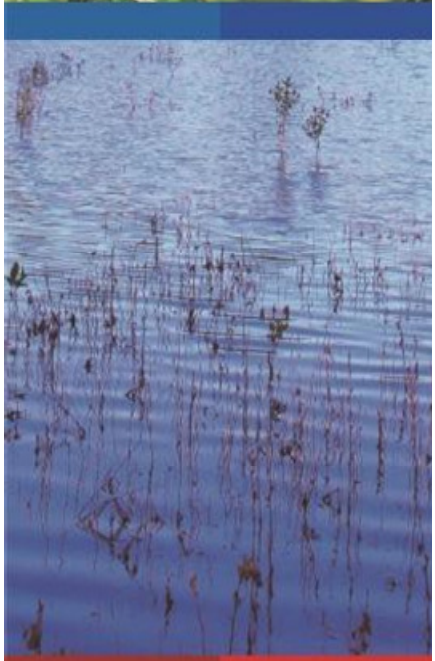

DIGBY WELLS
ENVIRONMENTAL

Proposed Open Pit Magnetite Mine and Concentrator Plant, Mokopane, Limpopo Province

Health Impact Assessment

Project Number:

VMC3049

Prepared for:

Pamish Investments No. 39 (Pty) Ltd

July 2015

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Health Impact Assessment**
Project Name:	**Proposed Open Pit Magnetite Mine and Concentrator Plant, Mokopane, Limpopo Province**
Project Code:	**VMC3049**

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EXECUTIVE SUMMARY

Pamish Investments No. 39 (Pty) Ltd (Pamish) is proposing the development and operation of a new Open Pit Magnetite Mine and associated infrastructure at a site located 45 km northwest of the town of Mokopane in Limpopo Province (the Project).

Pamish holds a prospecting right (LP 95 PR) for an area including the following farm portions: RE of Farm Vogelstruisfontein 765LR, RE of Farm Vliegekraal 783LR, RE of Farm Vriesland 781LR, RE of Farm Schoonoord 786LR, RE and Portions 1,2,3,4,5 and 6 of Farm Bellevue 808LR (Project site). The prospecting right allowed for the prospecting of iron ore, vanadium, titanium and other minerals. The combined area of the prospecting area is 10 109 hectares (ha).

Pamish now wishes to mine the magnetite resources at the Project site. In terms of the requirements of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), (MPRDA) as amended, a Mining Right Application (MRA) must be submitted to the Department of Mineral Resources (DMR) for the Project. In support of the MRA, an Environmental Impact Assessment (EIA) process must be undertaken in accordance with the new EIA Regulations (GN R. 982), December 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). Environmental Authorisation is in addition required for certain listed activities ancillary to the mining operation as contained in the Listing Notices (GN R983, 984 and 985).

Digby Wells Environmental (Digby Wells) has been appointed to undertake all environmental permitting and specialist studies required for the development of the proposed Magnetite Open-Pit Mining Project (the Project). The specialist studies to be undertaken as part of this assignment include a Health Impact Assessment (HIA).

Methodology

A HIA is a practical, multi-disciplinary process, combining a range of qualitative and quantitative evidence in a decision-making framework. A HIA seeks to identify and estimate the lasting or significant changes of different actions on the health status of a defined population. The methodology of this HIA was based on the Good Practice Note (GPN) for HIAs as supported by the International Finance Corporation (IFC). The IFC has published a set of Performance Standards (PS) for large projects that will require international funding. PS4 which deals specifically with Community Health, Safety and Security, recognises that project activities result in both positive and negative impacts to

IFC Performance Standard 4 "Community Health, Safety and Security"

"The client will evaluate the risks and impacts to the health and safety of the Affected Communities during project life-cycle and will establish preventive and control measures consistent with Good International Industry Practice (GIIP), such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognised sources. The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favour the prevention or avoidance of risks and impacts over minimization."

communities. The GPN has been developed specifically to provide guidance on community health for this Standard.

This approach was supported by a systematic and consistent approach to collecting and analysing baseline health data through the Environmental Health Areas (EHA) framework. Twelve different EHAs are described, which provide a linkage between project-related activities and potential positive or negative community-level impacts. This incorporates a variety of biomedical and key social determinants of health. Through this integrated analysis, cross-cutting environmental and social conditions that contain significant health components are identified instead of focusing primarily on disease-specific.

Specific Potentially Affected Communities (PACs) and health impacts related to different activities of the Project have been described.

Activities

The specific activities of the HIA[1] included:

- A desktop literature review outlining the host country and community health profile;
- Collecting primary data by participatory means with the use of semi-structured questionnaires and key informant interviews with relevant stakeholders;
- Collecting additional secondary information that was not available in the public domain that is available in published and grey data;
- Understanding Project designs, present and planned work activities, project schedule and location of PACs;
- Considering the potential future health impact that the Project will have on the health of the respective communities;
- Determining the existing health needs of the community based on health strategies, infrastructure, programs, service priorities, delivery plans and challenges; and
- Developing evidence-based recommendations to avoid/mitigate negative and enhance positive impacts resulting from the Project at the relevant project stage.

The field work was performed by Social Science specialists from Digby Wells. The desktop work was completed in March 2015. The field work took place from the 30th March to 1st April.

[1] It should be noted that the HIA is specific to the health impacts on communities and does not address any aspect of health and safety applicable to the workforce at the mine and ancillary operations.

The Social Sciences team consulted a broad range of stakeholders. Key informant interviews were conducted with medical personnel at the local health facilities and hospitals. Focus Group Discussions (FGDs) were held in twelve (12) communities that are in close proximity to the Project including:

- Kaditshwene
- Lyden
- Sepharane
- Eseldrift
- Haakdooring
- Good Hope
- Claremont
- Talome
- Pudiakgopa
- Ditlotswana
- Malakonskop
- Rooivaal

Key Findings and Recommendations

Access to the Healthcare facilities is a challenge for the communities in the Project area as many reside more than 5 km from a health service point and have to rely on public or private transport to access care. In the area surrounding the Project footprint, healthcare provision is mainly in the form of mobile clinics which visit the communities once in two weeks. Emergency services are limited, especially after clinic operating hours (4 pm). Services are free substantiated by all respondents claiming not to pay for medical services. Some respondents claimed to have to pay for the state ambulance. The communities have a relatively high dependency ratio due to the high levels of poverty and unemployment.

Under the light of Healthcare services and infrastructure, the Project impacts need to be considered in two tangents. One, being a positive impact whereby there is the potential for the Project to support the development of improved health services through direct and indirect interventions; and the second, being a negative impact whereby the Project may stretch the already burdened capacity of the Healthcare services in the Mokopane and communities in the vicinity of the Project area.

An influx of people into the Project area can be expected and may have specific health impacts. The spontaneous migration and settlement of labourers and their families may introduce a wide range of concerns into the Project area. These include:

- Increased use of and demand for already inadequate community housing, water, sanitation, food, and medical services can mean that health needs go unmet and new health challenges arise (with a likely increase in cost);
- Housing inflation and potential increase in communicable diseases including tuberculosis (TB) and Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS). This can, however, be mitigated by Health Systems Strengthening (HSS) to improve TB case detection and case management in local dispensaries; developing and maintain site based TB and HIV/AIDS policies and programs; as well as TB outbreak preparedness and response plans;
- Emergency services are already limited in the area and an increase in trauma and accidents will place additional burdens on the health infrastructure; and
- The potential for an increase in accidents and injuries due to changes in road traffic, may significantly and adversely affect levels of accidents in the area.

Poverty and high levels of illiteracy and unemployment play a key role in local social challenges within the Local Municipality. The youth are especially at major risk for social ills such as alcoholism and drug abuse. These in turn play a major role in domestic violence and high risk sexual behaviour.

Due to increased demand on limited services, there is an increased potential for environmental contamination through poor waste disposal. Pamish could support local authorities with sanitation programs in Project affected communities.

A number of determinants can influence the potential for an increase in HIV/AIDS in the Project area. These are generally as an indirect influence of the Project but some direct impacts from the workforce do exist. Some mitigation measures to abate these include: developing an HIV/AIDS and STI policy and program that incorporates both the workplace and community considerations; developing a community based HIV and Sexually Transmitted Illness (STI) strategy; implementing HIV/AIDS education programs. Pamish has developed a comprehensive Health, Safety, Environment and Community (HSEC) Policy (which has been discussed in and appended to this Report) and is committed to the implementation of this Policy.

An influx of people during the construction and operational phases of the Project may result in food inflation, increasing food deprivation and nutrition-related diseases. If long term food inflation occurs, food deprivation may affect susceptible sub-populations such as the children and marginalised groups. Poor food hygiene practices may also increase food-related illnesses. More consumption of fast food related to increased income may increase non-communicable (lifestyle) diseases such as obesity and diabetes. This can be mitigated through curbing food inflation and assisting with food and sanitation awareness materials. Providing education on lifestyle behaviours, including eating habits, exercise, etc. would also lessen the health impacts thereof. Pamish, together with the communities, can improve food

security by assisting with school feeding programs, including education on food gardens, nutrition, and good nutritional habits.

The Project may lead to increased traffic loads on primary and access roads and has thus the potential to increase the number of traffic accidents. This can be abated through improving road safety by collaborating with the district road-safety unit to establish and maintain pictorial road-safety signage near the site in local language (either SePedi or Shangaan) and English language (if needed); clearly demarcated pedestrian crossings in appropriate places etc. This could be achieved by establishing and implementing a Traffic Management Plan.

The following mitigations are recommended, by Aurecon (who was appointed by Digby Wells to undertake a traffic and transportation impact study), to mitigate traffic impacts on non-motorised transport delays; road safety and road condition (Aurecon, 2015):

- Impact on pedestrians and cyclists: In addition to the existing bus and taxi lay-bys provided along D4380 in the vicinity of the site, a bus and taxi drop off area is recommended on site.
- Impact on road safety conditions: The drivers of all heavy vehicles should be required to attend a specialised road safety and driving course that sensitises them to the impact that they have on driving conditions for other vehicles on these roads
- Impact on road condition: mine drivers should identify and report potholes and edge breaks on the provincial roads to the operations manager who in turn will report it to the Limpopo Department of Transport. In this way the proposed Magnetite Open Pit Mine project will have completed its obligations in bringing to the attention the deterioration of the road to the relevant department.

With regards to the social determinant of health, the expected influx of people and increased income may result in illegal substances being available more freely. It is difficult to speculate whether the prevalence of tobacco smoking and or substance abuse will increase due to the presence of the Project. However, it is likely that it will increase as there will be an increase in the number of young people with more than adequate incomes, who will be in a position to afford these commodities (such as tobacco). Pamish may be in a position to conduct substance-abuse prevention education programs in the workplace and within the communities already affected (by drugs and alcohol).

When discussing the exposure of people to potentially hazardous materials, noise and malodours, one needs to be cognisant of the in-migration of people. An influx of people into the Project area may increase domestic activities, including the use of domestic fuels. This may result in an increase in air pollution exposure, followed by associated increases in the prevalence of related respiratory illnesses. The clearing of the site (construction phase) and vehicular movement are the main activities and may have potential impacts on the ambient noise levels. There is sufficient evidence that noise causes adverse health effects such as cardiovascular effects.

Summary

The major health impacts of concern and outcomes of the impact assessment are presented in the table below.

Table 1-1: Summary Health Impact Assessment

Impact	Pre-mitigation						Post-mitigation					
	Duration	Extent	Intensity	Consequence	Probability	Significance	Duration	Extent	Intensity	Consequence	Probability	Significance
Transmission of communicable diseases due to overcrowding	Project life	Municipal Area	Negative	Highly detrimental	Highly probable	Moderate negative	Medium term	Municipal Area	Moderate - positive	Moderately detrimental	Probable	Minor negative
Transmission of STIs and HIV/AIDS	Permanent	Local	High negative	Highly detrimental	Probable	Major - negative	Long term	Local	Average	Moderately detrimental	Highly probable	Minor negative
Soil-, water- and waste-related diseases	Long term	Local	High negative	Moderately detrimental	Highly probable	Minor negative	Beyond project life	Local	Average	Moderate	Likely	Minor negative
Food and nutrition	Project life	Local	Moderate negative	Moderately detrimental	Likely	Minor negative	Medium term	Local	Average	Moderately detrimental	Likely	Minor negative
Road traffic accidents and other accidental injuries	Beyond project life	Local	Very high negative	Highly detrimental	Likely	Moderate - negative	Project Life	Local	Average	Moderately negative	Probable	Minor negative
Air pollution and noise	Project Life	Limited	Low negative	Moderately detrimental	Highly probable	Minor negative	Project Life	Limited	Low positive	Moderately detrimental	Probable	Minor negative
Gender-based violence, alcohol and drugs	Long term	Local	Very high negative	Highly detrimental	Highly probable	Moderate negative	Medium term	Local	Average	Moderately detrimental	Probable	Minor negative
Non-communicable Diseases	Long term	Municipal	High negative	Moderately detrimental	Probable	Minor - negative	Medium term	Local	Minor negative	Moderately detrimental	Probable	Negligible negative

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AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
APPA	Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)
ARV	Antiretroviral Drugs
BHS	Baseline Health Surveys
BoD	Burden of Disease
BUR	Bed Utilisation Rate
CARMMA	Campaign on Accelerated Reduction of Maternal Mortality in Africa
CHMP	Community Health Management Plan
DEA	Department of Environmental Affairs
DM	District Municipality
DoH	Department of Health
EHA	Environmental Health Area
EHIA	Environmental Health Impact Assessment
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESHIA	Environmental, Social and Health Impact Assessment
HAART	Highly Active Antiretroviral Therapy
HCT	HIV Counselling and Testing
HIA	Health Impact Assessment
HIV	Human Immunodeficiency Virus
HPCSA	Health Professions Council of South Africa
HSS	Health Systems Strengthening
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IFC	International Finance Corporation
KAP	Knowledge, Attitude and Practices
KAPB	Knowledge, Attitudes, Practices, and Belief
KII	Key Informant Interviews

LED	Local Economic Development
LM	Local Municipality
MDGs	Millennium Development Goals
MDR	Multidrug Resistant
MRC	Medical Research Council
NEM: AQA	National Environment Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NCD	Non-communicable Diseases
NGO	Non-Governmental Organisation
NHA	National Health Act, 2003 (Act No. 61 of 2003)
NHLS	National Health Laboratory Service
PAC	Potentially Affected Community
PCD	Pollution Control Dam
PM	Particulate Matter
PMTCT	Prevention of Mother-to-Child Transmission
SAHR	South African Health Review
SANS	South African National Standards
SIA	Social Impact Assessment
STI	Sexually Transmitted Infection
TB	Tuberculosis
TSF	Tailings Storage Facility
TSP	Total Suspended Particulates
VCT	Voluntary counselling and testing
WHO	World Health Organization
XDR-TB	Extensively Multidrug Resistant TB

1 Introduction

In the developing world, large-scale Projects in the extractive industry and natural resources sectors are often controversial and associated with long-term adverse health consequences to local communities. In many industrialised countries, Health Impact Assessment (HIA) has been institutionalised for the mitigation of anticipated negative health effects while enhancing the benefits of Projects, programmes and policies.

Human activities are intimately embedded in, and dependent on the natural environment, which is in turn impacted by human activities. Human activities and all our social constructs are a subsystem of the natural environment and are intrinsically dependent on the health of ecosystems (Sadler, 1996).

However, environmental quality is only one variable affecting human health. A comprehensive definition of health, such as that provided by the World Health Organization (WHO), “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 2010), acknowledges the influence of the multitude of human social constructs and their complex inter-relationships.

Development Projects are expected to have beneficial effects on health and well-being because they create jobs and provide other economic benefits that contribute to a better standard of living. Although there are exceptions, economic well-being has been repeatedly linked with longevity and other indicators of health because people with adequate incomes can afford to eat balanced diets and live healthier lifestyles. However, development Projects also have the capacity to cause adverse effects on health and well-being at the individual and community level. Sometimes these effects are experienced by people who do not share in the Project’s benefits. One of the negative effects that can be associated with Projects is related to physical health, such as mortality and morbidity from disease and injury. Social and community health may also be affected negatively where individuals face a loss of cultural identity and quality of life, social disruption and violence, and a breakdown of community and family support networks. Furthermore, socio-cultural well-being can be affected by increasing stress, anxiety, and feelings of alienation.

This document presents the results of the HIA for the proposed Pamish Investments No. 39 (Pty) Ltd (Pamish) Magnetite Open Pit Mine and associated infrastructure (the Project) near the town of Mokopane in Limpopo Province, South Africa. The objective of this Report is to assess the human health impacts associated with the Project on the population of concern, with particular reference to vulnerable people, through the evaluation of various determinants of health, including those identified in the various specialist studies.

To ensure that environmental health becomes part of the Environmental Impact Assessment (EIA) decision making process, a health assessment will need to be integrated into the present EIA process in a structured and systematic manner. This will ensure that human health issues, resulting from a listed activity, are addressed before the start of such activities.

This HIA report is structured into three sections. The first deals with the baseline assessment or the existing status quo. The health baseline section provides the necessary information

for determining the status quo of health in and around these towns, based on the activities pertaining to the Project. The second section addresses the impact that the Project may have on the current health status of the communities of concern. The third section includes an impact assessment and mitigation strategy developed using data from the baseline study and health impact assessment sections. Specific focus is given to Environmental Health Areas as specified by the IFC.

1.1 Project Location

The Project is to be situated 45 km north-west of Mokopane Town, in the Waterberg District of Limpopo Province, South Africa (see Plan 1, Appendix B). The province comprises a land area of 123 910 square kilometres (km^2) and borders Botswana, Zimbabwe and Mozambique to the north and the Mpumalanga, Gauteng and North West Provinces to the south. Limpopo comprises five district municipalities, namely Mopani, Sekhukhune, Vhembe, Capricorn and Waterberg District Municipality (WDM).

The WDM is comprised of six local municipalities (LM), namely Mogalakwena, Lephalale, Bela-Bela, Modimolle, Thabazimbi and Mookgophong. The Mining Right Area (MRA) is situated entirely within Mogalakwena LM which borders Aganang LM (within the Capricorn District Municipality) to the East, Mookgophong LM to the South, Lephalale LM (within the WDM) to the West and Blouberg LM (also within the Capricorn District Municipality) to the North. The ore bodies that are planned to be mined are situated on the farm portions Vogelstruisfontein 765 LR, Vriesland 781 LR, Vleigekraal 783 LR, Schoonoord 786 LR and portions Re/1, Re/2, 3, 4, 5 and 6 of the farm Bellevue 808 LR.

The mineral generated from the proposed mine will either be transported via road, then onto rail in Mokopane and onwards to the nearest port; or via road, directly to Durban/Richards Bay for export to international markets.

The Mogalakwena Local Municipality (MLM) covers an area of approximately 6 100 km^2. There are three proclaimed townships and 178 villages within the MLM. Villages directly surrounding the Project infrastructure include Eseldrift, Groesbeek, Ga-Mokwena, Haakdoring, Malokong, Pudiakagopa, Taolome, Bakenberg Traditional Authority, Basogadi, Ditlotswana, Malokongskop, Mosate, Mothoathoase, Rooivaal, Kaditshwene, Lyden, Mokamole, Sepharane and Limburg.

The Project site includes perennial and non-perennial streams which traverse the area. The Mogalakwena River, which is a tributary to the Limpopo River, is located within 10km, on the western side of the Project site and flows towards the north into the Limpopo River (Plan 2 and Plan 3, Appendix B). The Sterk River also traverses the project area west of the Mogalakwena River. The Sterk River is a tributary to the Mogalakwena River. A non-perennial stream called Borobela is located on the eastern side of the Mogalakwena River and it flows towards the west, feeding into the Mogalakwena River.

1.2 Terms of Reference

Digby Wells Environmental (Digby Wells) has been contracted by Pamish to conduct a HIA for an open-pit magnetite mining Project in the Limpopo Province. A HIA was conducted as a specialist study, in support of the compilation of the EIA. This study evaluates the evidence from readily available information, to assess the health impacts associated with the Project on the population of concern. The Project aimed to adhere to the relevant provisions contained in the Equator Principles (IFC, 2006)[2]. These provisions had been derived from the principles themselves and the International Finance Corporation (IFC)'s Performance Standards and Environmental Health and Safety (EHS) Guidelines.

The Terms of Reference (ToR) for the HIA comprised the following;

- Desktop literature review to:
  - Outline the country and regional health status; and
  - Review country-specific health regulations.
- A field visit to:
  - Undertake primary participatory data collection in the form of focus group discussions (FGDs), interviewing women in the different potentially affected communities (PACs);
  - Gather additional information that was not available in the public domain during the desktop review. This includes collection of information from health facilities, from the national health information management system, as well as from unpublished reports and documents;
  - Identify key informants and conduct interviews using a semi-structured questionnaire;
  - Assess the standards of the local health facilities and functionality of the health management information system; and
  - Visualise the Project and location of communities in relation to planned Project activities.
- Impact assessment process which involved:
  - Considering the potential future health impacts that the magnetite Project will have on the health of the respective communities;

[2] The new safeguard policies and standards of the International Finance Corporation (IFC), part of the World Bank, were established in 2006. These contain a requirement for health impact assessment in large projects. The standards have been accepted by most of the leading lending banks who are parties to the Equator Principles.

- Determining the existing health needs of the community based on health strategies, infrastructure programs, service priorities, delivery plans and challenges;
- Based on the existing evidence, rating the likelihood and consequence of different health impacts to outline their significance and prioritisation for mitigation; and
- Considering recommendations for mitigation/management of priority impacts. Recommend measures to avoid/mitigate negative and enhance positive impacts resulting from the Project at the relevant Project stage.

2 Project Description

This section provides basic information pertaining to the Project. It commences with a general overview of the envisaged Project.

2.1 Key Operational Aspects of the Project

2.1.1 Proposed Activities

The activities that will be undertaken as part of the Project are related to the construction, operation and decommissioning of an open pit magnetite mine. The activities associated with each phase of the Project are listed below:

- Construction Phase
  - Site clearance and vegetation removal;
  - Change of land-use from agriculture to mining;
  - Topsoil[3] and overburden[4] and stockpiling;
  - Development of access and haul roads;
  - Surface infrastructure development (e.g. stormwater channels, bridges, dams, offices, concentrator and workshops);
  - Water abstraction and use;
  - Waste generation, storage and disposal (hazardous and general);
  - Use of heavy machinery (haul trucks, excavators etc.); and
  - Employment and capital expenditure.

[3] Topsoil is the upper, outermost layer of soil, usually the top 2 m. It has the highest concentration of organic matter and microorganisms and is where most of the Earth's biological soil activity occurs.

[4] Overburden (also called waste or spoil) is the material that lies above an area that lends itself to economical exploitation (like mining), such as the rock, soil, and ecosystem that lies above an ore body.

- Operational Phase
  - Development of two open pits;
  - Development of a waste rock dump (WRD);
  - Operation of a concentrator plant (including crushing, grinding and screening);
  - Conveyor belts;
  - Hauling of waste rock;
  - Partial backfilling of pits with waste rock;
  - Development of a TSF;
  - Pollution Control Dam (PCD), water storage dam and associated pipelines;
  - Stormwater diversion berms and channels;
  - Storage of fuels, process concentrate, maintenance/workshop oils and explosives storage facilities;
  - Waste generation, storage and disposal (hazardous and general);
  - Product storage (magnetite concentrate);
  - Sewerage treatment plant;
  - Use of heavy machinery (haul trucks, FEL, excavators etc.); and
  - Employment and operational expenditure.
- Decommissioning Phase
  - Dismantling and removal of major equipment and infrastructure;
  - Waste generation, storage and disposal;
  - Rehabilitation of disturbed areas including stockpile dumps, pits, etc.;
  - Partial backfilling of pits with waste rock; and
  - Post-closure environmental monitoring.

2.1.2 Mineral to be mined

The Project is located on the Bushveld Igneous Complex (BIC). The BIC consists of a lower sequence of layered mafic and ultramafic rocks known as the Rustenburg Layer Suite (RLS) and an overlying unit of granites known as the Lebowa Granite Suite. These layered rocks occur in four areas known as the Western, Northern, Eastern, and Bethal limbs. The Project is located in the Northern Limb and in the Upper Zone of the RLS.

Within the Project site, two titano-magnetite zones have been identified, namely the vanadium-rich Main Magnetite Layer (MML) and the iron and titanium-rich P-Q zone. The

MML consists of two titano-magnetite layers separated by a parting consisting of lower concentrations of titano-magnetite.

The target mineral for the proposed mine is vanadiferous titano-magnetite of the MML, which will be processed to produce a magnetite concentrate which will eventually be sold or alternatively used for vanadium production. Other minerals which may be found in association and which are included in the mining right application are: Vanadium, Titanium, Iron Ore, Phosphate, Platinum Group Metals, Gold, Cobalt, Copper, Nickel, Chrome and all minerals found in association with these elements. A second orebody, the so-called P-Q Zone, also has indicated and inferred resources and may be mined at a later stage.

The mineral reef outcrops and dips to the west and has been intersected at depths exceeding 400 m below surface, and a resource has been calculated on the MML to a depth of 120 m. The P-Q Zone also outcrops, and dips to the west and has resources calculated to depths of 400 m.

Magnetite is a nontoxic mineral, one of the three common naturally occurring iron oxides (chemical formula Fe_3O_4) and a member of the spinel group. Magnetite is best known for its property that it is strongly attracted to magnets. Some forms of Magnetite from specific localities are in fact themselves magnetic. This form is known as lodestone, and is the only mineral that has natural magnetic properties. Magnetite is usually mined from large deposits in open pit mines. Banded iron formations and some metamorphic formations contain significant quantities of magnetite.

2.1.3 Mining Method

Open pit mining is considered the optimal mining method based on the thickness and positioning of the mineral resource. The main magnetite layer is covered by 2 m of topsoil which will be stripped to expose the outcrop. Open pit mining is proposed to be undertaken outwards from the middle of the strike length advancing north and south to an initial depth of 20 m below the surface then to 40 m and thereafter to 60 m and 80 m. A bench height of 10 m will be used to allow for the separate loading of the two ore layers and the parting. The parting ore will either be stockpiled as a low grade ore or be sent to the waste rock dump, depending on its grade.

The Life of Mine (LoM) is approximately 30 years with a Run of Mine (RoM) of up to one million tonnes per annum (tpa).

There are two open pits planned, which are separated by the D4380 Provincial Road, the approximate footprints of the north and south open pits are 129 ha and 66 ha respectively. Please refer to Plan 4, Appendix B for the Project infrastructure layout map. It is likely that the north pit (129 ha) will be mined first for approximately 17 years, thereafter the south pit (66 ha) will be mined for the remaining 13 years.

2.1.4 Mineral Processing

Ore will be transported from the open pit to the plant by trucks. A concentrator plant will be constructed for initial processing. Ore processing will commence with crushing which is undertaken in three stages and produces material with a size of 44 millimetres (mm). Based on typical industry performance, the plant is assumed to perform for 5 500 operational hours per annum (i.e. 358 operating days per annum, with an 80% utilisation of 80% availability).

Material from the stockpile (containing crushed material) will then be reclaimed and processed through a conventional rodmill-ballmill combination to produce a product of 53 micrometres (µm). Following grinding, magnetite will be recovered through a three-stage low intensity magnetic separation circuit. The magnetic separation product will be dried by a filter press and stockpiled for further processing, while the non-magnetic waste will be disposed of at the proposed tailings dam.

2.2 Proposed Infrastructure

Large Projects such as this one will generally build a significant number of physical structures that can impact the overall human environment. The Project infrastructure includes:

- Waste rock dump (WRD);
- Tailings dam;
- Pollution control facilities (clean and dirty water separation systems will form part of the mine design as well as the required PCDs);
- Oil trap at vehicle washbay and workshop areas;
- Settling ponds as part of the concentrator process;
- Sewerage treatment plant;
- General waste temporary storage facilities;
- Conveyors;
- Pipelines;
- Hazardous material storage; and
- Contractor Camp.

A plan of the Project site and associated infrastructure layout of the key Project components has been attached as Plan 4 of Appendix B.

2.3 Site Access

There is a single entrance to the Project site, via D4380 Provincial Road.

The haul roads will be constructed between the open pits, WRD, TSF and to the concentrator plant. It is planned that there will be two haul road crossings over the D4380 Provincial Road to access Pit 2 to the south of this Provincial Road.

Haul roads will be constructed according to recognised mine haul-road specifications i.e. road widths, gradients and layer-works, including safety berms and storm water drainage arrangements. The roads will be 8 m wide for the Light Duty Vehicles (LDVs) and 14 m wide for the Articulated Dump Truck (ADT) mining haul roads. The haul roads will be developed using crushed waste rock, which will be compacted and treated with a dust suppressant.

2.4 Project Timing/ Schedule

As mentioned, the LoM is approximately 30 years with a RoM of approximately one million tonnes per annum (tpa).

The planned Project schedule is as follows and is dependent on receipt of all regulatory approvals:

- Construction : March 2016 – March 2018 (2 years)
- Topsoil and Pre-stripping : 2018 -2019 (1 year)
- Production: 2019 – 2049 (27 years)

3 Statutory Requirements

This section provides an overview of legislation pertaining to the undertaking of an impact assessment specific to the health of surrounding communities.

3.1 South African Legislation Pertaining to Health

3.1.1 Constitution of the Republic of South Africa (Act 108 of 1996)

The over-arching legislation is the Constitution of South Africa (Act 108 of 1996) (the Constitution), in particular Section 24, which places people and their needs at the forefront of environmental management. The Constitution provides a right to “an environment that is not harmful to [human] health or well-being” and to have the environment protected, for the benefit of present and future generations, through reasonable legislative measures. These measures include the prevention of pollution and ecological degradation, the promotion of conservation, the securing of ecologically sustainable development and the utilisation of natural resources while promoting justifiable economic and social development.

3.1.2 The National Health Act (Act 61 of 2003)

The National Health Act, 2003 (Act No. 61 of 2003) (NHA) provides a framework for a structured uniform health system in South Africa, taking into account the obligations with

regard to health services imposed on the national, provincial and local governments by the Constitution and other laws. Any activity that gives rise to offensive/injurious conditions or is dangerous to health (e.g. accumulation of refuse) may have a negative impact on health and thus warrants being assessed in the EHIA (DOH, 2010). The Director General (DG) should issue and promote adherence to, norms and standards on health matters, including conditions that constitute a health hazard and facilitate the provision of indoor and outdoor environmental pollution control services. The Act also provides for environmental health investigations in Section 88.

3.1.3 National Ambient Air Quality Standards

The Department of Environmental Affairs (DEA) issued ambient air quality guidelines for several criteria pollutants, including particulates, sulphur dioxide, oxides of nitrogen, lead, ozone and carbon monoxide. The National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) adopted these guidelines as National ambient air quality standards. On 2 June 2006, the Minister of Environmental Affairs and Tourism announced his intention of setting new ambient air quality standards in terms of Section 9(1)(a) and (b) of the NEM:AQA. The proposed new standards were published for public comment in the Government Gazette of 9 June 2006. Since then, updated draft National standards with allowable frequencies of exceedance and compliance timeframes have been proposed.

The prevailing legislation in the Republic of South Africa with regards to air quality is the NEM:AQA. The NEM:AQA serves to repeal the Atmospheric Pollution Prevention Act (Act no. 45 of 1965) (APPA).

The purpose of NEM:AQA is to set norms and standards that relate to:

- Institutional frameworks, roles and responsibilities;
- Air quality management planning;
- Air quality monitoring and information management;
- Air quality management measures; and
- General compliance and enforcement.

Guidelines provide a basis for protecting public health from adverse effects of air pollution and for eliminating, or reducing to a minimum, those contaminants of air that are known or likely to be hazardous to human health and wellbeing (WHO, 2000). Once the guidelines are adopted as standards, they become legally enforceable. These standards prescribe the allowable ambient concentrations of pollutants which are not to be exceeded during a specified time period in a defined area. If the air quality guidelines/standards are exceeded, the ambient air quality is poor and the potential for health effects is greatest.

Air quality legislation comprises primary standards which protect human health and secondary standards which protect property, vegetation, climate and aesthetic values. The development of new industries that increase air pollution through the emission of gases in the atmosphere should be managed.

3.1.4 Other Legislation

Acts and Regulations pertaining to health and environmental, health in particular, are indicated in Table 3-1

Table 3-1: Acts and Regulations relevant to Health and Environmental Health

National legislation	Relevance to HIA
Atmospheric Pollution Prevention Act (Act 45 of 1965)	Hazardous substances associated with air pollution affect human health. This Act has identified some of the activities for which authorization for emissions is required from the DEA (DOH, 2010).
National Environmental Management: Waste Act (Act 59 of 2008)	The objectives of this Act are to protect health, well-being and the environment; to ensure that people are aware of the impact of waste on their health, well-being and the environment; to provide for compliance with the measures set out in the Act and to give effect to section 24 of the Constitution to secure an environment that is not harmful to health and well-being (DOH, 2010).
Mine Health and Safety Act (Act.29 of 1996)	Hazard identification and risk assessments should be conducted by every manager for the protection of the health of persons directly affected by mine activities (DOH, 2010).
National Water Act (Act 36 of 1998)	The quality of water in domestic water sources impacts on human health. The Act provides for the protection of water quality for the benefit of human health and aquatic ecosystems through the concept of the reserve determination process (DOH, 2010).
Water Services Act (No. 108 of 1998)	Water services (water supply services and sanitation services) may impact on human health. Water service providers have an important role to play in this regard. Proposed activities may involve industrial use of water, which is covered under section 7 of this Act (DOH, 2010)
Occupational Health and Safety Act (Act 85 of 1993) Regulations: R1248	Although Occupational Health does not pertain to mines, and is excluded from the HIA, because it is addressed by the OHS Act, it is important to identify occupational health hazards that may affect the health of the community (DOH, 2010).
Preferential Procurement Policy Framework Act, 2000 (PPPFA)	Encourages company to source products and services locally or regionally.

3.2 International Management Standards

There are a number of international guidelines or best practice guidelines that refer to community health in developing Projects. The World Bank Group's standards and norms, in particular those developed by its private sector arm, the IFC, are generally considered as the benchmark. The IFC has published a set of Performance Standards for large projects that will require international funding. Performance Standard 4 (PS4): Community Health, Safety and Security, recognises that Project activities result in both positive and negative impacts to communities (IFC, 2012). The objectives of PS4 are:

- To avoid or minimise risks to and impacts on the health and safety of the local community during the Project life cycle from both routine and non-routine circumstances; and
- To ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimises risks to the community's safety and security.

The general PS4 community health and safety requirement states that the client will evaluate risks and impacts to the health and safety of the affected community during all stages of a Project, and will establish preventative measures to mitigate and manage the identified health impacts. An Action Plan is to be disclosed and on-going engagement with affected communities is to be established (*ibid.*).

IFC Performance Standard 4 "Community Health, Safety and Security"

"The client will evaluate the risks and impacts to the health and safety of the Affected Communities during Project life-cycle and will establish preventive and control measures consistent with Good International Industry Practice (GIIP), such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognised sources. The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favour the prevention or avoidance of risks and impacts over minimization."

In addition to being considered the benchmark standards for major Projects, the IFC's Performance Standards are applicable to Projects seeking financing from either the IFC or other Equator Principles Financial Institutions (EPFIs).

3.3 Company Management Standards

Pamish does not yet have a specific management standard that addresses community health or supports the use of HIA as a tool. However, as part of the company's commitment to work with communities within which it operates, community healthcare is a key focus. Pamish is committed to providing a safe, injury free and healthy place to work – the health and safety of their employees and contract workers and adjoining communities is a key priority.

Pamish has developed a comprehensive Health, Safety, Environment and Community (HSEC) Policy (see Appendix E) and a HIV and AIDS Procedure (Appendix F) and is committed to the implementation of this Policy. With regards to the community, Pamish will communicate and consult with local communities and stakeholders with a view to fostering

mutual understanding and shared benefits through the promotion and maintenance of open and constructive dialogue and working relationships.

Pamish is committed to contribute to the social and economic development of local communities associated with their mine, through:

- Identifying of all the stakeholders associated with the Project and actively engage them on matters pertaining to their operations;
- Engage the community leadership structures to identify and support projects that address the needs of the communities; and
- Develop enterprise programmes that aim to reduce the negative effect of mine closure.

Pamish has a Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS) Procedure which aims to:

- Contribute towards minimising the social, economic and developmental consequences of this pandemic;
- Eliminate stigma and discrimination against individuals who are HIV positive;
- Encourage employees to be open about their HIV/AIDS status if they wish to do so;
- Collaborate with local, provincial and/or national government in the fight against HIV/AIDS;
- Provide a set of guidelines for the managing of employees with HIV/AIDS; and
- Ensure the fair and consistent treatment of employees with HIV/AIDS.

Pamish commits to the following provisions in combating the scourge of HIV/AIDS:

- An essential component of Pamish's strategy is providing prevention and education programmes in the workplace which clearly state how HIV/AIDS can be contracted, and what can be done to prevent contracting HIV/AIDS, thereby providing employees and contractors with the knowledge they require to protect themselves, their fellow employees, contractors and their families;
- Employees will be encouraged to ascertain their HIV status through active campaigns and the provision of counselling and testing facilities. The same facilities will also be available for contractors;
- Testing any employees for the HIV virus will only be undertaken at his/her explicit request and with informed consent which shall be on a strictly voluntary basis. Such a request may be submitted in writing, by the relevant employee;
- The confidentiality of medical information is guaranteed in that:
  - No flags or symbols will be used on any employee's medical, personnel or other records to indicate HIV status;

- Only the employee and the medical officer, either in-house or from an external company as the case may be, are to have knowledge of the said employee's HIV status; and

- Employee breach of any of the above may result in appropriate disciplinary action;
- Pre- and post-counselling services should be provided for an employee or contractor wishing to be tested;
- Prospective employees will not be required to undergo HIV testing as a pre-condition of the selection procedure.
- Employees or prospective employees with HIV will be treated justly and humanely as specified in the key principles above;
- The support and cooperation of local, provincial and national government will be garnered by way of joint Projects or where reasonably possible the formation of public/private partnerships with those institutions to join forces in the fight against HIV/AIDS; and
- Through its corporate social investment programme, Pamish will facilitate the training of peer educators and support home based care workers to ensure that every reasonable attempt is made to assist workers and the balance of the community in combating HIV/AIDS.

4 Framework and Methodology

Activities undertaken during this assessment are outlined below.

The impact assessment process provides the following:

- Considers the potential future health impacts that the Project will have on the health of these respective communities;
- Determines the existing health needs of the community based on health strategies, infrastructure, programmes, service priorities, delivery plans and challenges;
- Based on the existing evidence, ranks the likelihood and consequence of difference health impacts to determine the significance and prioritisation for mitigation. A confidence ranking is applied based on the available evidence; and
- Develops evidence-based recommendations to avoid/mitigate negative, and enhance positive, impacts resulting from the Project at the relevant Project stage.

4.1 Introduction and Definition

A HIA is a practical, multi-disciplinary process, combining a range of qualitative and quantitative evidence in a decision-making framework. An HIA seeks to identify and estimate the lasting or significant changes of different actions on the health status of a defined population (Winkler *et al*., 2010). A HIA may be defined as "*a combination of procedures, methods and tools by which a Project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population*". The objective of an HIA is to deliver evidence-based recommendations to maximize potential positive health benefits and prevent or mitigate any detrimental health impacts that a Project may have on the potentially affected communities (PAC) (WHO/ECHP, 1999).

The WHO defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. This is influenced through complex interaction of social, economic, genetic, and environmental factors (WHO, 2010c).

The ultimate deliverable of an HIA is a Community Health Management Plan (CHMP) (Winkler *et al*., 2011). This plan would be based on evidence and stakeholder input, prioritised according to impacts and needs and having clear indicators to monitor and evaluate Project impacts and programs. The CHMP will also facilitate the development of social development programs linked to health.

The holistic model of health used in the HIA process acknowledges that the health status of a population is affected by factors known as health determinants (e.g. education, income level, health services, etc.). All of these are closely interlinked and differentials in their distribution lead to health inequalities. These include both biophysical and social determinants of health as well and not just purely health outcomes. The methodology allows HIA practitioners to consider how a Project affects these determinants of health, as well as health outcomes.

4.2 Overview of the HIA Process

A standardised approach was considered for the HIA to ensure that evidence based recommendations supported the impact assessment. To ensure compliance with the IFC performance standards, and especially PS4, the methodology outlined in the Good Practice Note for HIA from the IFC, was adopted (IFC, 2009). The main elements of this are discussed briefly below so that the context of the HIA is understood.

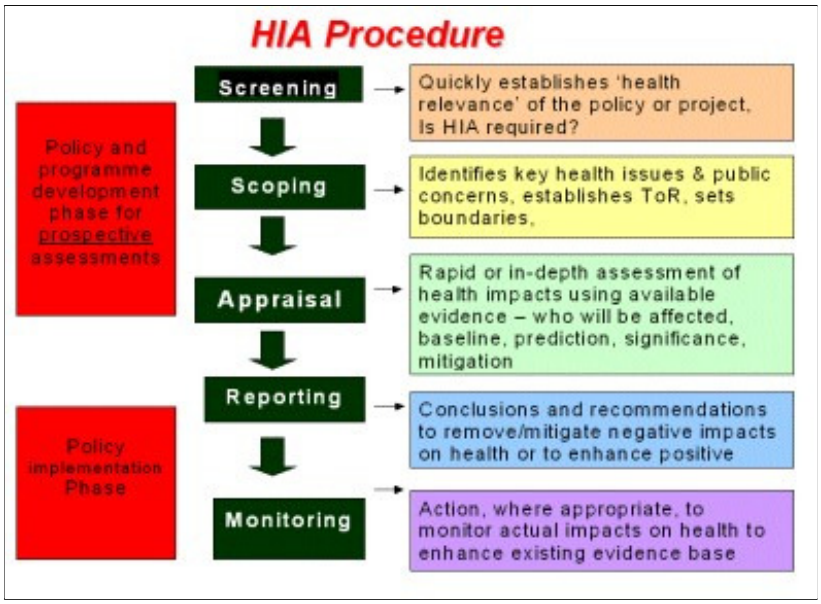

Figure 4-1: HIA Procedure (IFC, 2009)

The framework that is commonly used for an HIA follows a 6-step process (IFC, 2009):

- Screening (preliminary evaluation to determine the necessity of an HIA);
- Scoping (identifying the range of potential Project-related health impacts and defining the terms of reference for the HIA, based on published literature, local data and broad stakeholder consultation and how these may be influenced by the Project);
- Risk assessment (qualitative and quantitative appraisal of the potential health impacts in relation to defined communities and the Project development, including stakeholder participation);
- Appraisal and mitigation (development of a CHMP) based on the findings of the risk assessment);
- Implementation and monitoring (realisation of the CHMP including monitoring activities that allow for adaptation); and
- Evaluation and verification of performance and effectiveness (key step to analyse the HIA process as a whole).

This HIA will be available to influence design and inform the construction, operation and decommissioning phases of the Project. As HIAs are dynamic iterative processes they do require flexibility in their methodologies and tools, so that they can be fit for purpose for different Projects.

4.3 Determining the scale of the HIA

The level or scale of a HIA depends on the complexity of the Project, the magnitude of expected impacts, as well as the Project phase during which the HIA is undertaken. Various levels of HIA are defined in Table 4-1 below (IFC, 2009).

When gathering new field data for the HIA, the Project will encounter different levels of effort and needs. The key descriptive terms for these cases— "comprehensive" and "rapid appraisal"—indicate the different depths of analysis and consultation required, and whether the performance of the HIA involves collecting new field data.

In Figure 4-2, the 'potential health impact' axis considers health issues in the Project location, such as:

- Hazardous materials exposure—how the facility will operate, and what the potential exposures are to physical, biological, and chemical agents;
- Resettlement or relocation—moving communities or providing compensation for relocation;
- Endemic disease profile—malaria;
- HIV/AIDS, tuberculosis, schistosomiasis, etc.;
- Health systems and infrastructure—poor or non-existent health infrastructures; and
- Stakeholder concerns—critical community issues, such as water quality or access, increased road traffic and accidents.

The 'social sensitivity' axis in Figure 4-2 covers a broad range of issues, many of which are typically addressed within the social analysis of the potentially affected communities (for example, conflict, resettlement, political factors, vulnerable communities, human rights, and equity concerns). The vulnerable status includes factors such as gender, ethnicity, culture, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural resources (*ibid.*).

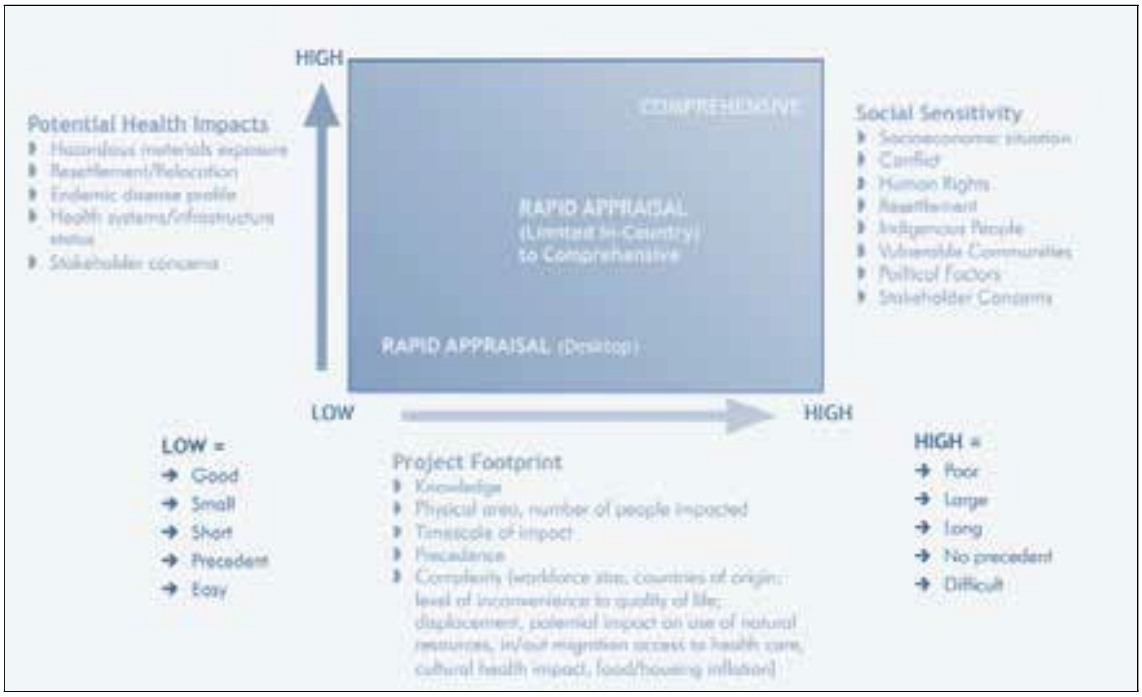

Figure 4-2: Selecting an HIA Type

Since the Project is a large, complex Project, and an influx of persons is expected, a Comprehensive HIA was deemed necessary, as opposed to Rapid Appraisal or Desktop HIA. An essential element of the comprehensive HIA is the need for some type of new data collection in potentially affected communities, and for helping to predict changes in health determinants, the associated risks, and health outcomes.

A comprehensive HIA includes screening, scoping, stakeholder consultation, risk assessment, appraisal, implementation and monitoring, and verification. Stakeholder communication and consultation should take place at all stages—from screening through implementation and monitoring (IFC, 2009). The activities undertaken in the comprehensive HIA are highlighted in Table 4-1.

Table 4-1: Levels of HIA (IFC, 2009)

Level of HIA	Characteristics
Desktop HIA	▪ Provides a broad overview of possible health impacts; ▪ Analysis of existing and accessible data; and ▪ No new Project specific survey data collection.
Scoping/Rapid Appraisal HIA	▪ Provides more detailed information of possible health impacts; ▪ Analysis of existing data; ▪ Stakeholder and key informant analysis; and ▪ No new Project-specific survey data collection.

Level of HIA	Characteristics
Comprehensive HIA	▪ Provides a comprehensive assessment of potential health impacts; ▪ Robust definition of impacts; ▪ New Project specific survey data collection; and ▪ Participatory approaches involving stakeholders and key informants.

4.4 Baseline Data Collection

The data collection activities of the HIA included a desktop literature review, participatory data collection (stakeholder input – questionnaire and FGDs) and direct observation. This method allows for the triangulation of data and provides a robust description of data as shown in Figure 4-3 (Winkler et al., 2011).

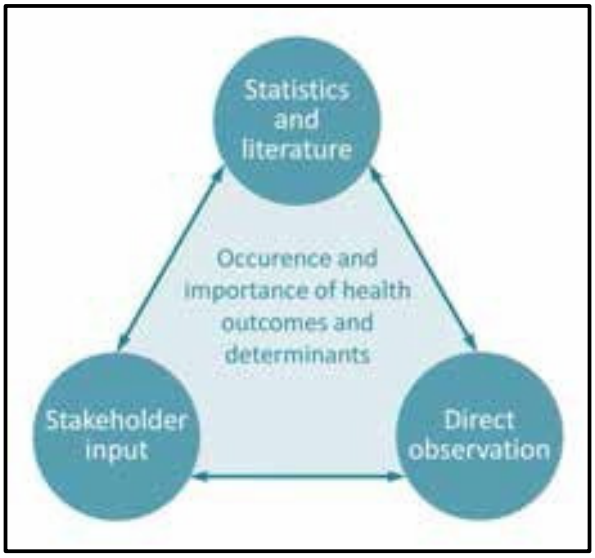

Figure 4-3: Triangulation of data (Winkler *et al.*, 2011)

4.4.1 Desktop Work

This involved a literature review of health related data in the public domain as well as a review of existing Project documentation and related secondary data. The literature review was completed before the field visit so that data gaps could be identified and questioning routes for key informant interviews (KII) and questionnaires could be developed. Priority was given to topics that contributed the most towards the burden of disease in South Africa and the Project site and also to health-related incidents related to mining.

The desktop work included an extensive literature review to inform the health profiling of the region and where possible the population in the Project site. The desktop work described the broad health status of the population, based on a systematic review of the 12 EHAs. It must be noted that there is limited information in the public domain regarding the health profile in the Limpopo Province, especially at the local level –which includes the PACs.

The outcomes of the literature review are presented in Section 4.8 of this Report and have been combined with the information that was acquired during the field visit and subsequent Project documentation review.

4.4.2 Questionnaire Design

Participatory tools were used in data collection. These tools included semi-structured interviews with four key informants, and a questionnaire administered to community members through FGDs (females only) and a detailed household survey (HS). It was decided to only include women groups during the FGDs as they, in many African communities, are considered to be the gatekeepers to family health and usually have a good understanding of critical issues that influence health at the community and household level. The questionnaires were designed to assist in the identification of the major health concerns for the community (malaria etc.), institutional issues (satisfaction or lack thereof with health facilities), socio-economic aspects and environmental concerns.

These questionnaires and discussions also sought to establish Knowledge, Attitudes, Practices, and Beliefs (KAPB) for specific diseases such as HIV/AIDS. The questionnaires used for the purpose of this study have been appended to this HIA Report, see Appendix C for the FGD questionnaire, and Appendix D for the key informant interview questionnaire.

4.4.3 Field Visit

A field visit was undertaken to:

- Collect primary participatory data in the form of semi-structured FGDs with women in the different PACs – see Plan 5, Appendix B for an illustration of where FGDs were held;
- Gather additional information that was not available in the public domain during the desktop review. This includes collection of information from health facilities, from the national health information management system, as well as from unpublished reports and documents –qualitative and quantitative data;
- Identify key informants and conduct interviews using a semi-structured questionnaire;
- Observe the standards of the local health facilities and functionality of the health management information system; and
- Visualise the Project and location of communities in relation to planned Project activities.

The field work which took place from the 30th March to 1st April 2015 was conducted by Ms Natasha Higgitt, a member of the Social Sciences Department of Digby Wells.

The field visit provided an opportunity to visualise and assess the prevailing situation in the communities and their relation to the Project. This was important to understand the potential areas of influence of the Project and also the general living conditions in the communities living in close vicinity to the Project site.

4.4.4 Key Informant Interviews

Interviews were conducted with key healthcare personnel from two (2) healthcare facilities – see Plan 6, Appendix B for an illustration of these healthcare facilities. The objective of these interviews was to gain a better understanding of the structure and capacity of the local health system and also to enquire what health statistics were available at the local level and where possible obtain authorised copies of statistics and reports. KIIs were conducted with the health personnel at these facilities, using a semi-structured questionnaire. This included specific questions about health, social and environmental determinants but with a different emphasis, depending on the level and role of each key informant being interviewed. Interviews and discussions were open and conducted in English and sePedi.

A semi-structured interview with an objective of obtaining a deeper insight into cultural health practices and medicinal plant use in the area was conducted with a Traditional Healer from Malakonskop.

The key informants consulted during the field visit are detailed in Table 4-2.

Table 4-2: Key Informants that were consulted during Field Work

Date:	30th March 2015	1st April 2015
Facility name:	George Masebe Hospital	Magobe Clinic
Name of person interviewed:	M. J Langa	Mary Ramafemo
Designation:	Communication officer	Manager
Location (village/ town):	Mokopane Town	Pudiakgopa
Type of facility:	Government Hospital	Government Clinic

4.4.5 Focus Group Discussions

In addition to visiting the local health facilities, FGDs were conducted in the immediate and wider Project site. The FGDs were held at the following villages:

- Kaditshwene
- Lyden
- Sepharane
- Eseldrift
- Haakdooring

- Good Hope
- Claremont
- Talome
- Pudiakgopa
- Ditlotswana
- Malakonskop
- Rooivaal

Only include women groups were included during the field visit as they usually have a good understanding of critical issues that influence health in their households, and wider communities as well. This allows for a high level understanding of the health challenges, from both a biophysical and social health perspective. FGD's were moderated in English, with simultaneous translation into the local languages spoken (SePedi) in the community, through a local translator. Figure 4-4 and Figure 4-5 illustrate FGDs that took place at Lyden and Haakdooring.

Figure 4-4: Focus Group Discussion at Lyden

Figure 4-5: Focus Group Discussion at Haakdooring Village

4.4.6 Detailed Household Surveys

A quantitative socio-economic survey of a representative sample of households immediately surrounding the Project site was be conducted by the Digby Wells Social Sciences Team. The primary objective of the survey was to gather reliable baseline information of the social environment in which the proposed mine will operate, which is necessary for the identification of risks and impacts associated with the Project. The topics covered in the survey included components required by the IFC for a comprehensive baseline, including the communities' health and nutrition.

A number of health-related questions were included in the socio-economic household survey. For detailed information on the steps taken to ensure a successful survey (survey planning, survey sampling, enumerator training, and quality control) are explicated in the Social Impact Assessment (SIA) Report.

The survey was conducted using a paper-based questionnaire applied to all respondents living in the PACs.

4.5 Impact Categorisation: Environmental Health Areas (EHAs) Framework

Potential community health impacts were identified on the basis of: (i) the available health data from the literature review; (ii) the information generated through stakeholder consultation; (iii) the knowledge of the Project context and developments; (iv) input from other specialist studies that inform the elements of the EIA and (v) experience of previous HIAs in similar settings (Winkler *et al*., 2010).

The identified potential impacts were then categorised in terms of twelve Environmental Health Areas (EHAs) – a set of health-related factors and considerations defined by IFC methodology. These are summarised in Table 4-3. The set of EHAs provides a linkage between Project-related activities and potential positive or negative community-level impacts, and incorporates a variety of biomedical and key social determinants of health. In this integrated analysis, cross-cutting environmental and social conditions that contain significant health components are identified instead of an HIA focusing primarily on disease-specific considerations – as is frequently done in many biomedical analyses of potential Project-related public health impacts. The EHA framework is based on an analysis performed and published by the World Bank (IFC, 2009).

Table 4-3: Environmental Health Areas

	Environmental Health Areas (EHAs)
1.	**Vector-related diseases** – Mosquito, fly, tick and lice-related diseases (e.g. malaria, dengue, yellow fever, lymphatic filariasis, rift valley fever, human African trypanosomiasis, onchocerciasis, etc.)
2.	**Acute respiratory infections and respiratory effects from housing** – Transmission of communicable diseases (e.g. acute respiratory infections, pneumonia, tuberculosis, meningitis, plague, leprosy, etc.) and respiratory infections that can be linked to overcrowding and housing inflation. It also considers indoor air pollution related to use of biomass fuels.
3.	**Veterinary medicine and zoonotic issues** – Diseases affecting animals (e.g. bovine tuberculosis, swinepox, avian influenza) or that can be transmitted from animal to human (e.g. rabies, brucellosis, Rift Valley fever, Lassa fever, leptospirosis, etc.)
4.	**Sexually-transmitted infections, including Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS) –** Sexually-transmitted infections such as syphilis, gonorrhoea, chlamydia, hepatitis B and, most importantly, HIV/AIDS. Linkages of TB will be discussed where relevant under HIV, but often linked to EHA1.
5.	**Soil-, water- and waste-related diseases** – Diseases that are transmitted directly or indirectly through contaminated water, soil or non-hazardous waste (e.g. diarrheal diseases, schistosomiasis, hepatitis A and E, poliomyelitis, soil-transmitted helminthiases, etc.)

	Environmental Health Areas (EHAs)
6.	**Food- and nutrition-related issues** – Adverse health effects such as malnutrition, anaemia or micronutrient deficiencies due to e.g. changes in agricultural and subsistence practices, or food inflation; gastroenteritis, food-borne trematodiases, etc. This will also consider feeding behaviours and practices. Access to land plays a major role in developing subsistence farming contexts.
7.	**Accidents/injuries** – Road traffic or work-related accidents and injuries (home and Project related); drowning
8.	**Exposure to potentially hazardous materials, noise and malodours** – This considers the environmental health determinants linked to the Project and related activities. Noise, water and air pollution (indoor and outdoor) as well as visual impacts will be considered in this biophysical category. It can also include exposure to heavy metals and hazardous chemical substances and other compounds, solvents or spills and releases from road traffic and exposure to mal-odours. There is a significant overlap in the environmental impact assessment in this section. Ionizing radiation also falls into this category.
9.	**Social determinants of health** – Including psychosocial stress (due to e.g. resettlement, overcrowding, political or economic crisis), mental health, depression, gender issues, domestic violence, suicide, ethnic conflicts, security concerns, substance misuse (drug, alcohol, smoking), family planning, health seeking behaviours, etc. There is a significant overlap in the Social Impact Assessment (SIA) in this section.
10.	**Cultural health practices** – Role of traditional medical providers, indigenous medicines, and unique cultural health practices
11.	**Health systems issues** – Physical health infrastructure (e.g. capacity, equipment, staffing levels and competencies, future development plans); program management delivery systems (e.g., malaria-, TB-, HIV/AIDS-initiatives, maternal and child health, etc.)
12.	**Non-communicable diseases** – Cardiovascular diseases, cancer, diabetes, obesity, etc.

4.6 Identification of Potentially Affected Communities

To identify and quantify potential health impacts, an accurate population profile needs to be determined. This is important to distinguish between differences in exposure and susceptibility (Mindell, 2001). Therefore, besides a demographic profile of the at-risk population and the identification of the most vulnerable groups, it is essential to understand how the development, construction and operation activities are likely to impact at both a household and community level.

The relevant overall population is divided into Potentially Affected Communities (PACs). A PAC is a defined community within a clear geographical boundary where Project-related health impacts may reasonably be expected to occur. The PACs which have been identified for this Project include:

- Eseldrift;
- Groesbeek;
- Ga-Mokwena;
- Haakdoring;
- Malokong;
- Pudiakagopa;
- Taolome;
- Bakenberg;
- Basogadi;
- Ditlotswana;
- Malokongskop;
- Mosate;
- Mothoathoase;
- Rooivaal;
- Kaditshwene,
- Lyden;
- Mokamole;
- Sepharane; and
- Limburg.

4.7 Impact Rating Methodology

The impact assessment methodology was developed by Digby Wells for assessing a range of environmental and socio-economic impacts according to severity, spatial scale, duration and probability. The impact rating process is designed to provide a numerical rating of the various environmental and socio-economic impacts identified for various Project activities. The same process was utilised in the rating of health impacts ensuring consistency with the overall impact rating process for the Projects EIA.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability of an impact occurring

where

***Consequence = Type of impact* x (*Intensity + Spatial Scale + Duration*)**

In the formula for calculating Consequence:

***Type of impact =* +1** (for positive impacts) ***or* -1** (for negative impacts).

The rating options for each variable in the formula, as well as the criteria for selecting a particular option, are given in Table 4-4 below.

Table 4-4: Impact Rating Options

Rating	Definition	
	Negative impacts (Type of impact = -1)	**Positive impacts (Type of impact = +1)**
Intensity		
7	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social and health order	Noticeable, on-going social and health benefits which have improved the livelihoods and living standards of the local community in general
6	Irreparable damage to highly valued items of cultural significance or breakdown of social and health order	Great improvement to livelihoods and living standards of a large percentage of population
5	Very serious widespread social and health impacts. Irreparable damage to highly valued items	On-going and widespread positive benefits to local communities which improves livelihoods
4	On-going serious social and health issues. Significant damage to structures or items of cultural significance	Average to intense social and health benefits to some people
3	On-going social and health issues. Damage to items of cultural significance	Average, on-going positive benefits, not widespread but felt by some
2	Minor medium-term social and health impacts on local population. Mostly repairable.	Low positive impacts experience by very few of population
1	Minimal social and health impacts, low-level repairable damage to commonplace structures	Some low-level social and health benefits felt by very few of the population

Rating	Definition	
	Negative impacts (Type of impact = -1)	**Positive impacts (Type of impact = +1)**
Spatial scale/Extent[5]		
7	International: The effect will occur across international borders	Very limited: Limited to specific isolated parts of the site
6	National: Will affect the entire country	Limited: Limited to the site and its immediate surroundings
5	Province/Region: Will affect the entire province or region	Local: Extending across the site and to nearby settlements
4	Municipal Area: Will affect the whole municipal area	Municipal Area: Will affect the whole municipal area
3	Local: Extending across the site and to nearby settlements	Province/Region: Will affect the entire province or region
2	Limited: Limited to the site and its immediate surroundings	National: Will affect the entire country
1	Very limited: Limited to specific isolated parts of the site	International: The effect will occur across international borders
Duration		
7	Permanent: The impact will remain long after the life of the Project	
6	Beyond Project life: The impact will remain for some time after the life of the Project	
5	Project Life: The impact will cease after the operational life span of the Project	
4	Long term: 6-15 years	
3	Medium term: 1-5 years	
2	Short term: Less than 1 year	
1	Immediate: Less than 1 month	
Probability		
7	Certain/Definite: There are sound scientific reasons to expect that the impact will definitely occur	
6	Almost certain/Highly probable: It is most likely that the impact will occur	
5	Likely: The impact may occur	

[5] The spatial scale is inverted for positive impacts because various scales have opposite meanings when considering their intensity. For e.g., the more widespread a negative impact the more intense (detrimental) it will be; conversely, the more widespread a positive impact the less intense (beneficial) it is for local communities.

Rating	Definition	
	Negative impacts (Type of impact = -1)	Positive impacts (Type of impact = +1)
4	Probable: Has occurred here or elsewhere and could therefore occur	
3	Unlikely: Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur	
2	Rare/improbable: Conceivable, but only in extreme circumstances and/or has not happened during lifetime of the Project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures	
1	Highly unlikely/None: Expected never to happen.	

After an impact had been rated on each variable in this table, its significance was calculated using the formula given above. Each impact was then categorised into one of eight categories in terms of its significance, as indicated in Table 4-5 below. The relationship between consequence, probability and significance ratings is also graphically depicted in Figure 4-6.

Table 4-5: Significance Ratings

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and/or natural environment	Negligible (negative)

Score	Description	Rating
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects	Major (negative)

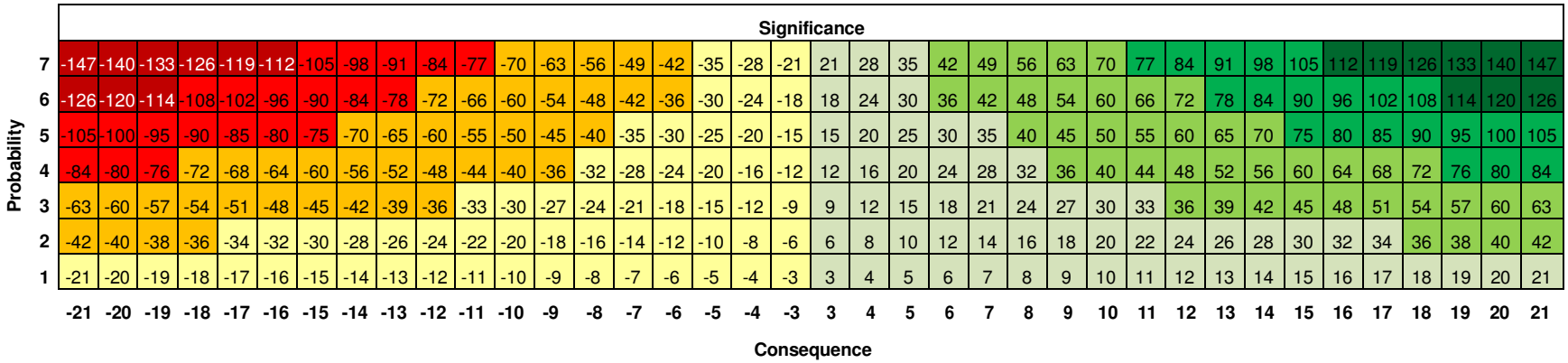

Figure 4-6: Relationship between Consequence, Probability and Significance Ratings

4.8 Data Gaps and Limitations of the HIA Study

This HIA has focused on understanding the high level health issues in the Project site. The HIA also assessed health data gaps that may exist and determined whether additional information would be required to inform a more comprehensive health evidence base.

The gap analysis included a critical appraisal of data quality of the sources identified during the HIA process.

The following are the recognised limitations of the HIA study:

- The HIA study often refers to local level data which has some limitations that need to be understood and respected. Recording and reporting of the health data within the visited Healthcare facilities is completed manually. It is important to note that this information was largely perceptions and subjective views of the status of health. However, this information is invaluable in understanding the health challenges in the area, although the limitation must be considered when evaluating information, as the ability to use it as a robust baseline and to use it to monitor relevant health impacts is limited; and
- Interviews and FGDs are normally based on respondents' self-declaration which may be prone to recall or response bias. Moreover, when it comes to questions on one's private life, study participants tend to be affected by a social desirability bias, where they may choose to give answers that are socially acceptable.

Due to the fact that construction activities on the site have not yet commenced, this HIA must be viewed as a predictive study on the risks and potential health impacts to community health.

5 Health Profile

5.1 Baseline Health Status: Country Specific

South Africa had an estimated population of 50.3 million people in 2011, of which slightly less than one million were under one year of age. The population density and the age-gender structure of the population vary dramatically across provinces in the country. The aging index (ratio of the number of people 65+ to the number under the age of 15 years) gives an indication of how far districts are in the demographic transition and, thus, where the greatest burden on health services is likely to fall in the future. Districts in the Northern and Western Cape have the highest aging index (DoH, 2012).

5.1.1 Public and Private Health Sector

South Africa has a large public sector and a smaller but fast growing private sector. The country's Healthcare system comprises a network of health facilities providing primary health care, supported by several higher levels of care. Healthcare in South Africa varies from the most basic primary healthcare, offered free by the state, to highly specialised, hi-tech health services available in both the public and private sector.

The public health sector is stretched and under-resourced in several places. While the state contributes about 40% of all expenditure on health, the public health sector is under pressure to deliver services to about 80% of the population. The private sector, on the other hand, is run largely on commercial lines and caters to middle- and high-income earners who tend to be members of medical schemes (South Africa Info, 2013). It also attracts most of the country's health professionals.

This two-tiered system is not only inequitable and inaccessible to a large portion of South Africans, but institutions in the public sector have suffered poor management, underfunding and deteriorating infrastructure. While access has improved, the quality of health care has fallen. The situation is compounded by public health challenges, including the burden of diseases such as HIV and Tuberculosis (TB), and a shortage of key medical personnel.

5.1.2 South African Health Care System

The South African government is responding with a far-reaching reform plan to revitalise and restructure the South African health care system, including:

- Fast-tracking the implementation of a National Health Insurance scheme, which will eventually cover all South Africans;
- Strengthening the fight against HIV and TB, non-communicable diseases (NCDs), as well as injury and violence;
- Improving human-resource management at state hospitals and strengthening co-ordination between the public and private health sector;
- Deploying "health teams" to communities and schools;
- Regulating costs to make health care affordable to all; and
- Increasing life expectancy from 56.5 years in 2009 to 58.5 years in 2014.

5.1.3 Healthcare Facilities

There are 4 200 public health facilities in South Africa. The number of people per clinic as per figures from 2013, was 13 718, exceeding WHO guidelines of 10 000 per clinic. However, figures from March 2009 show that people averaged 2.5 visits a year to public health facilities and the usable bed occupancy rates were between 65% and 77% at hospitals (South Africa Info, 2013).

Since 1994, more than 1 600 clinics have been built or upgraded. Free health care for children under the age of 6 and for pregnant or breastfeeding mothers was introduced in the mid-1990s (*ibid.*).

The National Health Laboratory Service (NHLS) is the largest pathology service in South Africa. It has 265 laboratories, serving 80% of South Africans. The laboratories provide diagnostic services as well as health-related research (*ibid.*).

5.1.4 Doctor Shortages

In March 2012, 165 371 qualified health practitioners in both public and private sectors were registered with the Health Professions Council of South Africa (HPCSA), the health practitioner watchdog body. This includes 38 236 doctors and 5 560 dentists (*ibid.*).

The doctor-to-population ratio is estimated to be 0.77 per 1 000. Due to the vast majority of General Practitioners – 73% – working in the private sector, there is approximately one practising doctor for every 4 219 people for public healthcare (*ibid.*). In response, the Department of Health (DoH) has introduced clinical health associates, midlevel health-care providers, to work in underserved rural areas.

Approximately 1 200 medical students graduate annually. In some communities, medical students provide health services at clinics under supervision (*ibid.*). Newly graduating doctors and pharmacists complete a year of compulsory community service in understaffed hospitals and clinics.

5.1.5 Quality of Services

Public health facilities in South Africa collectively scored less than 50% compliance with vital measures in two out of the six ministerial priority areas. These measures included: patient safety and security (34%) and positive and caring attitudes (30%) (DoH, 2012). The priority area waiting times scored the highest compliance to vital measures at 68%. Primary care facilities on average scored lower than hospitals in all priority areas. Overall, the facilities in Gauteng province obtained the highest compliance score on quality (69%) while the Northern Cape reflected the lowest (40%) (*ibid.*).

5.1.6 Functionality of Services

In terms of performance in the five functional areas (Clinical Services, Infrastructure, Management, Patient Care, Support Services and Clinical Care), the compliance score obtained by the country's facilities is the lowest for Clinical Services (38%) (DoH, 2012). Within Clinical Services, the area of Health Technology recorded the lowest compliance for both Primary Health Care (PHC) and hospital facilities followed by Pharmacy. This, and the low number of pharmacists working in public health facilities, needs urgent attention.

5.1.7 HIV/AIDS

The Human Immunodeficiency Virus can lead to Acquired Immune Deficiency Syndrome or AIDS. HIV destroys white blood cells called CD4+ T cells. These cells help the body fight diseases. This means that HIV stops one's body from fighting diseases.

HIV spreads when body fluids like blood or semen from an HIV positive person come into contact with broken skin from another person. The most common ways to get HIV is through unprotected (without a condom) sex with someone who is HIV positive, sharing needles, syringes and other equipment used to inject drugs, as well as mother to child transmission. HIV cannot be contracted by casual contact like hugging, shaking hands or sharing dishes, closed mouth or "social" kissing, saliva, tears or sweat, insects like mosquitoes and air or water.

HIV/AIDS and other poverty-related diseases such as TB and cholera place a tremendous strain on South Africa's health care system. According to Statistics South Africa, in 2011:

- The overall HIV prevalence rate was 10.6%. About one-fifth of South African women in their reproductive ages were HIV positive;
- There were 5.38 million people living with HIV. This was up from 4.21 million in 2001;
- 16.6% of the adult population (aged 15–49) years was HIV positive;
- There were about 2.01 million orphans due to HIV;
- New HIV infections for 2011 among adults was estimated at 316 900; and
- An estimated 1.06 million adults and 105 123 children were receiving antiretroviral treatment in 2010. This was up from 101 416 and close to 12 000 children in 2005.

In May 2012, the government reported to having cut the mother-to-child transmission rate from 3.5% in 2010 to less than 2%. It also stated that the rate of new infections had dropped from 1.4% to 0.8% in the 18 to 24 age groups (South Africa Info, 2013).

Risk factors for HIV infection were found to be the following:

- Early sexual debut;
- Intergenerational sex or age mixing;
- Multiple sexual partnerships; and
- Inconsistent and incorrect condom use.

5.1.8 Tuberculosis

Tuberculosis, or TB (Tubercle Bacillus) is a common, and in many cases lethal, infectious disease caused by various strains of mycobacteria, usually Mycobacterium tuberculosis (Kumar, 2007). Tuberculosis typically attacks the lungs, but can also affect other parts of the body. It is spread through the air when people who have an active TB infection cough, sneeze, or otherwise transmit respiratory fluids through the air. People nearby or in close proximity may breathe in these bacteria and become infected. The classic symptoms of active TB infection are a chronic cough with blood-tinged sputum, fever, night sweats, and weight loss (the latter giving rise to the formerly prevalent term "consumption").

Fuelled by the concomitant hyper-endemic TB and HIV epidemic, South Africa now has the highest incidence of TB in the world (981 per 100 000) and the third largest burden of TB, after China and India (DHB, 2011/12). TB management remains a challenge in South Africa; especially it's co-morbidity with HIV/AIDS. South Africa has one of the highest incidence rates of TB in the world. In 2010, the incidence rate for all types of TB was 805 per 100,000.

HIV and TB are so closely related that their relationship is often described as a co-epidemic: the co-infection rates exceed 70%, with TB being the most common opportunistic infection in HIV-positive patients.

Due to late detection, poor treatment management and drug-resistant forms of TB (known as DR-TB or multidrug-resistant TB; and XDR-TB or extensively drug-resistant TB) have increased significantly, with about 5 500 cases diagnosed during 2009 (*ibid.*).

Integrating the double scourge of HIV/AIDS and TB for the first time, the government has launched the National Strategic Plan for HIV/AIDS and TB for 2012 – 2016. It is shored up by a provincial implementation program.

The plan seeks to address the social structural drivers of HIV/AIDS, STD and TB care, prevention and support; to prevent new infections; to sustain health and wellness; and to protect human rights and access to justice of sufferers.

The HIV Counselling and Testing (HCT) campaign was launched in April 2010 – by mid-2012, almost 20 million people had been tested and knew their status. Millions were also screened for TB.

Increasing the number of anti-retroviral sites as well as Nurses certified to initiate Antiretroviral[6] (ARV) treatment has seen 1.7 million people placed on ARV treatment, from 1.1 million in 2009. South Africa has the largest ARV therapy program in the world, and an improved procurement process has seen a 50% decrease in the prices of ARV drugs (*ibid.*).

[6] The aim of antiretroviral treatment is to keep the amount of HIV in the body at a low level. This stops any weakening of the immune system and allows it to recover from any damage that HIV might have caused already. The drugs are also referred to asanti-HIV or anti-AIDS drugs.

5.1.9 Hypertension

Hypertension or high blood pressure (BP), sometimes called arterial hypertension, is a chronic medical condition in which the blood pressure in the arteries is elevated. Blood pressure is the force of blood pushing up against the blood vessel walls. The higher the pressure the harder the heart has to pump. Hypertension is a major risk factor for stroke, myocardial infarction (heart attacks), heart failure, aneurysms of the arteries (e.g. aortic aneurysm), peripheral arterial disease and is a cause of chronic kidney disease.

Hypertension is a common condition in South Africa and is a risk factor for heart attacks, stroke, left ventricular hypertrophy, renal disease, and blindness. People who have hypertension are usually unaware that they have the condition, unless the BP has been measured at health-care facilities. It is therefore frequently referred to as a 'silent epidemic' in South Africa. Consequently, hypertension is universally underdiagnosed and/or inadequately treated resulting in extensive target-organ damage and premature death. Furthermore, hypertension frequently co-exists with other risk factors for chronic diseases of lifestyle, such as diabetes and obesity.

More than 6.2 million South Africans have blood pressure higher than 140/90 mm Hg[7] (140 systolic and 90 diastolic). More than 3.2 million of these have blood pressure higher than 160/95 mm Hg. An estimated 53 men and 78 women die in South Africa each day from the impact of hypertension (Rayner, 2010).

High blood pressure is only under control if it is stabilised below a level of 140/90 mm Hg by means of treatment. Levels of 160/90 mm Hg do not translate to good control of blood pressure levels, since any blood pressure higher than 140/90 mm Hg could lead to gradual organ damage. Levels of blood pressure control are shockingly low, even in developed countries. In South Africa, only 21% of men and 36% of women with hypertension are taking drugs to reduce their blood pressure, while only 10% of men and 18% of women have their blood pressure levels reduced to the level that will eliminate the risk to their hearts, brain and kidneys.

5.1.10 Maternal Health

South Africa is a signatory to several international commitments such as the United Nation's Millennium Development Goals (MDGs), which seeks to address the health needs of women and children. However, in South Africa the health of mothers and children remains poor.

According to statistics from WHO, South Africa has a maternal mortality ratio of 310 deaths per 100 000 lives births. The infant (under the age of 1) mortality rate in 2010 was 41 deaths per 1 000 live births, while the mortality rate for those under the age of 5, was 57 per 1 000 live births (*ibid.*).

[7] Blood pressure is measured in units of "millimeters of mercury"; written mm Hg for short. Blood pressure measurements are always given in pairs, with the upper (systolic) value first, followed by the lower (diastolic) value.

Under the national Prevention of Mother-to-Child Transmission (PMTCT) program, every pregnant woman is offered HIV testing and counselling. If a woman tests positive for HIV, she is put on to a regime of anti-retroviral therapy to avoid transmitting the virus to her baby, and is offered a continuum of treatment, care and support for herself and her infant.

But it is really access and utilisation of Antenatal Care (ANC) services that most influence pregnancy outcome, child survival and maternal health. The renewed focus on primary health and the improving and expanding the health system infrastructure should go some way to addressing the high mortality rates – and get South Africa closer to the MDG target of reducing infant mortality to 20 deaths per 1000 births by 2015.

The Department of Health has a strategic plan in place which identifies “priority interventions” that will have the greatest influence on reducing mortality rates, as well as enhancing gender equity and reproductive health. The campaign on Accelerated Reduction of Maternal Mortality in Africa (CARMMA), an African Union initiative, was launched in May 2012 and aims to reduce maternal and infant mortality rates (South Africa Info, 2013).

5.1.11 Child Health

Immunisation is a significant barrier against disease and death, and the rates of children receiving their primary vaccines have steadily been increasing under immunisation programs. These aim to protect children against vaccine-preventable diseases, such as measles, TB, cholera and pertussis.

Measures to improve child health also include the expansion and strengthening of school health services and the establishment of district clinical specialist teams. Other prevention services, such as regular deworming and growth monitoring, help protect children's health.

The Health of Our Children Report compiled by the Department of Health in 2010, which surveyed 8 966 children, found that HIV prevalence among infants (age 0 to 2 years) was 2.1%, lower than the 3.3% average in the age 0 to 4 years, suggesting a positive impact of the national Prevention of Mother-to-Child Transmission program, begun in 2006 (South Africa Info, 2013).

5.1.12 Traditional Medicine

Traditional medicines are widely used in South Africa where, despite the influx of western treatments, around 27 million South Africans continue to use indigenous medicine (Cocks and Møller, 2002). The use of shrubs, herbs and trees for medicinal purposes is an ancient practice with long-standing importance to people from all levels of society.

The use of traditional healthcare comprising of plant-based medicines is not just with natural illnesses, but also for afflictions believed to be caused by the supernatural. In fact, a study of a South African village has shown that approximately one-third of the wild plants used served cultural and spiritual needs rather than basic utilitarian purposes (Cocks *et al*., 2008). In South Africa there are an estimated 200,000 registered healers (Summerton, 2006) whose extensive knowledge and reported ability to connect with ancestors are in continuous

demand. Furthermore, self-medication remains popular amongst the general public, especially for minor ailments such as coughing and diarrhoea (Dahlberg and Trygger, 2009).

The WHO observes that it is difficult to assign one definition to the broad range of characteristics and elements of traditional medicine, but that a working definition is essential. It thus concludes that traditional medicines: "[Include] diverse health practices, approaches, knowledge and beliefs incorporating plant, animal and/or mineral based medicines, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness" (WHO, 2002).

Traditional healers are generally divided into two categories – those that serve the role of diviner-diagnostician (or diviner-mediums) and those who are healers (or herbalists). The diviner provides a diagnosis usually through spiritual means, while the herbalist chooses and applies relevant remedies.

The WHO estimates that up to 80% of the population in Africa makes use of traditional medicine. In Sub-Saharan Africa, the ratio of traditional healers to the population is approximately 1:500, while medical doctors have a 1:40 000 ratio to the rest of the population (Abdool Karim, 2002). It is clear that traditional healers play an influential role in the lives of African people and have the potential to serve as crucial components of a comprehensive health care strategy. The Medical Research Council (MRC) founded a traditional medicines research unit in 1997 to introduce modern research methodologies around the use of traditional medicines. It also aims to develop a series of patents for promising new entities derived from medicinal plants.

5.1.13 Health Legislation in South Africa

An overview of legislation pertaining to the undertaking of an impact assessment specific to the health of surrounding communities has been discussed in Section 3. This section focusses on only the health legislation in the country.

The National Health Act, 2003 (Act No. 61 of 2003), provides a framework for a single health system for South Africa. The Act provides for a number of basic health care rights, including the right to emergency treatment and the right to participate in decisions regarding one's health.

The implementation of the Act was initiated in 2006, and some provinces are engaged in aligning their provincial legislation with the national Act.

Other legislation relating to health care includes laws which aim to:

- Ensure all health establishments comply with minimum standards through an independent entity (National Health Amendment Bill, 2010);
- Make drugs more affordable and provide for transparency in the pricing of medicines (Medicines and Related Substances Amendment Act (Act no. 59 of 2002));
- Regulate the medical schemes industry to prevent it from discriminating against "high risk" individuals like the aged and sick (Medical Schemes Act, 1998);
- Legalise abortion and allow for safe access to it in both public and private health facilities (The Choice on Termination of Pregnancy Act, (Act No. 92 of 1996);
- Limit smoking in public places, create public awareness of the health risks of tobacco by requiring certain information on packaging, and prohibit the sale of tobacco products to anyone younger than 18 (Tobacco Products Control Amendment Act (Act no. 23 of 2007));
- Provide for the introduction of mandatory community service for Nurses (Nursing Act, 2005);
- Introduce a process to develop and redesign mental health services so as to grant basic rights to people with mental illnesses (Mental Health Care Act, 2002); and
- Allow non-pharmacists to own pharmacies, with the aim of improving access to medicines (Pharmacy Amendment Act, 2000). This came into effect during May 2003.

Other important developments in health care policy and legislation include:

- The Health Professions Amendment Bill of 2006;
- The Traditional Health Practitioners Act (Act no. 35 of 2004); and
- Regulations relating to the Labelling and Advertising of Foodstuffs came into effect in May 2012, and aim to empower citizens to make healthy food choices.

5.2 Baseline Health Status: Project Region (Waterberg DM and Mogalakwena LM)

Of the 179 866 households in the WDM, 30.7% have piped water inside dwellings, 86.7% use electricity for lighting and 44.2% have a weekly refuse removal service. Of the population's citizens who are 20 years and older, 23.2% have Matric and 9.0% have higher education. The unemployment rate is 28.1%. The district falls in the socio-economic Quintile 3[8] and has estimated medical scheme coverage of 16.7%, the highest provincially.

The Mogalakwena LM is serviced by 3 Hospitals, 26 Clinics and 12 Mobile Clinics. More than 80% of the population is within 120 minutes of walking distance from health facilities (Day et al., 2012).

5.2.1 Burden of Disease

The WDM's 2009 Burden of Disease (BoD) profile is considered from an analysis of the causes of death. The figures provided for the WDM are above the South African mean of 30.2% and a long way from the internationally recognisable standard of 10%. Of the unusable classifications, 21.6% of deaths were assigned to 'ill-defined' causes and 11.6% to 'garbage codes[9]'. An analysis of the Years of Life Lost (YLLs) after redistribution of the deaths by four broad cause groups reflects that the highest proportion of YLLs was due to communicable diseases (together with maternal, perinatal and nutritional conditions) (35.4%), followed by non-communicable diseases (27.7%). HIV and TB (24.5%) ranked third whilst the lowest proportion (12.4%) of YLLs was due to injuries (*ibid.*).

[8] A socio-economic indicator, namely the deprivation index measures the relative deprivation of populations across districts within South Africa. It is a composite measure derived from a set of demographic and socio-economic variables obtained from the 2007 Community Survey and the 2005 and 2006 General Household Surveys. Based on the deprivation index, South African districts have been ranked into socio-economic quintiles. The quintiles are labelled 1 to 5 – quintile 1 being the most deprived, and quintile 5 being the least deprived (best-off).

[9] Intermediate causes of death, e.g. septicaemia; mechanisms of death, e.g. cardiac arrest; partially specified causes, e.g. cancer with unknown site of the disease; or risk factors, e.g. hypertension.

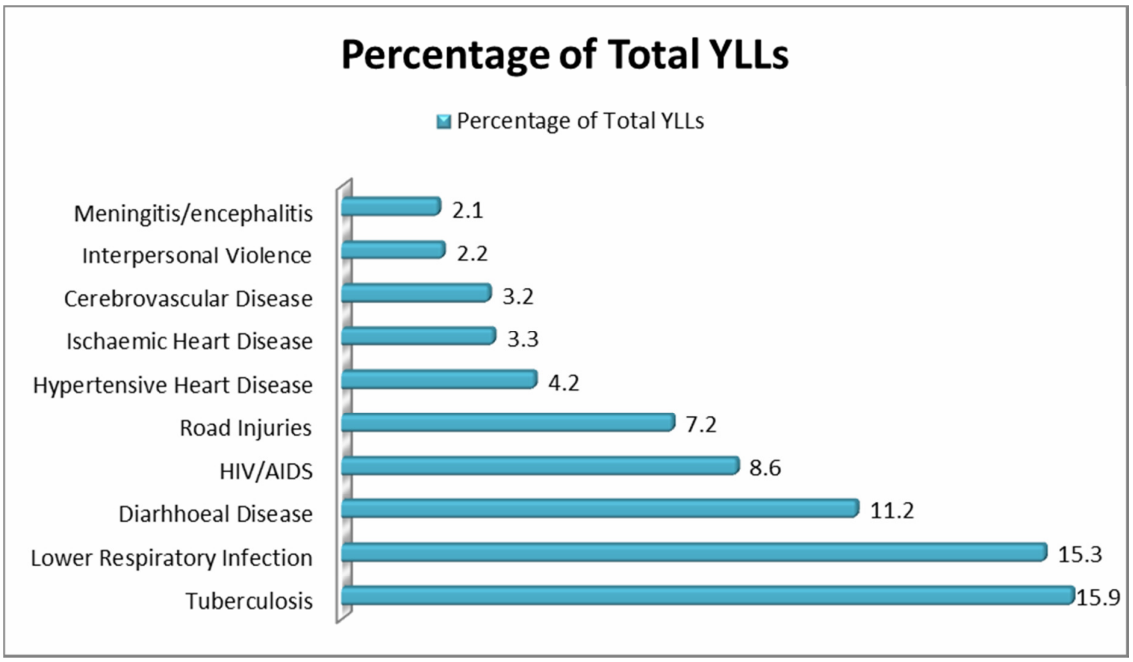

Figure 5-1: Leading causes of Years of Life Lost (YLLs): LP – DC36: WDM

5.2.2 Usable Bed Utilisation Rate

The usable Bed Utilisation Rate (BUR) is a process indicator (identifies activities related to the functioning of the health system) that is also a measure of efficiency. The BUR reflects how many of the usable beds in a hospital were occupied over a given time period, usually a year. A low BUR value for a given hospital may indicate that there is little or no need for the hospital in the particular community or area. Another explanation could be that the community chooses not to use the hospital for any number of reasons.

In contrast, a high BUR could indicate that patients are spending too long in the hospital and not being discharged appropriately or it could mean that there are insufficient beds to cater for the needs of the population.

The national BUR was 67.2% in 2011/12. The majority of Limpopo districts exceeded the national rate and the national target (*ibid.*). The WDM has 1.3 district hospital beds per 1 000 population, higher than both the provincial and national averages of 0.8 and 0.7 respectively. The bed utilisation rate was 61.4%, the lowest in the province, with an average length of stay of 4.5 days (*ibid.*).

5.2.3 HIV/AIDS

HIV and AIDS is major contributor to the disease burden in South Africa and has had a severe effect on the social and economic fabric of South Africa. To detect HIV infection early, the public health sector provides HIV counselling and testing to pregnant women to prevent mother-to-child transmission. During 2011/12, 98.8% of pregnant women were tested for HIV (Day *et al.*, 2012).

The antenatal client HIV 1st test rate dropped from 100.9% in 2010/11 to 99.4% in 2011/12 in the WDM. The antenatal client HIV 1st test positive rate decreased slightly from 24% in 2010/11 to 21.7%. The antenatal client HIV prevalence (routine data) was 26.7% and in line with the 2010 HIV Antenatal seroprevalence[10] Survey rate of 26.1% (*ibid.*). The rate of antenatal clients initiated on Highly Active Antiretroviral Therapy (HAART)[11] was 64%, well below the national average of 80.4%. The distribution rate for male condoms increased from 10.8 condoms per male (15 years and older) in 2010/11 to 27. This rate was above the provincial average of 19.7 condoms (Day *et al*., 2012).

Limpopo had the third lowest HIV prevalence in the country at 8.8% (Shisana *et al*., 2009). The antenatal HIV prevalence for the WDM was 24% (Day *et al*., 2012). The last HIV prevalence survey in the Mogalakwena Local Municipality was conducted in 2000 and estimated the prevalence to be 10.2% (Mogalakwena Local Municipality, 2012).

5.2.4 Tuberculosis

In 2010, there were 184.6 smear positive TB cases per 100 000 people in Limpopo, which remained the lowest incidence in South Africa. The TB cure rate in Limpopo was 70.3% in 2009, which was close to the national average of 71.1%. The WDM had the highest TB incidence in Limpopo, but also has the worst outcomes, with a smear conversion rate of only 55.6%, a low cure rate of 62.4% coupled with a high defaulter rate of 13.2%. There were 681 cases per 100 000 of TB in the WDM in 2011. In the same year, new HIV positive patients who had a confirmed TB rate was 14.4% (Day *et al*., 2012).

The TB incidence (all cases) was above 600 per 100 000 between 2008 and 2011 and then decreased to 565.1 per 100 000 in 2012 and 547.2 per 100 000 in 2013. The TB incidence decreased from 296 per 100 000 in 2010, and was for the first time below 200 at 148.7 per 100 000 in 2013.

5.2.5 Malaria

Malaria is endemic in three South African provinces, and is more prevalent in specific districts than others. Limpopo is one of these provinces. Malaria is a seasonal disease and quarterly monitoring of the incidence rate may not reflect disease trends accurately. Table 5-1 depicts the number of malaria deaths in Limpopo. Most cases of malaria reported in Limpopo are during the summer rainy season between September and May. Most cases are reported in December, due to the movement of people between malaria areas outside the province and areas under control within the province.

[10] Seroprevalence is the number of persons in a population who test positive for a specific disease based on serology (blood serum) specimens; often presented as a percent of the total specimens tested or as a proportion per 100,000 persons tested.

[11] highly active antiretroviral therapy is the name given to aggressive treatment regimens used to suppress HIV viral replication and the progression of HIV disease. The usual HAART regimen combines three or more different drugs such as two nucleoside reverse transcriptase inhibitors (NRTIs) and a protease inhibitor (PI), two NRTIs and a non-nucleoside reverse transcriptase inhibitor (NNRTI) or other such combinations.

There were 253 reported cases of malaria in the province between October and December 2012. This was a decrease from 504 during the same period in 2011 and 1,744 in 2010. The mean case fatality rate from malaria in South African has been reported to be about 1.1% per season. The incidence of malaria in the WDM between 1998 and 2005 was about 30.9 per 100,000 person years. The mean number of cases reported per season is about 190 while the mean number of reported deaths per season is 1.1 (Gerritsen *et al.*, 2008). The Department of Health and Social Development regularly sprays households, with 300,000 houses sprayed[12] (Indoor Residual Spraying (IRS)) between October and December 2012 (Politicsweb, 2012).

Table 5-1: Number of Deaths due to Malaria in Limpopo, 1997 – 2009

Year	Number of Deaths
1997	170
1998	160
1999	380
2000	324
2001	377
2002	359
2003	359
2004	313
2005	296
2006	183
2007	59
2008	80
2009	570
Source: Mortality and causes of death in South, 1997-2009; Findings from the death notification, Statistics South Africa	

5.2.6 Child Health

Immunisation is an essential intervention to protect children against vaccine-preventable diseases. During 2011/12 the national full immunisation coverage rate for children under the age of one was 95.2%, which exceeded the annual target of 95%. The Limpopo province, again, exceeded the national target (*ibid.*).

Immunisation is one of the most effective health care interventions to prevent serious illnesses and death in young children. Immunisation has a significant impact on morbidity and mortality rates and plays a critical role in efforts to achieve Millennium Development Goal 4 to reduce child mortality rates by two-thirds by 2015, compared to the 1990 baseline.

[12] Indoor Residual Spraying is the application of a long-lasting residual insecticide to potential malaria vector resting surfaces such as internal walls, eaves, and ceilings of all houses or structures (including animal shelters) where such malaria vectors might come into contact with the insecticide (WHO, 2013).

The Limpopo province ranked in the top 10 (in 2010/11) and showed large increases in immunisation rates over the past 5 years.

- The immunisation coverage under 1 year in the WDM increased from 80.6% in 2010/11 to 86.9% in 2011/12.;
- Over the same period the pneumococcal vaccine 3rd dose coverage increased from 80% to 103.2%, the rotavirus 2nd dose coverage increased from 82.8% to 109.6% and the measles 1st dose under 1 year coverage increased from 90.4% to 103.5%;
- The indicators that have numerators greater than the denominators resulting in coverage rates of more than 100% may indicate data quality issues; and
- The measles 1st to 2nd dose drop-out rate increased dramatically from 4.0% to 21.2% (*ibid.*).

5.2.7 Non-communicable Diseases

Non-communicable diseases play an important role in the overall burden of disease in the Limpopo Province. Strokes, chronic lung disease, heart disease, hypertension and diabetes are all mentioned in the top 20 disease burdens in the province (Bradshaw *et al.*, 2004). There is very little information in the public domain related to NCD at the district level.

- The diabetes mellitus and hypertension detection rate in the WDM in 2010 was estimated to be between 0.1 and 0.2% (Day *et al.*, 2012);
- The hypertension detection in the WDM was 0.1%; and
- The mental health case load was 0.8%, the lowest in the province and below the national average of 1.4% (*ibid.*).

5.3 Baseline Health Status: Local Level

The following section describes the baseline health status in the Project site and at local level with reference to the EHAs. This is based on the national and regional baseline health data that was identified during the desktop review and primary data collected during the field visit. Data at the local level is based on the aforementioned FGDs and KIIs that were carried out during the field visit.

5.3.1 Common Ailments

A list of common ailments that a household member had suffered from one of these ailments is presented in the table below. This information was obtained from the household survey conducted by the Digby Wells Social Team for the Project.

Table 5-2: Reported Health Problems in the Past Month

Type of disease	Children under 15	Women over 15	Men over 15
Cold / flu	18%	18%	10%
Eye infection	4%	14%	5%
Diarrhoea	5%	6%	3%
Skin rash	7%	3%	2%
Hypertension	-	6%	2%
Asthma	1%	3%	2%
Tuberculosis	1%	2%	2%
Witchcraft	0%	2%	2%
Intestinal worms	2%	1%	1%
Waterborne disease	0.2%	1.7%	0.5%
Diabetes	-	0.3%	0.9%
Arthritis	-	0.9%	0.3%
Pneumonia	0.2%	0.3%	-
HIV/Aids	-	0.2%	0.2%

5.3.2 EHA #1 Vector-Related Diseases

Vector-borne diseases are illnesses caused by pathogens and parasites in human populations. Distribution of these diseases is determined by a complex dynamic of environmental and social factors.

Vector-related diseases may be present in the community, resulting from unmanaged water bodies and vectors drawn to waste, such as rats and mice. The table below highlights whether the MLM provided certain solid waste services between the years 2012 – 2013.

Table 5-3: Solid Waste Services provided by the MLM

Solid Waste Services	2012/13
Is the municipality responsible to provide?	Yes
Does the municipality have infrastructure to provide?	Yes
Does the municipality actually provide?	Yes
Is the service outsourced/commercialised?	No
Number of households and non-domestic customers to which provided	48 717
Domestic households with access to free basic service	4 541

Whilst vector borne diseases are not common in the Limpopo, illegal dumping of waste and the influx of people coupled with poor environmental management may lead to establishment of vector breeding sites in the study area, a situation that may lead to emergence and increase in the prevalence of vector-borne diseases, e.g. malaria.

5.3.3 EHA #2 Communicable Diseases Linked To Housing Design

Communicable diseases are spread from one person to another or from an animal to a person. The spread of such diseases often happens via airborne viruses or bacteria, but also through blood or other bodily fluid. The terms infectious and contagious are also used to describe communicable diseases.

To have "healthy housing" it is necessary that the following elements are adequately addressed: shelter, water supply, sanitation, solid waste, wastewater, overcrowding, indoor air pollution, food safety, vectors of disease, as well as aspects related to transport, and shopping facilities (WHO 1997). Illnesses related to inadequate housing conditions are mainly communicable respiratory illnesses including TB and pneumonia.

5.3.3.1 General Housing and Respiratory Diseases

Both the WDM and MLM are experiencing increasing pressure to launch new housing developments to supply housing for its population. This pressure is attributed, in part, to the increase in mining Projects and general population growth (WDM, 2012). The 2012/2013 MLM Integrated Development Plan (IDP) estimates the housing backlog within the municipality at 32 000 units. However, those who do have access to housing mostly reside in formal dwellings. Of these as much as 84% of houses are not paid off. This indicates poor ability to pay back debt and also a high willingness to get into debt for housing purposes. This is discouraging for local economic developments (LED) prospects, as a high debt level will likely stifle spending in the area and will have a negative effect on consumer expenditure.

Informal settlements have been established within MLM, especially around popular urban areas as more people move from rural to urban areas to seek livelihood opportunities. For this reason they are also likely to appear adjacent to mining operations as this is fast becoming a large economic resource throughout the local municipality (MLM, 2012). This phenomenon increases the backlog of housing facilities to be provided by MLM. Informal settlements are also indicative of a lack of formal and affordable housing.

Informal settlements are very often devoid of basic sanitation and utilities, in addition to insecure tenure, poor housing quality and overcrowding, which combine to result in poor health outcomes of informal settlement residents. Informal houses are plagued by:

- Insufficient heating during winter months thus exacerbating upper respiratory tract infections;
- Lack of access to clean drinking water which may result in major diseases such as cholera, schistosomiasis;
- Vermin due to poor waste disposal and no refuse collection facilitate the spread of several vector borne diseases;
- Lack of improved sanitation facility –a proper toilet –which separates human waste from human contact. In addition, lack of education on practices such as hand washing - preferably with soap – which would prevent the transfer of bacteria, viruses and parasites found in human excreta which otherwise contaminate water resources, soil and food. This contamination is a major cause of diarrhoea, the second biggest killer of children in these places;
- Moisture in these poorly built/ designed homes leads to the establishment and easy spread of mould and fungi –which depress the human respiratory system;
- Poor ventilation with hardly any natural light which lowers the general tone and lessens resistance to disease. Sunlight and proper ventilation are especially important for the prevention of the spread of TB –i.e. in families where there is an advanced case of TB, the chances of infecting other family members is multiplied – ultraviolet (UV) light makes vitamin D, and vitamin D turns on innate immunity to TB; and
- Increased levels of noise in informal settlements may increase causes nervous tension, fatigue, headaches and reduction in work efficiency/ productivity by influencing sleep and other physiological events.

Based on the key informant interviews it was clear that most households live in a brick structure or traditional structures on individual properties (with more than one house on the respective property) or one house on a separate stand/property. According to data derived from the 2011 census there is not an extreme need for housing throughout the province as 88.7% of people in Limpopo reside in formal housing (Stats SA, 2011). Table 5-4 depicts the type of housing in the Project region. The household survey conducted in the PACs showed a similar scenario as it was confirmed during the field visit that much of the population within the PACs has some kind of formal residence. Houses were traditional brick or mud structures either with a thatch or corrugated iron roof.

Table 5-4: Type of Housing

Study area	Type of housing			
	Formal	Informal	Traditional	Other
Limpopo	89%	5%	4%	2%
Waterberg	86%	12%	1%	1%
Mogalakwena	94%	5%	1%	0%

Based on the KIIs as well as the household survey, overcrowding was stated as a problem with some respondents claiming to have ten individuals living in a three bedroomed house. Houses are basic and sufficient. Informal settlements do not appear to be a problem.

The majority of households within the local study area have access to electricity for lighting purposes. With regards to cooking and heating there seems to be a greater reliance on alternative energy sources, especially wood. It is reasonable to argue that wood is sourced from areas surrounding rural communities. This would have an adverse impact on human respiratory health.

According to KIIs as well as data collected from the household survey, TB is the most common respiratory disease in the PACs.

5.3.4 EHA #3 Veterinary Medicine and Zoonotic Diseases

A zoonotic disease is a disease that can be passed between animals and humans. Zoonotic diseases can be caused by viruses, bacteria, parasites, and fungi. These infectious diseases of animals have different modes of transmission. In direct zoonosis the disease is directly transmitted from animals to humans through media such as air (influenza) or through bites and saliva (Rabies). In contrast, transmission can also occur via an intermediate species (referred to as a vector), which carry the disease pathogen without getting infected.

No information on the current state of zoonotic diseases is available for the area. However, an influx of people who bring in animals, may lead to an increase in zoonotic diseases.

5.3.5 EHA #4 Sexually-Transmitted Infections, Including HIV/AIDS

All respondents in the FGDs reported to having heard about HIV/AIDS. With numerous respondents across the PACs stating that HIV/AIDS is a serious problem in their communities. It is clear to see that HIV/AIDS has affected all levels of these communities – from the youth to the elderly.

Both the interviewed personnel at George Masebe Hospital and Magobe Clinic listed HIV/AIDS as one of the top five most common illnesses that they treat. Both health facilities have the ability to diagnose HIV, and stock ARVs. KIIs highlighted the risk factors for HIV infection were found to be the early sexual debut (FGDs also asserted that a lot of young

people, from age thirteen, are sexually active); intergenerational sex or age mixing; multiple sexual partnerships; as well as inconsistent condom use.

Condoms are readily available within the communities. They are available for free at health facilities and they are also available in public toilets, shops, 'spazas', schools and shebeens. There is little stigma associated with buying condoms, although some women stated that they sometimes feel shy to take free condoms from public places.

There are regular HIV awareness campaigns within the communities. The key informants reported that there is good knowledge of HIV transmission and prevention measures. Most members of the communities also have a good attitude towards people with HIV, whilst a handful has discriminatory attitudes towards HIV positive people.

5.3.5.1 HIV/AIDS: Knowledge, Attitude and Behaviour

Many people stated that the level of HIV/AIDS is one of grave concern as it is "killing the people and leaving orphans". Conversely, several communities (Lyden, Eseldrift, FGD 6 - Good Hope, Claremont, Talome, Pudiakgopa, Ditlotswana, Malakonskop, and Rooivaal asserted that HIV/AIDS is not a serious problem in their communities as condoms are freely available, nurses educate them about this disease, and therefore expect that everyone should have knowledge on this disease.

FGD results suggest that the general levels of awareness and consistent knowledge on the disease and preventive behaviours is exceptionally good. However, the mere acknowledgement of the disease in the absence of the relevant preventive behaviours will not support any form of behaviour change or risk taking practices. With regards to family planning and contraceptives, some respondents reported that a lot of the men in their communities were opposed to the use of any form of contraceptives due to their 'tradition' and 'culture' which allows men to be promiscuous. Some 'traditional men' are also against artificial contraception. The only form of birth control permitted is abstinence. There is somewhat of a paradox in their beliefs, versus their behaviour as a lot of the young people engage in sexual activities and even have children, but are not married. Others, such as residents of the Haakdooring community, refuse to use condoms and base their choice on the notion of trust –"we trust each other, so there is no need to use condoms" said one of the respondents during the FGD.

There are high levels of stigma in the communities with associated discrimination as some individuals were not willing to purchase food from someone who they knew was HIV positive. Ten out of twelve communities engaged with during FGDs stated that they would keep their HIV positive family member's status a secret –mainly due to the stigma attached to the disease. Apart from this being attributable to a general respect for their family member's privacy, part of this is due to the poor levels of knowledge and beliefs. 'Traditional' and 'cultural' beliefs make it difficult to inform behavioural change information. The high levels of illiteracy also makes behavioural change communication somewhat challenging.

Information collected during the FGDs shows that a large proportion of respondents know the two main ways to prevent HIV, namely condom use, abstaining and having one uninfected sexual partner (monogamy –being faithful).

5.3.5.2 *Commercial Sex*

With regard to the negative impacts of the Project development it was reported, during FGDs, that there are no commercial sex workers in the broader study area. If commercial sex is not reported in the study communities then the challenge will be to maintain this situation when the practice is considered to be a challenge in the broader community. Should the mine lead to the emergence of more prostitution in the area there would be negative social and health connotations. There was also a concern raised that an influx of single male migrants from outside the area would place a burden on scarce resources and also cause an increase in the incidence of HIV and STI. Results from the household surveys suggest that disadvantaged young girls and child-headed households would be extremely vulnerable to single men with disposal income.

5.3.6 EHA #5 Soil, Water and Waste Related Diseases

Digby Wells' groundwater team carried out a hydrocensus (on identifying existing boreholes and springs) within a 5 km radius of the mining area. The main objective of this was to enhance the knowledge of the groundwater system and current groundwater users. All groundwater samples were taken in accordance with the Department of Water and Sanitation (DWS); Department of Health (DoH); and Water Research Commission's (WRC) Quality of Domestic Water Supplies: Volume 2: Sampling Guide (2000). Samples were collected from boreholes across the Project site to ensure a good representation of upstream and downstream water qualities, as well as different geological or aquifer units.

Six samples collected during the hydrocensus and five samples collected during the pumping test. These samples were submitted to a SANAS accredited laboratory, Aquatico Laboratories, Pretoria, South Africa for analysis.

The following field parameters were measured during the hydrocensus:

- pH;
- Total Dissolved Solids;
- Electrical Conductivity; and
- Temperature.

Groundwater samples collected during a recent (i.e. 2014) hydrocensus presented generally the regional geogenic/ambient groundwater quality with a calcium-magnesium-bicarbonate (Ca-Mg-HCO3) water type.

Safe drinking water and adequate sanitation is a necessity for good health, as households without safe water and proper sanitation systems are more vulnerable to water borne diseases. Government water schemes provide most households within the local study area with piped water; however, a considerable number of households still depend on groundwater resources for domestic and agricultural use (see Table 5-5). Rural communities are almost totally dependent on piped groundwater abstracted from boreholes by pumps. Data on ground water resources indicates that there are water shortages, especially during

the dry season, in the area. Water scarcity in the area prevents local water supply schemes to provide sustainable and reliable water to most rural communities.

Table 5-5: Household Water Supply

Water source	% Households
Regional/local water scheme	65%
Borehole	23%
Dam/pool/stagnant water	6%
Water vendor/tanker	4%
Other	2%
Source: StatsSA, 2013	

Water sources used by the households are shown in Figure 5-3 below. As can be seen from this figure, the majority (65%) of households have access to piped water in their house or yard (see Figure 5-2). Of the households who do not have access to water in their house or yard, about 75% have access to a water source (mostly a community standpipe) that is less than one kilometre from their homes.

Figure 5-2: A 'tap' in a yard at Goodhope Village

Only 12% of households report that they purify their water; the most common methods of water purification are chlorine tablets (used by 66% of the households who report that they purify their water), boiling (26% of households) and bleach (7%).

Pit latrines represent the most common form of sanitation facility, with only 4% of households relying on alternative sanitation services. Twenty-nine percent of surveyed households report that they share their sanitation facility with another household.

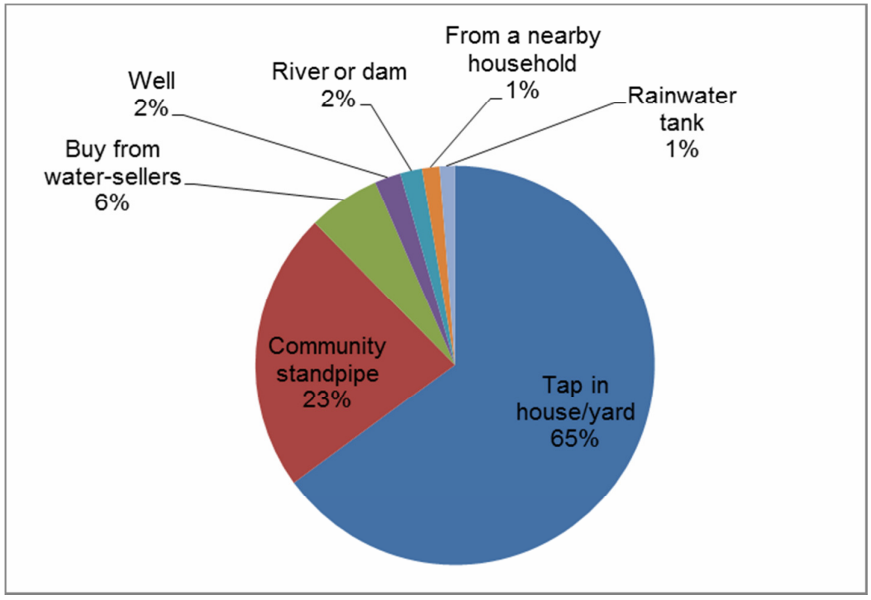

Figure 5-3: Water Sources

In terms of sanitation the majority of households within the local study area only have access to pit toilets (see Figure 5-4), followed by a small number of households that have access to flush sanitation.

Figure 5-4: Pit latrine in Sepharane Village

The local municipality owns a general landfill site which is licensed in terms of the Environmental Conservation Act, 1989 (Act No. 73 of 1989) –the Rebone Landfill site. The site receives 10 500 m^2 of waste on a monthly basis from various sources such as domestic, commercial and industrial premises. The operation of both sites is done in-house with available resources. Figure 5-5 below illustrates an illegal dumping site on the outskirts of the Mosate Village in the vicinity of the Project site.

Twenty seven percent (26.8%) of households have their refuse removed by local authorities weekly (Census 2011). One percent (1.3%) of households depends on a communal refuse dump. There was a decrease in the proportion of households without any refuse disposal from 9.7% in Census 2001 to 7.7% in 2011 (Mogalakwena Local Municipality Integrated Development Plan, 2010-2011).

Figure 5-5: Illegal dumping site on the outskirts of Mosate Village

5.3.7 EHA #6 Food and Nutrition Related Issues

Food security includes a variety of aspects such as stability of the availability of food, as well as stability of access to and utilisation of food (SAHR, 2008). Nutritional status is determined by the degree of nourishment. Under-nourishment, an indicator of food security, means consumption is continuously low. Approximately 52% of South African households experienced hunger in 2009 (WHO, 2010). Therefore food security is an important consideration in understanding potential health impact of development Projects. This EHA is affected by influx of people resulting in increased demand for food.

Based on the KIIs, food shortage is a serious problem in the local area. Six out of twelve, (50%), of the FGDs considered malnutrition as a serious problem within their communities –

see Figure 5-6. A few individual respondents similarly stated that malnutrition was a problem. This was relevant for both children and also the elderly as vulnerable groups. Much of this was linked to generally high levels of poverty in the communities. Food shortage has been noted as one of the main health needs in the area. Malnutrition is linked to poverty and food security issues, as the population cannot afford basic foodstuffs. Poor feeding practices related to poor education and illiteracy are bound to worsen the existing situation.

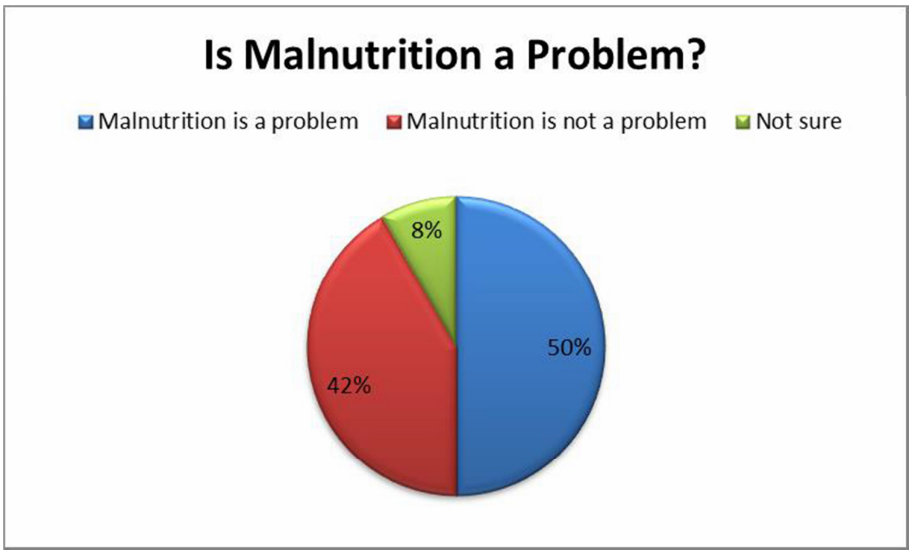

Figure 5-6: FGD Responses to the Issue of Malnutrition in their Communities

Maize meal porridge or “mieliepap” (‘pap’) is probably the most important staple food eaten in the PACs with all respondents mentioning this food as their staple diet. But does pap have a high or a low glycaemic index (GI)? The answer is not really straightforward because maize meal can have either a high GI, an intermediate or a low GI depending on the temperature at which it is eaten. There are a number of starches which have a lower GI when they are eaten cold, rather than hot. The nutritional value of maize meal per 100g serving is depicted in Table 5-6.

Table 5-6: Nutritional Content of a Serving of Pap

Per serving (100g)			
Calories	66	Sodium	1 mg
Total Fat	0 g	Potassium	0 mg
Saturated	0 g	Total Carbs	14 g
Polyunsaturated	0 g	Dietary Fiber	0 g
Monounsaturated	0 g	Sugars	0 g
Trans	0 g	Protein	0 g
Cholesterol	0 mg		
Vitamin A	0%	Calcium	0%

Vitamin C	0%	Iron	0%
*Percent Daily Values are based on a 2000 calorie diet. Individual daily values may be higher or lower depending on individual's calorie needs.			

5.3.8 EHA #7 Accidents / Injuries

Digby Wells appointed Aurecon to undertake a traffic and transportation impact study to be included into the ESIA report. There is a single entrance to the Project site, via D4380 Provincial Road. These municipal roads are double-lane tarred roads which are at present, in good condition.

The material from the proposed mine will either be transported via road, then onto rail in Mokopane and onwards to the nearest port; or via road, directly to Durban/Richards Bay for export to international markets. Haul roads will be constructed along hanging wall and footwall of both open pits. The haul roads will be constructed between the open pits, WRD, tailings dam and to the concentrator plant. It is planned that there will be one haul road crossing over the D4380 Provincial Road to access the open pit to the south.

The road network surrounding the Project site may potentially be affected by the heavy duty vehicles are outlined in Table 5-7.

Table 5-7: Roads Potentially Impacted by the Project (Aurecon, 2015)

Road Link	Jurisdiction	Function	Road Condition	Classification
D4380	Roads Agency Limpopo	Links Mokopane via N11 with Mogalakwena-cluster and numerous rural settlements situated further north-west.	Paved	Single Carriageway
D3507	Roads Agency Limpopo	Provides a link between the D4380 and the D1958. Provides access to several small rural settlements	Paved	Single Carriageway
D3534	Roads Agency Limpopo	Provides a link between the D4380 and the N11. Provides access to several small rural settlements.	Unpaved	Single Carriageway
D1958	Roads Agency Limpopo	Provides a link between the D4380 and the R518	Road not sealed	Single Carriageway
D3500	Roads Agency Limpopo	Links Mokopane with Mogalakwena cluster and numerous rural settlements situated further north-west	Paved	Single Carriageway

Road Link	Jurisdiction	Function	Road Condition	Classification
N11	South African National Roads Agency Limited	Provides a link between the site and Mokopane.	Unpaved	Single Carriageway, planned upgrade to duel carriageway
N11 Mokopane Ring Road	South African National Roads Agency Limited	proposed bypass linking N11 and N1	Planned	Planned

Accidents and injuries were commonly reported in the two of the KIIs. Road traffic accidents (RTA) are the not very common in the communities. Gender-based violence and crime related injuries such as assault are more common. There is a strong link to alcohol in domestic violence and motor vehicle accidents.

Examples of issues related to accidents and injuries include road traffic-related accidents and injuries, chemical spills and pollution releases, as well as accidents and injuries in the home environment. The Project will increase the need for transportation of people and goods, by road thereby increasing the number of vehicles (light and heavy) on many of the existing roads that may already be in a bad condition. This situation may slow down traffic; have an influence on the pace of development and increase the risk of accidents.

5.3.9 EHA #8 Exposure to Potentially Hazardous Materials, Noise and Malodours

While little information was available regarding potential environmental health exposures the following were considered and highlighted in the key informant interviews.

Some households still use wood for cooking and heating that may cause a health risk from indoor air pollution and associated respiratory health concerns. The housing arrangements and electrification of the area reduce the risks of this. Bush fires may also play a role as the emergency services are limited. As waste removal from households is a challenge, many households burn waste that can emit harmful by products, especially plastics, having an adverse effect on human health. Rural areas such as these often have illegal dump sites (see Figure 5-5) and those which are available can contaminate water supplies and present unhygienic conditions, further exacerbating the negative impacts of human health.

Dust will be generated by project activities such as vehicles using unpaved roads; the stockpiling of minerals, low grade materials, WRD, TSF walls etc. With effective mitigation measures the effect should be minimal.

Both general and hazardous waste will be generated on the Project site. These wastes will need to be handled, separated, stored and disposed of according to their classification. The following waste facilities are anticipated to be constructed as part of the Project:

- Oil traps at vehicle wash bay and workshop areas;
- Settling ponds as part of the concentrator process;
- PCDs;
- Sewerage treatment plant; and
- Temporary general and hazardous waste storage facilities.

Various hazardous substances will be stored on site, including fuels, lubricants, gas, oils, and explosives. There will be emulsion type explosives that would be mixed on site in emulsion tanks with the detonators stored in an explosive magazine (building). These materials will be to be stored in secured buildings or with the necessary bunds (110% of volume of materials). The specifications for hazardous material storage will be confirmed during the detailed mine design.

5.3.10 EHA #9 Social Determinants of Health

The social determinants of health are the conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels (WHO, 2013).

5.3.11 EHA #10 Cultural Health Practices

Culture and traditional values play a very important role in the local communities. The SePedi and Shangaan communities place a large emphasis on traditional values and practices and this relates to health care and health seeking behaviour. The community members' beliefs in their health as influenced by spiritual powers is an interesting notion of physical health and illness quite different from the Western perception hereof. It cannot be exclusively said how the respondents perceive physical and spiritual purposes of using the plants (whether physical illness is seen as physical irrespective of its cause).

Traditional medicine plays an integral role in health seeking behaviour and also where choices are made as to preference for health care. Traditional medicine could be accessed either initially or even after seeking care for a more western medical source.

Although it was reported that a number of households in the study area uses medicinal plants both for physical illnesses and spiritual purposes, traditional medicine did not play a major or an integral role in health seeking behaviour and also where choices are made as to preference for health care. The vast majority sought help from healthcare facilities as their first option. Numerous respondents stated that traditional medicine is often accessed after seeking care for a more western medical. From the KIIs it was apparent that some cultural traditions and religious beliefs of the local population in themselves pose a challenge in providing effective health services.

Key informants indicated that some traditional healers have been trained to assist with home-based care.

Figure 5-7 depicts how the average traditional healer in these PACs communities would dress.

Figure 5-7: Helen Mafofo, a Traditional Healer

The potential influx of people may result in an increase in unregistered medical practices. More people are practicing and using traditional medicine which may contribute to reducing the health burden if they are trained and knowledgeable. These practices may include traditional healers digging for plants in contaminated areas. An increase in the prevalence of malpractice by traditional healers may occur if the burden of disease increases due to a lack of health facilities or if there are more people with an increased income. Unscrupulous practices may result in negative health impacts.

5.3.12 EHA #11 Health Systems Issues

The health care infrastructure in the district and municipal area is relatively well served, but with a somewhat notable disproportion toward the urban compared with the more rural areas. While the infrastructure was reported as sound it was mentioned at the KIIs and also the household surveys that the major challenge for health service delivery in the area was the deteriorating state of health service delivery at the hospital and clinic levels.

Although more than half of the respondents were happy with the quality of services they receive from their local clinics and hospitals, a notable proportion of the surveyed population was unhappy with these services. They attributed their dissatisfaction to a lack of skilled staff to support the daily functioning of the facilities; the operating times of the facilities (clinics not being 24 hour facilities and sick people having nowhere to go during cases of emergency at night); a general disregard and lack of respect for patients (by the nurses); shortages of medication; failure of health practitioners to follow the Batho Pele Principles[13] with pride; long queues and overcrowding.

Key health personnel mentioned a shortage of staff, especially in the form of doctors. This creates service delivery challenges and often results in long waits for patients, and places increased stress on the current medical staff. Staff shortages were also reported at the clinic level and this associated with equipment, consumables and basic services like electricity (with regular power outages at some healthcare facilities), and limited documentation storage/filing methods, mean that these services do not function optimally.

5.3.12.1 Access to Healthcare

Most households live within 30 minutes' walk from a health facility (mostly a community clinic). Only 9% of surveyed households reported that they have to pay for the services of a medical practitioner. Thirteen percent of households reported that they sometimes make use of a traditional healer, but reliance on a pastor for healing is far more common (reported by 72% of survey respondents). A list of common ailments, as well as the percentage of households reporting that a household member had suffered from one of these ailments, is presented in Figure 5-8 below. Although respondents were not required to disclose their HIV/AIDS status, one case of HIV/AIDS was reported during the survey.

[13] Batho Pele principles were developed to serve as acceptable policy and legislative framework regarding service delivery in the public service. These principles are aligned with the Constitutional ideals of: promoting and maintaining high standards of professional ethics; providing service impartially, fairly, equitably and without bias; utilising resources efficiently and effectively; responding to people's needs; the citizens are encouraged to participate in policy-making; and rendering an accountable, transparent, and development-oriented public administration.

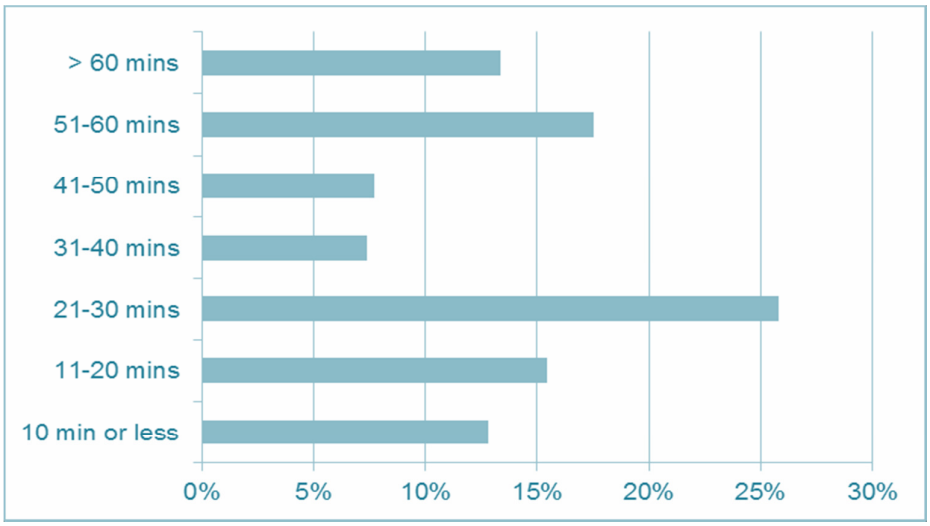

Figure 5-8: Distances to Health Facilities (minutes walk)

5.3.13 EHA #12 Non-Communicable Diseases

The term NCDs refers to a group of conditions that are not mainly caused by an acute infection, but rather result in long-term health consequences and often create a need for long-term treatment and care. These conditions include cancers, cardiovascular disease, diabetes and chronic lung illnesses. Many NCDs can be prevented by reducing common risk factors such as tobacco use, harmful alcohol use, physical inactivity and eating unhealthy diets. Many other important conditions are also considered NCDs, including injuries and mental health disorders.

The chief chronic conditions observed in the surveyed communities include chronic diseases such as hypertension, diabetes, stroke, and cancer. FGD respondents highlighted that hypertension/"high blood pressure" and diabetes are serious problems in their communities. This is also asserted by information obtained during the KIIs, where both interviewed key health personnel listed hypertension in their top five major illnesses facing their community.

6 Potential Health Impacts

6.1 Human Health Impacts of Magnetite/ Iron

Mineral prospecting and mining rarely result in a fully confined exposure to the target material being extracted from the environment. Where Iron Ore rock is not pure, and it rarely is pure, then Iron Ore dust is equally impure and thereby contains the impurities of which many are associated/ contaminated with 'heavy metals'[14]. Magnetite is the most commonly mined ore of iron. It is also the mineral with the highest iron content (72.4%).

[14] Heavy metals are those geological minerals with a metallic and metalloid character that are around 5 times the density of water and are poisonous at low concentration. Heavy metals include lead (Pb), cadmium (Cd), zinc

Where the concentration of those other 'heavy metals' is not immediately commercially viable to be processed then those other heavy metals are routinely dumped upon an above ground waste rock dump where the concentrations can be accumulated to a commercial viability whilst the dust from those piles can be spread (blown and/or washed) across the environment. As mentioned in Section 2.1.3 the parting ore will either be stockpiled as a low grade ore or be sent to the waste rock dump, depending on its grade.

Some heavy metals (like iron) have been reported to be of bio-importance to man and their daily medicinal and dietary allowances had been recommended. Dietary iron can be found in meat, whole meal products, potatoes and vegetables. The human body absorbs iron in animal products faster than iron in plant products. Iron is an essential part of haemoglobin; the red colouring agent of the blood that transports oxygen through the human body. Iron is an essential nutrient for humans. A common problem for humans is iron deficiency, which leads to anaemia. The average man needs an average daily intake of 7 mg of iron and, 11 mg for the average woman. A normal diet will generally provide all that is needed.

Iron may cause conjunctivitis, choroiditis, and retinitis if it contacts and remains in the tissue. Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in development of a benign pneumoconiosis, called siderosis, which is observable as an x-ray change. No physical impairment of lung function has been associated with siderosis.

Exposure to iron ore dust can cause metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, chest tightness and cough. Prolonged or repeated contact can discolour the eyes causing permanent iron staining. Repeated exposure might cause changes seen on a chest x-ray. Silica being a common constituent of iron ore dust, prolonged exposure might cause silicosis and other related lung diseases (Keast, 1989).

Zn), mercury (Hg), arsenic (As), silver (Ag) chromium (Cr), copper (Cu) iron (Fe), and the platinum group elements (Farlex, 2005). These other heavy metals are intercepted and need to be processed out of the targeted heavy metal (iron ore).

6.2 Human Health Impacts of Vanadium

It is imperative to remain cognizant that although Pamish seeks to mine magnetite (the Project will only generate a magnetite concentrate), the end product is potentially vanadium as the magnetite will be trucked and exported or alternatively sold to existing smelting operations. Due To the fact that the mine will only produce a magnetite concentrate, and not vanadium, the assessment of the potential health impacts of vanadium is not in the scope for the Project. The health impacts of vanadium have, however, been discussed in this subsection.

According to the WHO (2001), there is limited toxicokinetic information suggesting that vanadium is absorbed following inhalation (in humans) and is subsequently excreted via the urine with an initial rapid phase of elimination, followed by a slower phase, which presumably reflects the gradual release of vanadium from body tissue. Following oral administration, tetravalent vanadium is poorly absorbed from the gastrointestinal tract. There were no dermal studies available.

In inhalation and oral studies in laboratory animals, absorbed vanadium in either pentavalent or tetravalent states is distributed mainly to the bone, liver, kidney, and spleen, and it is also detected in the testicles (*ibid.*). The main route of vanadium excretion is via the urine. The pattern of vanadium distribution and excretion indicates that there is potential for accumulation and retention of absorbed vanadium, particularly in the bone. There is evidence that tetravalent vanadium has the ability to cross the placental barrier to the foetus.

The nature of the toxicity of vanadium pentoxide and other vanadium compounds is such that it is not possible to clearly identify the threshold level, for any route of exposure relevant to humans, below which there would be no concern for potential genotoxic activity.

A more recent study conducted by Lenntech Water Treatment Solutions (2014) states that insoluble vanadium compounds are not regarded as serious hazard, however, workers exposed to vanadium peroxide dust were found to suffer severe eye, nose and throat irritation. The uptake of vanadium by humans mainly takes place through foodstuffs, such as buckwheat, soya beans, olive oil, sunflower oil, apples and eggs.

This same study asserts that vanadium can have a number of effects on human health, when the uptake is too high. When vanadium uptake takes places through air it can cause bronchitis and pneumonia (Lenntech, 2014).

The acute effects of vanadium are irritation of lungs, throat, eyes and nasal cavities.

Other health effects of vanadium uptake are:

- Cardiac and vascular disease;
- Inflammation of stomach and intestines;
- Damage to the nervous system;
- Bleeding of livers and kidneys;

- Skin rashes;
- Severe trembling and paralyses;
- Nose bleeds and throat pains;
- Weakening;
- Sickness and headaches;
- Dizziness; and
- Behavioural changes.

The health hazards associated with exposure to vanadium are dependent on its oxidation state. Magnetite contains elemental vanadium. Elemental vanadium could be oxidized to vanadium pentoxide during welding. The pentoxide form is more toxic than the elemental form. Chronic exposure to vanadium pentoxide dust and fumes may cause severe irritation of the eyes, skin, upper respiratory tract, persistent inflammations of the trachea and bronchi, pulmonary oedema, and systemic poisoning. Signs and symptoms of overexposure include; conjunctivitis, nasopharyngitis, cough, laboured breathing, rapid heartbeat, lung changes, chronic bronchitis, skin pallor, greenish-black tongue and an allergic skin rash.

7 Impact Analysis, Mitigation and Enhancement

This HIA has focused on understanding what potential health impacts the Project may have on the nearby communities. To support this it was important to define the existing baseline health status of communities surrounding the Project site so that the potential for and direction of health impacts could be analysed.

Based on the findings in Section 5.3, potential high level health impacts are described below. These will consider options for stakeholder communication and development of both short term and long term management plans.

It is important to understand that assessing health impacts is often based on a broad range of factors. These can be influenced from a national or regional policy/program decision/intervention and thus may be extremely dynamic. The impact analysis considers the present state of health based on the community profile, and impacts related to the existing plans and designs of the Project (Winkler *et al*., 2010).

Furthermore, it is important to note that only the impacts relevant to the Project have been assessed and mitigated in the section below. EHA #1 (vector-related diseases), EHA #3 (veterinary medicine and zoonotic diseases) and EHA #10 (Cultural health practices) have not been discussed as, during the field visit and analysis, these were deemed immaterial in the PACs.

7.1 Key Issues and Related Health Impacts

This section provides an analysis of the potential impacts associated with the Project and has included the analysis of potential negative impacts and their mitigation measures, but

also includes potential positive impacts and measures to enhance these. This is based on the evidence presented in the baseline health description, the planned Project activities and information obtained from the other available specialist studies.

The key health impacts and needs have been described in the EHA framework to ensure consistency. Project specific determinants and comments will be described so as to inform the impact assessment. While it is recognised that some of these existing health needs will be inherited by the Project, and are often the responsibility of the government, they may influence these impacts and need to be considered for mitigation/management. It is also true that some of these management measures could overlap into social investment, especially for enhancement of certain impacts. For this reason the mitigation and enhancement has been divided into two different categories:

- **Project impact mitigation:** interventions required to mitigate the impacts of the Project on the communities; and
- **Corporate social Investment:** interventions suggested and recommended for the improvement of the existing poor health status of the communities.

7.2 EHA #2 Communicable Diseases Linked to Housing Design

7.2.1 Transmission of Communicable Diseases due to Overcrowding

With the expected population growth and influx of job seekers, who may bring their families along, household size may increase resulting in overcrowding. Influx/In-migration to the area has been mentioned as a potential impact in the SIA. The Project has the potential to attract outsiders and returning families. Population influx has the potential to contribute to the prevalence of respiratory problems in two ways. First, newcomers may carry strains of respiratory diseases (e.g. seasonal influenza viruses) to which the local population has limited resistance due to a lack of previous exposure.

Overcrowding, due to influx of people may lead to increase in the prevalence of respiratory health outcomes, including TB during construction and operation phases of the Project. Loss of income due to retrenchment may result in more people in a house, exacerbating the prevalence of respiratory diseases.

Second, in the absence of adequate and affordable housing, newcomers may settle in informal settlements without services such as water, electricity, etc. This may force them to rely on wood fires for cooking and indoor heating.

7.2.1.1 *Impact Evaluation and Management Measures*

EHA #2	**Increased disease related to overcrowding and close contact**					
Construction and into operations and closure						
	Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
Before Management	*Project life (5)*	*Municipal Area (4)*	*Negative (-5)*	***Highly detrimental (14)***	***Highly probable (6)***	***Moderate negative (-84)***
Management Measures						
Project impact mitigation ▪ Reduce the prevalence of TB by communicating with local-level TB-control program coordinators (DoH) to initiate case finding, treatment, and follow-up with family members and others living within the same housing compound as workers diagnosed with active TB; ▪ Improve vaccination coverage by collaborating with the DoH on awareness creation around vaccinations to communicable diseases for vulnerable sub-populations such as children and old people ▪ Labour policies should encourage hiring of local staff to avoid job seeking migrants. The Project should not hire at the front gate but consider a recruitment office at an off-site location; and ▪ Reduce the prevalence of communicable diseases by: ▪ Collaborating with relevant government departments, schools for awareness creation and improved understanding of factors exacerbating communicable diseases, including coping strategies that result in behaviour change; and ▪ Initiating competitions at schools for illustrating innovative ways to improve conditions at home - either by reducing exposure, susceptibility or increasing coping capability. **Corporate Social Investment** ▪ Support improvements in the capacity of local TB case management. This should include training of health care staff within community Healthcare centres, appropriate diagnostics for case detection of TB and a referral system for effective treatment. This can be through support of a local NGO or the Department of Health program. This will assist in addressing case surveillance and in ensuring that the TB situation does not deteriorate in the area.						
After Management (including implementation of CSI Measures)	*Medium term (3)*	*Municipal (4)*	*Moderate (3)*	***Moderately detrimental (10)***	***Probable (4)***	***Minor negative (-40)***
No-go Option						
No Change – existing status will not be affected.						

7.3 EHA #4 Sexually Transmitted Infections, Including HIV/AIDS

7.3.1 Transmission of STIs and HIV/AIDS

HIV/AIDS and STIs are significant existing public health challenges nationally and within Mokopane. STIs, if present and untreated, have been found to increase the risk of

transmission of HIV if one partner is infected. HIV's link with TB and its importance has been discussed above.

The potential influx and movement of labour (including contract workforce) into the area may pose an increased risk for STIs. There may be more disposable income either as a direct or indirect consequence of the Project. Commercial sex workers are more likely to establish in Mokopane town, but may also be attracted to communities surrounding the Project site, where local community may be vulnerable to opportunistic sexual liaisons. The likely effect of the Project employing a number of relatively well-paid employees may also increase the risk for transactional sex, especially if they are away from their normal family unit. Economic upliftment and settlement around the Project site may also lead to the adoption of "urban" values and lifestyle changes, which may also play a role in casual sexual engagement.

Women and young girls are extremely vulnerable and have limited negotiating power for safe practices and family planning. Gender based sexual violence is common and while there are NGO's active in the area, there is very little support for victims.

HIV/AIDS should be considered a major risk for the Project and the community and interventions should be implemented on a broad base in the workforce and the community.

There will be adequate amounts of disposable income in the area which will increase during the duration of the Project which may result in individuals partaking in transactional sex.

The transport corridors which will be improved with the development of the Project may increase traffic to the Project site, which may potentially result in high risk sexual activity along the transport route, including Mokopane.

7.3.1.1 Impact Evaluation and Management Measures

EHA#4	Sexually transmitted infections including HIV/AIDS					
Construction and into operations and closure						
	Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
Before Management	*Permanent (7)*	*Local (3)*	*High-negative (-6)*	***Extremely detrimental (-16)***	***Probable (7)***	***Major-negative (-112)***
Management Measures						
Project impact mitigation: ▪ Implement the existing HIV/AIDS policy that incorporates both the workplace and community considerations; ▪ Develop an integrated HIV management program that considers both the workplace and the community but with different levels of intervention. The workplace should include a comprehensive program while the program directed at PACs should have a focus on awareness and prevention activities. TB and STI must be integrated into this; ▪ Conduct a Knowledge, Attitude and Practices (KAP) study to understand levels of awareness and knowledge in both the workplace and community. This needs to have an emphasis on practices so that appropriate behaviour change programs are developed; ▪ Conduct a seroprevalence study in the area in partnership with the local health authorities; ▪ Ally with existing organisations, initiatives or neighbouring mining operations to support the local health authorities in extending care and treatment programs in the area –e.g. providing transportation for communities who do not have easy access to healthcare facilities or assisting in delivering the necessary drugs to HIV positive patients in their homes; ▪ Support the local health authorities with the establishment of voluntary counselling and testing (VCT) centres in the area; ▪ Support information campaigns and community based peer educator programs in both the workforce and community. These need to use locally acceptable tools and based on the finding of the KAP study. These must serve as indicators to monitor the impact of the behaviour change and must have a gender focus. Community based peer health educators will play a key role; ▪ Develop and implement an Influx Management Plan that also considers HIV; ▪ Support equal employment opportunities for women and establish livelihood programs to reduce risk for opportunistic sexual encounters and empower women and young girls to earn their own income to be in a position to provide for themselves without having to resort to sexual transactions; and ▪ Ally with existing organisations or neighbouring mining operations to provide financial support (amount to be agreed upon by both parties) NGO groups active in area on gender-based sexual violence –failure to secure these partnerships will have to result in Pamish embarking on this venture single-handedly and in their own capacity. **Corporate Social Investment:** ▪ Support the development and extension of any prevention of mother to child transmission programs currently running in the local communities –these can be any NGO or government programs; and ▪ Support community based condom distribution centres.						
After Management (including implementati	*Long term (4)*	*Local (3)*	*Average (4)*	***Moderately detrimental (11)***	***Highly probable (6)***	***Minor negative (-66)***

on of CSI Measures)						
No-go Option						
No Change – existing status will not be affected.						

7.4 EHA #5 Soil, Water and Waste Related Diseases

7.4.1 Water Management

The communities surrounding the Project site have good access to clean or improved water supplies. There is a heavy reliance on non-protected wells as a primary source of drinking water.

Influx during the construction and operational phases may also play a role in availability of water due to increased demand, which may ultimately negatively affect water quantity. Water-borne diseases such as diarrhoea are common and are linked to contaminated water and poor sanitary conditions. Water-washed diseases such as eye and skin infections are common. These are linked to poor hygiene.

During active construction periods, the Project may create new breeding sites for key mosquito vectors which would significantly increase the vector-borne disease risk. Water storage facilities require careful environmental engineering (for example, shoreline slopes and vegetation control) to prevent development of vector breeding sites. During construction and operation phases, tyres, drums, and other containers may become significant breeding sites for mosquitoes, with subsequent increased risk of malaria outbreaks.

During the construction phase the groundwater quality may be impacted on by localised hydrocarbon spills that may occur at workshop and yellow metal laydown areas, as well as hydrocarbon storage zones. Another potential risk to groundwater quality at the site is domestic waste generated by the construction phase contractors and client staff that may contaminate the groundwater resource. In addition, the groundwater quality may be impacted by general/ hazardous waste which is not placed in the impermeable bunded area before being taken to a registered landfill site. This was a low impact activity and mitigation measures were to dispose of all domestic waste at a dedicated, suitably constructed landfill site.

According to the Groundwater Study conducted by Digby Wells, the simulated, cumulative inflows into the two pits range between 3000 and 7000 m^3/day. The final drawdown cone extent from the open pit mining at the site extends approximately 1 km from the pit areas in the northern, southern and eastern directions, limited by the hills located east and west of the pit areas. The impact rating for the dewatering of the groundwater resource is medium, as the impact is highly probable and no mitigation is possible.

During the operational phase waste material will be generated at the site. The waste material will be disposed of at two waste rock dumps and one TSF. These waste facilities, along with the low grade ore stockpiles at the site, may release poor quality seepage into the

groundwater environment. The waste rock dumps and stockpile areas are both low impact during mining, as both are kept relatively small and will not result in large amounts of seepage. The TSF is likely to generate poor quality seepage, however no parameter of concern has been identified at the site.

An increase in income earned during construction and operational phases of the Project may improve the ability to afford basic environmental health services through increased access to such services and ability to pay for better services. This may result in a decline in cases of soil, water and sanitation-related diseases.

7.4.1.1 Impact Evaluation and Management Measures

EHA# 5	**Soil, water and waste related diseases**					
Construction and into operations and closure						
	Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
Before Management	*Long term (4)*	*Local (3)*	*High-negative (-5)*	***Moderately detrimental (-12)***	***Highly probable (6)***	***Minor-Negative (-72)***
Management Measures						

<table>
<tr><td colspan="7">Project impact mitigation
▪ Reduce releases into surface, soil, groundwater by:
▪ Providing adequate toilets for workers at each work site;
▪ Ensuring that waste is stored appropriately and collected regularly;
▪ Monitoring the quality of groundwater and surface water as prescribed by the groundwater and surface water reports, (to ensure that the project does not have any detrimental effects on community water sources;
▪ The borehole abstraction should be monitored and water levels at the abstraction borehole and nearby boreholes monitored regularly for any negative water level trends;
▪ the training of staff working in these areas on appropriate response actions to hydrocarbon spillages and ensuring that each area is supplied with appropriate spill response kits;
▪ Restrict access to Project created water bodies;
▪ Implement non-hazardous waste plans, including awareness and education in affected communities in collaboration with local waste management;
▪ Recycling programmes
▪ Conduct health education programs for project workers regarding hygiene, housing, nutrition, soil, water and sanitation issues related diseases; and
▪ Ensure proper waste management from project generated waste according to waste management principles.
Corporate Social Investment
▪ Ally with existing organisations, initiatives or neighbouring mining operations to provide financial or technical support the local authorities and other partners in supporting and improving water and sanitation services (e.g. building proper toilets for households, providing means to acquire safe drinking water) –failure to secure these partnerships will have to result in Pamish embarking on this venture single-handedly and in their own capacity;
▪ Establish water and sanitation committees in the communities to manage their own water and sanitation services. This will improve sustainability of any outreach support;
▪ Promote and support local authorities in improved collection and disposal of waste in communities;
▪ Support information campaigns in the community on water use, hygiene and general sanitation; and
▪ Schools within PACs should be supported with ventilated improved pit latrines.</td></tr>
<tr><td>After Management (including implementation of CSI Measures)</td><td>Beyond project life (6)</td><td>Local (3)</td><td>Average (3)</td><td>Moderate (-12)</td><td>Likely (5)</td><td>Minor negative (-60)</td></tr>
<tr><td colspan="7">No-go Option</td></tr>
<tr><td colspan="7">No Change – existing status will not be affected</td></tr>
</table>

7.5 EHA #6 Food and Nutrition Related Issues

7.5.1 Changes in Income and Expenditure Consumption

New projects have significant potential to alter underlying levels of community- and household-income poverty positively (IFC, 2009). These potential positive effects may have a profound impact on a variety of health performance indicators for all populations in a community (for example, children under age 5, women of reproductive age, elderly, and so

on). Conversely, projects can trigger significant inflation, impacting both food and housing in surrounding communities. Significant food inflation can adversely impact existing vulnerable groups, with negative consequences on individual- and community-level health performance indicators.

Significant food inflation can make recruitment and retention of healthcare workers and teachers extremely difficult for local communities. Significant and sudden changes in income can have a marked effect on alcohol usage and subsequent gender violence. Workforce education and training are potential key mitigation activities. In addition, long-term food inflation may increase food deprivation, nutrition-related effects, affecting especially vulnerable groups such as children and marginalised groups.

Increased revenues coupled with careful planning and checks and balances have the potential to make significant contributions to the progressive realisation of internationally protected economic, social and cultural rights. However, without transparency, good governance including channels for complaints and remedies (grievance mechanisms), and plans for inclusive growth, large foreign investments into natural resources may translate into huge profits for a few and harmful impacts for local communities most directly affected.

As mentioned, influx of people into the area will put a strain on existing land and crop yields may reduce. Inflation could reduce food security in a situation of already high food prices that communities cannot afford. Changes in practices also need to be considered over the medium term. The communities may start buying more food in the form of refined products as a result of economic upliftment. A reduction in physical exertion may also be as a result of changing livelihoods.

7.5.1.1 Impact Evaluation and Management Measures

EHA #6	**Food and Nutrition related issues**					
Operations and closure						
Before Management	**Duration**	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
	Project life (5)	*Local (3)*	*Moderate-negative (-4)*	***Moderately detrimental (-12)***	***Likely (5)***	***Minor-negative (-60)***
Management Measures						
Project impact mitigation: ▪ Support mitigation measures for communicable diseases such as malaria, diarrhoea and respiratory infection to reduce the co-morbidity created by malnutrition; ▪ Improve food security by: ▪ Collaborating with the DOH to conduct anthropometric monitoring (height, weight, age) within the potentially affected communities; ▪ Assisting with school feeding programmes, including education on food gardens, nutrition, and good nutritional habits; ▪ Running competitions between schools on nutritional issues to create awareness; ▪ Curb food inflation by:						

▪ Assisting with identification of community assets/skills to increase local food production, training of community care workers, and assist with relief where necessary but also with rehabilitation and development of affected vulnerable people; ▪ Collaborating with local health-education services to provide materials (from food- and nutrition-related health-education programs conducted for workers), to local health-education services and school programs; and ▪ Assisting with food and sanitation awareness materials to local district environmental health officers for educational sessions with food handlers and slaughterhouses, particularly vendors who sell food to construction workers and employees. **Corporate Social Investment:** ▪ Support sustainable livelihood programs through increased use of agriculture. The financial benefit of farming will be essential to support (e.g. establishing community gardens, assisting with the establishment of sustainable livestock farms to be run by the communities, for the communities); ▪ Promote access to education and schooling for women; ▪ Support maternal and child health programs. This can include supporting the promotion of Antenatal Care, breastfeeding practices, food preparation/hygiene, and family planning.						
After Management (including implementation of CSI Measures)	*Medium term (3)*	*Local (3)*	*Average (3)*	***Moderately detrimental (-9)***	***Likely (5)***	***Minor negative (-45)***
No-go Option						
No Change – existing status will not be affected						

7.6 EHA #7 Accidents/Injuries

7.6.1 Road Traffic Accidents and other Accidental Injuries

The construction and operations phases at the Project site (traffic impacts are anticipated to be greater during operation than construction) will generate additional traffic along the Mine Access Road, the D3534, D4380, D3500 and N11 as well as some other roads within the Project site, thus the potential to increase the number of traffic accidents. Some community members may be relatively naïve to risks from road traffic accidents and the larger volumes of traffic may increase their exposure risk. This is especially relevant for small children.

The risks and impacts related to Project-generated traffic during construction and operation of the mine were identified as:

- Increased traffic;
- Increased risk of vehicle collisions and personal injuries;
- Increased dust generation;
- Increased traffic noise; and
- Increased traffic and disruption of traffic flows.

There are limited emergency services so any delays to getting a patient to the appropriate healthcare can be significant and inappropriate movement of the patient has the potential to exacerbate injuries.

7.6.1.1 Impact Evaluation and Management Measures

EHA #7	Accidents and Injuries					
Construction and into operations and closure						
	Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
Before Management	*Beyond project life (6)*	*Local (3)*	*Very high-negative (-6)*	***Highly detrimental (-15)***	***Likely (5)***	***Moderate-negative (-75)***
Management Measures						

Project impact mitigation:

- Improve road safety by:
  - Collaborating with the district road-safety unit to establish and maintain pictorial road-safety signage near the site in local language and English language (if needed); clearly demarcated pedestrian crossings in appropriate places; descriptions along project roadways directly surrounding project facilities, including conveyor-belt routes, roadway rerouting areas, heavy-equipment crossing areas, etc.;
  - Regular vehicle maintenance; adequately trained drivers; use of appropriate fuel, adherence to speed limit, tracking of vehicles;
- Develop community security and safety management plans for the project related to the different activities. This should include emergency response plans for both community related accidents and also for the workplace. This must include a fire, rescue and chemical spill response capability, as well as medical emergency response strategies;
- It would serve Pamish well to engage the MLM and interested and affected parties to assist with programmes targeted at improving traffic management and road safety in the study area, which may not only reduce the loss of life years due to traffic accidents, but also improve access to and the pace of development in the area;
- Construction workers should, further, live as close as possible to the construction site as to avoid travelling which increases risk. This could also serve to lessen the impact on traffic volumes and help to reduce accidents; and
- Develop a clear policy for the management of emergencies or accidents in the community as a direct result of the projects activities.

Corporate Social Investment:

- Ally with neighbouring mining operations to provide financial support towards the refurbishment of the local health facilities to support any injuries or trauma. This should be limited to first aid and stabilisation prior to transport. This can also include emergency care training of the local health care practitioners, and or an ambulance for emergency response – failure to secure these partnerships will have to result in Pamish embarking on this venture single-handedly and in their own capacity. In both scenarios, Pamish would have to come to an agreement with the other parties on the level/ amount of financial support needed; and
- In partnership with the local authorities and police coordinate information campaigns about responsible driving including speed management and vehicle safety. Educational efforts on road safety should also be supported through the school system.

EHA #7	Accidents and Injuries					
After Management (including implementation of CSI Measures)	*Project life (5)*	*Local (3)*	*Average (3)*	***Moderately negative (-11)***	***Probable (4)***	***Minor negative (-44)***
No-go Option						
If the Project does not proceed – the No-Go Alternative - there will be no increase in traffic on access roads or provincial roads and no Project-related impacts in respect of traffic and transport.						

7.7 EHA #8 Exposure to Potentially Hazardous Materials, Noise and Malodours

Exposures and environmental health determinants as a result of the Project will be covered in a number of specialist reports. These include air quality, water, noise and soil studies.

The potential impacts of magnetite and ultimately, vanadium have been discussed above in Section 6.2.

7.7.1 Noise

Noise generated from Project activities is a factor to consider from a health perspective. The health impacts of noise are well described at both a physical and psychosocial level. Noise at the plant site will need to be managed with worker health and safety requirements and also based on IFC guidelines to reduce ambient noise that may affect surrounding communities.

In terms of the baseline noise conditions, the Digby Wells Environmental Noise Impact Assessment Report states that the existing ambient noise levels in the immediate area are typical of suburban districts, with the average daytime levels averaging at 45dBA, which is slightly below to the SANS suburban daytime guidelines (Digby Wells, 2015). The average baseline night time levels are 40dBA which is similar to the SANS suburban night time guidelines.

From the study, it is concluded by means of dispersion modelling that the noise produced by the project at the location of identified receptors will not measure above the existing baseline noise levels as well as not measure above the SANS day and night time guideline rating limit at the surrounding communities (SANS 10103:2008). Thus, the overall significance of the noise impact is expected to be negligible.

7.7.2 Health Issues Related to Suspended Particulate Matter

The main pollutant of concern identified as a result of the construction and operational phases of the mining development will be the particulate matter, whether in the form of total suspended particulates (TSP), PM_{10} or $PM_{2.5}$.

The impact of particulates on human health is largely dependent on (i) particle characteristics, particularly particle size and chemical composition, and (ii) the duration, frequency and magnitude of exposure. The potential of particles to be inhaled and deposited in the lung is a function of the aerodynamic characteristics of particles in flow streams. The aerodynamic properties of particles are related to their size, shape and density. The deposition of particles in different regions of the respiratory systems also depends on their size.

The nasal openings permit very large dust particles to enter the nasal region, along with much finer airborne particulates. Larger particles are deposited in the nasal region by impaction on the hairs of the nose or at the bends of the nasal passages. Smaller particles (< 8 µm in diameter) pass through the nasal region and are deposited in the tracheobronchial and pulmonary regions. Particles are removed by impacting with the wall of the bronchi when they are unable to follow the gaseous streamline flow through subsequent branches of the bronchial tree. As the airflow decreases near the terminal bronchi, the smallest particles are removed by Brownian motion, which pushes them to the alveolar membrane (CEPA/FPAC Working Group, 1998; Dockery and Pope, 1993).

The range of adverse health effects of PM is broad, involving respiratory and cardiovascular systems in children and adults. Both short- and long-term exposures lead to adverse health effects. Very young children, probably including unborn babies, are particularly sensitive to the adverse effects of PM. The evidence is sufficient to infer a causal relationship between exposure to PM and deaths from respiratory diseases in the post-neonatal period. Adverse effects of PM on lung development include reversible deficits of lung function as well as chronically reduced lung growth rate and long-term lung function deficit. The available evidence is also sufficient to assume a causal relationship between exposure to PM and aggravation of asthma, as well as cough and bronchitis symptoms. Daily mortality and hospital admissions have been linked with short term variation of PM levels. Increased mortality from cardiovascular and respiratory diseases and from lung cancer has been observed in residents of more polluted areas. The PM limits and standards are discussed in the Air Quality Impact Assessment Report.

Several community based studies using PM_{10} as an exposure indicator have indicated strong associations between PM and respiratory and cardiovascular effects at concentrations commonly experienced in typical urban environments (Dockery et al. 1993; Künzli et al. 2000). Exacerbating effects are not only chemical composition but also population susceptibility, duration of exposures and synergistic effects with other pollutants or cigarette smoking. According to the Air Quality Impact Assessment Report, sensitive areas such as Sepharane, Ditlotswana, Malakonskop Basogadi and Mathoathoase which are between 1 – 2 km buffers may be impacted. However, the farther away from the mine operation the lower the concentration residents are exposed to and the associated health risk.

Studies on animals and of human exposure have shown that the inhalation of iron ore can have some effect particularly on the upper airways. However, exposures would have to be at concentration levels far above environmental levels which would be associated with the

Project, and no effects should be observed in the exposure range experienced in the receptor areas surrounding the Project site.

The International Agency for Research on Cancer (IARC, 2000) has not classified iron oxides as carcinogens (substances that cause cancer) (Lewis 1995: database), and epidemiological data are not available to support any suggestion of carcinogenicity. Based on animal experiments iron oxide dust might serve as a co-carcinogenic substance, i.e. enhancing the development of cancer at a simultaneous exposure to a carcinogenic substance (Elinder, 1979: 435). However, this has not been shown conclusively.

7.7.2.1 Impact Evaluation and Management Measures

EHA #8	**Environmental health determinants: Air and noise pollution**					
Construction and into operations and closure						
	Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
Before Management	*Project life (5)*	*Limited (2)*	*Low negative (-3)*	***Moderately detrimental (-10)***	***Highly probable (6)***	***Minor negative (-60)***
Management Measures						
Project impact mitigation: ▪ Reduce spills by implementing emergency spill response plans and procedures, including medical monitoring plans, for each potential contaminant (project-related); ▪ The current buffers presented in the Air Quality Impact Assessment Report (1-2 km) be maintained and concerted efforts must be made to prevent proliferation of formal or informal settlements within the current buffer; ▪ Implement mitigation and monitoring measures as specified in the air quality, noise, surface water and groundwater assessment reports; Human health considerations should be considered based on results of the surveillance activity; ▪ Implement a dust control plan to identify the measures that will be taken to reduce the potential for particulate emissions associated with the Project.						
After Management (including implementation of CSI Measures)	*Project life (5)*	*Limited (2)*	*Low-negative (-3)*	***Moderately detrimental (-10)***	***Probable (4)***	***Minor negative (-40)***
No-go Option						
No Change – existing status will not be affected						

7.8 EHA #9 Social Determinants of Health

7.8.1 Influx Management

The Project faces the risk of unforced or voluntary migration, where it is assumed that migrants would be acting out of a rational self-interest as the motivating factor for moving into the Project area. Often, if people are leaving behind adverse home conditions, they are

migrating because of perceived opportunity rather than any specific guarantee of a job, particularly if a member of their extended family is already resident in the area (IFC, 2009). Migration is expected to yield positive benefits for the individual migrant (and his/her household), whether through remittance of incomes or settlement in the new location.

In-migration may have a wide range of negative impacts on the communities within close vicinity to the Project site of influence. These impacts include negative impacts on the environment; public infrastructure, services and utilities; the local and regional economy; livelihood strategies; public health; the social and cultural environment; and legacy issues. These community-level impacts may directly and indirectly affect the Project.

From a community health perspective, migrant workers have the potential to introduce infectious diseases and social problems. These may be mitigated through pre-employment health checks and treatment.

The pattern of labour-based and economic in-migration typically follows project demand for labour (ibid.). In the case of the Project, the construction phase has the highest workforce requirements. As the Project moves from construction to operational phase, and requires a smaller and more stable workforce, recently arrived migrants may move on as employment opportunities decrease and the disposable income of the local population declines.

Furthermore, the expected influx of people and increased income for those benefiting from employment and secondary economic growth may result in illegal substances being available more freely. It is difficult to speculate whether the prevalence of tobacco smoking and/or substance abuse may increase due to the presence of the Project. However, it is likely that it will increase as there will be an increase in the number of young people with more than adequate incomes, who will be in a position to afford these commodities.

In-migration can generate a range of positive environmental, social, and health impacts, including:

- Increased links to mainstream economy;
- Increased local skills base and labour pool;
- Business development opportunities;
- Employment creation;
- Opening of new markets for local products and services;
- Increased accessibility and availability of goods and services;
- Alternate livelihood opportunities;
- Improved local wage and income levels (including opportunities for local sourcing and higher prices obtainable for local products);
- Increased local tax revenue levels;
- Increased individual, household, and community empowerment stemming from increased income and wealth;

- Improved local training and skills development opportunities;
- Monetisation of remote rural economies, improving purchasing power and increasing trade;
- Opportunities to build community organizational structures;
- Improved access through development of road systems;
- Improved information and Communication;
- Improved access to and expansion of infrastructure, public services and utilities (housing, health, education, waste management, sanitation, electricity, water supplies, telecommunications); and
- Increased attention and input by government authorities, NGOs, etc.

7.8.2 Education Levels and Unemployment

Employment during the operational phase has the potential of being over a long period (LoM is 30 years), which can have a major, long term, positive impact for successful job applicants and their dependents. The operational workforce requirement for the mine is 150 employees, of which 69% and 7% will be semi-skilled and unskilled positions, respectively.

With mining and quarrying being a major industry in the region, it is expected that a sufficient number of the unemployed individuals in the wider community will have appropriate skills to qualify them for at least semi-skilled positions at the mine. Those that are less skilled may be more suited to manual labour such as earthworks and road construction. During the construction process potential candidates can also be identified to receive skills training for future opportunities.

This means that local communities can potentially take maximum advantage of employment opportunities to be created by the proposed mine, and that Pamish will likely be able to meet its local recruitment target of 40%.

However, it may not be possible to employ and train individuals from the local population in time for construction or operation, due to the level of skills required not being available locally. Pamish may be forced to make use of skilled migrant workers (from other towns and provinces), as training required may be too complex and time-consuming. Artisans for example train for 48 months if the practical experience is included before a qualifying trade test can be taken. A situation like this may pose a risk of tribalism as the local population may feel threatened.

7.8.3 Gender-Based Violence, Alcohol and Drugs

Gender-based violence occurs commonly and is often related to substance abuse. Women and young girls are often the most vulnerable.

While drug and alcohol abuse are currently not a major problem, these have the potential to increase during the lifespan of the Project.

Influx of people and increased income may result in illegal substances being available more freely. It is difficult to speculate whether the prevalence of tobacco smoking and or substance abuse will increase due to the presence of the Project. However, it is likely that it will increase as there will be an increase in the number of young people with decent incomes, who will be able to afford these.

7.8.3.1 Impact Evaluation and Management Measures

EHA #9	**Social determinants of health: Influx management, Gender-based violence, alcohol and drugs**					
Construction and into operations and closure						
	Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
Before Management	*Long term (4)*	*Local (3)*	*Very high-negative (-6)*	***Highly detrimental (-13)***	***Highly probable (6)***	***Moderate negative (-78)***
Management Measures						

Project impact mitigation:

- Pamish may be in a position to conduct substance-abuse prevention education programs in the workplace and within the already affected (by alcohol) communities;
- Improve financial skills in employees and extended families by conducting socio-economic education programmes, teaching financial skills;
- Reduce substance-abuse and improve social cohesion by:
  - Conducting substance-abuse prevention education programs in the;
  - Providing recreational facilities for workers without families;
  - Contributing to the establishment of appropriate community recreation facilities-considering needs and assets of community;
  - Collaborating with the relevant authorities to establish a system to monitor violence and community cohesion related to project activities – provide technical skills;
  - Participating in violence-prevention education programs, particularly focusing on gender violence and tribalism.
- Pamish could partner with government and NGO services to prevent social problems; and ensure pro-social leisure opportunities are readily available e.g. football league, volunteer programs Invest in community events and festivals to promote cultural exchange, celebration of diversity etc.;
- Refer to social management plans and recommendations as part of the social impact assessment;
- Pamish may commit to developing individuals, especially women as they are the backbone of the family unit and contribute significantly to the workforce and the workplace. This could take place via the support of initiatives and organisations that focus on gender issues; and
- Plan for closure. Throughout project-cycle publish materials for community; include information about the closure and decommissioning phase and its effects on both workers and communities. Programmes focusing on counselling, to assist with social issues such as depression associated with retrenchment and reskilling of employees in advance

Corporate Social Investment:

- Supporting education programs with a gender equity focus;
- Support cultural activities and sports, especially in schools;
- Identify and support vulnerable groups; and
- Support graduate training programs for the youth in the community.

EHA #9	**Social determinants of health: Influx management, Gender-based violence, alcohol and drugs**					
After Management (including implementation of CSI Measures)	*Medium term (3)*	*Local (3)*	*Average (3)*	***Moderately detrimental (-9)***	***Probable (4)***	***Minor negative (-36)***
No-go Option						
No Change – existing status will not be affected						

7.9 EHA #11 Health Systems Issues

There are several healthcare facilities within the Project site with one of these being the district hospital in Mokopane. However, there remains a challenge with the capacity of these facilities. There are a few NGOs such as the Red Cross which support health infrastructure and health system strengthening programs.

The main associated negative impact before mitigation is related to an increase on the already strained health system, combined with the possibility of an increased population. Influx of people may result in overburdened health facilities with inadequate health service. Impacts will be most noticeable during construction during which there may be a bigger influx, including contractors and job-seekers and the power plant health facilities may not be up-and-running yet.

There is also a shortage of adequately trained personnel to deliver quality health care. Supervision of health service centres and filling of vacant posts was also identified as a need in Magobe Clinic. These problems results in compromised health services delivery in Magobe Clinic, suggesting the need to improve access and provide adequately trained personnel to effect services, a process that will require substantial investment.

Availability of health information is a national issue. There is therefore no holistic and integrated system for the collection and analysis of data in relation to important environmental health outcomes for the MLM.

Health information management is generally good in the health facilities that surround the Project. This data is limited by the fact that diagnostics and human resource capacity is basic. However, it serves as the best form of health surveillance for the monitoring of health impacts if supported and managed well. Strategic investment in local health facilities can support this.

7.10 EHA #12 Non-Communicable Diseases

NCD plays a major role in the economics of the country as it is well recognised that poor adult health negatively effects economic well-being at an individual and household level, but also at a macro level. In such cases, labour productivity falls, and the social and medical costs of managing chronic diseases as well as an ageing population, increases.

The Project will in all likelihood enhance the socio-economic conditions in the area either from direct or cumulative benefits. As the Project starts to uplift health programs in the area through direct or indirect means, it will hopefully increase the life expectancy in the area and also the productive time of breadwinners. The short term effects may be an increased spending ability and adoption of more western sedentary lifestyle and diet. With prosperity and organised settlement may come a degree of urbanism with associated changes in values and behaviour, which predisposes the community to an increase in lifestyle related diseases such as obesity, hypertension and diabetes. This may place an additional burden on the local health care facilities that may not have an ability to diagnose and appropriately manage these conditions.

The Project will employ a number of permanent and temporary workers. Diet and lifestyle will need to be monitored in this sector, particularly with people having access to increased incomes and potentially free meals on the Project site. This is a workplace, as well as a community health concern.

In terms of the significance of the Project on the communities the following can be considered:

- Reduction in traditional lifestyle and values;
- Social and environmental factors that increase stress and unhealthy behaviours; and
- Increase pressure on existing health care facilities that only practice limited preventive health care.

These conditions are chronic in nature and difficult to predict at the local level. The cumulative impacts of the economic upliftment of the country will need to be considered and as such the impacts cannot solely be ascribed to the Project. Mitigation and management at the local level is however important.

7.10.1.1 Impact Evaluation and Management Measures

EHA #12	**Non-communicable diseases**					
Operations and closure						
	Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Significance**
Before Management	*Long term (4)*	*Municipal area (4)*	*High-negative (5)*	***Moderately detrimental (-13)***	***Probable (4)***	***Minor-negative (-52)***
Management Measures						

EHA #12	Non-communicable diseases					
Project impact mitigation: ▪ Support health education programs as part of a community based peer health educator program. These should focus on lifestyle risk factors such as diet, exercise, smoking and alcohol consumption. **Corporate Social Investment:** ▪ Support the local healthcare personnel with training on disease management programs and the recognition of NCD symptoms and associated management. This should include integrated management to include proper management strategies for hypertension and high cholesterol; and ▪ Support with diagnostic medical hardware.						
After Management (including implementation of CSI Measures)	*Medium term (3)*	*Local (3)*	*Minor negative (2)*	***Moderately detrimental (-8)***	***Probable (4)***	***Negligible negative (32)***
No-go Option						
No Change – existing status will not be affected						

8 Comments and Response

Was a medical doctor consulted? Can the assurance be given that people will not be affected?	Lesiba Makgakga	Diplikomong Village	28 September 2015	Village Meeting	The findings of the Blast and Vibration Assessment, Surface Water Assessment, Air Quality Assessment, Noise Assessment and Groundwater Assessment were presented to the Community Health Specialist. A community Health Impact Assessment was undertaken based on these studies (as well as field work) to determine the potential community health impacts that could be experienced. The findings of the Health Assessment confirmed that no significant health impacts are anticipated based on the proximity of surrounding receptors. A Medical Doctor was not consulted as part of the EIA process. Refer to Appendix P for a copy of the Community Health Assessment completed for the project.
Health impacts are a concern. The elderly are vulnerable to health issues. Clinical health	Reuben Mashego	Waterberg District Municipality	01 October 2015	Key Stakeholder Meeting	Asbestos will not be mined at this proposed operation. Magnetite will be mined and this mineral does not have equivalent health impacts.

records need to be kept. We are concerned about issues such as asbestosis.					A Community Health Impact Assessment was conducted as part of the EIA. A number of issues, including Tuberculosis (TB) and HIV were identified as existing health issues. Clinics were consulted as part of the Health Assessment, as well as household surveys within each of the various communities. This research helped informed potential health impacts that could be created or existing impacts that could be exacerbated as a result of this project. The detailed findings of the Health Assessment are attached as Appendix P of the EIA Report.

9 Conclusion

In conclusion, Pamish, through the magnetite Project need to consider two major factors related to community health. The first is the existing health needs of the community. These existing health needs are present regardless of the Project and represent the current health status of the community. Second, the Project will need to consider the future health impacts that it (the Project) may exert on the community.

This HIA has outlined the significant changes on the health status of the local communities that may be instigated by the magnetite Project. An attempt has been made to give a comprehensive outlook of the baseline health status of the Project site (where possible) and also to understand and prioritise future Project health impacts, based on the available evidence. Mitigation and management measures have been recommended and it is advised that these measures are incorporated into the overall environmental and social management plan for the magnetite Project.

An impact assessment has been undertaken, which has employed both qualitative and quantitative research methods and incorporated consultation with and participation of PACs and key informants. It is the specialist's opinion that due process has been followed. Where impacts have been found to be potentially significant, various mitigation measures to manage and monitor the impacts of the Project have been proposed.

Adequate mitigation measures are expected to reduce the significance of almost all negative impacts although not always to acceptable levels, while positive impacts will on average be significantly enhanced to maximise benefits to surrounding communities. The recommended mitigation measures must be implemented to minimise the impacts and ensuring compliance

with current legislative requirements. Lastly, it is recommended that Pamish inaugurates relationships with other institutions (e.g. government or NGOs) involved in local and regional Healthcare development and social upliftment so as to maximise the benefits of its contribution to the overall health status of the community.

It is recommended that the Project is allowed to proceed on the assumption that the environmental, social and health management commitments are adhered to.

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Appendix A: Declaration of Independence

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I, Vumile Dlamini as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Pamish Investments No. 39 (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the proposed Open-Pit Magnetite Mine and Concentrator Plant Project near Mokopane, Limpopo Province.

V. Dlamini

_____

Full name: Vumile Dlamini

Title/ Position: Environmental Health Consultant

Qualification(s): Post graduate degree: Environmental Analysis and Management

Experience (years): 8 years

Registration(s): International Association for Impact Assessment: South Africa

Appendix B: Plans

Plan 1: Regional setting

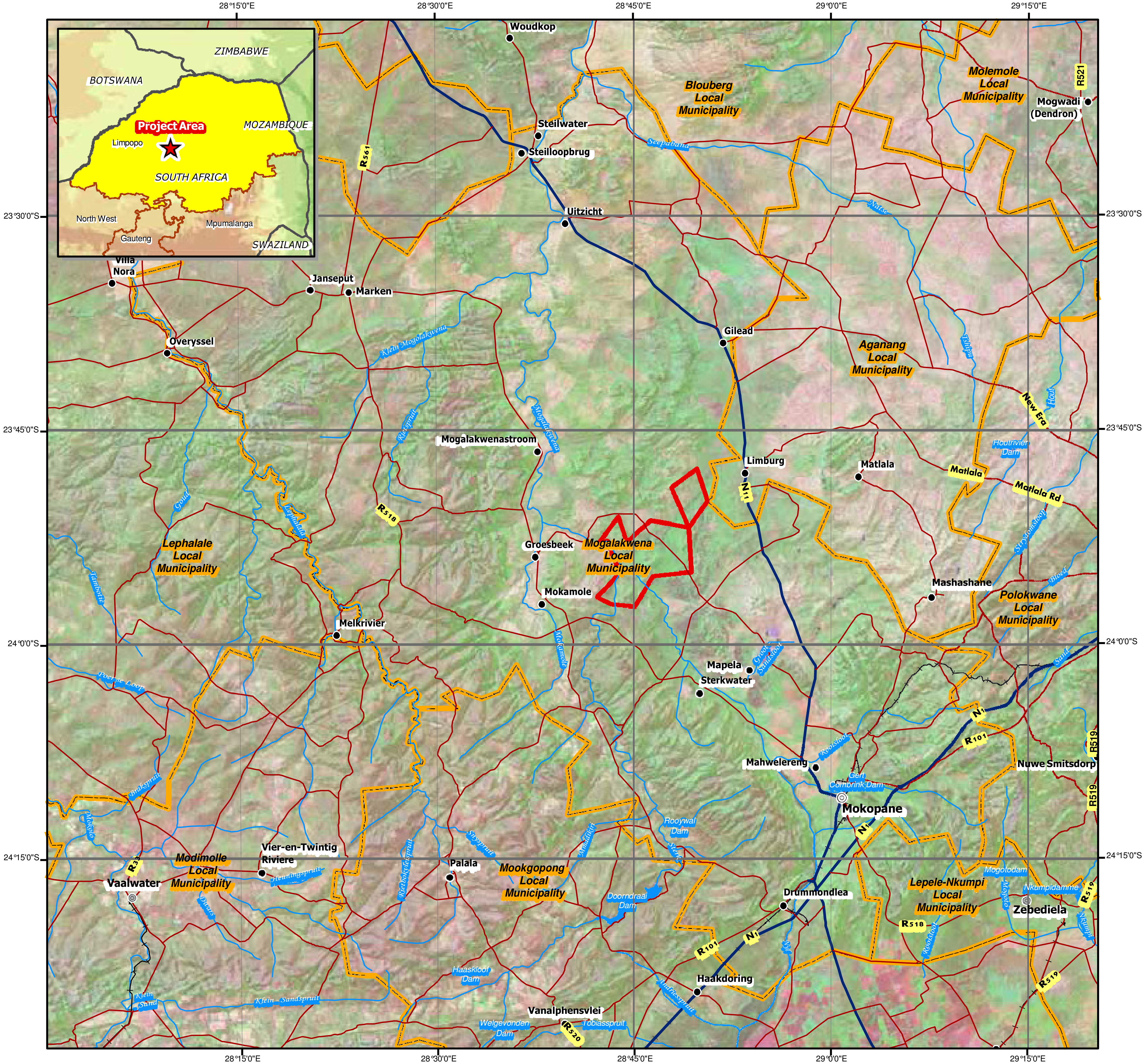
Plan 2: Local setting

Plan 3: Surface water resources

Plan 4: Project infrastructure layout

Plan 5: Focus Group Discussion locations

Plan 6: Healthcare facilities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ZIMBABWE
BOTSWANA
Project Area
MOZAMBIQUE
Limpopo
SOUTH AFRICA
North West
Mpumalanga
Gauteng
SWAZILAND
Woudkop
Steilwater
Steilloopbrug
Uitzicht
Villa Nora
Janseput
Marken
Overyssel
Gilead
Blouberg Local Municipality
Molemole Local Municipality
Mogwadi (Dendron)
R521
R561
Seepabana
Natse
Aganang Local Municipality
Klein Mogolakwena
Tshipu
New Era
Hout
Rietspruit
Mogalakwena
Mogalakwenastroom
Limburg
N11
Matlala
Houtrivier Dam
Matlala Rd
Strydomsloop
R518
Goud
Lephalala
Lephalale Local Municipality
Groesbeek
Mogalakwena Local Municipality
Mokamole
Mashashane
Bloed
Polokwane Local Municipality
Tambotie
Melkrivier
Poer-se Loop
Mapela
Groot Sandsloot
Sterkwater
Sand
N1
R101
R519
Nuwe Smitsdorp
Braksspruit
Mahwelereng
Rooisloot
Gert Combrink Dam
Mokopane
Rooywal Dam
Mokolo
R33
Vaalwater
Modimolle Local Municipality
Vier-en-Twintig Riviere
Heuningspruit
Palala
Mookgopong Local Municipality
Doorndraai Dam
Drummondlea
Lepele-Nkumpi Local Municipality
Mogotodam
Mogoto
Nkumpidamme
Zebediela
Nkumpi
Dwars
Rietbokvleispruit
Sterk
Nyl
Haaskloof Dam
Haakdoring
Andriesspruit
Klein Sand
Klein - Sandspruit
Vanalphensvlei
Welgevonden Dam
R520
Tobiasspruit
Mmadikiri
Sesspruit

Plan 1

Pamish Investments Magnetite Mine EIA

Regional Setting

Legend

- Project Area (10 100 ha)
- Secondary Town
- Other Town
- Settlement
- Main Road
- National Road
- Railway Line
- River
- Dam
- Local Municipal Boundary

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Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: scm.VMC3049.201408.102
Revision Number: 1
Date: 20/08/2014

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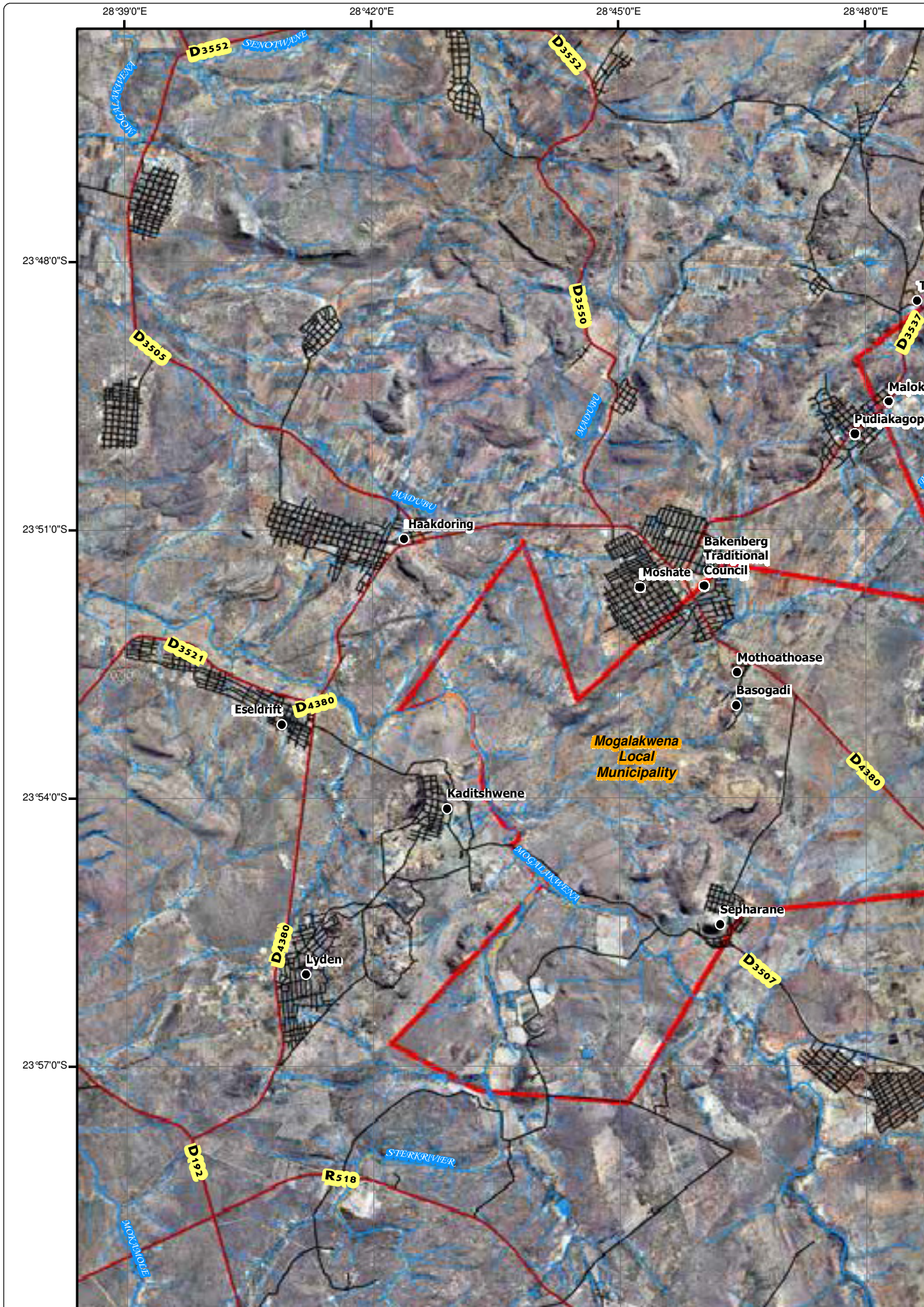
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SENOTWANE
MOGALAKWENA
D3552
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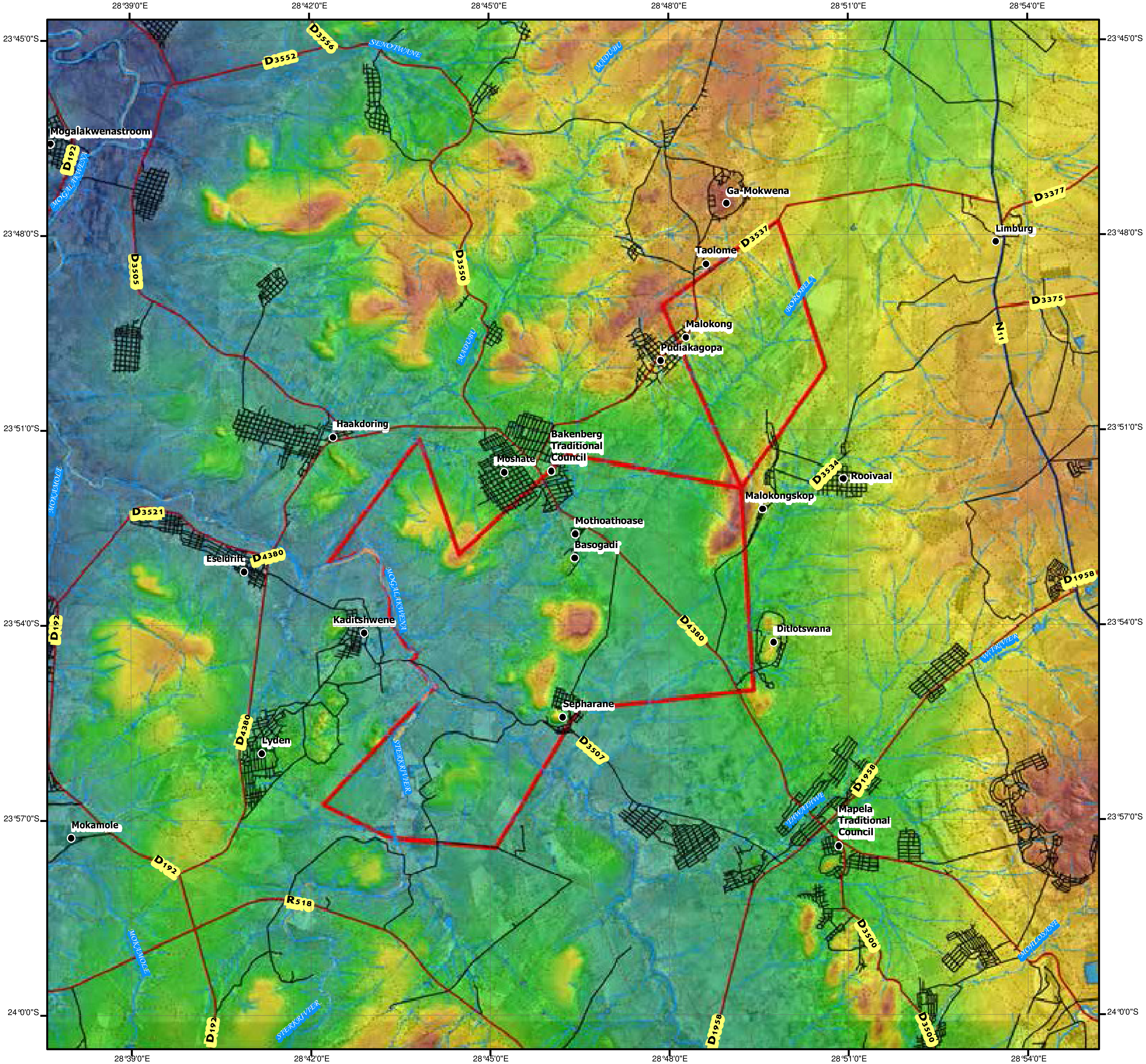
D3505
D3537
Malok
Pudiakagop
MADUBU
MADUBU
Haakdoring
Bakenberg
Traditional
Council
Moshate
D3521
Mothoathoase
Basogadi
Eseldrift
D4380
Mogalakwena
Local
Municipality
D4380
Kaditshwene
MOGALAKWENA
Sepharane
D4380
Lyden
D3507
D192
R518
STERKRIVIER
MOKAMOLE



Plan 3

Pamish Investments Magnetite Mine EIA

Surface Water Resources

Legend

- Project Area
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream

Topographical Model Elevation (m.a.m.s.l.)

High : 1382

Low : 900

DIGBY WELLS ENVIRONMENTAL

•Sustainability •Service •Positive Change •Professionalism •Future Focused •Integrity

Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: scm.VMC3049.201507.083
Revision Number: 1
Date: 13/07/2015

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Kilometres

1:110 000

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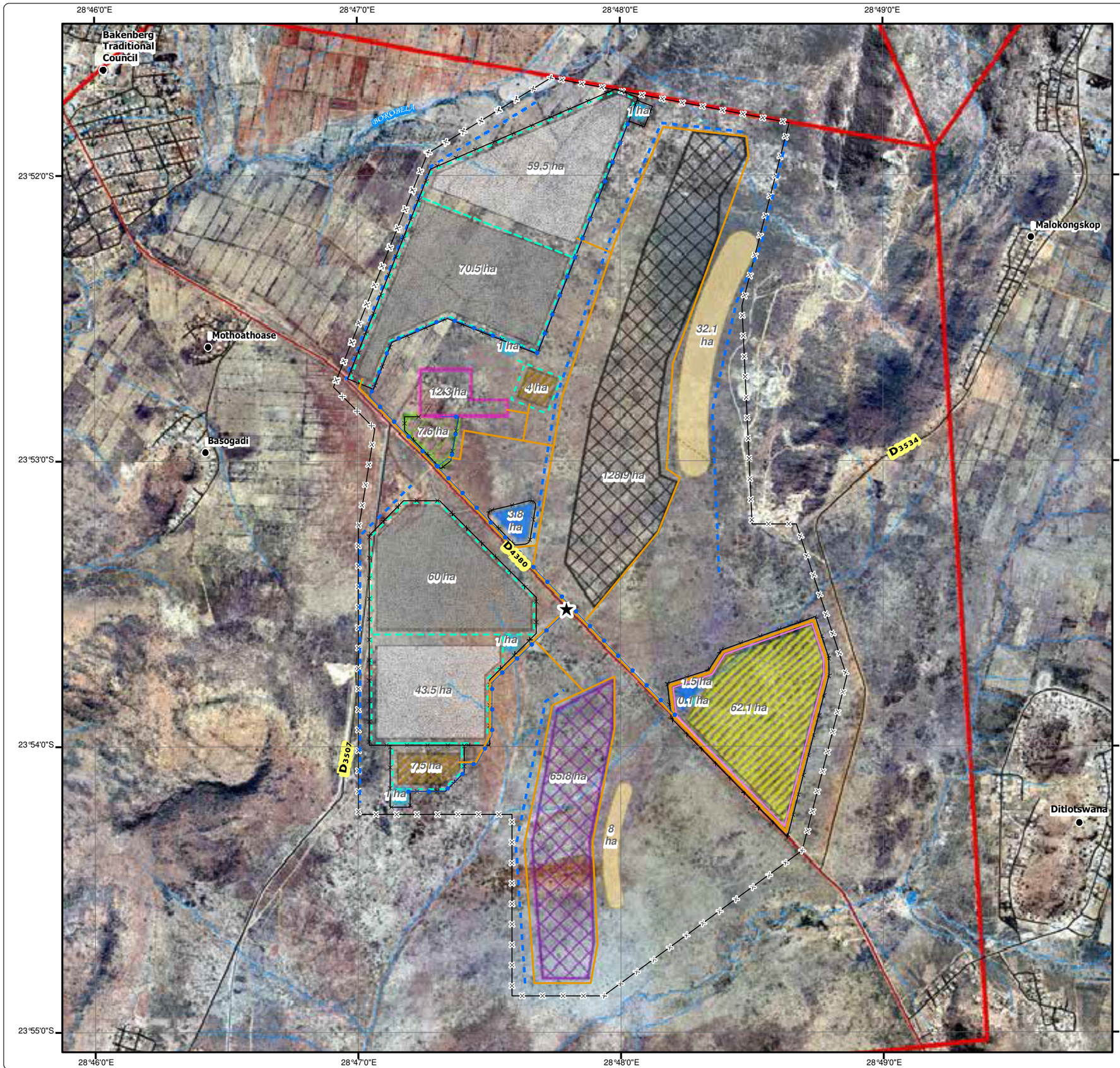
Plan 4

Pamish Investments Magnetite Mine EIA

Infrastructure Layout



Legend

- Project Area
- Settlement
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Dam Wall
- Dam / Lake

Infrastructure

- Access Point
- Dirty Water Trench (17128 m)
- Fence (18103 m)
- Perimeter Fence (16478 m)
- Pipeline (8100 m)
- Site Road (25504 m)
- Solution Trench (3557 m)
- Storm Water Trench (12732 m)
- Contractor's Camp (7.6 ha)
- Low Grade Stockpile (130.5 ha)
- Lower Grade Stockpile (103 ha)
- PCD (4 ha)
- Pit 1 (128.9 ha)
- Pit 2 (65.8 ha)
- Plant Area (12.3 ha)
- Return Water Dam (0.1 ha)
- Stormwater Dam (5.3 ha)
- Tailings Dam (62.1 ha)
- Topsoil Stockpile (40.1 ha)
- Waste Rock Dump (11.5 ha)

DIGBY WELLS ENVIRONMENTAL

•Sustainability •Service •Positive Change •Professionalism •Future Focused •Integrity

Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: scm.VMC3049.201506.001
Revision Number: 6
Date: 29/06/2015

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Kilometres

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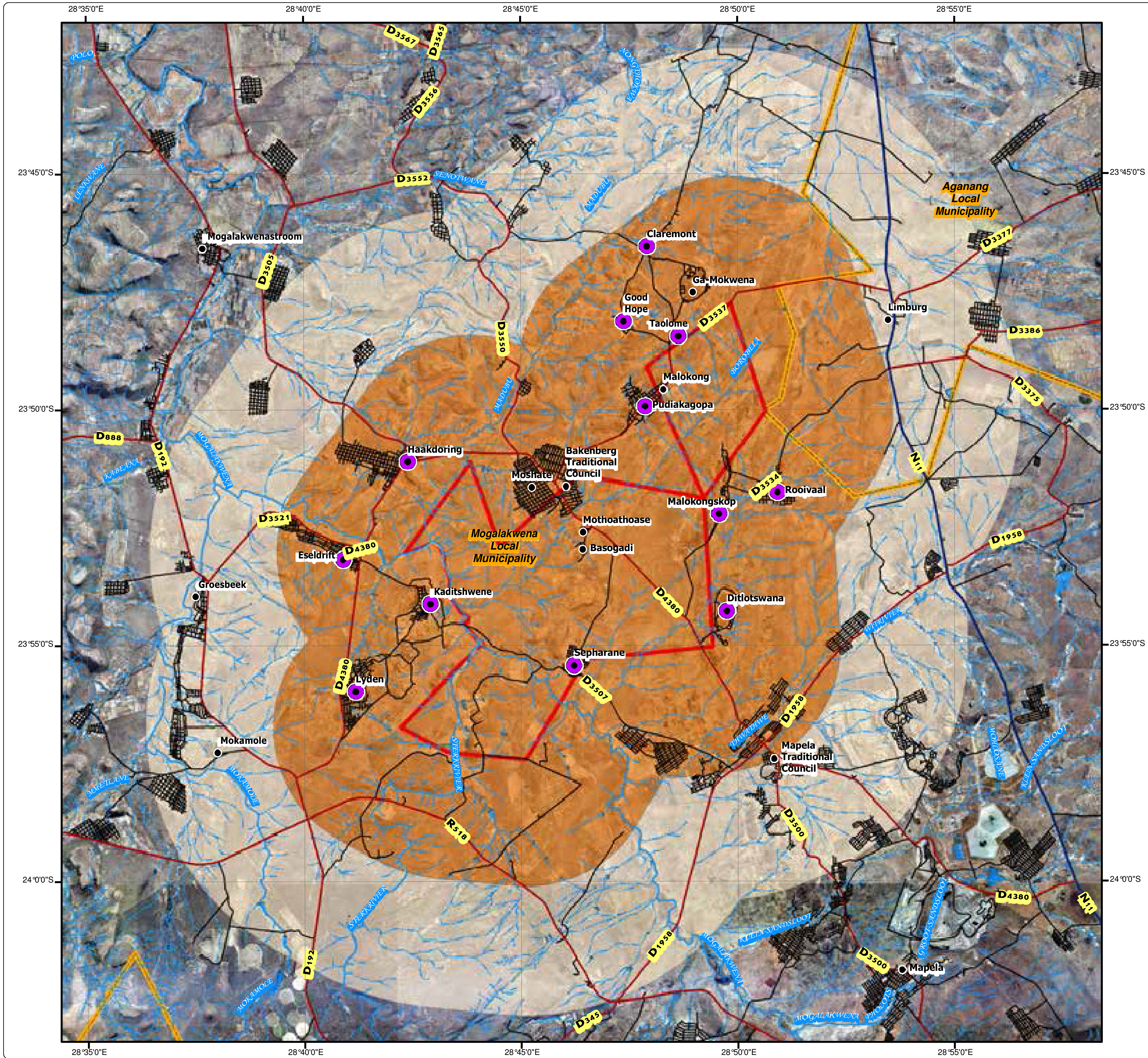
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24°0'0"S
Mogalakwenastroom
Claremont
Ga-Mokwena
Good Hope
Taolome
Limburg
Malokong
Pudiakagopa
Haakdoring
Bakenberg Traditional Council
Moshate
Rooivaal
Malokongskop
Mothoathoase
Basogadi
Mogalakwena Local Municipality
Aganang Local Municipality
Eseldrift
Groesbeek
Kaditshwene
Ditlotswana
Sepharane
Lyden
Mokamole
Mapela Traditional Council
Mapela
D3567
D3565
D3556
D3552
D3505
D3550
D3537
D3377
D3386
D3375
D888
D192
D3521
D4380
D3534
N11
D1958
D3507
D3500
R518
D345
POLO
LENKWANE
SENOTWANE
NONGHOKWA
MADUBU
BOROBELA
MOGALAKWENA
KABEANA
MMETLANE
MOKAMOLE
STERKRIVIER
WITRIVIER
THWATHWE
MOHLOSANE
KLEIN-SANDSLOOT
GROOT-SANDSLOOT
PHOLOTSI

Plan 5

Pamish Investments Magnetite Mine EIA

Focus Group Discussions

Legend

- Focus Group Discussions
- Project Area

Buffer of Project Area

- 0 - 5 km
- 5 - 10 km
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream
- Perennial Pan
- Wetland
- Local Municipal Boundary

DIGBY WELLS ENVIRONMENTAL

•Sustainability •Service •Positive Change •Professionalism •Future Focused •Integrity

Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: scm.VMC3049.201507.084
Revision Number: 1
Date: 13/07/2015

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Kilometres

1:150 000

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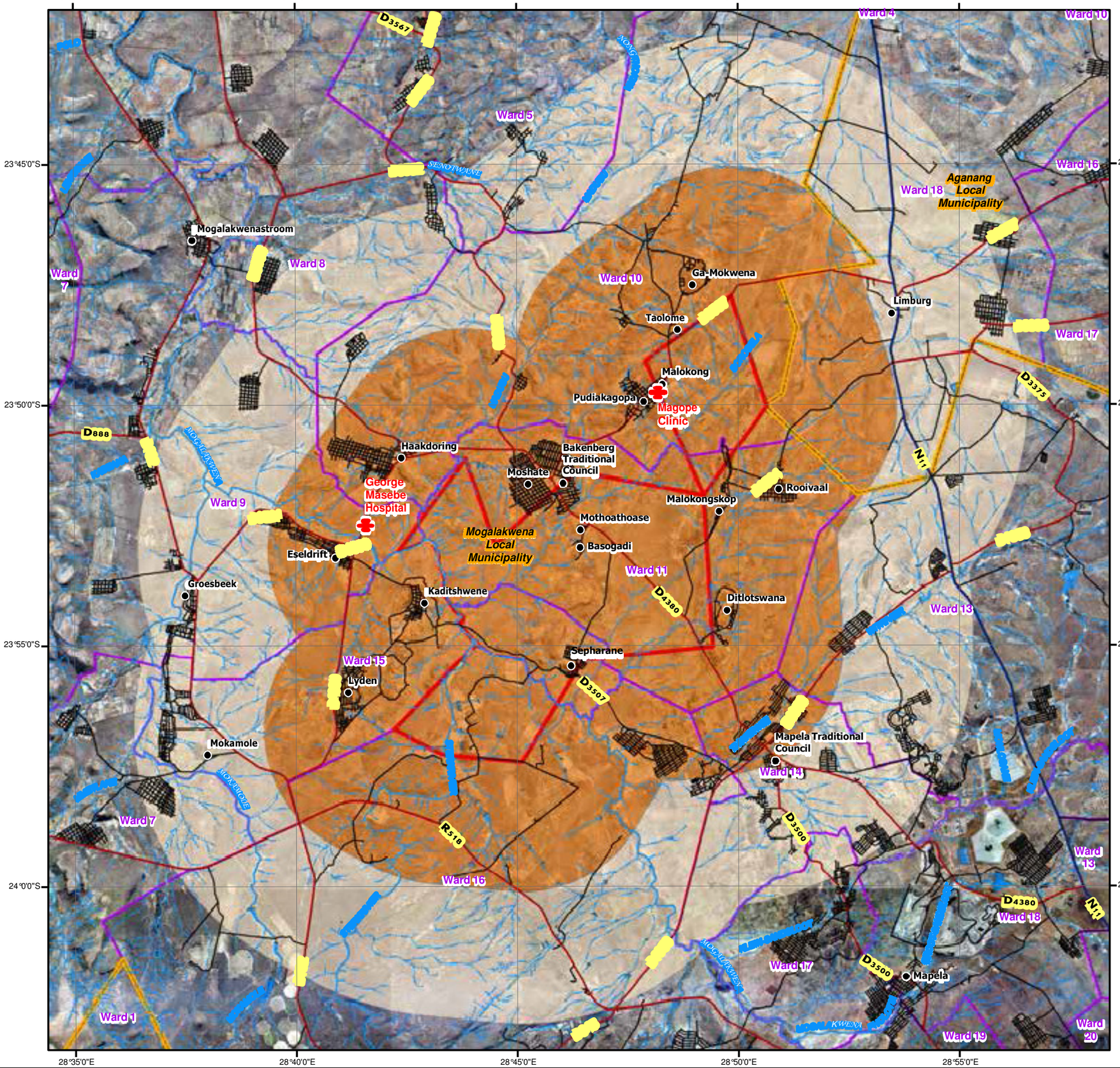
Plan 6

Pamish Investments Magnetite Mine EIA

Health Facilities



Legend

- Health Facility
- Project Area

Buffer of Project Area

- 0 - 5 km
- 5 - 10 km
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream
- Perennial Pan
- Wetland
- Local Municipal Boundary
- Ward Boundary (2012)

DIGBY WELLS ENVIRONMENTAL

•Sustainability •Service •Positive Change •Professionalism •Future Focused •Integrity

Projection: Transverse Mercator	Ref #: scm.VMC3049.201412.180
Datum: WGS 1984	Revision Number: 4
Central Meridian: 29°E	Date: 13/07/2015

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Kilometres

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Appendix C: Focus Group Discussion Questionnaire

DIGBY WELLS ENVIRONMENTAL
COMMUNITY HEALTH IMPACT ASSESSMENT
COMMUNITY QUESTIONNAIRE

Location/ Village Name	Date	Interviewer	Age of participants	No. of Respondents

Please may we ask a few questions related to health in your community? We will ask a number of questions related to health challenges you face in your community, the local health care services, the decision making in accessing the services and the general satisfaction of the available facilities. Please note that there are no right or wrong answers. Everyone's opinion is valued and important to us. Please let everyone speak and if you do not agree with a person then express this openly but without criticism as they are entitled to their opinion.

Please note that we do not represent Pamish Investments No. 39 (Pty) Ltd and thus cannot make commitments on their behalf. So questions related to requests or commitments that Pamish Investments has made should not be discussed. If you have any questions for us please feel free to ask.

Education:

Employment (currently employed):

Health seeking behaviour	
Where did you go first the last time when your child had a fever/cough?	
If they usually do not go to the healthcare facility, ask for the main reason for not doing so (Accessibility; Acceptability; Affordability)	
Where is the nearest health facility? (Also ask if there is any mobile clinic facility in the area and how frequently it comes to the community. Also inquire whether medical staff do home visits, e.g. during emergencies. Inquire about the presence of an ambulance) **How long does it take to walk there?** **How long does it take you to get there by car/ taxi/ bus?**	
Do you have to pay for medical services? (If yes) **How much do you pay?** (Find out if there is any community based health insurance scheme)	
Are you satisfied with the healthcare services you receive?	

If not why?	
How many traditional healers do you have in your village? **What sort of reasons will take you to the traditional healer?**	
Are there other health actors (e.g. NGOs) active in the communities? **If so what do they do?** (Note down active NGOs and what services they provide)	

1 **MATERNAL AND CHILD HEALTH**	
Do women in your community get antenatal care services? Where? **Are you satisfied with the services you receive?**	
Do all the new born children get vaccinations up to the age of one year? **Are there people in your community who do not take their children for vaccination?** (If yes) **Why?**	
Have your children under 5 been weighed and measured? **If so where? If not why?** (do they know the importance of this)	

Where do women normally deliver? **If at home, who assists?**	
Do women practice family planning in your village? (Discuss what methods they commonly use)	
Epidemiology of disease	
What are the 3 most important/ common diseases in your community?	
Do many people have skin disease?	

2 **LET'S TALK ABOUT HIV/AIDS**	
Have you heard about the disease called HIV/AIDS? **What is it?** **Do you think it is a serious problem in your community?** (Why do they think it is/isn't such a serious problem?)	
When you hear the word protection/prevention- what does it	

mean to you? (Discuss methods of prevention)	
Do people use condoms? **Are they easily accessible?** **Why do people use/ not use them?**	
Is there much commercial sex? *These questions below are to guide the conversation* **Who are the sex workers and where do they work? Who are the clients and where do they work?**	
Are there categories of men who are known to have many sexual partners? *These questions below are to guide the conversation* **Which categories are these? Who do they have sex with and why? Are some categories of men riskier than others and why?**	
Are young people having sex? *These questions below are to guide the conversation* **If so, at what age? Who are their partners? Why are they having sex so**	

early?	
Is it possible for a healthy-looking person to have HIV/AIDS? **Would you buy food from somebody who you knew had HIV/AIDS?** **If someone in your family had HIV/AIDS would you keep it a secret?**	

3 **SOIL AND WATER RELATED DISEASE**	
What is the main source for <u>drinking</u> water in the community? (Record type of water source)	
Does every household have its own latrine? (Record types of sanitation facilities in the community)	
Do people swim in, or drink from open water bodies in the area?	
Do you consider your environment clean or dirty? **Why?**	

Housing	
Are there any challenges related to housing or accommodation in your	

community? **Is overcrowding a problem?** (e.g. 8 people staying in a 2 bedroomed house)	

Food and Nutrition	
Do you have enough food in your community? (If there is a food shortage, find out why) **Is malnutrition a problem in the community (especially in children)?** Why (Bad feeding practices, food shortage)	
What food stuffs are most commonly consumed in the area?	
Do you generally buy food or grow it/ obtain from domestic livestock?	
Do you use salt in your diet? **Where do you buy the salt from? (Do a visual check that it is iodated)**	
Social Determinants of Health	
Do people in the community drink alcohol and smoke? (Discuss the extent of these vices)	

Do they use drugs?	
Is domestic violence common in your community?	
In general is there a feeling of wellbeing or state of hopelessness in your community?	

Project and Community Cohesion	
What are your general perceptions about the project?	
How do you think the project will influence your health and wellbeing?	
How do you think the project can help improve the community's health? **What can you as a community do to improve your own health?**	

THANK YOU

Appendix D: Key Informant Interview Questionnaire

DIGBY WELLS
ENVIRONMENTAL

Date:			
Facility name:			
Name of person interviewed:	Designation:		
Location (village/ town):			
Type of facility:	Clinic	Hospital	Other
Funding:	Government	Private	Other
How many people have access to this health care facility- the target population? Which villages/ communities?			
Is there constant water supply?	Yes	No	
What is the quality of the water?			
Is there constant electricity supply?	Yes	No	
Operating hours of clinic/ hospital:			
Please indicate the main illnesses, as well as those most commonly affected (women, children, elderly, men):	Illness	Most commonly affected	Rank (1=most common)

How many doctors work at this facility full-time?		
Do you have visiting doctors?		
If yes, from where?		
If yes, how often?		
How many (registered/ professional) nurses work at this facility full-time?		
Do you have visiting nurses?		
If yes, from where?		
If yes, how often?		
Does this facility have a mobile clinic?	Yes	No
Do doctors/ nurses from this facility conduct home visits if a patient is very ill/ bed ridden/ on their death bed?	Yes	No
If this facility is a clinic, where is the closest hospital?		
If this facility is a clinic, how are patients transported to hospital?		
Does this facility have an ambulance?	Yes	No
When a follow-up is required, do patients see the same nurse/ doctor they saw initially?	Yes	No

Do patients return for follow-up visits?	Yes	No
If not, what do you think the main reasons are?		
From where does the facility receive its medicine?		
How often does the facility receive its medicine?		
Does the facility ever run out of medicine?	Yes	No
If yes, does the patient receive anything in its place?	Yes	No
If yes, what?		
What is the most common medication prescribed?		
Does this facility store medicine for other facilities?	Yes	No
If yes, what types?		
Does this facility stock ARVs?	Yes	No
Does this facility stock birth control medicine or pills?	Yes	No
Do you distribute condoms from the health care facility? Are there any other condom distribution points in the community?		
Do patients pay to see a doctor?	Yes	No
Do patients pay to see a nurse?	Yes	No
Do patients pay for medicine?	Yes	No
Does the facility offer routine childhood vaccination services?		

What record of documentation do you keep?			
How are patient documents stored?	Hard copy only	Electronic only	Both
Does this facility currently have any health awareness campaigns or programs?			
Are there other health actors (e.g. NGOs) active in the communities? What services or activities do they perform?			
Considering the number of patients that come to the facility, would you say domestic violence is an issue of concern in this community?			
Judging by the numbers of patients who come to this facility, on a scale of one out of ten patients, how many would you say show symptoms of substance (drugs or alcohol) abuse?			
Are accidents common in the area? What form do these take on (road traffic, assault?)			
Do traditional medical practitioners play a role in health care in the community?			
Does this facility collaborate with traditional medical practitioners in any way?			
How do you think the project will influence the community's health?			
How do you think the project can help improve the community's health?			

Appendix E: Pamish Investments Health, Safety, Environment and Community (HSEC) Policy

HEALTH, SAFETY, ENVIRONMENTAL AND COMMUNITY POLICY

Bushveld Minerals and its subsidiaries ("Bushveld Minerals Resources Pty Ltd" and "Pamish Investment No. 35 Pty Ltd") are committed to the implementation of a comprehensive Health, Safety, Environment and Community (HSEC) Policy

This Policy is aimed at ensuring that Bushveld Minerals and any operating subsidiaries adhere to best practice Health, Safety, Environment and Community (HSEC) standards during all of exploration and development activities for the life of the project. In addition Bushveld Minerals will ensure that the activities of Contractors and Associates will be assessed against the IFC standards.

Health and Safety

The Company's aim is at all times to achieve zero lost-time injuries (LTI's) and fatalities at all stages of its activities from exploration to mining.

We are committed to operate a workplace that is free from injury- and Fatality for the well-being of employees, contractors and communities through:

- Identifying and eliminating safety, occupational and community health and hygiene hazards
- Develop safety, occupational health and community health programmes
- Provide training to develop positive culture and behaviour on safety and health

Environment

The Company will ensure that environmental management programmes for all stages of exploration, evaluation and development or mining are in place at an early stage.

We are committed to manage the environment affected by the operation by ensuring that will be useful at post-closure through:

- Identifying, eliminating and remediating the environmental impacts of our operational activities
- Continually improve the use of natural resources
- Identifying post-closure land use objective and develop programmes to achieve the objective

Labour

The company will establish and maintain a constructive employee-management relationship, promote the fair treatment, non-discrimination and equal opportunity of workers.

We are committed to a safe workplace that is based on mutual respect and fairness through:

- Upholding the right of employees to freedom of association and collective bargaining
- Providing appropriate training and development opportunities, providing equal opportunity at all levels of the organisation without bias
- Consulting, communicating and providing appropriate support to employees during significant organisational changes including closures, acquisitions and mergers
- Development and implementation of procedures in line with the constitution of South Africa and labour related legislations

Community

The company will communicate and consult with local communities and stakeholders with a view to fostering mutual understanding and shared benefits through the promotion and maintenance of open and constructive dialogue and working relationships.

We are committed to contribute to the social and economic development of local communities associated with our mine, through:

- Identifying of all the stakeholders associated with our mine and actively engage them openly on matters pertaining to our operation
- Engage the community leadership structures to identify and support projects that benefits the needs of the communities
- Develop enterprise programmes that will ensure that will lessen the effect of mine closure

In support of this policy Bushveld Minerals and its subsidiary commits to:

- Compliance with all applicable laws, regulations, standards and other requirements as a minimum base of health, safety, community, labour and environmental management practice
- Making All directors, managers, employees and contractors to understand their accountability and demonstrate leadership and commitment to the HSEC Policy
- Implementing HSEC management systems and programmes, including measurable objectives and targets that ensue implementation of the HSEC policy
- Establish and implement appropriate communication, consultation and information disclosure plan and procedures taking all stakeholders into consideration.
- Provide the means and resources necessary to lead, support, monitor and maintain accountability for implementation of this policy.
- Regularly reviewing this policy to ensure that it remains appropriate and relevant to the company activities

Fortune Mojapelo
Chief Executive Officer
Date: May 15, 2015

Appendix F: Bushveld Minerals Pty (Ltd) HIA and AIDS Procedure

BUSHVELD MINERALS PTY LTD

HIV AND AIDS PROCEDURE

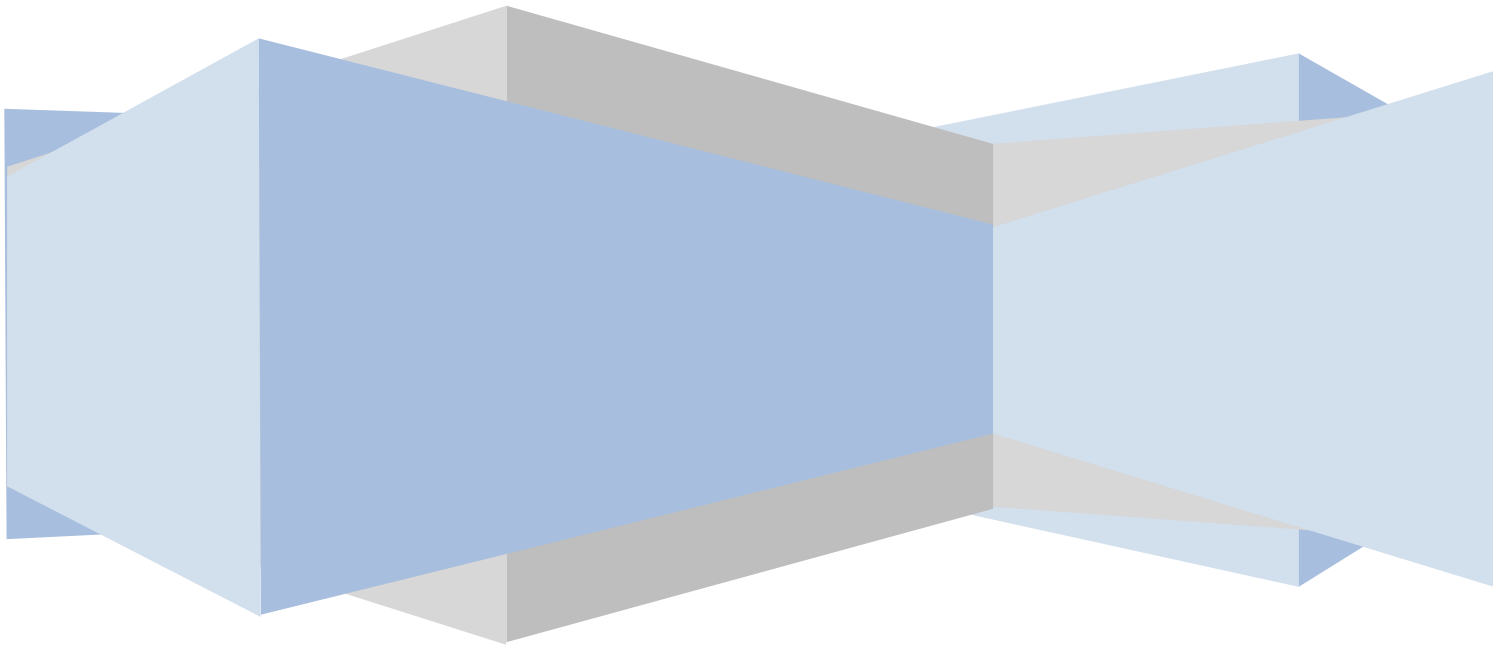

Table Of Contents

1. OBJECTIVE

The purpose of this Policy is to outline Bushveld Minerals commitments regarding HIV/AIDS.

Bushveld Minerals aims to:

- Contribute towards minimising the social, economic and developmental consequences of this
- pandemic;
- Eliminate stigma and discrimination against individuals who are HIV positive;
- Encourage employees to be open about their HIV/AIDS status if they wish to do so;
- Collaborate with local, provincial and/or national government in the fight against HIV/AIDS;
- Provide a set of guidelines for the managing of employees with HIV/AIDS;
- Ensure the fair and consistent treatment of employees with HIV/AIDS.

2. SCOPE

This policy applies to all Employees and Contractors of Bushveld Minerals.

3. RESPONSIBILITIES

The HSEC Manager of Bushveld Minerals or his/her delegate is responsible for reviewing this Policy annually or when major changes occur.

4. IMPLEMENTATION

It is the responsibility of the HSEC Manager to implement this Policy and ensure that everyone in each department and Bushveld Minerals Subsidiaries adheres to this Policy.

5. ABBREVIATIONS

Unless otherwise expressly stated, or the context requires, the words and expressions listed below shall, when used in this Procedure, including this introduction, bear the meanings ascribed to them:

AIDS means Acquired Immune Deficiency Syndrome;

BML means Bushveld Minerals;

Temporary Employees mean those Employees who are employed for fixed periods of time and whose services terminates automatically at the expiry of the fixed term or can be terminated on agreed notice, and includes labour hired from a third party or labour brokers.

Contractors mean those persons who work at Bushveld Minerals' premises or workplaces and who are independent contractors or who are employed by independent contractors or service providers;

Employee includes all Full time and Temporary Employees at the Bushveld Minerals;

Full Time Employees and **Part Time Employees** mean those employees who have a contract of service and are entitled to benefits such as sick leave, annual leave, etc.

HIV means Human Immunodeficiency Virus;

KAP means Knowledge Attitude and Practice;

Procedure means this HIV/Aids Procedure;

VCT means Voluntary Counselling and Testing; and

6. DEFINITIONS

- Basic Conditions of Employment Act, Act 75 of 1997 ("BCEA")
- Code of Good Practice on Key Aspects of HIV/AIDS on Employment (No. 21815, December
- 2000)("the Code")
- Compensation for Occupation injuries and Disease Act, Act 130 of 1993 ("COIDA")
- Constitution of the Republic South Africa, Act 108 or 1996 ("the Constitution")
- Employment Equity Act 55 or 1998 ("the EEA")
- Global Business Coalition on HIV/AIDS – Best Practice Standards (Section 13)
- Labour Relations Act 66 of 1995 ("the LRA")
- Mine Health and Safety Act, Act 29 of 1996 ("the MHSA")
- National Health Act, Act 61 of 2003 ("the NHA")
- National Strategic Framework for HIV and AIDS and
- Occupational Health and Safety Act, Act 85 of 1993 ("the OHSA")

7. LEGAL AND OTHER REQUIREMENTS (CODES, STANDARDS AND REGULATIONS)

Bushveld Minerals acknowledges and recognises the impact of HIV/AIDS pandemic to its Employees, their families and the communities in which it operates. Bushveld Minerals believes in the following principles in line with the International Labour Organisation:

7.1. Recognition of HIV/AIDS as a workplace issue

HIV/AIDS is a workplace issue and should be treated like any other serious, chronic or life threatening illness/condition in the workplace. This is necessary not only because it affects the workforce, but also because the workplace, being part of the local community, has a role to play in the wider struggles to limit the spread and effects of the pandemic.

7.2. Non-discrimination

In the spirit of respect for the human rights and dignity of persons infected or affected by HIV/AIDS, there should be no discrimination and stigmatization against individuals on the basis of their real or perceived HIV status.

7.3. Gender equality

The gender dimensions of HIV/AIDS should be recognised. Women are more likely to become infected and are more often adversely affected by the HIV/AIDS pandemic than men due to biological, socio-cultural and economic reasons. The greater the gender discrimination in societies and the lower the position of women, the more negatively they are affected by HIV. Therefore, equality of gender relations and the empowerment of women are vital to successfully prevent the spread of HIV infection and enable women to cope with HIV/AIDS.

7.4. Healthy work environment

A healthy work environment facilitates optimal physical and mental health in relation to work and adaptation of work to the capabilities of workers in light of their state of physical and mental health.

7.5. Social dialogue

The successful implementation of an HIV/AIDS policy and programme requires cooperation and trust between employers, Employees and their representatives and all levels of government, where appropriate, with the active involvement of Employees and/or Contractors infected with or affected by HIV/AIDS.

7.6. Screening for purposes of exclusion from employment or work processes

HIV/AIDS screening will not be required of job applicants or Employees. Testing of any Employee for HIV/AIDS will only be undertaken at the Employee's explicit request or with his/her consent and counselling services will be provided for Employees wishing to be tested for HIV/AIDS.

7.7. Confidentiality

Job applicants or Employees are not required to disclose their HIV status. Neither are fellow Employees obliged to reveal any such personal information about fellow Employees. Confidentiality of medical information about employees that are HIV positive will be adhered to at all times.

7.8. Continuation of employment relationship

HIV infection is not a cause for termination of employment. As with many other conditions, persons with HIV-related illnesses should be able to work for as long as they are medically fit and suitable and appropriate work is available, provided that they do not further jeopardise their health and safety or jeopardise the health and safety of their fellow Employees.

7.9. Prevention

Prevention of all means of HIV transmission can be achieved through a variety of strategies which are appropriately targeted to national conditions and which are culturally sensitive. Prevention can be furthered through changes in behaviour, knowledge, treatment and the creation of a non-discriminatory environment. The changes can be achieved through the provisions of information and education and in addressing socio-economic factors.

7.10. Care and support

Solidarity, care and support should guide the response to HIV/AIDS in the workplace. All Employees, including Employees with HIV, are entitled to affordable health services. There should be no discrimination against them and their dependants in access to and receipt of benefits from statutory social security programmes and occupational schemes.

8. GENERAL

Bushveld Minerals commits to the following provisions in combating the scourge of HIV/AIDS:

- An essential component of Bushveld Minerals's strategy is providing prevention and education programmes in the workplace which clearly state:
    - how HIV/AIDS can be contracted, and
    - what can be done to prevent contracting HIV/AIDS

  Thereby providing Employees and Contractors with the knowledge they require to protect themselves, their fellow Employees, Contractors and their families.
- Employees will be encouraged to ascertain their HIV status through active campaigns and the provision of counselling and testing facilities. The same facilities will also be available for Contractors.
- Testing any Employees for the HIV virus will only be undertaken at his/her explicit request and with informed consent which shall be on a strictly voluntary basis. Such a request may be submitted in writing, by the relevant Employee.
- The confidentiality of medical information is guaranteed in that:

- No flags or symbols will be used on any Employee's medical, personnel or other records to indicate HIV status;
- Only the Employee and the medical officer, either in-house or from an external company as the case may be, are to have knowledge of the said Employee's HIV status; and
- Employee breach of any of the above may result in appropriate disciplinary action.

- Pre- and post-counselling services should be provided for an Employee or Contractor wishing to be tested.
- Prospective Employees will not be required to undergo HIV testing as a pre-condition of the selection procedure.
- Employees or prospective Employees with HIV will be treated justly and humanely as specified in the key principles above.
- The support and cooperation of local, provincial and national government will be garnered by way of joint projects or where reasonably possible the formation of public/private partnerships with those institutions in order to join forces in the fight against HIV/AIDS.
- Through its corporate social investment programme, Bushveld Minerals will facilitate the training of peer educators and support home based care workers to ensure that every reasonable attempt is made to assist workers and the balance of the community in combating HIV/AIDS.

9. PROCEDURE

9.1. Recruitment

Many factors will be taken into account in the selection of suitable applicants. The medical requirement for employment is a sufficient degree of fitness required to fulfil the job requirements. The selection process requires a standard pre-placement medical examination and a red ticket. The medical examination does not include an HIV test, or indirect screening methods such as questions in verbal or written form about HIV tests and/or questions related to the assessment of HIV risk behaviour. The only health related criterion for employing an individual is the person's fitness to perform the work offered.

9.2. Present Employees

Employees who are aware that they have HIV/AIDS need only inform Bushveld Minerals once they are unable to perform their duties or if their counsellor or medical practitioner recommends that they do so.

If an Employee is aware that they have HIV/AIDS then provided they: -

- are able to meet acceptable standards of work performance and work attendance, and
- their condition does not constitute a threat to their fellow Employees according to medical opinion they will be treated consistent with other Employees.

Bushveld Minerals has an obligation to provide a safe working environment for all Employees and Contractors. Therefore appropriate, reasonable precautions will be taken to ensure that an Employee's or Contractor's condition does not present a health and/or safety threat to other Employees or Contractors.

In the case of any Employee who is HIV positive:

- they will be governed by the same contractual obligations as all other Employees;
- their HIV positive status will not be justification for the non-performance of duties as agreed to between Bushveld Minerals and that Employee.
- their HIV status will not be used as a criterion for promotion, training and/or development opportunities;
- their HIV status will not be used as a criterion for the provision of benefits; and
- they will not be dismissed on the basis of their HIV status, nor will it influence retrenchment procedures.

9.3. Testing of Employees

The medical testing of an Employee is permissible only when it is a legislative requirement or for a justifiable reason based on medical facts, employment conditions, social policy, fair distribution of Employee benefits and/or the inherent requirements of the job. As stated above, the medical requirement for employment is a sufficient degree of fitness required to fulfil the job requirements. Selection process requires a standard pre-placement medical examination and a red ticket. HIV testing does not form part of the pre-employment medical examination and no Employee is obliged to undergo an HIV test.

9.3.1. Authorised Testing

Bushveld Minerals will at all times comply with the legal requirements on HIV testing and reserves the right to approach the Courts to obtain authorisation for HIV testing where it deems it to be necessary in order to pursue the objectives of this Policy or Bushveld Minerals's operational or business requirements.

9.3.2. Permissible Testing

Bushveld Minerals will provide testing to an Employee who has voluntarily requested such a test in the following circumstances:

- in terms of the VCT programme and other HIV/AIDS awareness programmes that Bushveld Minerals may conduct at various operational units from time to time;
- in the event of an occupational accident carrying a risk of exposure to blood or other body fluids;
- for the purpose of applying for compensation following an occupational accident involving the risk of exposure to blood or other body fluids.

This testing will only be undertaken:

- at the Employee's initiative;
- within the confines of a health care worker and Employee-patient relationship;
- with the Employee's informed consent. Informed consent means that the Employee is in possession of the relevant information, understands the information and then agrees to take the tests being fully aware of the necessity, benefits, risks, alternatives and any possible social implications of the outcome of the test;
- pre- and post-test counselling will be provided; and
- in utmost confidentiality. The results of the test will be conveyed to the Employee only. An Employee has the right to privacy and is not legally required to disclose their HIV status to Bushveld Minerals or to any other Employee other than the individuals who run the VCT Programme unless if the Employee's express written consent is obtained.

Furthermore, any Employee who wishes to ascertain his/her status outside the ambit of the VCT programme may request Bushveld Minerals to assist him/her in obtaining an HIV test. Bushveld Minerals will pay for the test unless covered by the appropriate medical aid. Should the Employee make such a request, Bushveld Minerals will arrange for the test and make the appropriate pre- and post-test counselling service available to that Employee.

We believe that voluntary counselling and testing for HIV is a critical intervention that helps to link care and support for those with HIV infection to our broader prevention programmes aimed at turning the tide of the HIV/AIDS pandemic.

Bushveld Minerals will, where reasonably possible, assist with obtaining counselling for the partner and/or immediate family members of the HIV positive Employee. Where such services exist, specialist community agencies will be used for counselling.

9.3.3. Employees who are HIV positive

Once an employee develops any opportunistic disease related to the AIDS virus, the impact of the disease on his/her ability to perform his/her job will have to be assessed. This is done by jointly agreeing to a medical examination to determine that person's ability to perform his/her duties.

Termination of employment will only be considered due to incapacity when the Employee is too ill to continue employment and where no position suitable for the Employee's state of health is available. Any termination of employment due to incapacity will be dealt with in accordance with the relevant guidelines contained in the Code of Good Practice: Dismissal, Schedule 8 to the LRA. The normal ill-health retirement regulations as defined in the provident fund of which the Employee is a member will apply.

10. COMPLIANCE TO THE PROCEDURE

It will be the responsibility of every HOD's and Subsidiary Head to ensure that this procedure is adhered at all time.