Table 1: Impact Assessment during Construction Phase

CONSTRUCTION PHASE: SITE ACCESS AND SITE ESTABLISHMENT		
Potential impact and risk: **Loss of topsoil, increased dust levels, and soil compaction**	**IMPACT 1: SOIL EROSION & SOIL COMPACTION:** **The clearing of areas for mining logistics, the waste rock dump site, MRDSF and all other infrastructure will result in the removal of existing vegetation and topsoil, which will disturb the soil increasing the potential for soil erosion by wind and loss of soil in the event of rainfall. Soil compaction will result from ongoing repeated use of access tracks.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site and Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Probable	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Dust impacting on adjacent vegetation and causing a nuisance to workers. Compaction of topsoil where vehicles drive outside demarcated areas damages seed bank and habitat for invertebrates.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	
Degree to which the impact can be **avoided**:	High	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	• After clearing, the affected area shall be stabilized to prevent any erosion or sediment runoff. Stabilized areas shall be demarcated accordingly. • Incremental clearing of ground cover should take place to avoid unnecessary exposed surfaces. • Reasonable measures must be undertaken to ensure that any exposed areas are adequately protected against the wind and potential stormwater run-off. • Top soil shall be removed separately and stockpiled separately from other soil base layers. • The stockpile areas for soil base layers are temporary as they will be re-used on a cut and fill basis. • Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion of the material. • Topsoil storage areas must be convex and should not exceed 2m in height. • Topsoil must be treated with care, must not be buried or in any other way be rendered unsuitable for further use (e.g. by mixing with spoil) and precautions must be taken to prevent unnecessary handling and compaction. • In particular, topsoil must not be subject to compaction greater than 1 500 kg/m² and must not be pushed by a bulldozer for more than 50 metres. Trucks may not be driven over the stockpiles. • Reduce drop height of material to a minimum. • Temporarily halt material handling in windy conditions. • A speed limit of 30km/hour will be displayed and enforced through a fining system. All vehicle drivers using the access road and entering the site will be informed of the speed limit.	N/A

	• Soil erosion and compaction on the section of public road (should this road not be surfaced) is required to be monitored and timeously repaired. • Soil erosion on private haul roads is to be regularly monitored and repaired. • Compacted areas that are not required for access shall be scarified after use during decommissioning and rehabilitation.	
Residual impacts:	Potential loss of invertebrates that live in the top layers of the soil.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Water Resources	**IMPACT 2: SURFACE & GROUNDWATER RESOURCES** **Potential for ground water pollution due to oil spills during routine maintenance of equipment, and potential for polluted run-off into nearby watercourse. Limited use of groundwater during site establishment.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Unlikely	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Rainfall is very seldom and evaporation rate is very high. Indirect impacts on surface water are very unlikely. The adjacent water course is currently much polluted from the untreated waste water entering the system, and any water added to from dewatering of mine shafts (should this be required during construction) will assist in the dilution of the surface water.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	
Degree to which the impact can be **avoided**:	High	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	**Groundwater Mitigation measures during Construction Phase** (section 8.1.3 in Appendix 2 of **Appendix D**) **Essential** groundwater mitigation measures during construction are as follows: • Ensure that the design of the TSF and WRD complies with GN R632 published in terms of the NEM:WA: the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits. • Limit abstraction to 130 KL/d over an eight hour per day, followed by 16h recovery, before the next pumping schedule commences. • Implement and follow water saving procedures and methodologies. • Take care that onsite sanitation facilities are well maintained and serviced regularly. • Place oil traps under stationary machinery, only re-fuel machines at fueling station, construct structures to trap fuel spills at fueling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only. • Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials; • Ensure vehicles and equipment are in good working order and drivers and operators are properly trained. • Ensure that good housekeeping is implemented.	N/A

	Best practice groundwater mitigation measures during construction are as follows: • Implement a monitoring system to record the abstraction point's (NEM-MS) water level and volume abstracted on a regular basis, i.e. at least monthly, preferably weekly; • Monitor water levels in FMS073A, NEM-MS, NNM-MP, FMS-VS1, and FMN-VS on a regular basis, i.e. at least monthly, preferably weekly; • Collect water samples at FMS073A, NEM-MS, NNM-MP, FMS-VS1, and FMN-VS every 3 months and submit to SANAS accredited laboratories for analysis of pH, EC, macro-chemistry (Na, Mg, K, Ca, NH4, Cl, SO4, Total Alkalinity, PO4, F, NO3), VOC, TOC and trace-metals (Fe, Al, Se, Cu, Pb, Zn, Cd, As, Sb and U) and microbiology; • Adhere to the recommended abstraction rates indicated (in subsection 4.6 in Appendix 2 of **Appendix E**); • Minimise storage of hazardous substances onsite during construction; • Service construction vehicles at a commercial service station if possible; • Maintain vehicles to limit the potential for accidental hydrocarbon spillages; • Encourage contractors to report, react and manage all spills and leaks so that any subsequent spills can be cleaned up immediately to prevent contamination of the groundwater; and, • Maintain and service onsite sanitation facilities regularly. **Generic mitigation measures for surface water resources** • Manage any road widening activities and construction of culverts and pipelines within the watercourse and (National Water Act Regulated Area), to prevent an increase in suspended solids, turbidity and pollution from machinery entering the watercourse habitat. • Oils and lubricants must be stored within sealed containment structures. • Any mechanical equipment maintenance must be undertaken on drip trays or UPVC sheets to prevent spills/ leaks onto the soil. • When not in use, a drip tray must be placed beneath mechanical equipment and vehicles. • Machinery must be kept in good working order and regularly inspected for leaks. • A spill kit will be available on each site where mining activities are in progress. • Any spillages will be cleaned up immediately and treated in the bio-cells (soil farms) which are located on the adjacent mine. • Waste materials generated on site must be stored in suitable lidded containers and removed off site to a suitable disposal facility. • Waste separation must be undertaken if practical for recycling • Provide all workers with environmental awareness training and comply with the requirements of the EMPr. • Provide a bin at the site and provide a mobile ablution facility.	
Residual impacts:	Disposal of contaminated soil on site at the mine's headquarters.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Biodiversity	**IMPACT 3: BIODIVERSITY - LOSS OF NATURAL VEGETATION AND ECOLOGICAL FUNCTIONING IN AN ECOLOGICAL SUPPORT AREA (ESA)**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A

Indirect impacts:	• Soil disturbance caused by vegetation clearing will provide suitable conditions for the establishment and spreading of alien invasive vegetation. • Removal of alien invasive vegetation if required, is a positive impact, and will benefit local ecological functioning.	N/A
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Degree to which the impact can be **avoided**:	Low	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	• Refer to **Diagram 5.1.1 and 5.1.2,** which show the proposed areas for mining and the existing tracks that will be used. • Manage any road widening activities and construction of culverts and pipelines within the watercourse and (National Water Act Regulated Area), to prevent an increase in suspended solids, turbidity and pollution from machinery entering the watercourse habitat. • The location of the MRDSF has been earmarked for the existing disturbed area from historical mining activities on the site as shown in Diagram 5.5.1., where there is barren soil, and almost no vegetation. • Remove alien invasive vegetation if required and ensure ongoing alien vegetation clearing in the area. • No indigenous plants outside of the demarcated work areas may be damaged. • The noise and vibration caused by the earthmoving equipment will disturb smaller animals . These will move away whilst operations are in progress. Should any animals be encountered these should be moved away by a suitably trained nature conservation officer, if necessary. • Topsoil is to be stockpiled and replaced during the Decommissioning and Closure Phase.	N/A
Residual impacts:	Improvement in biodiversity following rehabilitation, especially of decommissioned MRDSF site where topsoil will be placed and vegetation encouraged through hydro-seeding.	N/A
Cumulative impact post mitigation:	Very-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very-Low	N/A
Potential impact and risk: Contamination & Pollution	**IMPACT 4: POTENTIAL FOR SOIL CONTAMINATION, AND WASTE GENERATION DURING CONSTRUCTION PHASE**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Possible	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Windblown litter will cause visual blight. Hydrocarbons are toxic and will cause vegetation die-back and soil poisoning.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be **avoided**:	High	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	• Oils and lubricants must be stored within sealed containment structures.	N/A

	• Any mechanical equipment maintenance must be undertaken on drip trays or UPVC sheets to prevent spills/ leaks onto the soil. • When not in use, a drip tray must be placed beneath mechanical equipment and vehicles. • Machinery must be kept in good working order and regularly inspected for leaks. • A spill kit will be available on each site where mining activities are in progress. • Any spillages will be cleaned up immediately. • Waste materials generated on site must be stored in suitable lidded containers and removed off site to a suitable disposal facility. • Waste separation must be undertaken. • Provide all workers with environmental awareness training. • Provide a bin at the site. • Regularly dispose of any solid waste at a municipal waste disposal site. • Ensure all workers comply with the requirements of the EMPr. • Provide mobile ablution facilities.	
Residual impacts:	A lack of waste food management encourages vermin.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Visual Landscape	**IMPACT 5: VISUAL INTRUSION Caused by machinery, topsoil stockpiles, cleared areas, and movement of trucks on site during preparation of site establishment.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	The local area is characterised by mining infrastructure, and the project site has existing historical mine shafts, waste rock dumps, and a degraded area used as a mine residue dam that was not rehabilitated.	N/A
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	Medium	N/A
Degree to which the impact can be **mitigated**:	Medium	N/A
Proposed mitigation:	• The construction areas shall be kept neat and tidy at all times. Equipment must be kept in designated areas and storing/stockpiling shall be kept orderly. • Place shade cloth around the construction site camp to demarcate the area.	N/A
Residual impacts:	Good housekeeping will ensure a neat and well-maintained construction area reducing visual impact.	N/A
Cumulative impact post mitigation:	Very Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very Low	N/A

Potential impact and risk: Potential Impacts on Social, and Biophysical Environments	**IMPACT 6: EMMISSIONS (DUST, VEHICLES, NOISE & LIGHT): Noise and dust will be created by site establishment equipment (e.g. front-end loaders), blasting (if required during construction), and vehicles (emitting Greenhouse Gases & other fugitive emissions). Light pollution will occur from safety lighting at the construction camp, etc.**	
	PREFERRED AND ONLY ALTERNATIVE	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Local & Short Term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	• Carbon emissions from vehicle exhausts have a negative impact on the ozone layer. • Local residents along the access tracks and roads would be impacted on by noise, dust and vehicle emissions during the construction activities. • Light pollution is visible in remote areas for long distances.	N/A
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	Medium	N/A
Degree to which the impact can be **mitigated**:	Medium	N/A
Proposed mitigation:	• The Applicant shall adhere to the local by-laws and regulations regarding the noise and associated hours of operations. • The Applicant shall limit noise levels (e.g. install and maintain silencers on machinery). The provisions of SANS 1200A Sub clause 4.1 regarding "built-up" area shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas. • Construction and demolition activities generating output of 85dB or more, shall be limited to normal working hours and not allowed during weekends to limit the impact of noise of neighbours. No amplified music shall be allowed on site. • Hauling vehicles shall adhere to municipal and provincial traffic regulations including speed limits. • Vehicles used on site for the construction related activities shall be maintained and in a good working condition so as to reduce emissions. • Engines shall be turned off when the vehicle is temporarily parked or stationery for long periods. • Stockpiles must be maintained (covered where necessary) to avoid wind erosion of the material. • Reduce drop height of material to a minimum. • Temporarily halt material handling in windy conditions. • Wetting of road surfaces will reduce dust. • Incremental clearing of ground cover should take place to avoid unnecessary exposed surfaces. • Provide lighting to ensure safety standards are met, and direct light away from public areas (such as the public access road). • Ensure workers are supplied with Health and Safety equipment for noise and dust where applicable. • Apply safety standards for blasting.	N/A
Residual impacts:	Carbon emissions have impact on climate change.	N/A
Cumulative impact post mitigation:	Very Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very Low	N/A

Potential impact and risk: Potential Impacts on Heritage, Paleontological and Cultural landscape	**IMPACT 7: POTENTIAL FOR HERITAGE , PALAEONTOLOGICAL AND CULTURAL IMPACTS: Refer to Appendix C1 (AIA) AND C2 (PIA).**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative for low significant findings	N/A
Extent and duration of impact:	Local & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite (as recorded in **Appendix C1**)	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Loss	N/A
Degree to which the impact can be reversed:	Irreversible for low significance findings	N/A
Indirect impacts:	Loss of context of heritage resources.	N/A
Cumulative impact prior to mitigation:	Low for insignificant findings	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low for insignificant findings	N/A
Degree to which the impact can be **avoided**:	Very low for insignificant findings	N/A
Degree to which the impact can be **managed:**	Very low for insignificant findings	N/A
Degree to which the impact can be **mitigated**:	Very low for insignificant findings	N/A
Proposed mitigation:	• Provision for on-going heritage monitoring by an environmental manager acquainted at a basic level with the kinds of heritage resources potentially occurring in the area. • Should unexpected finds be made during development (e.g. precolonial burials; ostrich eggshell container cache; or localised Stone Age sites with stone tools, pottery), the relevant Heritage Authority should be contacted. • Officials from relevant heritage authorities (National, Provincial or Local) to be permitted to inspect the site at any time in relation to the heritage component of the management plan.	N/A
Residual impacts:	None identified for insignificant findings	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Socio-Economic Environment	**IMPACT 8: CREATION OF EMPLOYMENT & JOB SECURITY DURING CONSTRUCTION PHASE WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Positive	Negative
Extent and duration of impact:	Local, District and Short term	Local, District & Short Term
Consequence of impact or risk:	Gain	Loss
Probability of occurrence:	Definite	Definite
Degree to which the impact may cause irreplaceable loss of resources:	No Loss	Medium
Degree to which the impact can be reversed:	Irreversible (employment can be lost by an individual due to non-performance but the job provision is irreversible)	Reversible
Indirect impacts:	• Upskilling • Local economic spin-offs through increased income earned, and through purchasing of local materials • Income generation for landowners in a time of drought where livestock farming is not sustainable.	• No upskilling • No local economic spin-offs from purchase of equipment and

		goods for construction phase. • Opportunity cost for landowner and applicant.
Cumulative impact prior to mitigation:	Medium (-)	Medium (-)
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	Medium (-)
Degree to which the impact can be **avoided**:	Very low	Medium
Degree to which the impact can be **managed:**	High	Medium
Degree to which the impact can be **mitigated**:	High	Medium
Proposed mitigation:	• Employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling) • Employment of skilled labour.	No mitigation possible with No-Go alternative.
Residual impacts:	The upliftment of unemployed people, with positive impact on standard of living for their families. Local and regional economic spin-offs from investment through Social Labour Plan. Influx of workers looking for opportunities and employed workers will result in a change to the demographics of the local communities.	No job creation or potential for upskilling of previously disadvantaged labour, and no supply of copper and tungsten.
Cumulative impact post mitigation:	Medium (+)	Medium (-)
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (+)	Medium (-)

Table 2: Impact Assessment during Operational Phase

OPERATIONAL PHASE		
Potential impact and risk: Change in Topography	**IMPACT 1: CHANGE IN TOPOGRAPHY ABOVE GROUND & GEOLOGY BELOW GROUND: Ore removed below ground will leave voids. Mined ore will be stored as Run of Mine rock stockpiles prior to processing; waste rock dump, and a self-raising Mine Residue Disposal Storage Facility impacting on the site's topography.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	High	N/A
Degree to which the impact can be reversed:	Irreversible	N/A
Indirect impacts:	Increase in habitat creation for fauna (rock hyrax and lizards) on waste rock dumps.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	Medium	N/A
Degree to which the impact can be **mitigated**:	Medium	N/A
Proposed mitigation:	The focus of topographic rehabilitation may not be obvious at the time of mine planning and must be addressed as the mine develops and the Closure Plan must be reviewed periodically for continued relevance in the light of changed mine path or long-term plans. • The waste rock dump must be designed to meet minimum slope stability and safety standards and vegetated to reduce erosion and runoff. • The "valley fill" natural angle of repose of 37° for rock waste dumps is compatible with the natural rocky terrain with steep slopes and no terracing will be required. • The ongoing management of the self-raising MRDSF shall be in accordance with the relevant regulations and as per the Conceptual Design Report contained in **Appendix E**. • The basic rehabilitation methodology will therefore strive to replicate the pre-mining topography, wherever possible, or at least not to increase overall slope gradients without emplacement of adequately designed erosion control or runoff diversion structures.	N/A
Residual impacts:	• Visual change in landscape and topography following rehabilitation improving sense of place. • Creation of new habitats. • Potential for instability below ground.	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Loss of soil, increased dust levels, and soil compaction	**IMPACT 2: SOIL EROSION & SOIL COMPACTION The potential for soil erosion by wind and storm water run-off; soil compaction from repeated use of access tracks inside the mining area.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A

Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Medium	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	• Dust impacting on adjacent vegetation decreasing palatability for livestock and fauna, and causing a nuisance to workers. • Compaction of topsoil damages seed bank and habitat for invertebrates.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	Medium	N/A
Degree to which the impact can be **mitigated**:	Medium	N/A
Proposed mitigation:	• After clearing, the affected area shall be stabilized to prevent any erosion or sediment runoff. Stabilized areas shall be demarcated accordingly. • Incremental clearing of vegetation should take place to avoid unnecessary exposed surfaces. • Reasonable measures must be undertaken to ensure that any exposed areas are adequately protected against the wind and storm water run-off. • Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion of the material. • Reduce drop height of material to a minimum. • Temporarily halt material handling in windy conditions. • A speed limit of 30km/hour will be displayed and enforced through a fining system. All vehicle drivers using the access road and entering the site will be informed of the speed limit. • Compacted areas that are not required for access shall be scarified after use during decommissioning and rehabilitation. • Provision must also be made for efficient storm water control to prevent erosion. • Soil erosion and compaction on the section of public road, should it remain unsurfaced, used by the Applicant is required to be monitored and timeously repaired. • Soil erosion on private haul roads is to be regularly monitored and repaired.	N/A
Residual impacts:	• Unmanaged soil erosion will result in loss of topsoil. • Unmanaged dust from unsurfaced roads will cause a nuisance and impact on the health of the workers. • Dust impacting on adjacent vegetation decreasing palatability for livestock and fauna.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Groundwater Resources	**IMPACT 3.1: GROUND WATER RESOURCES: QUALITY AND QUANTITY** **Process water is to be obtained from the Nababeep shaft (NEM-MS), as per the sustainable yield of the groundwater detailed in Appendix 2 in Appendix E. Water is to be recycled from the mining operations.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A

Indirect impacts:	The verification of the movement of groundwater and contaminants, as per the various models reported on in the Hydrogeological Report (Appendix 2 in **Appendix E**).	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	**Mitigation Measures during Operational Phase** (see Section 8.2.3 in Appendix 2 of **Appendix E**): **Essential** groundwater mitigation measures during operations are as follows: • Implement and follow water saving procedures and methodologies; • Take care that onsite sanitation facilities are well maintained and serviced regularly; • Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials; • Place oil traps under stationary machinery, only re-fuel machines at fueling station, construct structures to trap fuel spills at fueling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only; • Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials; • Ensure vehicles and equipment are in good working order and drivers and operators are properly trained; • Ensure that good housekeeping rules are applied, and emergency spill clean-up procedures and equipment are in place; • Incorporate adequate lining, under drainage and seepage collection facilities into the TSF design; • Design and construct the RWD and SWD with adequate liners in place; • Draw-up and strictly enforce procedures to handle accidental spillage and leaks at process water producing/using facilities and pipelines; • Slope the WRD and RoM Stockpiles to prevent rainwater ponding and maximises storm water runoff; • Channel dirty stormwater runoff to the SWD; and, • Incorporate adequate leakage detection and spill control measures in the facility's design and construction. **Best practice** groundwater mitigation measures during operation are as follows: • Install a groundwater monitoring system with monitoring boreholes drilled upstream and downstream of facilities where potential groundwater risk is highest, i.e. TSF, RWD, SWD and Treatment Plant. Suggested number of monitoring boreholes are as follows: • TSF and RWD – one upstream and two downstream; and • SWD – one upstream and one downstream. • Install a monitoring borehole upstream of the site on the Nababeep Fault to monitor background groundwater level and chemistry downstream of the old Nababeep mine site; • Install a monitoring borehole downstream of the site on the Nababeep Fault to monitor groundwater level and chemistry downstream of the site; • Monitor groundwater dewatering discharge and water quality at the three SAFTA underground mines, i.e. FMS, FME and FMN; • The groundwater monitoring should include the following: o The water levels at all monitoring boreholes and the NEM-MS must be recorded on at least a monthly basis. Best results are obtained if automatic flow meters and water level recorders set to take hourly readings are installed; o Water samples must be collected at all monitoring boreholes, the NEM-MS and the three SAFTA mines on a three-monthly basis and submitted to a SANAS accredited laboratory for analysis of pH, EC, macro-	N/A

	chemistry (Na, Mg, K, Ca, NH4, Cl, SO4, Total Alkalinity, PO4, F, NO3), COD and trace-metals (Fe, Mn, Al, Se, Cu, Pb, Zn, Cd, As, Sb and U); and, o A SACNASP registered hydrogeologist should evaluate the monitoring data on an annual basis and compile a monitoring report. • Adhere to the recommended abstraction rate for NEM-MS (indicated in subsections 4.6 of in Appendix 2 of **Appendix E)**; and • Minimise storage of hazardous substances onsite during operation. **Generic mitigation measures** • Ensure water abstraction is within allowable limits set by the Department of Water & Sanitation (DWS). Any conditions set by DWS in the license approval process will need to be adhered to. • Ensure that an effluent purification and recycling system is installed.	
Residual impacts:	Draw down of groundwater will take a very long time to recover estimated at 87 years in the specialist report, subject to good rainfall in the area	N/A
Cumulative impact post mitigation:	Medium-High	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-High	N/A
Potential impact and risk: Potential Impacts on Surface water Resources	**IMPACT 3.2: SURFACE WATER RESOURCES A watercourse is located to the west of the logistics area. Management of stormwater run-off to keep clean water from entering polluted water systems.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Unlikely	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Indirect impacts on surface water could result during storm water events from unmanaged pollutants entering the river system. This Mining Right Application is highlighting the lack of maintenance of the municipal WWTW that is heavily polluting this watercourse.	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	• Ensure that an effluent purification and recycling system is installed. • Implement an integrated waste management system on site. • Ensure all hazardous substances are stored correctly. • Ensure stormwater berms divert stormwater away from infrastructure in the mine area. • Adhere to the management of the MRDSF contained in the Conceptual Design report (**Appendix E**) to ensure that this waste disposal facility does not pollute surface water resources, and ensure the ongoing maintenance of the stormwater diversion trenches associated with this MRDSF. • Ensure all pipelines and powerlines located within close proximity to the water course are maintained and erosion of support structures does not occur to compromise the integrity of the infrastructure, resulting in water pollution	N/A

	or river bank erosion.	
Residual impacts:	Potential for the polluted water course to be diluted with stormwater run-off.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Biodiversity	**IMPACT 4: LOSS OF NATURAL VEGETATION AND ECOLOGICAL FUNCTIONING IN AN ECOLOGICAL SUPPORT AREA (ESA)** **The proposed mining area footprint will result in an impact on localised ecological functioning, although limited as much of the site is disturbed from historical mining activities.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Irreversible	N/A
Indirect impacts:	Soil disturbance caused by vegetation clearing will provide suitable conditions for the establishment and spreading of alien invasive vegetation. Removal of alien invasive vegetation is a positive impact, and will benefit the ecological functioning. Fencing the mine site will assist in the re-establishment of small fauna hunted by local communities.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	• The mining area and stockpile areas must be demarcated and the footprint contained within the demarcated areas as shown on Diagram 5.1.1 and 5.1.2 (position of FMS to be corrected). • The annual rehabilitation plan must be implemented. • Rehabilitation of the MRDSF as per the Conceptual Design Report (**Appendix E**) will improve the local biodiversity of this site. • Remove alien invasive vegetation, and ensure ongoing alien vegetation clearing should this be required. • No indigenous plants outside of the demarcated work areas may be damaged. • The noise and vibration caused by the earthmoving equipment will disturb smaller animals. These will move away whilst operations are in progress. Should any animals be encountered these should be moved away by a suitably trained nature conservation officer, if necessary.	N/A
Residual impacts:	Increase in habitat creation for fauna (rock hyrax and lizards) on waste rock dump.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A

Potential impact and risk: Contamination & Pollution	**IMPACT 5: POTENTIAL FOR SOIL CONTAMINATION, AND WASTE GENERATION DURING OPERATIONAL PHASE** **Waste rock dump; overburden; industrial waste (hazardous wastes, oil & greases); domestic waste; waste water, including effluent & sewage sludge and the MRDSF**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Possible	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Medium	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Windblown litter will cause visual blight. Hydrocarbons are toxic and will cause vegetation die-back and soil poisoning. A lack of waste food management encourages vermin.	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	• **Waste rock** from the mining process is to be disposed of in the waste rock dump as show in Diagram 5.1.1. • **Industrial waste (i.e. including hazardous wastes and oils and greases)** - Separation of wastes into classes will ensure that waste is disposed of safely and according to the correct procedure. In order to ensure that waste classes are kept in separate streams, training will be undertaken. - Petrochemical spillages to be collected in a drip tray and drum to store; excavate spill affected soil for disposal at a registered hazardous waste facility. - Hazardous waste is to be disposed of at Vissershoek Landfill. • **Domestic waste (i.e. waste that is generated from the offices)** - Domestic waste - separated at source into recyclable products. These must then be removed and recycled by recognised contractors. (Note that the mine is responsible for the waste from cradle to grave). - Disposal at a registered and officially permitted commercial or municipal landfill site is the most cost-effective option for materials that cannot be recycled. - Domestic waste generated by workers needs to be sorted and all biodegradable waste must be stored in separate drums provided for. • **Mine residue Disposal Storage Facility (MRDSF)** - Manage the MRDSF according to the Conceptual Report (**Appendix E**) to ensure that the waste disposal facility complies with relevant legislation. • **Waste water** - Equipment used in the mining process will be adequately maintained so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid. - By keeping contaminated and clean water separate and establishing controlled runoff washing bays, the flow and end destination of decontamination washing water will be controlled. - Slow storm water runoff with contoured, low-gradient drains and channels, as well as retention ponds. A series of	N/A

	ponds may also be used to remove sediment and other contaminants from water before reuse or reintroduction into the mining process. - Ensure that a purification and recycling sewage and effluent management system is installed.	
Residual impacts:	Recycling of waste material creates employment.	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Potential Impacts on Visual Landscape	**IMPACT 6: VISUAL INTRUSION** **Caused by the machinery, topsoil and rock stockpiles, cleared areas, and movement of trucks on site.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	
Extent and duration of impact:	Site & Long term	
Consequence of impact or risk:	Loss	
Probability of occurrence:	Definite	
Degree to which the impact may cause irreplaceable loss of resources:	Low	
Degree to which the impact can be reversed:	Reversible	
Indirect impacts:	The local topography and landscape is already altered due the historical mining onsite and existing mines in the local area.	
Cumulative impact prior to mitigation:	Medium	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	
Degree to which the impact can be **avoided**:	Medium	
Degree to which the impact can be **managed:**	Medium	
Degree to which the impact can be **mitigated**:	Medium	
Proposed mitigation:	• The site shall be kept neat and tidy at all times. Equipment must be kept in designated areas and storing/stockpiling shall be kept orderly. • Mitigation of the visual impact of "heaped fill dumps" and "sidehill dumps" will include limited topsoil application to the slope and revegetation on the top of the dump. • The visual impact of the MRDSF will be mitigation during rehabilitation when re-vegetation is facilitated.	
Residual impacts:	Good housekeeping will ensure a neat and well-maintained operational area reducing visual impact.	
Cumulative impact post mitigation:	Low	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	
Potential impact and risk: Potential Impacts on Social, and Biophysical Environments	**IMPACT 7: EMMISSIONS (DUST, VEHICLES, NOISE & LIGHT)** **Blasting will generate noise, vibration and dust. Hauling vehicles emit Greenhouse Gases and other fugitive emissions. Dust will be generated on access roads, and in rock dumping. Lighting impacts on surrounding communities and fauna. Dust generated from MRDSF.**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site and Long Term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause	Low	N/A

irreplaceable loss of resources:		
Degree to which the impact can be reversed:	Low	N/A
Indirect impacts:	• Carbon emissions from vehicle exhausts have a negative impact on the ozone layer. • Residents outside the project site that reside along the access road would be impacted on by noise, dust (if road is not surfaced) and vehicle emissions. • Lighting attracts insects, and a localized food chain is likely to develop.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be **avoided**:	Medium	N/A
Degree to which the impact can be **managed:**	Medium	N/A
Degree to which the impact can be **mitigated**:	Medium	N/A
Proposed mitigation:	• Health and safety equipment is required for workers. • Wetting helps reduce dust generation. • No amplified music should be allowed on site. • Existing tracks will be used as haul roads and will only be upgraded to facilitate haul trucks by applying dust suppression and/or hardening compound such as Macadamite. • On public roads the vehicles shall adhere to municipal and provincial traffic regulations including speed limits. • Vehicles used on site for the construction related activities shall be maintained and in a good working condition so as to reduce emissions. • Engines shall be turned off when the vehicle is temporarily parked or stationery for long periods. • Reduce drop height of material to a minimum. • Temporarily halt material handling in windy conditions. • Provide lighting to ensure safety standards are met, and direct light away from public areas (such as the public access road). • Use energy efficient bulbs that do not attract insects. • Ensure workers are supplied with Health and Safety equipment for noise and dust where applicable. • Apply safety standards for blasting. • Ensure dust suppression on MRDSF if required.	N/A
Residual impacts:	Dust settling on adjacent vegetation can impact on vegetative growth.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	
Potential impact and risk: Potential Impacts on Heritage, Paleontological and Cultural landscape	**IMPACT 8: POTENTIAL FOR HERITAGE, PALAEONTOLOGICAL AND CULTURAL IMPACTS: Refer to Appendix C1 (AIA) and C2 (PIA).**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Negative for low significant finings	N/A
Extent and duration of impact:	Local & Long term	N/A
Consequence of impact or risk:	No Loss (AIA). No loss for fossils (see PIA).	N/A
Probability of occurrence:	Possible	N/A
Degree to which the impact may cause irreplaceable loss of resources:	No loss (according to Specialist Report).	N/A
Degree to which the impact can be reversed:	Irreversible for low significance findings	N/A
Indirect impacts:	Loss of context of insignificant findings.	N/A

Cumulative impact prior to mitigation:	Low for insignificant findings	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low for insignificant findings	N/A
Degree to which the impact can be **avoided**:	Very low for insignificant findings	N/A
Degree to which the impact can be **managed:**	Very low for insignificant findings	N/A
Degree to which the impact can be **mitigated**:	Very low for insignificant findings	N/A
Proposed mitigation:	• Provision for on-going heritage monitoring by an environmental manager acquainted at a basic level with the kinds of heritage resources potentially occurring in the area. • Should unexpected finds be made during development (e.g. precolonial burials; ostrich eggshell container cache; or localised Stone Age sites with stone tools, pottery), the relevant Heritage Authority should be contacted. • Officials from relevant heritage authorities (National, Provincial or Local) to be permitted to inspect the site at any time in relation to the heritage component of the management plan.	N/A
Residual impacts:	None identified for insignificant findings	N/A
Cumulative impact post mitigation:	Very-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very-Low	N/A
Potential impact and risk: Potential Impacts on Socio-Economic Environment	**IMPACT 9: CREATION OF EMPLOYMENT & JOB SECURITY DURING OPERATIONAL PHASE WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Positive	Negative
Extent and duration of impact:	Local, district and Long term	Local, District & Long Term
Consequence of impact or risk:	Gain	Loss
Probability of occurrence:	Definite	Definite
Degree to which the impact may cause irreplaceable loss of resources:	No loss	Medium
Degree to which the impact can be reversed:	Irreversible (employment can be lost by an individual due to non-performance but the job provision is irreversible)	Reversible
Indirect impacts:	• Section of Municipal road upgraded for mine access. • Generation of awareness of watercourse contamination caused by Municipal WWTW dysfunction. • Upskilling. • Local economic spin-offs through increased income earned, and through purchasing of local materials required for the operational activities. • Income generation for landowners in a time of drought where livestock farming is not sustainable.	• No upskilling. • No local economic spin-offs due to lack of income earned. • No ongoing supply of copper and tungsten to local and international markets. • Opportunity cost for landowner and applicant.
Cumulative impact prior to mitigation:	Medium (-)	Medium (-)
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	Medium (-)
Degree to which the impact can be **avoided**:	Very low	Medium
Degree to which the impact can be **managed:**	High	Medium

Degree to which the impact can be **mitigated**:	High	Medium
Proposed mitigation:	• Employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling)	No mitigation possible with No-Go alternative.
Residual impacts:	• The upliftment of unemployed people, with positive impact on standard of living for their families. • Local and regional economic spin-offs from investment through Social Labour Plan. • Influx of workers looking for opportunities and employed workers will result in a change to the demographics of the local communities.	No job creation or potential for upskilling of previously disadvantaged labour.
Cumulative impact post mitigation:	Medium (+)	Medium (-)
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (+)	Medium (-)

Table 3: Impact Assessment during Decommissioning and Closure Phase

DECOMMISSIONING & CLOSURE PHASE		
Potential impact and risk: Potential Impacts on Biophysical Environment	**IMPACT 1: REHABILITATION OF MINED AND CLEARED AREAS As per Rehabilitation, Decommissioning and Mine Closure Plan (Appendix G)**	
ALTERNATIVE	**ALTERNATIVE 1 (PREFERRED)**	**NO-GO ALTERNATIVE**
Nature of impact:	Positive	N/A
Extent and duration of impact:	Local and Long term	N/A
Consequence of impact or risk:	Gain	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	No loss	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Improved visual impact for tourism.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be **avoided**:	Very low (rehabilitation is mandatory)	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	• Implementation of Final Rehabilitation, Decommissioning and Mine Closure Plan (**Appendix G**). • The focus of topographic rehabilitation may not be obvious at the time of mine planning and must be addressed as the mine develops and the Closure Plan must be reviewed periodically for continued relevance in the light of changed mine path or long-term plans. • Compacted areas shall be scarified after use during decommissioning and rehabilitation. • Any stored topsoil shall be spread over the scarified surfaces. • Rehabilitation of the MRDSF as per **Appendix E**. • **Other mitigating with regard to residual environmental impact** - Implementing screening as part of the cleaning activities before materials is moved from the mine. - The infrastructure area will be screened for petrochemical spills and cleaned and waste from the temporary storage facility will be removed and the area cleaned. - Unwanted steel, sheet metal and equipment needs to be sold or disposed of as scrap metal. Recycling and reusing materials may reduce garbage haul fees or generate income through the sale of scrap metal and old equipment. - All steel structures and reinforcing will be discarded or sold as scrap. - All equipment and other items used during the mining operation needs to be removed from the site. - Used oils / hydrocarbons fuels / liquids are to be collected in sealed containers (stored on concrete slabs) and removed from site for recycling by a reputable company. - All waste in the temporary storage area for used lubrication products and other hazardous chemicals will be disposed of at a collection point from where it will be collected by a waste recycling company. - All temporary waste storage areas need to be cleaned out and waste removed. - Tyres to be return to supplier or a company that uses old tyres for making door mats, shoes, swings, etc. - Batteries to be return to supplier or disposed at a permitted hazardous waste facility. - Fluorescent tubes to be collected in sealed containers (stored on concrete slabs) and removed from site for disposal at a permitted hazardous waste facility. - Chemical containers to be returned to supplier or disposed of at a legal, permitted facility that is capable of disposing of the waste. (DO NOT sell chemical containers to workers or communities). - Laboratory waste (chemicals) - Returned to supplier or disposed of at a permitted facility that is capable of	N/A

	disposing of the waste. - Industrial chemicals (laboratory waste) - Returned to supplier or disposed of at a permitted facility that is capable of disposing of the waste. These liquid wastes cannot be disposed of on the waste dumps. - Redundant structures, buildings and civil foundations (down to one meter below surface for subsurface infrastructure) will be removed for use elsewhere or demolished and discarded. - All redundant infrastructure and services needs to be demolished including ruins, buildings, foundations and footings. - Building rubble will be used as backfill in excavations or removed from site in the absence of excavations. - Remove all power and water supply installations not to be retained by landowner in terms of section 44 of the MPRDA. - Removing underground infrastructure to one meter below surface. - Excavations created by removing subsurface infrastructure needs to be filled, levelled and compacted. - Final walk through of complete mining lease area to ensure no mining related waste and of re-usable infrastructure remain on site. - As part of this phase training of personnel in the implementation of the Closure Plan will be done and the implementation of the environmental awareness plan will be an ongoing process.	
Residual impacts:	Increase in natural habitat following rehabilitation processes.	N/A
Cumulative impact post mitigation:	Very Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very Low	N/A
Potential impact and risk: Potential Impacts on Biophysical Environment	**IMPACT 2: GROUNDWATER** **As per Appendix 2 in Appendix E and Rehabilitation, Decommissioning and Mine Closure Plan (Appendix G)**	
ALTERNATIVE	**ALTERNATIVE 1 (PREFERRED)**	**NO-GO ALTERNATIVE**
Nature of impact:	Neutral	N/A
Extent and duration of impact:	Local and Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	No loss	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Increased knowledge of groundwater resource in area.	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be **avoided**:	Very low (rehabilitation is mandatory)	N/A
Degree to which the impact can be **managed:**	High	N/A
Degree to which the impact can be **mitigated**:	High	N/A
Proposed mitigation:	**Mitigation measures during Decommissioning Phase** (See Section 8.3.3 in in Appendix 2 of **Appendix E**) **Essential** groundwater mitigation measures during decommissioning are as follows: • Take care that onsite sanitation facilities, machinery and vehicles are well maintained and serviced regularly; • Place oil traps under stationary machinery, only re-fuel machines at fueling station, construct structures to trap fuel spills at fueling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only; • Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials; • Ensure vehicles and equipment are in good working order and drivers and operators are properly trained;	N/A

	• Ensure that good housekeeping rules are applied; • Encourage contractors to report, react and manage all spills and leaks so that spills can be cleaned up immediately to prevent contamination of the groundwater; • Limit rainwater infiltration by top-soiling and vegetating the TSF; • Continue to collect and return leachate from the under drainage and seepage collection facilities at the RWD until dry; • Maintain RWD until leachate from the under drainage and seepage collection facilities of the TSF are dry before decommissioning the RWD; and, • Continue with groundwater monitoring detailed (in subsection 8.2 *[as included above]* of in Appendix 2 of **Appendix E**). **Best practice** groundwater mitigation measures during decommissioning are as follows: • Maintain the groundwater monitoring system and procedures described (in subsection 8.2.3 of in Appendix 2 of **Appendix E**); • The groundwater monitoring should include the following: – The water levels at all monitoring boreholes and the NEM-MS must be recorded on at least a three-monthly basis. Best results are obtained if automatic flow meters and water level – recorders set to take hourly readings are installed; – Water samples must be collected at all monitoring boreholes, the NEM-MS and the three SAFTA mines on a three-monthly basis and submitted to a SANAS accredited laboratory for analysis of pH, EC, macro-chemistry (Na, Mg, K, Ca, NH4, Cl, SO4, Total Alkalinity, PO4, F, NO3), COD and trace-metals (Fe, Mn, Al, Se, Cu, Pb, Zn, Cd, As, Sb and U); and – A SACNASP registered hydrogeologist should evaluate the monitoring data on an annual basis and compile a monitoring report. **Mitigation Measures in Post-Operational Phase** (see Section 8.4.4 in in Appendix 2 of **Appendix** E) Best practice groundwater mitigation measures during post-operational decommissioning are as follows: • Maintain the groundwater monitoring system and procedures described in subsection 8.2.3 (in Appendix 2 of **Appendix E**) for five years, or as indicated by the regulatory authorities; • Groundwater monitoring should include the following: – The water levels at all monitoring boreholes and the NEM-MS must be recorded on at least a six-monthly basis. Best results are obtained if automatic flow meters and water level recorders set to take hourly readings are installed; – Water samples must be collected at all monitoring boreholes, the NEM-MS and the three SAFTA mines vent shafts if possible, on a six-monthly basis and submitted to a SANAS accredited laboratory for analysis of pH, EC, macro-chemistry (Na, Mg, K, Ca, NH4, Cl, SO4, – Total Alkalinity, PO4, F, NO3), COD and trace-metals (Fe, Mn, Al, Se, Cu, Pb, Zn, Cd, As, Sb and U); and – A SACNASP registered hydrogeologist should evaluate the monitoring data on an annual basis and compile a monitoring report. **Groundwater Monitoring System** (Section 9 in Appendix 2 of **Appendix E**) A groundwater monitoring plan as indicated in subsection 8 must be implemented as early as possible, and before the proposed mining activities commence, to identify trends in water level and water quality behaviour in local aquifers pre-development, during construction, operation, decommissioning and post-operation. This information will inform the ongoing implementation and development of a water management strategy and management of impacts within the site area and on downstream or down gradient water users. The results of monitoring, and any changes to the water management strategies, must be reported to management and DWS as per the WUL for specific items, and a detailed monitoring report submitted to the DWS on an annual basis. The report serves to notify DWS of areas of contamination (concentrations exceeding baseline quality) or reduction in water	

	supply and the actions implemented, in progress or planned to address the identified impacts including source identification and control. Water quality data is assessed against the baseline data and subjected to trend analysis and waste load calculations. Should contamination (concentrations exceeding baseline quality) or reduction in water supply be detected, SAFTA will notify the Regional Director of DWS as soon as it is practicable. **Groundwater EMPr** (Section 10.3 in Appendix 2 of **Appendix E**). 1. Lowering of Groundwater Levels during Facility Operation • Implement and adhere to water saving procedures and methodologies. 2. Rise of Groundwater Levels Post-Facility Operation Based on the flow modelling results, which takes into consideration the mining schedules, dewatering, water supply abstraction and natural recharge, the groundwater drawdown levels from the end of the 15-year LoM to 30 years post-facility operation, are likely to change as follows: • FMN (mined & dewatered year 2 to 5) – decline from a drawdown of c.5 m to c.13 m, i.e. a decline of c.0.27 m/a. This decline will cease and start to rise once the rate of recovery at the other two mines have started to reduce, where after full recovery will also likely to be c.50-60 years post-facility operation; • FME (mined & dewatered year 5 to 11) – rise from a drawdown of c.28 m to c.11 m, i.e. a rise ofc.0.57 m/a. Should this rate of recovery continue, the water level might only fully recover c.50 years post-facility operation; • FMS (mined & dewatered year 11 to 15) – rise from a drawdown of c.47 m to c.19 m, i.e. a rise of c.0.93 m/a. Should this rate of recovery continue, the water level might only fully recover c.50 years post-facility operation; • NEM-MS (abstraction over 15 years LoM) – rise from a drawdown of c.67 m (i.e. 138 mbgl) to c.44 m (i.e. 115 mbgl), i.e. a rise of c.0.77 m/a. Should this rate of recovery continue, the water level might only fully recover c.87 years post-facility operation. Note: The decline after closure at FMN, which is to be mined first, is caused by groundwater flowing from this area to recharge the dewatered mine voids at FME, FMS and NEM-MS. Also, actual recovery time could be much reduced by an exceptionally good rainy season, or two. 3. Spread of Groundwater Pollution Post-Facility Operation The model results indicate that the potential contaminant plume from the unlined TSF (worse-case scenario) does not migrate beyond the site boundary with the maximum concentration not exceeding 40% of the leachate concentration in the upper aquifer. Thirty years post closure the plume appears to be confined to the immediate vicinity of the TSF and within <150 m of the TSF perimeter (Figure 7-5 in Appendix 2 of **Appendix E**).	
Residual impacts:	Contaminant plume (for an unlined TSF worse-case scenario)	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Potential Impacts on Socio-Economic Environment	**IMPACT 3: CREATION OF EMPLOYMENT, JOB SECURITY WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS DURING DECOMMISSIONING & CLOSURE PHASE**	
ALTERNATIVE	**PREFERRED AND ONLY ALTERNATIVE**	**NO-GO ALTERNATIVE**
Nature of impact:	Positive	Negative
Extent and duration of impact:	Local, district and Short term	Local, District & Short Term
Consequence of impact or risk:	Gain	Loss
Probability of occurrence:	Definite	Definite
Degree to which the impact may cause irreplaceable loss of resources:	No loss	Medium
Degree to which the impact can be reversed:	Irreversible (employment can be lost by an individual due to non-performance but the job provision is irreversible)	Reversible

Indirect impacts:	• Upskilling. • Local economic spin-offs through increased income earned.	• No upskilling • No local economic spin-offs due to lack of income earned. • Opportunity cost for landowner and applicant.
Cumulative impact prior to mitigation:	Medium (-)	Medium (-)
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	Medium (-)
Degree to which the impact can be **avoided**:	Very low	Medium
Degree to which the impact can be **managed:**	High	Medium
Degree to which the impact can be **mitigated**:	High	Medium
Proposed mitigation:	• Ongoing employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling)	No mitigation possible with No-Go alternative.
Residual impacts:	The upliftment of unemployed people, with positive impact on standard of living for their families. Local and regional economic spin-offs from investment through Social Labour Plan. Change to the demographics of the local communities if people move on to the next available place of work.	No job creation or potential for upskilling of previously disadvantaged labour.
Cumulative impact post mitigation:	Medium (+)	Medium (-)
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (+)	Medium (-)