LOM that will generate R301 177 million of revenue in 2013 prices. About 85% of this revenue will be earned from production of PGMs. At this stage, most of PGMs mined at the Lesego Platinum Mine are expected to be exported, unless the structure of the PGM beneficiation industry changes in the country. This means that the operations of the Lesego Platinum Mine will directly contribute to the growth of merchandise exports in the country. The export sales of PGMs and other mined commodities during the LOM will positively impact on the balance of payment.

Significance Rating

The impact is positive.

11.2.7.2 Impact on production

- **Construction Phase**

Impact Description

The economic benefits of the capital investment into the proposed mine will spread throughout the national economy and will positively impact all economic sectors either through direct, indirect, or induced effects. About 33.7% of the increase in production output stimulated by the project will be created through direct effects. This impact will be largely experienced by companies that will be directly involved in the construction of the mine, i.e. construction contractors and engineering firms. Approximately 34.1% of the production output generated as a result of the construction activities will be stimulated though indirect effects, i.e. by companies that will be supplying inputs and services to the contractors and engineering firms operating on site.

In addition to the direct and indirect impacts created by capital investment into the mine, the project will result in significant positive induced economic impacts. Construction activities will stimulate the creation of new temporary employment opportunities through both direct and indirect effects that will in turn increase the household income. This will result in increased demand for consumer goods and stimulate new business sales throughout the economy

Significance Rating

The impact is positive.

- **Operational Phase**

Impact Description

The Lesego Platinum Mine will generate about R301 177 million (2013 prices) of revenue during its LOM, of which about R116 156 million (2013 prices) will be spent on operations. The resulting operating expenditure will have a positive impact on the local, provincial, and national economies through the stimulation of production induced and consumption induced impacts. About three quarters of the turnover to be generated by the mine will be created directly by mining activities, while the rest will be stimulated through multiplier effects. Overall, the sector that is expected to have the largest increase in business sales during the operation phase is mining due to the direct impacts. The procurement of goods and services for the mine's operation, as well as consumption induced effects that will be created as a result of job creation and subsequently increase in household income will further stimulate the economy to the value of R105 564 million (2013 prices) over the entire operational period. This means that for every R1ml of revenue generated by the mine, the production in the country will further increase by R0.4 million.

Significance Rating

The impact is positive.

11.2.7.3 Impact on GDP-R

- **Construction Phase**

Impact Description

The R12 680 million (2013 prices) spending on the establishment of the Lesego Mine during the 13-year period will generate R13 697 million (2013 prices) of Gross Domestic Product. Of this, approximately one out of every four Rand will be created through direct effects, i.e. in the construction sector itself, while the rest will be created through indirect and induced impacts. Increase in business sales of the suppliers to the projects and suppliers to these suppliers will generate R4 710 million of GDP-R throughout the 13-year construction period; an increase in household spending, which comes as a result of additional household income stimulated through direct and indirect effects of the project, will generate an additional R5 344 million of GDP-R.

As in the case with the production impacts, changes in GDP-R during the construction phase will be temporary and will largely be spread throughout the entire country rather than be localised within the Limpopo Province or the local municipality. Some of the induced impacts though will be localised due to the envisaged spending pattern of the construction workers who will be based in the local communities and spending some of their income in the local economies.

Significance Rating

The impact is positive.

- **Operational Phase**

Impact Description

The continuous operation of the mine and associated infrastructure will stimulate economic activities of directly and indirectly affected businesses, which subsequently leads to the creation of new business sales and generation of value add. The business sales generated by the mine over its lifespan through direct and spin-off effects will translate into R288 645 million (2013 prices) of Gross Domestic Product per region. On average, the annual impact of the mine's operations on GDP-R of the country will equate to R4 582 million in 2013 prices and will last for 53 years. This equates to about 0.17% of the current size of the South African economy. During the steady state production period lasting from 2025 until 2052, the mine's annual impact on the national economy will equate to about R6 704 million in 2013 prices, which is an equivalent of 0.25% of the national GDP-R.

Significance Rating

The impact is positive.

11.2.7.4 Impact on employment

- **Construction Phase**

Impact Description

The establishment of the Lesego Platinum Mine is expected to create 71 939 FTE man-years over the entire construction period. Of these, 19 410 FTE man-years or 27.0% will be created on site or directly by construction activities. About four out of ten FTE man-years or 29 794 FTE man-years in total will be created through indirect impacts during construction, while the rest (22 735 FTE man-years) will be created through consumption induced impacts.

The biggest share of construction jobs created on site is expected to be skilled and highly skilled positions. Opportunities for unskilled and semi-skilled workers will also be created, which will enable a greater participation of the local labour in the construction activities considering the local skills levels. Taking into account that construction will last for a prolonged period of 13 years, employment created on site during this time will be highly beneficial for the local communities.

Significance Rating

The impact is positive.

- **Operational Phase**

Impact Description

The operation of the proposed Lesego Platinum Mine is expected to make a prominent positive change in the Fetakgomo and Lepelle-Nkumpi unemployment situation. During the first few years of mine's lifespan, the production will be on the ramp-up and the number of people employed will gradually increase from 405 people in 2019 to 6 010 people in 2028. During the steady state production period, the number of people employed at the mine will vary slightly; on average, though, 5 122 employment opportunities will be sustained at the mine during this period. After 2052, the production at the mine will gradually start decreasing and the number of people employed will start to decline every year.

Although as suggested above the employment at the mine will vary throughout the LOM, its positive impact on employment in the area will be sustainable and significant considering the labour force profiles of the primary study areas. In addition to the direct jobs created on site, the mine will also stimulate the creation of sustainable employment opportunities through production and consumption induced impacts. Through the indirect effects, an average of 2 008 FTE man-years will be created and sustained along the supply chain throughout the LOM.

Significance Rating

The impact is positive.

11.2.7.5 Impact on household income

- **Construction Phase**

Impact Description

Creation of more than 71 000 direct, indirect and induced FTE man-years during the construction period will temporarily increase affected households' income to the value of R6 792 million in 2013 prices. About a third of this income will be earned by households whose members will be working on the construction site. Since some of these construction workers will be recruited from outside the area, not all of that sending will be localised in the local municipalities; nevertheless, a great portion thereof, as well as income earned by households that will benefit through induced employment, will remain in the local communities thus improving the standard of living of the benefiting households albeit for a temporary period. Considering that the average household size in South Africa was 3.8 people, on average of 19 500 people will benefit in the country from the income generated as a result of construction activities that will be sustained for approximately 13 years.

Significance Rating

The impact is positive.

- **Operational Phase**

Impact Description

The creation of new jobs during the start of operations and support of these employment opportunities throughout this project's operations will have a beneficial impact on household income levels. It is estimated that households benefiting from the project directly will earn on average R833 million per annum. This will allow these households to improve their standards of living, considering that the average income that is expected to be earned by workers employed at the mine will be more than two times that of the average household income in the primary study area. In addition to income earned by miners, other households in the province and other parts of the country will also benefit. On average, an additional R345 million (2013 prices) in household income will be earned by households that will benefit from jobs created as a result of multiplier effects.

Significance Rating

The impact is positive.

11.2.7.6 Impact on skills development

- **Construction Phase**

Impact Description

In order to facilitate skills development, the contractor selected for the establishment of the mine will be required to spend between 3% and 5% of their payroll on human resource development. Considering the estimated direct labour costs of R2 236 million in 2013 prices that will be incurred throughout construction, this could translate into a total allocation of R67 million to R111 million (2013 prices), which equates to an annual average expenditure of between R4.8 million and R8 million. Once the contractor is appointed, a human resource development schedule that the contractor will need to adhere to will be formulated and will be submitted for approval to the Department of Mineral Resources (DMR).

Significance Rating

The impact is positive.

- **Operational Phase**

Impact Description

The local communities suffer from significant skills shortage particularly those required in the mining operations. The Lesego Platinum Mine plans to institute a number of programmes aimed at developing the local human resource base and assisting the mine in achieving its objective of procuring at least 80% of the required work force from the local communities. As part of its Human Resource Development Programme, the mine will offer mentorships, learnerships, internships, and bursaries to assist in the development of the local skills and knowledge. Overall, R6.6 million is planned to be spent in the first five years on skills development.

Significance Rating

The impact is positive.

11.2.7.7 Impact on government revenue

- **Construction Phase**

Impact Description

The construction phase of the proposed Lesego Platinum Mine will last for 13 years. During this period, the construction company and the workers will be earning income and paying government taxes including income taxes and payroll taxes. Overall, it is estimated that a total of R837 million in 2013 prices will be earned by government from investment in the mine's establishment during the 2013 – 2026 period.

Significance Rating

The impact is positive.

- **Operational Phase**

Impact Description

The project, through its operations, will contribute a significant amount to government revenue through payments of income taxes, royalties, and payroll taxes. It is estimated that a total of R77 389 million in 2013 prices will be paid to government in the form of taxes throughout the LOM. Of this, total government income earned through payroll taxes will amount to about R11 302 million, income from company tax will equate to R47 184, and income collected through royalties will value at R18 903 million. In addition to these payments, the mine will also pay local rates and taxes that will increase the local municipalities' revenue.

Significance Rating

The impact is positive.

Table 11-1 Impact Significance Rating Table

Activity	Impact	Phase	Probability		Duration		Scale		Magnitude/ Severity		Significance		
			Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	WOM	WM
Ecology													
Clearance of vegetation	Direct habitat destruction	Construction & Operational	5	Definite	4	Long Term	1	Local	6	Medium	55	Moderate	Low
			5	Definite	4	Long Term	1	Local	2	Low	35		
Artificial lighting	Light pollution	Construction & Operational	5	Definite	4	Long Term	3	Regional	8	High	75	High	Moderate
			5	Definite	4	Long Term	3	Regional	2	Low	45		
Construction of buildings, fences and roads	Habitat fragmentation	Construction & Operational	5	Definite	4	Long Term	1	Local	6	Medium	55	Moderate	Low
			5	Definite	4	Long Term	1	Local	2	Low	35		
Vehicle usage & movement	Road mortalities / negative effect of human activities	Construction & Operational	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate	Low
			4	Highly Probable	4	Long Term	3	Regional	2	Low	36		
Vehicle and personnel movement, delivery of materials	Spread and establishment of alien invasive species	Construction & Operational	5	Definite	4	Long Term	3	Regional	8	High	75	High	Low
			4	Highly Probable	4	Long Term	3	Regional	2	Low	36		
Snaring, killing & hunting, fires, littering, inadequate	Negative effect of human activities	Construction & Operational	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate	Low
			4	Highly Probable	4	Long Term	3	Regional	2	Low	36		

sanitation, introduction of invasive fauna & flora													
Aquatic													
Abstraction of water from the Olifants River for construction and operational activities as well as demolition and rehabilitation activities	Impacts on instream flow	Construction, operation and decommissioning	1	Improbable	3	Medium Term	2	Site	6	Medium	11	Negligible	Negligible
			1	Improbable	1	Short Term	2	Site	2	Low	5		
Clearance of footprint areas, topsoil stockpiling, usage of construction vehicles, run-off from operational areas, inappropriate rehabilitation	Impacts due to sedimentation and loss of aquatic refugia	Construction, operation and decommissioning	4	Highly Probable	4	Long Term	2	Site	6	Medium	48	Moderate	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		
Clearance of footprint areas, topsoil stockpiling, usage of construction vehicles, run-off from operational areas, inappropriate rehabilitation	Impacts on instream habitat	Construction, operation and decommissioning	4	Highly Probable	4	Long Term	2	Site	6	Medium	48	Moderate	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		

Construction of the bridge across the Olifants River, erosion and sedimentation during construction, operational and decommissioning activities	Impacts on instream migratory corridors	Construction, operation and decommissioning	4	Highly Probable	4	Long Term	2	Site	6	Medium	48	Moderate	Negligible
			2	Probable	1	Short Term	1	Local	2	Low	8		
Spills from construction vehicles, seepage and runoff from "dirty" construction areas, incorrect separation of clean and dirty water systems	Impacts on taxa sensitive to changes is water quality	Construction, operation and decommissioning	4	Highly Probable	5	Permanent	3	Regional	6	Medium	56	Moderate	Negligible
			2	Probable	4	Long Term	2	Site	2	Low	16		
Construction , operation and decommissioning of the mine, associated bridge and roadway	Impacts due to canalisation and erosion	Construction, operation and decommissioning	2	Probable	5	Permanent	1	Local	2	Low	16	Negligible	Negligible
			1	Improbable	1	Short Term	1	Local	2	Low	4		
Construction, operational and decommissioning activities leading to sedimentation and impairment of water quality	Impacts on rare and endemic species	Construction, operation and decommissioning	2	Probable	5	Permanent	2	Site	2	Low	18	Negligible	Negligible
			2	Probable	4	Long Term	1	Local	2	Low	14		
Wetland													

Siting of infrastructure, vegetation removal, construction activities in wetland areas, construction of access, haul roads and pipelines, vehicular access, overburden dump construction, decommissioning activities, rehabilitation, spillages and seepage	Encroachment by mining activities on the Olifants River (large perennial system)	Planning, Construction, Operational, Decommissioning	4	Highly Probable	4	Long Term	3	Regional	8	High	60	Moderate	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Siting of infrastructure, vegetation removal, construction activities in wetland areas, construction of access, haul roads and pipelines, vehicular access, overburden dump construction, decommissioning activities,	Encroachment by mining activities on Pelangwe & Mohlaletsi Rivers (smaller perennial system)	Planning, Construction, Operational, Decommissioning	2	Probable	4	Long Term	3	Regional	8	High	30	Low	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		

rehabilitation, spillages and seepage													
Siting of infrastructure, vegetation removal, construction activities in wetland areas, construction of access, haul roads and pipelines, vehicular access, overburden dump construction, decommissioning activities, rehabilitation, spillages and seepage	Encroachment by mining activities on drainage lines (non-perennial systems)	Planning, Construction, Operational, Decommissioning	2	Probable	4	Long Term	3	Regional	6	Medium	26	Low	Negligible
			2	Probable	1	Short Term	2	Site	2	Low	10		
Ineffective planning/separation of clean and dirty water system, spillages, seepage, rehabilitation	Impact on Olifants River due to seepage of dirty water	Planning, Construction, Operational, Decommissioning	4	Highly Probable	4	Long Term	3	Regional	8	High	60	High	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		
Ineffective planning/separation of clean and dirty water system, spillages, seepage,	Impact on Pelangwe and Mohlaletsi Rivers due to seepage of dirty water	Planning, Construction, Operational, Decommissioning	2	Probable	4	Long Term	3	Regional	8	High	30	Low	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		

rehabilitation													
Ineffective planning/separation of clean and dirty water system, spillages, seepage, rehabilitation	Impact of drainage lines due to seepage of dirty water	Planning, Construction, Operational, Decommissioning	2	Probable	4	Long Term	3	Regional	8	High	30	Low	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		
Vehicular movement and access in wetland areas	Impact on Olifants River due to vehicles entering sensitive areas	Planning, Construction, Operational, Decommissioning	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Vehicular movement and access in wetland areas	Impact on Pelangwe and Mohlaletsi Rivers due to vehicles entering sensitive areas	Planning, Construction, Operational, Decommissioning	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Vehicular movement and access in wetland areas	Impact on drainage lines due to vehicles entering sensitive areas	Planning, Construction, Operational, Decommissioning	2	Probable	3	Medium Term	2	Site	6	Medium	22	Low	Negligible
			1	Improbable	1	Short Term	2	Site	2	Low	5		
Rehabilitation	Impact on Olifants River due to ineffective rehabilitation	Planning, Construction, Operational, Decommissioning	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		

Rehabilitation	Impact on Pelangwe and Mohlaletsi Rivers due to ineffective rehabilitation	Planning, Construction, Operational, Decommissioning	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Rehabilitation	Impact on drainage lines due to ineffective rehabilitation	Planning, Construction, Operational, Decommissioning	2	Probable	4	Long Term	2	Site	8	High	28	Low	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Site clearance, siting of infrastructure, vegetation removal, construction of mining infrastructure, haul and access roads, vehicular access, spillages and seepage, decommissioning activities, rehabilitation	Loss of ecological services - Olifants River	Planning, Construction, Operational, Decommissioning	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Low
			2	Probable	3	Medium Term	3	Regional	6	Medium	24		
Site clearance, siting of infrastructure, vegetation removal, construction of mining infrastructure, haul and access roads, vehicular access,	Loss of ecological services - Pelangwe & Mohlaletsi Rivers	Planning, Construction, Operational, Decommissioning	4	Highly Probable	4	Long Term	3	Regional	8	High	60	High	Low
			2	Probable	3	Medium Term	3	Regional	6	Medium	24		

spillages and seepage, decommissioning activities, rehabilitation													
Site clearance, siting of infrastructure, vegetation removal, construction of mining infrastructure, haul and access roads, vehicular access, spillages and seepage, decommissioning activities, rehabilitation	Loss of ecological services - Drainage lines	Planning, Construction, Operational, Decommissioning	2	Probable	4	Long Term	2	Site	8	High	28	Low	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Soils and Land Capability													
Site establishment & clearing	Stripping of topsoil and subsoil material for shaft and construction areas	Construction	5	Definite	5	Permanent	1	Local	6	Medium	60	Moderate	Low
			5	Definite	3	Medium Term	1	Local	2	Low	30		
Construction of buildings and infrastructure	Construction of buildings and infrastructure	Construction	5	Definite	5	Permanent	1	Local	6	Medium	60	Moderate	Low
			5	Definite	3	Medium Term	1	Local	2	Low	30		
Vehicle operation	Hydrocarbon spillages on site due to vehicle operation	Construction	5	Definite	3	Medium Term	1	Local	6	Medium	50	Moderate	Negligible
			2	Probable	1	Short Term	1	Local	2	Low	8		

Stockpiling	Stockpiling of soil material	Construction	5	Definite	3	Medium Term	1	Local	6	Medium	50	Moderate	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		
Use of land for mining activities	Land use alteration	Construction	5	Definite	5	Permanent	2	Site	8	High	75	High	Moderate
			5	Definite	3	Medium Term	2	Site	6	Medium	55		
Site clearance, excavation and removal of vegetation	Erosion of soil on site due to human activities	Construction	5	Definite	3	Medium Term	2	Site	6	Medium	55	Moderate	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		
Vehicle operation	Hydrocarbon spillages on site due to vehicle operation	Operational	5	Definite	1	Short Term	3	Regional	6	Medium	50	Moderate	Negligible
			2	Probable	1	Short Term	1	Local	2	Low	8		
Site clearance, excavation and removal of vegetation	Erosion of soil on site due to human activities	Operational	5	Definite	4	Long Term	2	Site	6	Medium	60	Moderate	Negligible
			2	Probable	4	Long Term	1	Local	2	Low	14		
Use of stockpiles soil material	Incorrect use of stockpiled soil material for rehabilitation purposes	Decommissioning	5	Definite	5	Permanent	1	Local	6	Medium	60	Moderate	Low
			5	Definite	5	Permanent	1	Local	2	Low	40		
Site clearance, excavation and removal of vegetation	Erosion of soil on site due to human activities	Decommissioning	5	Definite	3	Medium Term	2	Site	6	Medium	55	Moderate	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		
Geohydrological													
Erosion and siltation	Erosion and siltation of	Construction	4	Highly Probable	1	Short Term	3	Regional	6	Medium	40	Low	Negligible

	surface water features		2	Probable	1	Short Term	3	Regional	6	Medium	20		
Oil, grease and diesel spillages from construction vehicles	Oil, grease and diesel spillages from construction vehicles impacting on water resources	Construction	4	Highly Probable	1	Short Term	2	Site	6	Medium	36	Low	Negligible
			2	Probable	1	Short Term	2	Site	6	Medium	18		
Flooding of construction camps	Flooding	Construction	4	Highly Probable	1	Short Term	1	Local	8	High	40	Low	Negligible
			1	Improbable	1	Short Term	1	Local	8	High	10		
Sanitation facilities	Pollution of groundwater / surface water due to sanitation facilities	Construction	4	Highly Probable	1	Short Term	2	Site	6	Medium	36	Low	Negligible
			1	Improbable	1	Short Term	2	Site	6	Medium	9		
Storage of chemicals and building materials	Ground and surface water pollution due to storage of chemicals and building materials	Construction	4	Highly Probable	1	Short Term	2	Site	6	Medium	36	Low	Negligible
			2	Probable	1	Short Term	2	Site	6	Medium	18		
Over abstraction from water supply borehole during construction phase	Over abstraction from water supply borehole during construction phase	Construction	4	Highly Probable	1	Short Term	2	Site	8	High	44	Moderate	Negligible
			1	Improbable	1	Short Term	2	Site	8	High	11		
Spillages from diesel (fuel	Spillages from diesel	Construction	4	Highly Probable	1	Short Term	2	Site	8	High	44	Moderate	Negligible

storage) facilities	(fuel storage) facilities leading to pollution of ground and surface water		1	Improbable	1	Short Term	2	Site	8	High	11		
Oil, grease and diesel spillages from mine vehicles	Oil, grease and diesel spillages from mine vehicles impacting on ground and surface water	Operational	4	Highly Probable	4	Long Term	2	Site	6	Medium	48	Moderate	Low
			2	Probable	4	Long Term	2	Site	6	Medium	24		
Seepage of dirty water into the aquifer	Seepage of dirty water into the aquifer impacting on groundwater resource	Operational	5	Definite	4	Long Term	1	Local	8	High	65	High	Low
			2	Probable	4	Long Term	1	Local	8	High	26		
Sanitation facilities	Pollution of groundwater due to sanitation facilities	Operational	4	Highly Probable	4	Long Term	1	Local	6	Medium	44	Moderate	Negligible
			1	Improbable	4	Long Term	1	Local	6	Medium	11		
Storage of chemicals and mining materials	Groundwater pollution due to storage of chemicals and mining materials	Operational	4	Highly Probable	4	Long Term	1	Local	6	Medium	44	Moderate	Low
			2	Probable	4	Long Term	1	Local	6	Medium	22		
Spillages from diesel (fuel storage) facilities	Spillages from diesel (fuel storage) facilities leading to pollution of ground and	Operational	4	Highly Probable	4	Long Term	1	Local	8	High	52	Moderate	Low
			2	Probable	4	Long Term	1	Local	8	High	26		

	surface water												
Seepage from tailings disposal facility	Seepage from tailings disposal facility impacting on groundwater	Operational	4	Highly Probable	4	Long Term	1	Local	8	High	52	Moderate	Low
			2	Probable	4	Long Term	1	Local	8	High	26		
Formation of acid mine drainage from mine residue facilities	Formation of acid mine drainage from mine residue facilities impacting on groundwater	Operational	1	Improbable	5	Permanent	3	Regional	8	High	16	Negligible	Negligible
			1	Improbable	5	Permanent	3	Regional	8	High	16		
Contamination of groundwater by mine residue leachate	Contamination of groundwater by mine residue leachate	Operational	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Negligible
			2	Probable	5	Permanent	2	Site	2	Low	18		
Contamination of surface water by mine residue leachate	Contamination of surface water by mine residue leachate	Operational	2	Probable	5	Permanent	3	Regional	8	High	32	Low	Negligible
			2	Probable	5	Permanent	2	Site	2	Low	18		
Sulphate leaching from the TDF	Sulphate leaching from the TDF impacting on groundwater	Operational	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Negligible
			1	Improbable	5	Permanent	3	Regional	8	High	16		
Metal and arsenic leaching from TDF	Metal and arsenic leaching from the TDF impacting on groundwater	Operational	1	Improbable	5	Permanent	3	Regional	8	High	16	Negligible	Negligible
			1	Improbable	5	Permanent	3	Regional	8	High	16		

Nitrate leaching from TDF / WRD	Nitrate leaching from the TDF / WRD impacting on groundwater	Operational	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Negligible
			1	Improbable	5	Permanent	3	Regional	8	High	16		
Pollution of rivers from runoff from the TDF	Pollution of rivers from runoff from the TDF	Operational	4	Highly Probable	5	Permanent	1	Local	8	High	56	Moderate	Negligible
			1	Improbable	5	Permanent	1	Local	8	High	14		
Vandalism	Vandalising of boreholes and related infrastructure	Operational	5	Definite	5	Permanent	2	Site	8	High	75	High	Negligible
			1	Improbable	5	Permanent	2	Site	2	Low	9		
Damages to pipeline due to poor visibility of the pipeline	Damages to pipeline due to poor visibility of pipeline	Operational	4	Highly Probable	5	Permanent	1	Local	6	Medium	48	Moderate	Negligible
			1	Improbable	1	Short Term	1	Local	2	Low	4		
Flood / storm water	Damages from flooding / storm water	Operational	4	Highly Probable	4	Long Term	2	Site	6	Medium	48	Moderate	Negligible
			1	Improbable	1	Short Term	2	Site	2	Low	5		
Water Quality; encrustation in / corrosion of pipelines, equipment and appliances	Encrustation in / corrosion of pipelines, equipment and appliances	Operational	4	Highly Probable	4	Long Term	1	Local	2	Low	28	Low	Negligible
			2	Probable	1	Short Term	1	Local	2	Low	8		
Water Quality; Algae / micro-organisms growth in pipelines and reservoirs	Algae / micro-organisms growth in pipelines and reservoirs	Operational	4	Highly Probable	3	Medium Term	1	Local	2	Low	24	Low	Negligible
			1	Improbable	1	Short Term	1	Local	2	Low	4		
Leaking pipes	Leaking pipes leading to water loss	Operational	4	Highly Probable	3	Medium Term	1	Local	6	Medium	40	Low	Negligible
			1	Improbable	1	Short Term	1	Local	2	Low	4		

Transmission losses and evaporation	Transmission losses and evaporation leading to water loss	Operational	4	Highly Probable	3	Medium Term	1	Local	6	Medium	40	Low	Negligible
			1	Improbable	1	Short Term	1	Local	2	Low	4		
Dewatering	Water from Olifants River flowing into mine workings	Operational	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Negligible
			2	Probable	1	Short Term	2	Site	6	Medium	18		
In-adequate seepage capturing	In-adequate seepage capturing from seepage capturing boreholes drilled within the Phosiri Dome leading to low abstraction rates	Operational	4	Highly Probable	3	Medium Term	1	Local	6	Medium	40	Low	Negligible
			1	Improbable	1	Short Term	1	Local	2	Low	4		
Dewatering	Depletion of community water supply boreholes	Operational	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Negligible
			2	Probable	1	Short Term	2	Site	6	Medium	18		
Mine dewatering	Permanent radius of influence due to mine dewatering	Decommissioning	5	Definite	5	Permanent	3	Regional	6	Medium	70	High	Low
			4	Highly Probable	4	Long Term	3	Regional	2	Low	36		
Formation of acid mine drainage	Formation of acid mine drainage from the TDF	Decommissioning	1	Improbable	5	Permanent	3	Regional	8	High	16	Negligible	Negligible
			1	Improbable	5	Permanent	3	Regional	8	High	16		
Sulphate leaching	Sulphate leaching from	Decommissioning	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Negligible

	the TDF		1	Improbable	5	Permanent	3	Regional	8	High	16		
Metal and arsenic leaching	Metal and arsenic leaching from the TDF	Decommissioning	1	Improbable	3	Medium Term	1	Local	8	High	12	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	8	High	12		
Nitrate leaching	Nitrate leaching from the TDF	Decommissioning	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Negligible
			1	Improbable	5	Permanent	3	Regional	8	High	16		
Runoff from the TDF material	Pollution of rivers from runoff from the TDF material	Decommissioning	4	Highly Probable	5	Permanent	1	Local	8	High	56	Moderate	Negligible
			1	Improbable	5	Permanent	1	Local	8	High	14		
Dust from the TDF	Contamination of surface water from wind-blown dust from the TDF	Decommissioning	2	Probable	5	Permanent	1	Local	8	High	28	Low	Negligible
			1	Improbable	5	Permanent	1	Local	8	High	14		
Air Quality													
All activities	Fugitive dust emissions (TSP, PM10) from construction activities impacting upon air quality	Construction	2	Probable	3	Medium Term	2	Site	6	Medium	22	Low	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
Earthworks	Dust generation (TSP, PM10) from earthworks impacting on air quality	Construction	2	Probable	3	Medium Term	1	Local	6	Medium	20	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		

Site development	Dust generation (TSP, PM10) from site development activities impacting on air quality	Construction	2	Probable	3	Medium Term	1	Local	2	Low	12	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
Unpaved Roads	Generation of vehicle entrained dust from the operation and movement of construction vehicles, and gaseous emissions from vehicles and construction equipment impacting on air quality	Construction	2	Probable	3	Medium Term	2	Site	6	Medium	22	Low	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
Civil Works	Dust generation (TSP, PM10) from construction activities and gaseous emissions from blasting impacting on air quality	Construction	1	Improbable	3	Medium Term	1	Local	2	Low	6	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
Scenario 1 All Sources	All activities	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High	High
			5	Definite	4	Long Term	3	Regional	6	Medium	65		

Scenario 1 Unpaved Roads	Vehicle activity on unpaved haul roads resulting in fugitive dust and gaseous emissions, with impacts on air quality	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High	High
			5	Definite	4	Long Term	3	Regional	6	Medium	65		
Scenario 1 Wind Erosion	Wind-blown dust from waste rock dumps, topsoil dump and TDF impacting on air quality	Operational	2	Probable	4	Long Term	1	Local	2	Low	14	Negligible	Negligible
			1	Improbable	4	Long Term	1	Local	2	Low	7		
Scenario 1 Materials Handling	The handling of materials during operations will result in fugitive dust emissions (TSP, PM 10 and PM2.5) which will impact on air quality	Operational	2	Probable	4	Long Term	1	Local	2	Low	14	Negligible	Negligible
			1	Improbable	4	Long Term	1	Local	2	Low	7		
Scenario 1 Ventilation Shaft	Gaseous emissions from the ventilation shaft stack and primary and secondary crushers'	Operational	1	Improbable	4	Long Term	1	Local	6	Medium	11	Negligible	Negligible
			1	Improbable	4	Long Term	1	Local	2	Low	7		

	baghouses will impact upon air quality												
Scenario 1 Crushing	The primary and secondary crushing or ore will result in fugitive dust which will impact air quality	Operational	2	Probable	4	Long Term	2	Site	6	Medium	24	Low	Negligible
			1	Improbable	4	Long Term	2	Site	6	Medium	12		
Scenario 2 All Sources	All activities	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High	Moderate
			5	Definite	4	Long Term	2	Site	6	Medium	60		
Scenario 2 Unpaved Roads	Vehicle activity on unpaved haul roads resulting in fugitive dust and gaseous emissions, with impacts on air quality	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High	Moderate
			5	Definite	4	Long Term	2	Site	6	Medium	60		
Scenario 2 Wind Erosion	Wind-blown dust from waste rock dumps, topsoil dump and TDF impacting on air quality	Operational	2	Probable	4	Long Term	1	Local	2	Low	14	Negligible	Negligible
			1	Improbable	4	Long Term	1	Local	2	Low	7		
Scenario 2 Materials Handling	The handling of materials during operations	Operational	2	Probable	4	Long Term	1	Local	2	Low	14	Negligible	Negligible
			1	Improbable	4	Long Term	1	Local	2	Low	7		

	will result in fugitive dust emissions (TSP, PM 10 and PM2.5) which will impact on air quality												
Scenario 2 Ventilation Shaft	Gaseous emissions from the ventilation shaft stack and primary and secondary crushers' baghouses will impact upon air quality	Operational	5	Definite	4	Long Term	2	Site	6	Medium	60	Moderate	Negligible
			1	Improbable	4	Long Term	1	Local	2	Low	7		
Scenario 2 Crushing	The primary and secondary crushing or ore will result in fugitive dust which will impact air quality	Operational	2	Probable	4	Long Term	2	Site	6	Medium	24	Low	Negligible
			1	Improbable	4	Long Term	2	Site	6	Medium	12		
Incline shaft	Generation of TSP and PM10 emissions from the sealing of shafts and inclines and associated	Post-operational / Closure	1	Improbable	3	Medium Term	1	Local	2	Low	6	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		

	infrastructure removal impacting on air quality												
Topsoil and waste dumps	Generation of TSP and PM10 emissions from the recovering of materials from stockpiles for rehabilitation and re-vegetation of surroundings impacting on air quality	Post-operational / Closure	2	Probable	3	Medium Term	1	Local	2	Low	12	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
Processing plant	TSP and PM10 emissions from infrastructure removal at the processing plant impacting on air quality	Post-operational / Closure	1	Improbable	3	Medium Term	1	Local	2	Low	6	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
Administrative facilities and human resource facilities	TSP and PM10 emissions from infrastructure removal including offices, workshops	Post-operational / Closure	1	Improbable	3	Medium Term	1	Local	2	Low	6	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		

	and housing, impacting on air quality												
Unpaved roads	Fugitive dust and gaseous emissions from the operation and movement of vehicles on unpaved roads during rehabilitation and closure, impacting on air quality	Post-operational / Closure	2	Probable	3	Medium Term	1	Local	2	Low	12	Negligible	Negligible
			2	Probable	3	Medium Term	1	Local	2	Low	12		
Blasting	Fugitive dust and gaseous emissions from possible blasting impacting on air quality	Post-operational / Closure	1	Improbable	1	Short Term	1	Local	2	Low	4	Negligible	Negligible
			1	Improbable	1	Short Term	1	Local	2	Low	4		
Heritage													
General construction and operational activities, vehicular operation and blasting, construction of TDF	Impact on Site SA01	Construction and Operational	4	Highly Probable	5	Permanent	1	Local	8	High	56	Moderate	Low
			2	Probable	5	Permanent	1	Local	6	Medium	24		
General construction and operational activities, vehicular	Impact on Site HP06	Construction and Operational	4	Highly Probable	5	Permanent	1	Local	8	High	56	Moderate	Negligible
			2	Probable	5	Permanent	1	Local	2	Low	16		

operation and blasting													
Construction of WRD	Impact in Site BP04	Construction	5	Definite	5	Permanent	1	Local	8	High	70	High	Low
			4	Highly Probable	5	Permanent	1	Local	2	Low	32		
Construction of TDF	Impact in Site BP05, BP08 and BP12	Construction	5	Definite	5	Permanent	1	Local	8	High	70	High	Low
			5	Definite	5	Permanent	1	Local	2	Low	40		
Construction of TDF	Impact in Site BP06	Construction	5	Definite	5	Permanent	1	Local	8	High	70	High	Low
			5	Definite	5	Permanent	1	Local	2	Low	40		
Construction of TDF	Impact in Site BP07	Construction	5	Definite	5	Permanent	1	Local	8	High	70	High	Low
			5	Definite	5	Permanent	1	Local	2	Low	40		
Construction of TDF	Impact in Site BP10	Construction	5	Definite	5	Permanent	1	Local	8	High	70	High	Low
			5	Definite	5	Permanent	1	Local	2	Low	40		
Construction of TDF	Impact in Site BP11	Construction	5	Definite	5	Permanent	1	Local	8	High	70	High	Low
			5	Definite	5	Permanent	1	Local	2	Low	40		
Social													
Community Health & Safety	Spread of infectious diseases such as HIV and TB	Construction, Operational, Decommissioning	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Low
			2	Probable	5	Permanent	3	Regional	6	Medium	28		
Community Health & Safety	Pressure on existing health services	Construction	4	Highly Probable	3	Medium Term	3	Regional	8	High	56	Moderate	Low
			2	Probable	3	Medium Term	3	Regional	6	Medium	24		

Community Health & Safety	Pressure on existing health services	Operational	2	Probable	3	Medium Term	3	Regional	6	Medium	24	Low	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Community Health & Safety	Increase in traffic-related incidents	Construction	4	Highly Probable	3	Medium Term	2	Site	6	Medium	44	Moderate	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Community Health & Safety	Increase in traffic-related incidents	Operational	4	Highly Probable	4	Long Term	2	Site	6	Medium	48	Moderate	Negligible
			2	Probable	4	Long Term	2	Site	2	Low	16		
Changes in social environment	Change in social fabric	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Moderate
			4	Highly Probable	3	Medium Term	2	Site	6	Medium	44		
Changes in social environment	Change in social fabric	Operational	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Changes in social environment	Tension between local residents and newcomers	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Changes in social environment	Tension between local residents and newcomers	Operational	4	Highly Probable	3	Medium Term	2	Site	6	Medium	44	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Changes in social environment	Formation of informal settlements	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Changes in social environment	Formation of informal settlements	Operational	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Low
			2	Probable	4	Long Term	2	Site	6	Medium	24		
Changes in social	Improvement in	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	High

environment	educational facilities		5	Definite	3	Medium Term	2	Site	8	High	65		
Changes in social environment	Improvement in educational facilities	Operational	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	High
			5	Definite	4	Long Term	2	Site	8	High	70		
Changes in social environment	Increase in crime rates	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Changes in social environment	Increase in crime rates	Operational	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Low
			2	Probable	4	Long Term	2	Site	6	Medium	24		
Local / regional economy	Job creation	Pre-construction	5	Definite	1	Short Term	2	Site	6	Medium	45	Moderate	Moderate
			5	Definite	1	Short Term	2	Site	8	High	55		
Local / regional economy	Job creation	Construction	5	Definite	3	Medium Term	3	Regional	8	High	70	High	High
			5	Definite	3	Medium Term	3	Regional	8	High	70		
Local / regional economy	Job creation	Operational	5	Definite	4	Long Term	3	Regional	8	High	75	High	High
			5	Definite	4	Long Term	3	Regional	8	High	75		
Local / regional economy	Job creation	Decommissioning	5	Definite	5	Permanent	3	Regional	8	High	80	High	High
			5	Definite	5	Permanent	2	Site	8	High	75		
Local / regional economy	Skills development	Pre-construction	4	Highly Probable	1	Short Term	2	Site	6	Medium	36	Low	High
			5	Definite	4	Long Term	3	Regional	8	High	75		
Local / regional economy	Skills development	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	High
			5	Definite	4	Long Term	3	Regional	8	High	75		

Local / regional economy	Skills development	Operational	4	Highly Probable	4	Long Term	3	Regional	8	High	60	Moderate	High
			5	Definite	4	Long Term	3	Regional	8	High	75		
Local / regional economy	Skills shortage	Construction & Operational	4	Highly Probable	3	Medium Term	3	Regional	8	High	56	Moderate	Negligible
			2	Probable	1	Short Term	3	Regional	6	Medium	20		
Local / regional economy	Conflict about jobs and benefits	Pre-construction	4	Highly Probable	3	Medium Term	2	Site	6	Medium	44	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Local / regional economy	Conflict about jobs and benefits	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Moderate
			4	Highly Probable	3	Medium Term	2	Site	6	Medium	44		
Local / regional economy	Conflict about jobs and benefits	Operational	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Local / regional economy	Expectations of the community	Pre-construction	5	Definite	3	Medium Term	2	Site	8	High	65	High	Moderate
			4	Highly Probable	1	Short Term	2	Site	8	High	44		
Local / regional economy	Expectations of the community	Construction	5	Definite	3	Medium Term	3	Regional	8	High	70	High	Moderate
			4	Highly Probable	3	Medium Term	3	Regional	8	High	56		
Local / regional economy	Expectations of the community	Operational	4	Highly Probable	4	Long Term	3	Regional	8	High	60	Moderate	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Local / regional infrastructure	Services	Construction	5	Definite	3	Medium Term	3	Regional	8	High	70	High	Moderate
			4	Highly Probable	3	Medium Term	3	Regional	6	Medium	48		
Local / regional	Services	Operational	5	Definite	4	Long Term	3	Regional	8	High	75	High	Moderate

infrastructure			4	Highly Probable	4	Long Term	3	Regional	6	Medium	52		
Local / regional infrastructure	Services	Decommissioning	5	Definite	5	Permanent	3	Regional	8	High	80	High	High
			5	Definite	5	Permanent	3	Regional	8	High	80		
Local / regional infrastructure	Transport infrastructure	Pre-construction	4	Highly Probable	1	Short Term	2	Site	6	Medium	36	Low	Negligible
			2	Probable	1	Short Term	2	Site	2	Low	10		
Local / regional infrastructure	Transport infrastructure	Construction	5	Definite	3	Medium Term	3	Regional	8	High	70	High	Moderate
			4	Highly Probable	3	Medium Term	3	Regional	6	Medium	48		
Local / regional infrastructure	Transport infrastructure	Operational	5	Definite	4	Long Term	3	Regional	8	High	75	High	Moderate
			4	Highly Probable	4	Long Term	3	Regional	6	Medium	52		
Local / regional infrastructure	Housing	Construction	5	Definite	3	Medium Term	3	Regional	8	High	70	High	Low
			2	Probable	3	Medium Term	3	Regional	6	Medium	24		
Local / regional infrastructure	Housing	Operational	4	Highly Probable	3	Medium Term	3	Regional	8	High	56	Moderate	Negligible
			2	Probable	1	Short Term	3	Regional	6	Medium	20		
Local / regional infrastructure	Recreational facilities	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Moderate
			4	Highly Probable	3	Medium Term	2	Site	6	Medium	44		
Local / regional infrastructure	Recreational facilities	Operational	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Physical environment	Loss of livelihoods	Construction	2	Probable	3	Medium Term	2	Site	8	High	26	Low	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		

Physical environment	Loss of livelihoods	Operational	5	Definite	4	Long Term	2	Site	8	High	70	High	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Physical environment	Sense of place	Pre-construction	4	Highly Probable	3	Medium Term	2	Site	6	Medium	44	Moderate	Low
			4	Highly Probable	3	Medium Term	2	Site	2	Low	28		
Physical environment	Sense of place	Construction	5	Definite	3	Medium Term	2	Site	8	High	65	High	Moderate
			4	Highly Probable	3	Medium Term	2	Site	6	Medium	44		
Physical environment	Sense of place	Operational	5	Definite	4	Long Term	2	Site	8	High	70	High	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Government and other role players	Failure of government to deliver essential services	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Government and other role players	Failure of government to deliver essential services	Operational	5	Definite	4	Long Term	2	Site	8	High	70	High	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Government and other role players	NGO's opposing the project	Pre-construction	2	Probable	3	Medium Term	2	Site	6	Medium	22	Low	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Government and other role players	NGO's opposing the project	Construction	2	Probable	3	Medium Term	2	Site	6	Medium	22	Low	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Government and other role players	NGO's opposing the project	Operational	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Low
			2	Probable	4	Long Term	2	Site	6	Medium	24		

Government and other role players	NGO's working in partnership with the project	Pre-construction	4	Highly Probable	1	Short Term	2	Site	6	Medium	36	Low	Moderate
			4	Highly Probable	1	Short Term	2	Site	8	High	44		
Government and other role players	NGO's working in partnership with the project	Construction	5	Definite	3	Medium Term	2	Site	8	High	65	High	High
			5	Definite	3	Medium Term	2	Site	8	High	65		
Government and other role players	NGO's working in partnership with the project	Operational	5	Definite	4	Long Term	2	Site	8	High	70	High	High
			5	Definite	5	Permanent	2	Site	8	High	75		
Health													
Mining/operational activities	Impact from criteria pollutants	Operational	2	Probable	4	Long Term	2	Site	6	Medium	24	Low	Negligible
			2	Probable	4	Long Term	2	Site	2	Low	16		
Mining/operational activities	Impact from DPM	Operational	1	Improbable	4	Long Term	2	Site	2	Low	8	Negligible	Negligible
			1	Improbable	4	Long Term	2	Site	2	Low	8		
Mining/operational activities	Impact from contaminants in water	Operational	1	Improbable	4	Long Term	2	Site	2	Low	8	Negligible	Negligible
			1	Improbable	4	Long Term	2	Site	2	Low	8		
Visual													
Construction activities, vehicular movement	Impact from dust dispersal	Construction	5	Definite	4	Long Term	2	Site	6	Medium	60	Moderate	Low
			4	Highly Probable	4	Long Term	2	Site	2	Low	32		
Construction of infrastructure	Visual impact	Construction	5	Definite	4	Long Term	2	Site	6	Medium	60	Moderate	Moderate
			5	Definite	4	Long Term	2	Site	6	Medium	60		

Lighting	Visual impact at night due to lights	Construction	5	Definite	5	Permanent	3	Regional	6	Medium	70	High	High
			5	Definite	5	Permanent	2	Site	6	Medium	65		
Operational activities, vehicular movement, soil erosion	Impact from dust dispersal	Operational	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Operational infrastructure, TDF	Visual impact	Operational	5	Definite	4	Long Term	3	Regional	8	High	75	High	High
			5	Definite	4	Long Term	3	Regional	6	Medium	65		
Lighting	Visual impact at night due to lights	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High	Moderate
			5	Definite	4	Long Term	2	Site	6	Medium	60		
Decommissioning activities, rehabilitation	Impact from dust dispersal	Decommissioning	4	Highly Probable	3	Medium Term	2	Site	6	Medium	44	Moderate	Moderate
			4	Highly Probable	3	Medium Term	2	Site	6	Medium	44		
Decommissioning of infrastructure, TDF	Visual impact	Decommissioning	5	Definite	5	Permanent	3	Regional	8	High	80	High	Moderate
			5	Definite	4	Long Term	2	Site	6	Medium	60		
Lighting	Visual impact at night due to lights	Decommissioning	2	Probable	3	Medium Term	2	Site	6	Medium	22	Low	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Noise													
Site establishment, vegetation clearance, topsoil removal, construction vehicle and machinery	Noise from construction activities impacting on surrounding communities	Construction	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Moderate
			4	Highly Probable	3	Medium Term	2	Site	8	High	52		

operation, preparing of foundations, general construction activities, sinking of shaft													
Rock deposition at WRD, mining operations, operation of ventilation fans, material handling / transfer, operation of conveyer belt system, activities at plant	Noise from mining activities during the daytime impacting upon surrounding communities	Operational	1	Improbable	4	Long Term	3	Regional	8	High	15	Negligible	Negligible
			1	Improbable	4	Long Term	3	Regional	8	High	15		
Rock deposition at WRD, mining operations, operation of ventilation fans, material handling / transfer, operation of conveyer belt system, activities at plant	Noise from mining activities during the night-time impacting upon surrounding communities	Operational	2	Probable	4	Long Term	3	Regional	8	High	30	Low	Low
			2	Probable	4	Long Term	3	Regional	8	High	30		
Traffic													
Vehicular operation and usage of roads	Increase in traffic	Construction & Operational	5	Definite	4	Long Term	2	Site	8	High	70	High	Moderate
			5	Definite	4	Long Term	2	Site	6	Medium	60		

Construction of access roads	Improved access points	Construction, Operational, Decommissioning	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	High+
			5	Definite	5	Permanent	2	Site	8	High	75		
Construction of access roads and road upgrades	Impeded access	Construction	4	Highly Probable	1	Short Term	2	Site	6	Medium	36	Low	Negligible
			2	Probable	1	Short Term	2	Site	2	Low	10		
Construction of access roads and road upgrades	Improved road quality	Construction, Operational, Decommissioning	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	High +
			5	Definite	5	Permanent	2	Site	8	High	75		
Use of existing gravel roads	Deterioration in road quality	Construction	2	Probable	1	Short Term	2	Site	8	High	22	Low	Negligible
			1	Improbable	1	Short Term	2	Site	6	Medium	9		
Economic													
Impact on balance of payment	Temporary negative impact on current account	Construction	4	Highly Probable	1	Short Term	3	Regional	2	Low	24	Low	Low
			4	Highly Probable	1	Short Term	3	Regional	2	Low	24		
Impact on production	Temporary increase in production in the country	Construction	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High+	High+
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on GDP-R	Temporary increase in the country's GDP-R	Construction	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High+	High+
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on employment	Creation of employment opportunities during construction	Construction	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High+	High+
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on household	Temporary increase in	Construction	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High+	High+

income	household income		5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on skills development	Development of skills during construction	Construction	4	Highly Probable	3	Medium Term	3	Regional	6	Medium	48	Moderate +	High+
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on government revenue	Increase in government revenue during construction	Construction	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High +	High+
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on balance of payments	Sustainable export earnings form sale of PGM and other mined commodities	Operational	5	Definite	4	Long Term	3	Regional	8	High	75	High +	High+
			5	Definite	4	Long Term	3	Regional	8	High	75		
Impact on production	Increase in production during operation	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High+	High+
			5	Definite	4	Long Term	3	Regional	6	Medium	65		
Impact on GDP-R	Sustainable increase in GDP-R during operations	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High+	High+
			5	Definite	4	Long Term	3	Regional	6	Medium	65		
Impact on household income	Increase in household income	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High+	High+
			5	Definite	4	Long Term	3	Regional	6	Medium	65		
Impact on employment	Creation of employment opportunities	Operational	5	Definite	4	Long Term	3	Regional	6	Medium	65	High+	High+
			5	Definite	4	Long Term	3	Regional	6	Medium	65		
Impact on skills development	Skills development to support mine's	Operational	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate +	Moderate+
			4	Highly Probable	4	Long Term	3	Regional	6	Medium	52		

	operational activities												
Impact on government revenue	Increase of government revenue during operations	Operational	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate +	Moderate+
			4	Highly Probable	4	Long Term	3	Regional	6	Medium	52		

11.3 ENVIRONMENTAL IMPACT STATEMENT

An assessment of potential impacts identified for the mining development was undertaken. The impacts identified for assessment were assessed within numerous specialist studies. The specialist studies undertaken to this effect are listed in Section 9.

The specialist studies recommended mitigation measures in order to reduce or eliminate any impacts which were identified. All impacts identified were analyzed according to key considerations, a description of which is included in chapter 11 and the associated appendices (APPENDIX E 2 and APPENDIX E 3).

The impacts with **a high significance**, **without mitigation (WOM)** are summarized in the table below. The impact rating **with mitigation** (WM) is indicated to the right. The complete impact rating is included in Table 11-1.

Table 11-2 High Significance Impacts

Activity	Impact	Phase	Significance	
			WOM	**WM**
Ecology				
Artificial lighting	Light pollution	Construction & Operational	High	Moderate
Vehicle and personnel movement, delivery of materials	Spread and establishment of alien invasive species	Construction & Operational	High	Low
Wetland				
Ineffective planning/separation of clean and dirty water system, spillages, seepage, rehabilitation	Impact on Olifants River due to seepage of dirty water	Planning, Construction, Operational, Decommissioning	High	Negligible
Rehabilitation	Impact on Olifants River due to ineffective rehabilitation	Planning, Construction, Operational, Decommissioning	High	Low
Rehabilitation	Impact on Pelangwe and Mohlaletsi Rivers due to ineffective rehabilitation	Planning, Construction, Operational, Decommissioning	High	Low
Site clearance, siting of infrastructure,	Loss of ecological services - Olifants River	Planning, Construction, Operational,	High	Low

vegetation removal, construction of mining infrastructure, haul and access roads, vehicular access, spillages and seepage, decommissioning activities, rehabilitation		Decommissioning		
Site clearance, siting of infrastructure, vegetation removal, construction of mining infrastructure, haul and access roads, vehicular access, spillages and seepage, decommissioning activities, rehabilitation	Loss of ecological services - Pelangwe & Mohlaletsi Rivers	Planning, Construction, Operational, Decommissioning	High	Low
Soils and Land Capability				
Use of land for mining activities	Land use alteration	Construction	High	Moderate
Geohydrological				
Seepage of dirty water into the aquifer	Seepage of dirty water into the aquifer impacting on groundwater resource	Operational	High	Low
Contamination of groundwater by mine residue leachate	Contamination of groundwater by mine residue leachate	Operational	High	Negligible
Sulphate leaching from the TDF	Sulphate leaching from the TDF impacting on groundwater	Operational	High	Negligible
Nitrate leaching from TDF / WRD	Nitrate leaching from the TDF / WRD impacting on groundwater	Operational	High	Negligible
Vandalism	Vandalising of boreholes and related infrastructure	Operational	High	Negligible
Dewatering	Water from Olifants River flowing into mine workings	Operational	High	Negligible
Dewatering	Depletion of community water supply boreholes	Operational	High	Negligible

Mine dewatering	Permanent radius of influence due to mine dewatering	Decommissioning	High	Low
Sulphate leaching	Sulphate leaching from the TDF	Decommissioning	High	Negligible
Nitrate leaching	Nitrate leaching from the TDF	Decommissioning	High	Negligible
Air Quality				
Scenario 1 All Sources	All activities	Operational	High	High
Scenario 1 Unpaved Roads	Vehicle activity on unpaved haul roads resulting in fugitive dust and gaseous emissions, with impacts on air quality	Operational	High	High
Scenario 2 All Sources	All activities	Operational	High	Moderate
Scenario 2 Unpaved Roads	Vehicle activity on unpaved haul roads resulting in fugitive dust and gaseous emissions, with impacts on air quality	Operational	High	Moderate
Heritage				
Construction of WRD	Impact in Site BP04	Construction	High	Low
Construction of TDF	Impact in Site BP05, BP08 and BP12	Construction	High	Low
Construction of TDF	Impact in Site BP06	Construction	High	Low
Construction of TDF	Impact in Site BP07	Construction	High	Low
Construction of TDF	Impact in Site BP10	Construction	High	Low
Construction of TDF	Impact in Site BP11	Construction	High	Low

Social				
Community Health & Safety	Spread of infectious diseases such as HIV and TB	Construction, Operational, Decommissioning	High	Low
Local / regional economy	Job creation	Construction	High+	High+
Local / regional economy	Job creation	Operational	High+	High+
Local / regional economy	Job creation	Decommissioning	High+	High+
Local / regional economy	Expectations of the community	Pre-construction	High	Moderate
Local / regional economy	Expectations of the community	Construction	High	Moderate
Local / regional infrastructure	Services	Construction	High	Moderate
Local / regional infrastructure	Services	Operational	High	Moderate
Local / regional infrastructure	Services	Decommissioning	High	High
Local / regional infrastructure	Transport infrastructure	Construction	High	Moderate
Local / regional infrastructure	Transport infrastructure	Operational	High	Moderate
Local / regional infrastructure	Housing	Construction	High	Low
Physical environment	Loss of livelihoods	Operational	High	Moderate
Physical environment	Sense of place	Construction	High	Moderate

Physical environment	Sense of place	Operational	High	Moderate
Government and other role players	Failure of government to deliver essential services	Operational	High	Moderate
Government and other role players	NGO's working in partnership with the project	Construction	High	High
Government and other role players	NGO's working in partnership with the project	Operational	High	High
Visual				
Lighting	Visual impact at night due to lights	Construction	High	High
Operational infrastructure, TDF	Visual impact	Operational	High	High
Lighting	Visual impact at night due to lights	Operational	High	Moderate
Decommissioning of infrastructure, TDF	Visual impact	Decommissioning	High	Moderate
Traffic				
Vehicular operation and usage of roads	Increase in traffic	Construction & Operational	High	Moderate
Economic				
Impact on production	Temporary increase in production in the country	Construction	High +	High +
Impact on GDP-R	Temporary increase in the country's GDP-R	Construction	High +	High +
Impact on employment	Creation of employment opportunities during construction	Construction	High +	High +
Impact on household income	Temporary increase in household income	Construction	High +	High +

Impact on government revenue	Increase in government revenue during construction	Construction	High +	High +
Impact on balance of payments	Sustainable export earnings form sale of PGM and other mined commodities	Operational	High +	High +
Impact on production	Increase in production during operation	Operational	High +	High +
Impact on GDP-R	Sustainable increase in GDP-R during operations	Operational	High +	High +
Impact on employment	Creation of employment opportunities	Operational	High +	High +
Impact on household income	Increase in household income	Operational	High +	High +

Most of the impacts associated with the development could be mitigated to low or moderate levels of significance. The impacts of **high significance after mitigation** are as follows:

- Social impacts relating to job creation, services and partnerships with NGO's. These impacts are positive and of high significance after mitigation.
- Economic impacts relating to employment and other positive economic impacts and are of high significance.
- Visual impacts relating to lighting, mining infrastructure and the TDF. These impacts are permanent (LoM).

Air quality impacts relating to fugitive dust and gaseous emissions from unpaved roads. The impact from dust and emissions from the north access road cannot be mitigated sufficiently and remains high after mitigation due to the PM2.5, PM10 and dust fallout impact areas, if mitigated, still being outside the mine license area. Mitigation measures resulting in higher control efficiency should be considered should the north access road be used as well as conducting baseline monitoring in order to update the air quality model.

12 CUMULATIVE IMPACTS

Cumulative impacts can arise from one or more activities. A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

The assessment of cumulative impacts on a study area is complex; especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated. It is often difficult to determine at which point the accumulation of many small impacts reaches the point of an undesired or unintended cumulative impact that should be avoided or mitigated. There are often factors which are uncertain when potential cumulative impacts are identified.

The anticipated impacts resulting from the construction and operation of the mine could potentially result in cumulative effects in the following areas:

- Air quality;
- Visual impact;
- Ecological Impact; and
- Social impact.

12.1 Air Quality impact

The cumulative impact for fugitive dust and gaseous emission was determined and assessed during the air quality assessment (APPENDIX L).

Due to the absence of ambient dust fallout rates, cumulative dust fallout rates could not be determined. The predicted cumulative annual average SO2 concentrations are low and do not exceed the NAAQS of 50μg/m³. Cumulative PM10 GLCs without and with mitigation in place are high, exceeding the NAAQS daily and annual limits at all the sensitive receptors. With mitigation in place the predicted impacts reduce but are still in exceedence. As the possible cumulative PM10 concentrations determined are in exceedence of the selected criteria on-site and at multiple sensitive receptors around the mine, it is important that feasible air quality management measures for PM10 emissions be considered to ensure the lowest possible impacts on the residential areas.

This can be achieved through a combination of mitigation and management measures and implementation of ambient monitoring. The following mitigation and management measures are proposed:

- Water Sprays on all unpaved roads. 75% control efficiency can be achieved by spraying water on roads.
- Mitigation measures for underground materials handling should be implemented.
- 83% control efficiency can be achieved by hooding with baghouses with fabric filters.
- 83% control efficiency due to dust extraction in place at primary and secondary crushing, i.e. hooding with fabric filters.

12.2 Visual Impact

The proposed Project is anticipated to have an visual impact on residents of Apel, Phosiri, Lekurung, Lesetsi, Mooiplaas, Mooiklip, Tiekiedraai, Strydkraal, Doringdraai, Tswaing, Ga-Nchabeleng, Ga-Nkwana, Ga-Mankopane, Ga-modupi and Ga-Matlala as well as on the viewers with visual access to the site that travel on the tarred road adjacent to the Project site. The proposed Project will result in changes in the baseline environment that will cause visual impacts such as depreciation of the landscape character, the views of the visually valuable northern mountainous area being obscured by Project components, the negative effects of the mining activities on air quality that contribute cumulatively to visibility and the sense of place altering this to an undesirable standard.

Thus the visual impact and impact on sense of place of the project will contribute to the cumulative negative effect on the aesthetics of the study area due to the population and settlement of the surrounding land. The following mitigation measures can be implemented:

- All existing natural vegetation should be retained where possible and incorporated into the site rehabilitation as the vegetation will form a visual screen for some viewers located close to the proposed site.

- An ecological approach to rehabilitation and vegetative screening measures, as opposed to a horticultural approach to landscaping should be adopted. For example communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. A registered landscape architect should be consulted for this purpose.

- The TDF should be vegetated in order to control the dust but also to blend the TDF into the surrounding environment.

- During construction, operation, decommissioning and closure of the development, access roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.

- Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances.

- As far as possible concurrent rehabilitation should take place to minimize the intensity of the visual impact.

- A registered Landscape Architect (SACLAP) should be appointed to design the relevant mitigation measures and to ensure that they are effectively implemented.

12.3 Ecological Impact

The cumulative ecological impacts will exist as some areas of the site are in a degraded state. By implementing the following general mitigation and management actions on site, the impact on faunal populations can be rendered low:

- Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction process.

- A speed limit should be imposed on the access roads to minimize road kills. Speed humps should be constructed at strategic places along the access road to enforce lower speeds.

- Roads should be designed without pavements to allow for the movement of small mammals.

- Hunting, trapping, poisoning and shooting of animals should be prevented. This will necessitate negotiations with the local inhabitants and informal settlers.

- Do not feed any wild animals on site.
- Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the vulture birds of prey occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.
- Waste bins and foodstuffs should be made scavenger proof.
- Monitoring of the environmental aspects should be done over the longer term to ensure that impacts are limited to a minimum during the constructional and operational phases. Monitoring of specific species such as pythons and specific bird species such as stork species and other water birds is necessary to ensure that this species would be unaffected over the longer term by the development. Information on the rare species should be provided to workers to make them more aware of these species and their behaviour.

12.4 Social Impact

Potential cumulative impacts can be summarized as:

- Increase in crime
- Decrease in water quality
- Increased nuisance – dust, noise, traffic
- Influx of people
- Potential increase in respiratory diseases
- Increased pressure on infrastructure
- Sense of place

The following measures will assist in mitigating these impacts:

- Form a partnership with a Non-Profit Organisation (NPO) such as Future Families (www.futurefamilies.co.za) to provide the necessary social services to people whose lives are affected by infectious diseases.
- Develop an in-house infectious diseases strategy to address health issues with the workforce. Align strategy with community HIV strategy followed by NPO.

- Appoint a community liaison officer that deals specifically with the surrounding communities. Compile a community relations plan. Establish a community liaison forum that meets every three months – at this forum the mine can give feedback on its activities and keep the communities informed about matters that concern them. It can be a useful mechanism to manage expectations and build relationships.
- Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise integration.
- Design and implement a Drug and Alcohol Management Policy, and undertake regular testing on site, to minimise negative interactions with the local community.
- Establish a detailed grievance mechanism for communities to lodge concerns, suggestions and complaints which can be dealt with by the Project in a timely manner.
- Implement workforce education programs on cultural diversity and tolerance.
- Provide regular information updates to the Police 'Officer in Charge' at local Police Stations. Invite local Police to attend relevant induction sessions – provide information on relevant safety and security issues, as well as relevant behaviour protocols, to the workforce.
- Develop a recruitment policy that allows equal opportunity to all people (woman, disabled) and give preference to local labour. Communicate the policy and requirements to the affected communities through the media, community leadership and a community liaison forum. Establish labour desks in easy accessible areas.
- Engage with the municipalities to discuss strategic long-term planning. Coordinate the outcomes of the Social and Labour plan with the Integrated Development Plans of the municipalities. Become a member of the IDP Forum.
- Engage with local service providers to prepare them for the potential increase in the demand for transport in the local and regional areas.
- Establish an environmental forum to give feedback to affected communities twice a year regarding environmental aspects such as dust, water and noise pollution and how Lesego manage and mitigate these aspects.

13 ENVIRONMENTAL MONITORING AND AUDITING

13.1 Site Specific Monitoring

Site specific monitoring recommendations have been made by the various specialists of which the studies have been attached hereto under APPENDIX G to APPENDIX V. It will be required that the approved EIR be monitored by an independent and qualified Environmental Control Officer (ECO). The ECO will compile monthly reports that should be audited on a bi-annual basis. The costs hereof have been accounted for as part of the Closure and Rehab Cost. The most pertinent aspects requiring monitoring and or follow up investigations include: ecology, water, heritage, air quality, noise, blasting and vibration, socio-economic and aquatic environment.

13.2 External audits

External system and process audits will be undertaken by an accredited auditing body on an annual basis, or as otherwise specified by the auditing body.

Legal audits are undertaken on an annual basis. The legal audits are conducted by an external legal specialist.

13.3 Internal audits

Internal system and process audits will be conducted by a team of internal auditors who have received the relevant environmental audit training. The audit team must be selected and notified of the upcoming audit at least one month prior to the internal audit. Internal audits will be conducted on a bi-annual basis.

13.4 Internal checklists

Monthly inspections must be carried out at each operational area in order to monitor its progress or maintenance with the EMS and to monitor key environmental aspects.

14 MINE CLOSURE AND REHABILITATION

AGES was appointed as part of the DFS to compile a Mine Closure Plan and Estimate of Financial Provision for infrastructure and activities associated with the proposed project. The closure plan will aim to establish the expected environmental liability for the project. The mine closure plan and the associated financial provision will be included in the EMPR document.

The closure objectives and goals are highlighted as follows:

- To rehabilitate all disturbed land to a state that is suitable for its post closure use;
- To ensure that affected areas are safe and secure for both human and animal activities;
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated;
- To rehabilitate all disturbed land to a state where limited or preferably no post closure management is required;
- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality); and
- To limit the impact on personnel whose positions may become redundant on decommissioning of the operations.

14.1 Legal Framework for Closure

The closure plan and financial estimate is deemed to be satisfactory according to the Mine and Petroleum Resources Development Act, 2002 (Act 28 of 2002). The holder of mining rights must make the prescribed financial provision for the rehabilitation and management of the negative environmental impacts due to mining activities.

14.2 Accounting Policy

Mines are required to make provision for all costs arising from environmental damage caused by the mining operations. This includes provision for decommissioning and rehabilitation and restoration costs. This report aims to establish a financial estimate for activities in 3 categories:

- Activities carried out during the operational phase of mining activities;
- Activities carried out during the rehabilitation and closure phase; and
- Activities carried out during the maintenance and aftercare phase.

14.3 Post Closure Land Capability

Soils are generally shallow and those that are somewhat suitable for agriculture are used for subsistence agriculture only. The Agricultural potential is thus classified as moderate. The soil on site can be used for rehabilitation post-mining if adequately managed. The erodibility of the soil is moderate as they occur at the foot of steep slopes. The low or non-existent vegetation cover increases the erosion potential. The erodibility should be considered in all mining activities.

Direct impact of the mining activity would be mostly through excavation and soil moving. It is thus suggested that erosion and dust generation as well as spillages of oil, etc. from vehicles be controlled. A nominal depth of 100mm topsoil was assumed in rehabilitation processes.

The post closure land use proposed for the project area is to return the area to wilderness/natural area or area suitable for grazing land. The soil and land use capability study (Terrasoil Science, 2012) conducted for the project area concluded that the project area is either residential area, natural land or areas already disturbed by subsistence agriculture.

14.4 Summary of Rehabilitation, Closure and Aftercare Plan

In some cases cost estimates were based on the total footprint area indicated on the layout maps as no detail design of the plant is available as yet. With more detailed design drawings, a more accurate estimate will be possible. As this closure plan is only developed conceptually, a more detailed cost estimate is not yet required. The following items are included in the closure and rehabilitation plan for the project.

The assessment of and criteria attached to the following infrastructure elements are discussed in further detail in the Mine Closure and Rehabilitation Report (APPENDIX U):

- Dismantling of Processing Plant and Related Structures
- Demolition of Housing and Administrative Facilities:
- Rehabilitation of Access Roads:
- Sealing of Shafts, Adits and Inclines
- Rehabilitation of Overburden and Spoils:
- Rehabilitation of Processing Waste Deposits:
- Fencing

- Water management
- General Surface Rehabilitation
- Monitoring and Management

14.5 Financial Estimate of Rehabilitation and Closure Financial Liability

This section summarizes the financial provision for closure calculated for the activities and infrastructure described in this document. All calculations are according to the criteria as set out in Section 9 of the Mine Closure Plan (APPENDIX U) and in line with the DMR's Mine Closure Quantum Guideline document. As per the guideline, additional weighing factors have been taken into account in the calculations. The classifications can be seen in Table 14-1 and Table 14-2.

Table 14-1 Weighing Factor 1

Weigh Factor 1	Flat	Undulating	Rugged
Nature of Terrain/Accessibility	1.00	1.10	1.20

Table 14-2 Weighing Factor 2

Weigh Factor 2	Urban	Peri-urban	Remote
Proximity from Urban Area	1.00	1.05	1.10

In this case a first (terrain) weighting factor of 1.15 has been taken into account in the calculations as the nature of terrain varies between rugged (mountainous area) and undulating (general project area). For the second weighting factor (proximity) a value of 1.10 was used, taking into account that the project is approximately 65km from the nearest large urban centre (Polokwane). These weighting factors are added to the subtotal cost calculations before the addition of preliminary and design costs and contingencies.

Rates are based on knowledge of rates from previous and current projects, but must be reassessed in the implementation phase of the project. 'Preliminary and General' (P&G) and 'Detail Design' have been included in all cost estimates. The 'Detail Design' rates were based on rates as provided by the Engineering Council of South Africa.

'Immediate Closure Provision' refers to the projected 'lights-out' closure scenario at the end of the first year of mining. This is typically the amount that initially needs to be accounted for in the mine's closure liability fund. Once operations commence, this amount should be updated every year as part of the annual liability assessment required by the MPRDA. 'Life-of-Mine' provision refers to the estimated final provision foreseen once all operations have seized and decommissioning and rehabilitation is due to commence.

14.6 Closure and Rehabilitation Conclusions

Based on the calculations of the financial provision for closure for the mining operation proposed for the project, the following conclusions can be made:

- Immediate Closure Liability
  - In the event of an immediate 'lights-out' closure event at the end of the first year of operations, the total financial provision required to successfully rehabilitate the mine is R 22 383m;
- Life-of-Mine Closure Liability
  - Final LOM closure liability, without any progressive rehabilitation actions is estimated to be R 215 756m;
  - R 10 664m of the final LOM liability is to be planned for during the 60 year operational phase of the mine at a rate of R0.62 per ton of material processed; and
  - R 205 091m will be required for the rehabilitation, closure and aftercare in the case of successful progressive rehabilitation during the operational phase.

Table 14-3: Summary of Financial Provision for Rehabilitation and Closure

ITEM No	DESCRIPTION		IMMEDIATE CLOSURE PROVISION		LIFE-OF-MINE CLOSURE PROVISION		
			CLOSURE ZAR	AFTERCARE ZAR	OPERATIONAL ZAR	CLOSURE ZAR	AFTERCARE ZAR
1	MINE, PROCESSING PLANT AND RELATED STRUCTURES		R 3,690,469	R -	R -	R 49,206,247	R -
2	WORKSHOPS AND ADMINISTRATIVE FACILITIES		R 2,289,782	R -	R -	R 7,632,606	R -
3	REHABILITATION OF ACCESS ROADS		R 101,630	R -	R 609,777	R 1,422,814	R -
4	SEALING OF SHAFTS, ADITS AND INCLINES		R 172,500	R -	R -	R 3,450,000	R -
5	REHABILITATION OF OVERBURDEN AND SPOILS		R 370,737	R -	R 3,294,500	R 4,944,110	R -
6	REHABILITATION OF PROCESSING WASTE DEPOSITS AND EVAPORATION PONDS		R 253,862	R -	R 2,820,693	R 2,820,693	R -
7	GENERAL SURFACE REHABILITATION		R 53,817	R -	R -	R 107,634	R -
8	FENCING		R 348,000	R -	R -	R 348,000	R -
9	WATER MANAGEMENT		R 429,740	R -	R -	R 429,740	R -
10	MONITORING AND MANAGEMENT		R 3,976,303	R 5,292,526	R 1,364,832	R 78,161,238	R 7,056,702
	SUBTOTAL 1		**R 11,686,839**	**R 5,292,526**	**R 8,089,802**	**R 148,523,080**	**R 7,056,702**
	Weighting Factor 1: Nature of Terrain	1.02	R 233,737	R 105,851	R 161,796	R 2,970,462	R 141,134
	Weighting Factor 2: Proximity to Urban Area	1.05	R 584,342	R 264,626	R 404,490	R 7,426,154	R 352,835
	SUBTOTAL 2		**R 12,504,918**	**R 5,663,003**	**R 8,656,088**	**R 158,919,696**	**R 7,550,671**
	Preliminary and Provisional Costs	8%	R 1,000,393	R 453,040	R 692,487	R 12,713,576	R 604,054
	Detail Design Costs	4%	R 500,197	R 226,520	R 346,244	R 6,356,788	R 302,027
	Contingency	10%	R 1,400,551	R 634,256	R 969,482	R 17,799,006	R 845,675
	TOTAL FINANCIAL PROVISION		**R 15,406,059**	**R 6,976,820**	**R 10,664,300**	**R 195,789,065**	**R 9,302,426**

15 CONCLUSION & RECOMMENDATIONS

In assessing the environmental feasibility of the proposed project, the requirements of all relevant legislation has been considered. This relevant legislation has informed the identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project. The conclusions of this Environmental Impact Assessment Report are the result of comprehensive studies and specialist assessments. These studies were based on issues identified through the Scoping process and the parallel process of public participation. The public consultation process has been thorough, taking the time available into account, and every effort has been made to include representatives of all stakeholders within the process.

15.1 SPECIALIST CONCLUSIONS & RECOMMENDATIONS

The preceding chapters of this report provide a detailed assessment of the predicted environmental impacts on specific components of the social and biophysical environment as a result of the proposed project. This chapter concludes the EIR report by providing recommendations on the various key areas as identified during the environmental assessment process evaluation of the most important environmental impacts identified through the process. It draws on the information gathered as part of the process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion about the proposed project.

It is recommended that the following issues undergo further investigation, following authorization and prior to construction, to reduce uncertainty:

- Heritage Resources (further heritage survey of TDF footprint, Phase 2 Archaeological Impact Assessment, Palaeontological Impact Assessment);
- Fishway Needs and Design Criteria Assessment
- Air, noise, water monitoring and aquatic bio-monitoring will be conducted prior to construction to determine a baseline. Thereafter, environmental monitoring will be conducted throughout the operational phase.
- Socio-Economic impacts will be assessed continuously as part of the public participation process conducted according to the requirements of the MPRDA as part of the Mining Right Application (MRA).

Extensive site specific recommendations have been made in the detailed specialist assessments (attached hereto) and EMP. The following section serves as a summary of the overall management recommendations as part of this Environmental Study. Also refer to the overall sensitivity map (Figure 6-35):

15.1.1 Ecological Impact Conclusions & Recommendations

Conclusion:

The proposed site for the development does not occur in a unique vegetation entity on the lower lying plains in relation to the larger surrounding landscape, although the vegetation associated with the mountainous areas and the Olifants River are sensitive entities that provide valuable habitat features for a large variety of flora and fauna. Extensive efforts have been made to optimize the placement of infrastructural elements as ensure that the impact on the ecosystem functioning will be minimal, if rehabilitation measures are implemented correctly through the development of a rehabilitation plan for the site.

Provided that the proposed mining area is consistent with the sensitivity map and take all the mitigation measures into consideration stipulated in the Ecological Assessment Report (APPENDIX G) and the EMP (to be submitted with the EIR and EMPr), the planned mining development can be supported. Permits for the removal of protected tree species will need to be applied for before construction commences. Only one red data species was found during the survey, namely *Adenia fruticosa*. As the layout plan would not impede into the species' habitat, no further action is necessary.

Recommendations:

- Mitigation needs to be implemented to reduce the impacts from Moderate or High (without mitigation) to Negligible or Low (with mitigation). This will prevent any negative impacts on the ecosystem and will in all probability allow the degraded areas to recover to an enhanced state compared to the current state of the site.

- The preservation of natural ecological corridors in the area should be considered a high priority. These corridors are between the mine development and the ecological sensitive ridge and between the mine development and the Olifants River.

- Rehabilitation must take place concurrently and be done by a team of specialist integrating their expertise in order to ensure effective rehabilitation, also leading to reduced costs of the LoM.

- Establish an on-site nursery and apply for the necessary Tree Permit as budgeted for, in advance.

15.1.2 Aquatic Impact Conclusions & Recommendations

Conclusion:

The water quality in this segment of the Olifants River is generally considered adequate for supporting the aquatic ecology of the area. From the results of the aquatic assessment it is evident that most of the impacts can be considered to be of moderate significance prior to mitigation with only the impact on instream flow and impact on rare and endemic species being low. After mitigation, all impacts can be considered negligible since all the envisaged impacts are deemed to be relatively easily mitigated to levels which are acceptable. It is however of importance to note that the envisaged reduction on impacts are dependent on good levels of mitigation being undertaken in line with best practice protocols.

Based on the findings it is the opinion of the aquatic ecologist that from an aquatic ecological point of view that the proposed mining project be considered favourably provided that the mitigatory measures as presented in the aquatic assessment are adhered to (APPENDIX T).

Recommendations:

- It is recommended that the mine implement an aquatic biodiversity offset through the construction of a fishway at the Lebalelo off take weir in order to improve the continuity of the Olifants River in this area. This will significantly aid in minimising impacts on the aquatic ecology of the area and will offset some of the potential impacts that the mine may have on the Olifants River system.

- Monitoring of aquatic resources is recommended for LoM. In addition, a toxicological monitoring program of the mine's process water is deemed essential in order to determine the risk that the mine poses to the sensitive and important receiving environment. The monitoring program as presented in the aquatic assessment should be implemented.

- The various specialist management measures recommended specifically for the construction of the bridge must be implemented and monitored by the ECO.

15.1.3 Wetland Impact Conclusions & Recommendations

Conclusions:

Three types of wetland systems, namely the larger perennial system (Olifants River), smaller perennial systems (e.g. Pelangwe and Mohlaletsi Rivers) and numerous non-perennial systems, were identified within the mine lease area. The Olifants River is the major perennial system located within the subject property. All systems have been fragmented by current and historic community development and agricultural activities.

The Olifants River had a moderately high ecological function and service provision and is one of the major and important riparian systems in the area. And therefore has a very high conservation value. The smaller perennial systems have an intermediate ecological function and service provision, and are important in terms of flood attenuation by reducing floods and damages from floods. The non-perennial systems have a moderately low ecological function and service provision.

After conclusion of the wetland biodiversity assessment, it is the opinion of the wetland ecologists that the proposed mine development be considered favourably, provided that the recommendations as contained in the wetland assessment (APPENDIX S) are adhered to.

Recommendations:

Extensive site specific recommendations have been made in the Wetland Assessment, the following management recommendations are summarized here:

- A 100 m buffer zone is recommended for the larger and smaller perennial systems, i.e. Olifants, Pelangwe and Mohlaletsi Rivers.
- A 32 m buffer zone is recommended for the non-perennial systems.
- Wetland areas and associated buffer zones must be clearly marked.
- Mining activities are not to infringe upon the wetland boundaries or associated buffer zones. Should it be absolutely unavoidable that mining activities occur within these areas, relevant authorisation should be obtained according to the National Environmental Management Act (NEMA) 107 of 1998 and Section 21 c and i of the National Water Act 36 of 1998 and exemption must be obtained in terms of Regulation GN704 of the National Water Act.

- All areas affected by construction and mining should be rehabilitated upon closure of the mine.

15.1.4 Soil and Land use Management Conclusions & Recommendations

Conclusions:

The soils found on the site are predominantly sandy and susceptible to erosion. The land use is limited to mainly extensive grazing and subsistence agriculture due to climatic and soil constraints. The main risks in the area are related to erosion and the negative impact on subsistence agriculture. The agricultural potential of this area is very low due to the shallow soils as well as the generally low and erratic nature of the rainfall in the area. Post mining agricultural potential depends to a very large extent on the rehabilitation.

Recommendations:

- It is recommended that adequate stormwater management and erosion mitigation should be included from the start of the project.
- It is recommended that the mine could as part of its management of risks institute programs to improve yields in the area through training and improvement of access to fertilisers.
- It is recommended that the maximum volume of usable soil/material has to be stripped in order to secure the maximal thickness of post-closure soils as well as soil material that can be used for capping of waste dumps.
- The soils on the site can be used for rehabilitation post-mining and will, if adequately managed, support vegetation. Care should be taken to maintain the placed soils on level slopes as well as to place original topsoil material over original subsoil material. It is imperative that topsoil be replaced as topsoil and subsoil as subsoil.

The soil and land use characteristics of the site have been taken into consideration during the mine closure costing exercise (APPENDIX J).

15.1.5 Water Impact Conclusions & Recommendations

Conclusion:

Site Characterisation

A hydrocensus within a radius of 5 km from the site was conducted during May 2011 and an updated hydrocensus within a radius of 10 km during May 2012. 51 sites were recorded, of which 26 boreholes are located within the communities surrounding the proposed project area. A total of 35% of the 51 boreholes recorded during the hydrocensus are in use, the remaining 65% of boreholes are not in use. The average water level measured during the hydrocensus was 9.47 mbgl with a minimum measured in BH 9 of 1.53 mbgl and a maximum of 27.69 mbgl in H01-2722.

Seven water supply exploration boreholes were drilled as initial investigation to evaluate the groundwater resources of the regional area as a viable water supply option. Two groundwater types were identified in the project area. A sulphate rich type to the west of the Olifants River and a relatively sulphate poor type to the east of the Olifants river. As such, two baselines were developed for the project area. Both baselines were classed as dangerous for domestic usage.

Isotope analyses concluded that based on chemical results a clear difference exists between the Olifants River and groundwater. No inflow of river water occurred into the groundwater abstracted during the pump testing. This may however change with time if abstraction continues and river water enters the aquifer.

Environmental Site Water Balance

An environmental site water balance was compiled. The average make-up water use would be 10 352 m^3/d (119.8 ℓ/s) for mining, plant and potable water requirements, which represents 1.04 m^3/ton milled. The potable component would be 615 m^3/d, and the drinking water component would be 15 m^3/d.

Groundwater Balance

A groundwater balance concluded that sufficient recharge to groundwater regime exists therefore making it a viable option for future expansion.

Groundwater Flow Modelling

A numerical groundwater flow model was developed for the sub catchment using the modelling package Feflow 5.4. The model domain measured 728.88 km^2 in surface area. The groundwater flow direction shows that the hydraulic gradient is from the topographical high in the south towards the Crocodile River in the North West.

A conservative approach based on the precautionary principle was followed in the simulations. The dykes were assumed to be permeable and the faults younger than the dykes. This results in a larger radius of influence; however, once data becomes available, the model should be updated and re-calibrated accordingly

Mine Dewatering

Simulated mine dewatering reaches a maximum of 85 ℓ/s (7344 m³/d). Evaporation losses in the underground mine can significantly reduce this volume by up to 50 %.

Contaminant Transport

The contaminant transport was simulated with the combined mine dewatering and water supply to model maximum impacts.

The maximum sulphate parameter simulated during the geochemical assessment possibly leaching from the TDF is 2400 mg/ℓ. Both point sources i.e. the TDF and WRD were simulated to increase linearly from the baseline concentrations of 1000 mg/ℓ for sulphates to the maximum fluf assigned i.e. 2400 mgℓ/

The underground mine acts as a sink in the numerical flow model and induces a hydraulic head gradient towards the underground mine. This will cause seepage to travel along this head gradient towards the underground mine. The weathered aquifer could act completely different with hydraulic gradients in the opposite direction. Thus shallow and deep boreholes should be drilled around the WRD to assess the potential for seepage in all directions.

Waste rock dump and leachate characterisation

Groundwater and leachate mixing was modelled in order to determine the effect the leachate may have on the composition and quality of groundwater. The modelling results indicated that the groundwater composition after mixing of the leachate with the groundwater to the east of the Olifants River was only marginally affected. Elevated sulphate, calcium, chromium and aluminium concentrations above baseline values are an indicator that these elements may be potential contaminants on the system and must be monitored. The groundwater to the west of the Olifants river is of such poor quality that the addition of the leachate in a 1:10 ratio caused dilution and hence improvement of the water quality.

Model uncertainties were evaluated and of most significance is the control sulphide minerals have on the system. An increase in sulphur of less than 1 wt. % S cannot effectively be buffered through silicate weathering in this system. The resultant leachate will be of acidic nature opposed to a neutral/alkali composition. Low pH values will allow for the mobilisation of metals which may potentially further degrade surface and groundwater systems.

Recommendations:

The following recommendations are provided regarding the water provision and water management for the development:

- A weather station should be installed at site.
- A detailed water monitoring protocol has been compiled which must be followed (Refer to APPENDIX W).
- LMON 2 should be equipped and used as water supply borehole during construction. The borehole should be subjected to a 96 hour constant head test to evaluate sustainability and catchment area.
- Local aquifers and geological lineaments should be explored to supplement the mine water supply with process water derived from sustainable developed groundwater resources.
- The mine water inflow should be mitigated with cover drilling to allow the pressure head in permeable or fracture zones to drop before development through these zones take place or an approach of sealing (grouting etc.) of fractures could be adopted.
- A detailed surface water study should be done to ensure that inflows via shafts and portals and the Olifants River do not occur. A flow station should be constructed up and down stream of the site to measure flows in the Olifants River and address any loss thereof due to mine dewatering once operational.
- The groundwater flow model should be updated every 2 years and calibrated against newly required and measured monitoring data.
- Should abstraction of groundwater continue at borehole LMON 9, it is recommended that sampling and isotope analysis be conducted regularly.
- To obtain a better understanding of groundwater flow in this area between LMON 9 and the river; a detailed study of geological structures that could form a barrier between the river and LMON 9 could be conducted.
- Detailed studies should be conducted to investigate possible water resources in the future and groundwater exploration should be conducted and a well field should be implemented to supplement the outstanding water requirement.

- Additional groundwater seepage capturing boreholes should be drilled below i.e. downstream of the TDF within the neck of the Phosiri Dome and downstream of the WRD.
- Stormwater harvesting should be implemented on the TDF i.e. all stormwater should be captured and redirected to the return water sump for reuse in the mine circuit.
- Clad and isolate the TDF and WRD to limit ingress and recharge to these facilities and minimise potential leaching into the groundwater
- A grout curtain should be installed south of the TDF in the neck of the Phosiri Dome, roughly 350 m wide and 150 m deep. This grout curtain should seal the fracture running along the neck of this dome. If springs develop between the grout curtain and the TDF wall due to the hydraulic head difference, phytoremediation and evaporation ponds should be used to capture this seepage and limit potential flow towards the Olifants River.
- Aquifer tests should confirm the success of the grout curtain after the construction there-of.
- The radius of influence due to mining will decrease; however, a permanent radius of influence could exist. Affected groundwater users should be compensated.
- Simulate post closure geochemical leaching and quantify possible AMD generation, metal leaching
- Follow-up geochemical studies are required to specifically determine the sulphide content of the waste to be deposited on the waste rock dumps and tailings facilities.

15.1.6 Stormwater Management Conclusions & Recommendations

Conclusion:

This study and al supporting clean and dirty water management structures was designed in accordance with sections 6 of the GN704.

Recommendations:

The following recommendations are provided regarding stormwater management:

- The dirty water collected on the tailings dam facility (TDF) should be encouraged to seep into the TDF or stored in the return water dam to minimize the required volume of the stormwater dam on site;
- A specialist study should be conducted to investigate the possibility of replacing the stormwater channels with manmade marshes in cascading ponds to treat the dirty water sufficiently to discharge or re-use. This approach could eliminate the need for post closure stormwater infrastructure; and
- Design the manmade marshes to also treat the sewage generated on the plant and discharge it with the dirty water.

15.1.7 Air Quality Impact Conclusions & Recommendations

Conclusions:

Without mitigation in place the proposed operations are likely to result in high PM2.5, PM10 GLCs outside the mine boundary and at the settlements nearby and slightly elevated NO2 and DPM GLCs and dust fallout outside the mine boundary and at the settlements nearby. With mitigation, the PM2.5, PM10 impacts reduce significantly but still do not comply with the NAAQS at some of the sensitive receptors and off-site.

The reason for this is that the annual baseline concentration used in determining the cumulative concentrations is high and exceeds the NAAQS. The baseline concentration used was obtained from model results and is for Limpopo which is more than 50 km away from the site. This means the concentration may not be representative of the baseline ambient PM10 concentrations on site.

It is however likely that if the suggested recommendations are implemented that there will be compliance off-site and at all sensitive receptors.

Recommendations:

With regards to the expected impact on air quality it is recommended that:

- Baseline air quality monitoring should be conducted to establish an accurate ambient baseline for the project area. This could reduce the modelled PM10 concentrations and the possible air quality impact.

- That the proposed management and mitigation measures contained in APPENDIX W and in the Air Quality Impact Assessment (APPENDIX L) are implemented by the mine.

- That the silt content of the on-site unpaved roads be sampled and analysed in order to determine the actual silt content of the road material on-site. The current silt content was assumed to be 13%. By halving the silt content, the emissions from the unpaved roads would reduce by between 46% for PM10 and 38% for TSP.

- That the wind speed gauge of the weather station be tested. The wind direction was confirmed through MM5 data but the wind speed in general is very low with an exceptionally high percentage of calm conditions.

- That the emissions from underground mining activities and the ventilation shaft be measured to ensure the impacts are below the ambient air quality and OHS limits. Therefore, monitoring of the ventilation shaft stacks and crusher baghouses are recommended.

15.1.8 Heritage Impact Conclusions & Recommendations

Conclusions:

Stone Age material dating to all periods of the Stone Age occur within the study area. Of the identified sites, only SA01 will be impacted upon by the proposed mining development.

A large number of sites dating to the Earlier and Later Iron Age occur within the project boundary. These sites range from medium to high heritage priority. The mining development does not adversely or positively affect the heritage resources at these sites and therefore the impact is considered to be none.

Sites dating to the Historical / Colonial Period in the project site relate to ruined farmsteads, stone wall enclosures and middens. The sites are generally of medium-low significance due to poor preservation. Site HP06 is located close to or within the proposed mine development margins and may potentially be damaged or lost.

Twenty-six graves were identified in the project area. Small cemeteries and graves in the study area outside of proposed mine development zones are of heritage priority and carries high significance ratings. However, since the sites are away from the proposed mine, the impact by the proposed activity is considered to be none. A number of burials and cemeteries will be directly impacted upon by the construction of the TDF and WRD and will need to be fenced off or relocated.

Due to the significant impact on heritage resources from the proposed development, there is a risk of delay in the project due to SAHRA delaying in issuing authorisations. A significant number of burial places will need to be relocated and this is an extremely complicated, time consuming and sensitive process. Community opposition in this regard could result in delays in the project. Therefore, a full social consultation process with both the communities and SAHRA should occur well in advance.

Recommendation:

- Since the palaeontological sensitivity of rock units within the study area is generally low the impact significance of the proposed mining activities as far as fossil heritage is concerned, is likely to be small. However, a Palaeontological Impact Assessment is recommended.
- It is recommended that Site SA01 be recorded and that site monitoring be done if any construction activities take place in the vicinity of the site.
- Should any phase of development impact on heritage sites, it is recommended that a Phase 2 Archaeological Impact Assessment is carried out prior to commencement of development.
- Should Site HP06 be impacted by development activities, it is recommended that the site be documented and that a destruction permit be acquired from SAHRA.
- A conservation buffer zone of at least 50m should be established around all graves and cemeteries. In addition, it is recommended that all cemeteries and burial places be properly fenced and access control be implemented.
- Full grave relocations are recommended for graves that are directly impacted by the development.
- It is highly likely that further burials will occur in areas demarcated for development and it is recommended that a dedicated field survey with the assistance of relatives and affected families be done in order to document all graves in the project area, with emphasis on the TDF footprint.
- A careful watching brief monitoring process is recommended for all stages of construction and infrastructure development. Should any subsurface paleontological / archaeological / historical material be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately

15.1.9 Social Impact Conclusions & Recommendations

Conclusions:

The proposed Lesego Mine will be situated in an area that is in dire need of economic development. It is an area of little economic opportunity, high levels of unemployment and severe poverty. The mine will change this environment dramatically. It is undeniable that this change will cause major social impacts, both positive and negative. During the life of mine the mine will provide an entire generation with new opportunities to escape the poverty cycle.

The nature and scale of the potential positive impacts associated with the mine is significant, and if managed and mitigated correctly, it would assist the government towards achieving some of the Millennium Development Goals, especially in the Limpopo Province.

Although there will be negative social impacts, it can be mitigated. In the light of the findings of the SIA and the potential positive impacts associated with the mine, it is recommended that the mine proceed.

Recommendations:

The following general recommendations are made:

- Compile and implement a community relations strategy;
- Appoint a stakeholder relationship manager to assist with management of social impacts and dealing with community issues;
- Create a community liaison forum;
- Install proper grievance and communication systems;
- Establish an environmental forum;
- Involve the community in the process as far as possible through the relevant forums – encourage co-operative decision-making and management and partnerships with local entrepreneurs;
- Make monitoring activities part of the Safety, Health and Environmental systems;
- Engage with relevant role players e.g. police and municipalities in pre-construction phase to lay the foundation of future working-relationships; and
- Engage and form partnerships with NGO's to assist with the management of social impacts in communities.

The need for the proposed project is undeniable in the current economic conditions. It is therefore recommended that the project proceed. The management of social impacts is a long-term process. It is recommended that the SIA should be updated throughout the life of the mine to accommodate the changing social environment and include new impacts that may occur. In addition, it is recommended that a Socio-economic study be conducted to assess the economic impact of the project on the surrounding businesses and communities.

15.1.10 Health Impact Conclusions & Recommendations

Conclusions:

Based on the estimated increase in the personal risks associated with exposure to criteria pollutants, it is concluded that the increase in risk of all health endpoints assessed increases significantly at the Nkotokwane receptor location, if exposure should occur as modelled. This increase is shown to occur irrespective of the access route alternative. Other receptor locations also indicate increase in the personal risk of mortality associated with particulate and NO_2 exposure, but the increases are not significant. Mitigation of dust emissions significantly reduces the estimated risks associated with particulates for the Nkotokwane receptor location, for both the north and south routes.

Based on the modelled air pollutant concentrations and the results presented above it can be concluded that the northern access route is preferable to the southern access as the potential for health effects associated with the northern route is less significant.

Exposure to DPM was evaluated for both access route alternatives, assuming long-term chronic exposure. The hazard quotients calculated indicate that for either alternative the probability of non-cancer health effects occurring at any of the receptor locations as a result of DPM exposure is low.

It was concluded that the potential for health effects associated with potential contamination of groundwater would have insignificant effect on human health risks in the study area. It has to be noted that the assessment of contaminants in groundwater was based on simple dilution factors that illustrate the effect the addition of contaminates in leachate from only one source may have on concentrations in groundwater.

Recommendations:

- It is recommended that dust mitigation measures, as included in the modelling by the air quality specialist, be implemented to prevent possible health effects associated with particulates generated from vehicle movements.
- It is further recommended that airborne concentrations of PM10 and NO_2 be monitored, specifically in the vicinity of the Nkotokwane residential area. Any exceedence of these values can be regarded as an indication of a potential for health effects and measures should be implemented immediately to reduce

airborne pollutant concentrations.

- As it is uncertain whether there are any other sources that may contribute to the contamination of groundwater it is recommended that contaminant concentrations in groundwater be monitored on a regular basis to ensure water quality is not adversely affected by the activities associated with the proposed Project. It is further recommended that concentrations of calcium and sulphate be included in this groundwater monitoring programme. Although there are no significant health effects associated with calcium and sulphate in groundwater, high concentrations of these ions can have a detrimental effect on the acceptability and suitability of water.

15.1.11 Visual Impact Conclusions & Recommendations

Conclusions:

The visual impact of the proposed mine development will be intrusive to the area and this is mainly due to the fact that the dominant land use in the area is rural residential and the mine will not blend into this environment. The Plant, TDF and Waste Rock Dumps will be positioned within the valley area to the northeast of the Phosiri Dome while the TDF is nestled in the valley created by the converging hills. The project structures are tall and this, together with the position of the structures, results in a high visibility for the proposed Project. The intensity of the visual impact of the proposed Project would be moderate for the construction and decommissioning phase but high for the operational phase.

The significance of the visual impact during the construction and operational phases will be high. The visual impact would be mitigated to moderate for the majority of the elements with some remaining high assuming that mitigation measures as described in this report and other specialist reports is adequately implemented.

Recommendations:

Mitigation measures would be feasible and effective in reducing the visual impact on some residential views from within the proposed mining boundary and surrounding residents. It is proposed that the following actions be implemented:

- It is recommended that all existing natural vegetation be retained where possible and incorporated into the site rehabilitation as the vegetation will form a visual screen for some viewers located close to the proposed site.
- It is recommended that an ecological approach to rehabilitation and vegetative screening measures, as opposed to a horticultural approach to landscaping should be adopted. A registered landscape architect should be consulted for this purpose.

- The TDF should be vegetated in order to control the dust but also to blend the TDF into the surrounding environment.
- During construction, operation, decommissioning and closure of the development, access roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.
- Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances.
- It is recommended that as far as possible concurrent rehabilitation should take place to minimize the intensity of the visual impact.
- It is recommended that a registered Landscape Architect (SACLAP) should be appointed to design the relevant mitigation measures and to ensure that they are effectively implemented.

15.1.12 Noise Impact Conclusions & Recommendations

Conclusions:

The noise assessment indicated that there is a noise impact of moderate significance during the construction phase and of negligible significance during the daytime operational phase and a noise impact of low significance at night during the operational phase. Mitigation measures were proposed that would reduce the noise levels as experienced by the closest noise-sensitive developments, with the magnitude of the reduction depending on the selection of the mitigation measures.

Recommendations:

It is highly recommended that the developer investigate the feasibility of moving the waste rock dump to a location between the community and the proposed mine. Should the waste rock dump be located further than 400m from the closest noise-sensitive development, the impact can be reduced to low.

It is recommended that quarterly noise monitoring be conducted by an acoustical consultant for the first year of operation, and, depending on the findings of the monitoring report, to be extended, reduced or stopped. Noise measurements should be conducted over a period of 24 hours.

It is further recommended that a noise monitoring programme should be implemented in the operational phase and additional measurements should be taken at the location of any receptors that have complained to the mine regarding noise originating from the operation.

15.1.13 Traffic Impact Conclusions & Recommendations

Conclusions:

There are currently no surfaced roads up to the proposed surface infrastructure of the mine site. In order to obtain access to the mine, new roads will have to be constructed and sections of existing roads upgraded. At this stage there is still uncertainty about where the product will go, and two road transport options were modelled in the traffic assessment. One taking product to the Anglo Smelter close to Polokwane and the other to a smelter in Rustenburg.

The product that will be transported will be in a concentred form and 8 to 10 x 30-ton truck loads are expected per day, 5 days per week. The traffic assessment concluded that there is capacity to accommodate the additional 8 to 10 truck trips per day during the week. Furthermore, from a traffic flow point of view the proposed mine can be supported.

Recommendations:

The following recommendations were made:

- Access be obtained via the upgrading of Road D4065 from Road D4066 to the mine.
- Access to the mine can also be obtained via a southern access road from Road D2450 with a bridge over the Olifants River.

A number of recommendations were made with regards to upgrades at the following intersections:

- Intersection R37 and Anglo Plant access
- Intersection D4066 and R37
- Intersection D4066 and D3612
- Intersection D4066 and D4065
- Section D4250 and southern access road

It is recommended that facilities be provided on-site at the mine to accommodate public transport operators, buses and minibus taxis, and the safe loading and off-loading of passengers.

15.1.14 Floodline Impact Conclusions & Recommendations

Conclusions:

All mine infrastructure is situated outside the 1:100 year floodline.

Recommendations:

The following recommendations were made:

- An early warning system should be implemented to warn management of imminent floods.
- A follow-up study should be conducted during the EIA phase.

15.1.15 Economic Impact Conclusions & Recommendations

Conclusions:

The proposed Lesego Platinum Mine will have a significant positive effect on the national economy in terms of stimulation of domestic production, job creation, government revenue, and export earnings. The proposed project is also expected to bring a much needed rejuvenation to the local economies that face high unemployment and poor economic growth rates. The project has the ability to increase the size of the local economies by between 15 to 21% and reduce the combined unemployment rate from 25.4% to 17.6%. Furthermore, the project falls within the developmental priorities of the local municipalities that have identified the expansion of the mining sector as one of the means to develop the local economies and uplift its communities. Based on the above, it can be safely concluded that the proposed project will be highly beneficial for the domestic economy and local communities. From the economic perspective, it should be approved for development.

Recommendations:

The following recommendation was made:

- From an economic perspective, the project should be approved for development.

15.1.16 Mine Closure & Rehab Conclusions & Recommendations

Conclusions:

Based on the calculations of the financial provision for closure for the mining operation proposed for the Lesego Platinum Mine Project, the following conclusions can be made:

<u>Immediate Closure Liability</u>

- In the event of an immediate 'lights-out' closure event at the end of the first year of operations, the total financial provision required to successfully rehabilitate the mine is R 22 838 m;

<u>Life-of-Mine Closure Liability</u>

- Final LOM closure liability, without any progressive rehabilitation actions is estimated to be R 215 756;

- R 10 664m of the final LOM liability is to be planned for during the 22 year operational phase of the mine at a rate of R0.55 per ton of material processed; and
- R 205 091m will be required for the rehabilitation, closure and aftercare in the case of successful progressive rehabilitation during the operational phase.

Recommendations:

Based on the conceptual closure plan described above it is recommended that the following actions be taken in order to better quantify the closure provision in subsequent project stages:

- Develop a Implementation-level closure plan that will incorporate final design information;
- Develop a funding model together with a mine rehabilitation specialist and a qualified financial planner;
- Progressive rehabilitation has been included in more DFS closure plan and the mine must ensure that provision for progressive rehabilitation is incorporated into the operational cost of their activities; and
- A detailed rehabilitation and closure implementation plan must be developed and incorporated into the mine's Environmental Management Plan (EMP).

15.2 CLOSING STATEMENT & WAY FORWARD

The findings of the specialist studies undertaken within this EIA provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that provided that the recommended mitigation and management measures are implemented there are no environmental fatal flaws that should prevent the proposed project from proceeding.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA and EMP will form part of the contract with the contractors appointed to construct and maintain the proposed plant and associated infrastructure. The EIA and EMP would be used to ensure compliance with environmental specifications and management measures. The implementation of this EIA and EMP for key cycle phases (i.e. construction and operation) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

15.2.1 Way forward

1. Draft EIR and EMPr published. This draft EIR and the EMPr will be circulated to registered interested and affected parties for comment for a period of 30 days. Notifications of the availability of the reports and the venues at which the full EIR will be available for reviewing will distributed to all registered interested and affected parties.

2. Comments Report. Comments on the Draft EIR and EMPr will be synthesised by the project team into a comments report, which will be appended to the final Report.

3. Revise draft EIR and EMPr. This draft report will be updated by addressing and responding to the issues raised during the review period by I&APs. Responses from the proponent to key issues will also be included.

4. Final EIR and EMPR. The revised final report will be published with the various specialist reports appended. This will be submitted to the Limpopo Department of Environment and Economic Development (LEDET) and made available for review by I&APs.

16 REFERENCES

Aucamp, I. 2012. Lesego Platinum Mine: Social Impact Assessment, July 2012.

De Jager, M. 2013. Lesego Platinum Mine (Pty) Ltd: Noise Impact Study for Environmental Impact Assessment. M2 Environmental Connections cc. February 2013.

Grobler, Mostert and Stolp. 2011. Pre-Feasibility Study for the proposed Lesego platinum mining activities, Limpopo Province. November 2011.

Havenga, C. Traffic Impact Assessment Lesego Platinum Mine. Corli Havenga Transportation Engineers. November 2012.

Henning, B.J. 2013. An Environmental Report on the Ecology (Flora and Fauna) for the proposed development of the Lesego Platinum Underground Mine and associated infrastructure, Limpopo Province. AGES. January 2013.

Henning, W. 2011. Lesego Platinum Definitive Study: Site Access Road Report. DRA. November 2011.

Kruger, N. 2013. Lesego platinum mine, Sekhukune area, Steelpoort, Limpopo Province: Archaeological Impact Assessment Report. AGES, February 2013.

Leirião, S., Matsebula, T., Hallowes, J. 2013. Lesego Floodline Analysis: Technical Note. January 2013.

Liebenberg-Enslin and Gresse. 2013. Air Quality Impact Assessment for the Lesego Platinum Mine in Limpopo Province, South Africa. January 2013.

LNR. 2011. Wind data for weather stations 30744, 30757 and 30883.

Meyer, W.J., Van Coller, A. 2013. Lesego Platinum Mine: Water Specialist Study for the purposes of an EIA and Water Supply, February 2013.

Mucina and Rutherford. 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Ncube, D et al. 2010. Lesego Platinum Project: Scoping Study Report.

Plomp, H. 2004. A process for assessing and evaluating environmental management risk and significance in a gold mining company. Conference Papers-Annual National Conference of the International Association for Impact Assessment: South African Affiliate.

Potgieter, N. 2013. Human Health Risk and Impact Assessment for the proposed Lesego Platinum Mining Project, Limpopo Province. Envirosim Consulting. January 2013.

Theron, C.F. 2013. Lesego Platinum Mine: Definitive Mine Closure Plan and Estimate of Financial Provision. February 2013.

Theron, C.F. 2013. Lesego Platinum Mine: Water Supply Definitive Feasibility Study. January 2013.

Urban-Econ Development Economists. 2013. Lesego Platinum Mine, Limpopo – Economic Impact Assessment. July 2013.

Van der Waals, J. 2012. EIA Level: Soil, Land use, Land capability and Agricultural Potential Survey: Proposed Lesego platinum mine, Limpopo Province. Terra Soil, December 2012.

Van Staden, S. 2012. Aquatic Ecological Assessment of the Olifants River and associated drainage features in the vicinity of the proposed Lesego Platinum Mine. SAS 212018. Scientific Aquatic Services, June 2012.

Van Staden, S. 2012. Wetland Delineation, Function and PES Assessment of the aquatic resources in the vicinity of the proposed Lesego platinum mine. SAS 212018. Scientific Aquatic Services, June 2012.

Young, G. & Smit, F. 2012. Visual Impact Assessment Report: Definitive Feasibility Phase for the proposed Lesego Platinum Mine, Limpopo Province. July 2012.

http://www.miningweekly.com/print-version/government-impelling-local-pgm-beneficiation-2012-02-03

http://www.bullion.org.za/content/?pid=86&pagename=Platinum

APPENDIX A PUBLIC PARTICIPATION

APPENDIX A 1 BACKGROUND INFORMATION DOCUMENT AND REGISTRATION FORM

APPENDIX A 2 CORRESPONDENCE TO AND FROM I&AP'S

APPENDIX A 3 PROOF OF DELIVERY – NOTIFICATION LETTERS

APPENDIX A 4 SITE NOTICES

APPENDIX A 5 PROOF OF SITE NOTICES

APPENDIX A 6 NEWSPAPER ADVERT

APPENDIX A 7 PROOF OF NEWSPAPER ADVERT

APPENDIX A 8 ISSUES AND RESPONSE REPORT

APPENDIX A 9 MEETING MINUTES

APPENDIX B CORRESPONDENCE TO AND FROM LEDET

APPENDIX C COMPANY PROFILE AND CV'S OF THE PROJECT TEAM

APPENDIX D LAYOUTS

APPENDIX D 1 PROPOSED LAYOUT

APPENDIX D 2 ALTERNATIVE LAYOUTS

APPENDIX E METHODOLOGY AND IMPACT RATINGS

APPENDIX E 1 IMPACT ASSESSMENT METHODOLOGY

An impact can be defined as any change in the physical, chemical, biological, cultural and/or socio-economic environment that can be attributed to human activities related to alternatives under study for meeting a project need. The assessment of impacts was based on DEAT's (1998) Guideline Document: EIA Regulations. The significance of the aspects/impacts of the process were rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes used the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts was determined through a synthesis of the criteria below:

Probability. This describes the likelihood of the impact actually occurring.

Improbable: The possibility of the impact occurring is very low, due to the circumstances, design or experience.

Probable: There is a probability that the impact will occur to the extent that provision must be made therefore.

Highly Probable: It is most likely that the impact will occur at some stage of the development.

Definite: The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.

Duration. The lifetime of the impact.

Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.

Medium term: The impact will last up to the end of the phases, where after it will be negated.

Long term: The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.

Permanent: Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale. The physical and spatial size of the impact

Local: The impacted area extends only as far as the activity, e.g. footprint.

Site: The impact could affect the whole, or a measurable portion of the above mentioned properties.

Regional: The impact could affect the area including the neighbouring residential areas.

Magnitude/ Severity. Does the impact destroy the environment, or alter its function.

Low: The impact alters the affected environment in such a way that natural processes are not affected.

Medium: The affected environment is altered, but functions and processes continue in a modified way.

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

Significance. This 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.

Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.

Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.

Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.

High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The following weights were assigned to each attribute:

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude/Severity	Low	2
	Medium	6
	High	8
Significance	**Sum(Duration, Scale, Magnitude) x Probability**	
	Negligible	<20
	Low	<40
	Moderate	<60
	High	>60

The significance of each activity was rated without mitigation measures and with mitigation measures.

Impact Assessment and significance rating

This section of the report addresses all possible impacts as a result of the plant's operations during the different phases of development. Impacts during the construction phase were also rated. It must however be noted that impacts during this phase was assumed from information provided by the Applicant.

Impacts on the identified key issues were assessed according to the following structure:

- ***Source of the impact***: to be identified (e.g. vegetation clearance on site, passage of vehicles on dirt roads, etc).

- ***A Description of the impact*** will describe the interaction between the activity and the environment, i.e. how and why the impact occurs and how the activity changes the environment.

- ***Significance:*** an explanation of the significance rating of the impact with and without mitigation, with reference to the impact assessment criteria will be provided. Impacts will be rated as highly significant, or of low significance. Fatal flaws will additionally be identified. There are no mitigation measures which can be implemented to manage a fatal flaw.

- ***Mitigation:*** The mitigation measures that can be implemented to eliminate or minimise negative impacts or result in the optimization of positive benefits must, wherever possible, will be expressed as practical actions.

APPENDIX E 2 AIR QUALITY DETAILED IMPACT ASSESSMENT

Air Quality Impact

The following section was completed with the assistance of the air quality impact assessment conducted by Airshed.

- **Construction Phase**

o **Fugitive dust emissions (TSP, PM10) from construction activities**

Impact Description

The construction operations will include construction of infrastructure such as workshops, stores, offices, parking bays, waste collection and storage areas, change houses, water reservoirs, roads, a TDF, topsoil dump, waste dumps, conveyors, an incline shaft, a ventilation shaft and milling and DMS facilities. These construction activities would result in the generation of fugitive dust such as TSP and PM10.

Significance Rating

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will however reduce the severity to low, thereby reducing this impact from low to negligible.

o **Dust generation (TSP, PM10) from earthworks**

Impact Description

The following earthwork activities during the construction phase will result in fugitive dust emissions:

- Drilling and blasting activities
- Clearing, grubbing and bulldozing activities
- Soil excavation
- Stockpiling of topsoil, waste and other material
- Disposal and treatment of contaminated soil

Significance Rating

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as probable. The impact will be limited to the local extent and has therefore been rated as negligible.

- **Dust generation (TSP, PM10) from site development activities**

  Impact Description

  The following site development activities during the construction phase will result in fugitive dust emissions:

  - Clearing of vegetation and topsoil
  - Bulldozing
  - Road grading
  - Backfill of material from borrow pits
  - Opening and management of borrow pits

  Significance Rating

  The above mentioned impact has medium term duration and a low severity. The probability of occurrence has been rated as probable. The impact will be limited to the local extent and has therefore been rated as negligible.

- **Vehicle entrained dust and gaseous emissions**

  Impact Description

  The clearing of areas for the construction of new on-site roads and the use of these roads will result in TSP and PM10 emissions. The operation and movement of construction vehicles and machinery on unpaved roads will also contribute to fugitive dust. In addition, the tailpipe emissions from vehicles and construction equipment such as graders, scrapers and dozers will result in gaseous emissions.

  Significance Rating

  The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will however reduce the severity to low, thereby reducing this impact from low to negligible.

- **Dust generation (TSP, PM10) and gaseous emissions from blasting**

  Impact Description

The excavation of foundations, construction activities and the storage and handling of material will contribute to fugitive dust emissions. Blasting activities will also result in gaseous emissions.

Significance Rating

The above mentioned impact has medium term duration and a low severity. The probability of occurrence has been rated as improbable therefore the impact has been rated as negligible.

- **Operational Phase**

There are two transport options available for the transportation of product from the plant to off-site. Scenario 1 involves the use of the north access road and Scenario 2 involves the use of the south access road. Both options were modelled in terms of air quality and their impacts are assessed below.

- **Vehicle activity on unpaved haul roads**

Impact Description

Vehicle-entrained dust from unpaved roads is a significant source of dust, especially where there are high traffic volumes on a road and/or the road is utilised by heavy equipment. The force of the wheels travelling on unpaved roads causes the pulverisation of surface material. Particles are lifted and dropped from the rotating wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. The quantity of dust emissions from unpaved roads will vary linearly with the volume of traffic expected on that road.

Significance Rating – Scenario 1 & Scenario 2

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however not reduce the significance of the impact and the impact will remain high even after mitigation measures have been implemented.

- **Wind-blown dust from waste rock dumps, topsoil dump and TDF**

Impact Description

The proposed tailings disposal facility, waste dump and topsoil dump are the most likely sources of wind erosion. Emissions from the waste dump were calculated to be insignificant due to the size of the material on the dumps and the moisture content of the material. Emissions from the tailings disposal facility were calculated to be insignificant due to the moisture content of the material. The topsoil dump is thus the main source of windblown dust.

Significance Rating – Scenario 1 & Scenario 2

The above mentioned impact has long term duration and a low severity. The probability of occurrence has been rated as probable and therefore the significance of the impact can be considered as negligible.

- **Handling of materials during operations**

Impact Description

The handling of waste rock, ore and crushed ore are potential significant sources of dust generation at the various transfer points between the shaft, the Merensky and UG2 stockpiles, the waste dump and the fines stockpiles. Conveyor transfer points also constitute tipping point where dust emissions are generated. The handling of product is a lesser source as it does not consist of as many handling actions. The quantity of dust generated depends on various climatic parameters, such as wind speed and precipitation, in addition to non-climatic parameters such as the nature and volume of the material handled. Fine particulates are most readily disaggregated and released to the atmosphere during the material transfer process, as a result of exposure to strong winds. Increases in the moisture content of the material being transferred will decrease the potential for dust emission, since moisture promotes the aggregation and cementation of fines to the surfaces of larger particles.

Significance Rating – Scenario 1 & Scenario 2

The above mentioned impact has long term duration and a low severity. The probability of occurrence has been rated as probable, thus rating the significance of the impact as negligible.

- **Gaseous emissions from the ventilation shaft stack and primary and secondary crushers' baghouses**

Impact Description

In the estimation of ventilation emission, use was made of the PM ACGIH TLVs for PM2.5, PM10 and TSP emission rates and the miscellaneous vehicle exhaust emission factors for DPM, CO, SO2 and NOx emission rates. Compared with other platinum mines where measured data is available, the calculated emission rates for PM2.5, PM10 and TSP are high; however, as a conservative approach the higher emissions rates were used.

In the estimation of crusher baghouses' emissions a general emission from baghouses was assumed. To be conservative the emissions from mitigated crushers were used rather than the baghouse emissions as the crusher emissions were larger.

Significance Rating – Scenario 1 & Scenario 2

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as improbable for Scenario 1 but definite for scenario 2. The significance rating for Scenario 1 was calculated as negligible while Scenario 2 is moderate. Proposed mitigation measures will however reduce the impact for Scenario 2 from moderate to negligible.

- **The primary and secondary crushing or ore**

Impact Description

Crushing operations can be a significant dust-generating source if uncontrolled. Dust fallout in the vicinity of crushers also gives rise to the potential for re-entrainment of dust by vehicles or by wind at a later date. The large percentage of fines in the deposited material enhances the potential for it to become airborne.

Primary and secondary crushing will occur along the conveyor circuit from the shaft to the mill, and will result in fugitive dust emissions such as TSP, PM10 and PM2.5 if not mitigated.

Significance Rating – Scenario 1 & Scenario 2

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will however reduce the occurrence of the impact to improbable, thus reducing the significance from low to negligible.

- **Post-operational / Closure Phase**

- **Sealing of shafts and inclines and associated infrastructure removal**

Impact Description

Sealing of the shafts and inclines as well as the associated infrastructure removal will result in the generation of TSP and PM10 emissions.

Significance Rating

The above mentioned impact has medium term duration and a low severity. The probability of occurrence has been rated as improbable, and therefore the significance of the impact can be considered negligible.

- **Recovering of materials from stockpiles**

Impact Description

The removal of materials from stockpiles and waste dumps as part of rehabilitation and re-vegetation of the surroundings can result in the generation of TSP and PM10 emissions.

Significance Rating

The above mentioned impact has medium term duration and a low severity. The probability of occurrence has been rated as probable, however the significance of the impact can be considered negligible.

- **Infrastructure removal at the processing plant**

Impact Description

Infrastructure removal at the processing plant site may result in TSP and PM10 emissions.

Significance Rating

The above mentioned impact has medium term duration and a low severity. The probability of occurrence has been rated as improbable, and therefore the significance of the impact can be considered negligible.

- **Infrastructure removal including offices, workshops and housing**

Impact Description

The removal of administrative and human resource facilities, including offices, workshops and housing, may result in the generation of TSP and PM10 emissions.

Significance Rating

The above mentioned impact has medium term duration and a low severity. The probability of occurrence has been rated as improbable, and therefore the significance of the impact can be considered negligible.

- **Operation and movement of vehicles on unpaved roads**

Impact Description

Vehicle entrainment on unpaved road surfaces during rehabilitation will result in the generation of TSP and PM10. Tailpipe emissions from vehicles used during the closure phase will also contribute to gaseous emissions. Once rehabilitation has been concluded, vehicle activity on site should cease.

Significance Rating

The above mentioned impact has medium term duration and a low severity. The probability of occurrence has been rated as probable, however the significance of the impact can be considered negligible.

- **Fugitive dust and gaseous emissions from possible blasting**

Impact Description

The demolition of infrastructure may necessitate the use of blasting, which in turn will result in the generation of TSP and PM10 emissions.

Significance Rating

The above mentioned impact has short term duration and a low severity. The probability of occurrence has been rated as improbable, and therefore the significance of the impact can be considered negligible.

APPENDIX E 3 SOCIAL DETAILED IMPACT ASSESSMENT

Social Impacts

The following section was completed with the assistance of the social impact assessment conducted by Ptersa (APPENDIX L).

- **Community health and safety impact**

  - **Spread of infectious diseases such as HIV and TB**

Impact Description

HIV/Aids is a national problem in South Africa and is already present in the community. It is likely that the number of HIV positive people in the community will increase due to the presence of the workforce, of which some will probably be migrant workers. In-migration triggers a dramatic rise in the “four M’s”: men, money, movement (influx), and mixing (i.e., the interaction between high and low disease prevalence groups). These factors are the conditions necessary to produce a surge in sexually transmitted diseases.

Infectious diseases such as tuberculosis may increase – this is a risk to the communities and the workforce, and since it is an underground mine where people will work in close proximity to each other in confined areas this risk should be managed from a community and health and safety perspective. In traditional communities there are often prejudices about illnesses such as HIV/Aids, and therefore the mitigation and management of this impact should be done in a culturally sensitive manner. There is currently no cure for HIV, and treatment entails chronic drug use, therefore this impact is seen as a permanent, irreversible impact.

Significance Rating

The above mentioned impact has a permanent duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the occurrence of the impact to probable, thus reducing the significance from high to low.

  - **Pressure on existing health services**

Impact Description

It is anticipated that a significant percentage of the workforce will be recruited from the local community over time and those coming from outside will be integrated into the existing communities. Current health services in the community will not meet the demand created by people moving into the area. It is likely that this situation will change as the area grow, but external factors such as other mines in the area and government decisions may also impact on the situation.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the occurrence of the impact to probable, thus reducing the significance from moderate to low.

Significance Rating – Operational Phase

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from low to negligible

- **Increase in traffic-related incidents**

Impact Description

Many workers would not have their own transport, so buses and taxis will probably be used as modes of transport. The mine will be in a rural area where there are not high volumes of traffic. Pedestrians (especially vulnerable groups like school children and the elderly) are not used to traffic, and most of the roads in the area are gravel roads. Impacts will result from dust and a potential increase in accidents.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from moderate to negligible.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from moderate to negligible.

- **Changes in the social environment**

  - **Change in social fabric**

Impact Description

The project area is rural and social change in the area has been gradual. The proposed mine will expedite social change and this will cause social impacts. New people moving into the area will change the social fabric in the communities. This will impact on the sense of community, traditional values and social capital of the affected communities. Social vices such as alcohol and drug abuse, prostitution and gangsterism may increase. It is possible that the power dynamics in the area will change due to people with different belief systems moving into the area. These people may not recognise the authority of the tribal leadership, or may simply not be used to such a system.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain moderate.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain moderate.

  - **Tension between local residents and newcomers**

Impact Description

Tension between new and old residents in the area can result from a number of factors such as competition for the attention of the opposite sex, newcomers earning more money and thus having more disposable income, availability of opportunities and clashes in culture. There may be an increase in teenage pregnancies due to single young men entering the area where there are limited recreational opportunities.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to low.

Significance Rating – Operational Phase

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the probability of the impact to probable, thus reducing the significance from moderate to low.

- **Formation of informal settlements**

Impact Description

People often migrate to an area looking for opportunities, and then do not have the money to return to their homes. As a result they end up living in shacks in informal settlements. Alternatively one member of a family moves to an area for working opportunities and leaves their family behind. Due to the cost of supporting two households these people often end up living in informal settlements. As the mine will result in an increase in people to the area looking for employment, there is a risk that informal settlements may be created in the immediate area around the mine.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to low.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to low.

- **Improvement in educational facilities**

Impact Description

The employees of the mine will have school-going children. There will thus be a greater need for educational facilities. There are a number of schools in the area and the mine will have a positive impact on the schools by providing parents who can pay school fees, contributions to the school infrastructure, bursaries and exposure of teachers.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however increase the probability of the impact to definite, thus increasing the significance from moderate to high.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however increase the probability of the impact to definite, thus increasing the significance from moderate to high.

- **Increase in crime rates**

Impact Description

More people in an area usually mean an increase in crime levels. Opportunistic criminals make use of the opportunity to conduct their business, and there will be more affluent people moving into the area.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to low.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to low.

o **Local / regional economic impacts**

- **Job creation**

Impact Description

Mining has an undeniable impact on the economic functioning of communities. Unemployment levels in the area are very high, and the Lesego Mine will create over 6000 jobs during the life of the mine. This is a significant positive impact, and will be magnified by supporting businesses that will establish themselves in the area. The economic spinoffs of the proposed projects in terms of the informal economy will also be significant.

Significance Rating – Pre-construction Phase

The above mentioned impact has short term duration and a medium severity. The probability of occurrence has been rated as definite. The impact is positive and the significance is moderate.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The impact is positive and the significance is high.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as definite. The impact is positive and the significance is high.

Significance Rating – Decommissioning

The above mentioned impact has a permanent duration and a high severity. The probability of occurrence has been rated as definite. The impact is positive and the significance is high.

- **Skills development**

Impact Description

As part of their Social and Labour Plan, Lesego Mine will invest in bursaries, internships and other skills development initiatives, some of which has already been initiated. The Lesego Mine will give a much-needed economic injection and bring skills to an area where there is a dire need for development.

Significance Rating – Pre-construction Phase

The above mentioned impact has short term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however increase the severity of the impact to high, thus increasing the significance from low to high.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however increase the probability of the impact to definitive, thus increasing the significance from moderate to high.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however increase the probability of the impact to definitive, thus increasing the significance from moderate to high.

- **Skills shortage**

Impact Description

Due to the lack of development in the area there is a shortage of skilled labour. This will be a significant challenge for Lesego Platinum. Their extended construction period of approximately seven years will provide them with some opportunity to invest in the development of skills of the local people. Other existing mines in the area are the Bokoni Mine, 20 km to the north east of the proposed site, owned by Anooraq and Anglo Platinum and Lonmin Limpopo Mine, ~ 30 km to the west of the proposed site, owned by Lonmin PLC. There are also a number of proposals for mines in the area. It can therefore be anticipated that there will be labour shortages in the area for some time to come, as the demand is far more than the supply.

Significance Rating

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to negligible.

- **Conflict about jobs and benefits**

Impact Description

Given the shortage of opportunities, another potential negative impact that may result from the mine is community conflict about available jobs and distribution of benefits. There are a number of potential beneficiaries involved, including three tribal authorities, two local and two district municipalities. There is therefore potential for conflict on a number of levels – from grassroots to political level.

Significance Rating – Pre-construction Phase

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the occurrence of the impact to probable, thus reducing the significance from moderate to low.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain moderate.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain moderate.

- **Expectations of the community**

Impact Description

There are high levels of expectations amongst community members about the benefits that the mine will bring to the area. Not all of these expectations will be met, and the mine should have a strategy in place that deals with the management of community expectations.

Significance Rating – Pre-construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the duration of the impact to short term, thus reducing the significance from high to moderate.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the occurrence of the impact to highly probable, thus reducing the significance from high to moderate.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain moderate.

- **Local / regional infrastructure impacts**
  - **Services**

Impact Description

Impacts on local and regional infrastructure will be experienced in services such as water, sewage and electricity. The mine will need to access these services, and the local demand for the services will increase as a result of people moving into the area to work at the mine. The government provides most of these services and as a result, the mine would need to enter in negotiations to ensure adequate services are available for their activities, their workers and the surrounding communities. This impact can also have a positive spin-off by bringing additional infrastructure into the area, and leaving the infrastructure behind after decommissioning.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

Significance Rating – Decommissioning Phase

The above mentioned impact has a permanent duration and a high severity. The probability of occurrence has been rated as highly definite. The impact is positive and the significance is high.

- **Transport infrastructure**

Impact Description

Transport infrastructure such as roads and public transport will also be affected as there will be an increase of heavy vehicles and other traffic in the area. This may impact negatively on the quality of the roads. There will also be a greater demand for public transport locally and regionally because of people commuting to work.

Significance Rating – Pre-construction Phase

The above mentioned impact has short term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from low to negligible.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

- **Housing**

Impact Description

Another area of infrastructure which will be affected is housing. There will be an influx of people into the area and due to the skills shortage it is highly likely that a number of these people will be from the outside. It is highly likely that people would have to relocate their entire family to the area. The current housing infrastructure will not be able to meet the demand. Housing for the construction force is another aspect that must be considered. A significant construction force will be required to construct the mine, and the local skills base will not be able to supply the technical skills required for the construction of an underground mine. The construction phase is anticipated to be approximately seven years, which means that the construction workers will need accommodation for that period.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to low.

Significance Rating – Operational Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to negligible.

- **Recreational facilities**

Impact Description

There is currently a shortage of public recreational areas in the surrounding communities. More people in the area will increase the pressure on the recreational areas. This impact can be positive if the mine adds to the recreational areas, or allow the general public to access recreational areas that was established for the staff.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain moderate.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain moderate.

- **Physical environmental impacts**

  - **Loss of livelihoods**

Impact Description

Bio-physical impacts can result in social impacts. The most significant potential social impact is the loss of livelihoods due to impacts on the physical environment. Aspects to consider here is loss of grazing and access to clean water for domestic animals, as subsistence farming forms part of the livelihood strategy of most of the local community.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will reduce the severity of the impact to medium. The impact will however remain low.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

  - **Sense of place**

Impact Description

The impact on the sense of place will take place through nuisance factors such as dust, noise, vibrations and lights at night. From a social perspective it is important to acknowledge that the impacts may occur, and to put measures on communicating the mitigation of these impacts in place. Baseline studies of current conditions should also be conducted and kept to use in the future. Many of the impacts may only surface later in the life of the mine, and to avoid disputes and assist in settling claims, good record keeping of environmental data is essential.

Significance Rating – Pre-construction Phase

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from moderate to low.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

- **Impacts from government and other role players**
  - **Failure of government to deliver essential services**

Impact Description

The government is an important stakeholder in the project, since they will act as a regulatory authority, but also will need to assist with the mitigation of most of the potential social impacts. If the government fails to fulfil their role, the affected communities will experience the worst of the impacts. There is a history of service delivery-protests and leadership struggles in the area. There is potential that the mine might be caught in the middle of these struggles, therefore it is very important for the mine to have good relationship with all the stakeholders.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to low.

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from high to moderate.

- **NGO's opposing the project**

Impact Description

NGO's often perform the role of activists and have an important role to play as part of civil society. There is a risk that they can oppose the proposed mine, or cause conflict in the community through misdirected activism. This impact is more likely to surface in the operational phase of the mine.

Significance Rating – Pre-construction Phase

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from low to negligible.

Significance Rating – Construction Phase

The above mentioned impact has medium term duration and a medium severity. The probability of occurrence has been rated as probable. The proposed mitigation measures will however reduce the severity of the impact to low, thus reducing the significance from low to negligible

Significance Rating – Operational Phase

The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however reduce the severity of the impact to medium, thus reducing the significance from moderate to low.

- **NGO's working in partnership with the project**

  Impact Description

  NGO's can also be engaged with and work in partnership with the mine throughout all the phases of the mine to assist with the management and mitigation of social and environmental impacts, and play a positive role.

  Significance Rating – Pre-construction Phase

  The above mentioned impact has short term duration and a medium severity. The probability of occurrence has been rated as highly probable. The proposed mitigation measures will however increase the severity of the impact to high, thus increasing the significance from low to moderate.

  Significance Rating – Construction Phase

  The above mentioned impact has medium term duration and a high severity. The probability of occurrence has been rated as definite. The impact is positive and the significance is high.

  Significance Rating – Operational Phase

  The above mentioned impact has long term duration and a high severity. The probability of occurrence has been rated as definite. The proposed mitigation measures will however increase the duration of the impact to permanent. The impact is positive and the significance is high.

APPENDIX F SPECIALIST SIGNED DECLARATION OF INDEPENDENCE

APPENDIX G ECOLOGICAL ASSESSMENT (AGES)

APPENDIX H PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT (AGES)

APPENDIX I GEOHYDROLOGICAL AND WATER SUPPLY ASSESSMENT (AGES)

APPENDIX J SOIL, LAND USE AND LAND CAPABILITY AND AGRICULTURAL POTENTIAL ASSESSMENT (TERRASOIL SCIENCE)

APPENDIX K NOISE IMPACT ASSESSMENT (MENCO)

APPENDIX L AIR QUALITY IMPACT ASSESSMENT (AIRSHED)

APPENDIX M SOCIAL IMPACT ASSESSMENT (PTERSA)

APPENDIX N VISUAL IMPACT ASSESSMENT (NEWTON LANDSCAPE ARCHITECTS)

APPENDIX O TRAFFIC IMPACT STUDY (CORLI HAVENGA TRANSPORTATION ENGINEERS)

APPENDIX P HEALTH IMPACT ASSESSMENT (ENVIROSIM)

APPENDIX Q   STORMWATER ASSESSMENT (AES)

APPENDIX R FLOODLINE ANALYSIS TECHNICAL NOTE (DHI)

APPENDIX S WETLAND ASSESSMENT (SAS)

APPENDIX T AQUATIC ASSESSMENT (SAS)

APPENDIX U MINE CLOSURE AND REHABILITATION REPORT (AES)

APPENDIX V ECONOMIC IMPACT ASSESSMENT

APPENDIX W EMP