DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

THE DEVELOPMENT OF THE PROPOSED LESLIE 1 COAL MINING PROJECT, MPUMALANGA PROVINCE

2 August 2018

DMR Reference: MP 30/5/1/2/2/10207 MR

10 Impact Assessment

10.1 Methodology for assessing the significance of Environmental Impacts

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance. As read within the DWS's Best Practice Guideline: G4 – Impact Prediction, there are three basic components that define an impact (or a risk). Figure 10-1 represents the relationship between these three components and their influence on the significance of a certain impact of a project.

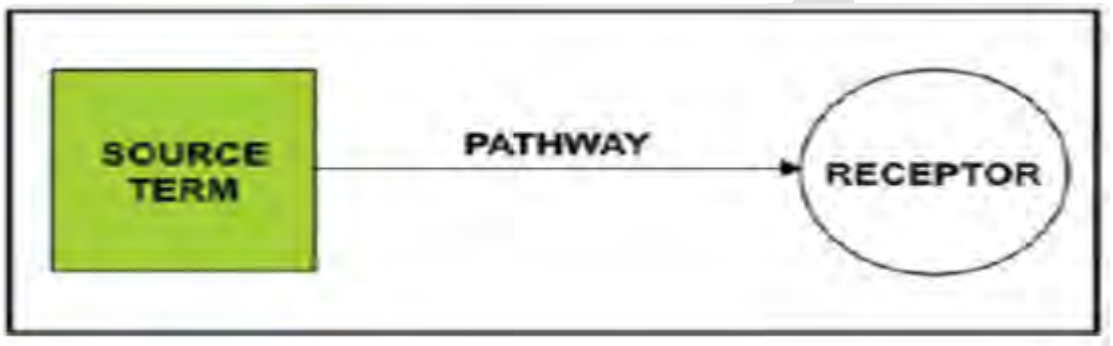

Figure 10-1: Impact prediction model

The impact significance rating system is presented in Table 10-1, Table 10-2 and Table 10-3, and involves three parts:

- **Part A**: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale/ population and duration;
- **Part B**: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
- **Part C**: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from **Part B**) and the probability of occurrence.

10.1.1 Part A: Defining Consequence in Terms of Magnitude, Duration and Spatial Scale

Use these definitions to define the consequence in Part B.

Table 10-1: Consequence Rating Methodology

IMPACT CHARACTERISTICS	DEFINITION	CRITERIA
Magnitude	Major -	Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded

IMPACT CHARACTERISTICS	DEFINITION	CRITERIA
	Moderate -	Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded
	Minor -	Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded
	Minor +	Minor improvement; change not measurable; or threshold never exceeded
	Moderate +	Moderate improvement; within or better than the threshold; or no observed reaction
	Major +	Substantial improvement; within or better than the threshold; or favourable publicity
Spatial scale or population	Site or local	Site specific or confined to the immediate project area
	Regional	May be defined in various ways, e.g. cadastral, catchment, topographic
	National/ International	Nationally or beyond
Duration	Short term	Up to 18 months.
	Medium term	18 months to 5 years
	Long term	Longer than 5 years

10.1.2 Part B: Determining Consequence Rating

Rate consequence based on definition of magnitude, spatial extent and duration.

Table 10-2: Consequence Rating Methodology

			SPATIAL SCALE/ POPULATION		
			Site or Local	Regional	National/ international
MAGNITUDE					
Minor	**DURATION**	**Long term**	Medium	Medium	High
		Medium term	Low	Low	Medium
		Short term	Low	Low	Medium
Moderate	**DURATION**	**Long term**	Medium	High	High
		Medium term	Medium	Medium	High
		Short term	Low	Medium	Medium

			SPATIAL SCALE/ POPULATION		
			Site or Local	Regional	National/ international
Major	DURATION	Long term	High	High	High
		Medium term	Medium	Medium	High
		Short term	Medium	Medium	High

10.1.3 Part C: Determining Significance Rating

Rate significance based on consequence and probability.

Table 10-3: Significance Rating Methodology

		CONSEQUENCE		
		Low	Medium	High
PROBABILITY (of exposure to impacts)	Definite	Medium	Medium	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium

10.2 Impacts and Cumulative Impacts identified for the Leslie 1 Project

This Subchapter serves to provide insight on the major positive, negative and cumulative impacts associated with the development of the Leslie 1 Project. The potential impacts are discussed per environmental feature/ aspect. For more detail please refer to the specialist study contained in the appendices.

10.2.1 Soil, Land Capability and Agricultural Potential

10.2.1.1 Construction Phase

Table 10-4: Soil horizon impact assessment matrix before and after mitigation

Impact Description	Disturbance of in situ horizon organisation due to stripping and stockpiling of topsoil	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Major -
Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	High
Probability	Definite	Definite
Significance of Impact	**High**	**High**
Mitigation	The only mitigation for this impact is to keep the surface disturbance footprint as small as possible. However, horizon inversion/disturbance is a permanent impact.	
Cumulative Impact	No	

Table 10-5: Soil fertility impact assessment matrix before and after mitigation

Impact Description	Loss of soil fertility through impacts on nutrient cycles due to stripping and stockpiling of topsoil	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Moderate -
Duration	Long Term > 5 years	Medium Term > 18 months < 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	Medium
Probability	Definite	Definite
Significance of Impact	**High**	**Medium**
Mitigation	Soil nutrient cycles can somehow be maintained by revegetation of topsoil stockpiles and through proper ecological land rehabilitation	
Cumulative Impact	No	

Table 10-6: Soil compaction impact assessment matrix before and after mitigation

Impact Description	Soil compaction due to vehicle traffic and construction infrastructure	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Moderate -
Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	Medium
Probability	Definite	Definite
Significance of Impact	**High**	**Medium**
Mitigation	The project footprint should be kept as small as possible. Traffic should be restricted to haul roads only. Topsoil stripping and stockpiling should not be conducted during wet periods, soil moisture should be below a pre-determined level.	
Cumulative Impact	No	

Table 10-7: Arable land impact assessment matrix before and after mitigation

Impact Description	Loss of arable land capability as a result of soil stripping and construction of infrastructure	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Major -
Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	High
Probability	Definite	Definite
Significance of Impact	**High**	**High**
Mitigation	Current soil rehabilitation techniques are not able to restore the current arable land capability and the loss is therefore permanent	
Cumulative Impact	Yes	

Table 10-8: Wetland impact assessment matrix before and after mitigation

Impact Description	Loss of wetland land capability as a result of soil stripping and construction of infrastructure	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Moderate -
Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	Medium
Probability	Definite	Unlikely
Significance of Impact	**High**	**Low**
Mitigation	Avoid wetland areas and do not include in areas of surface disturbance	
Cumulative Impact	No	

Table 10-9: Land use impact assessment matrix before and after mitigation

Impact Description	Change in land use from agriculture to mining	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Major -
Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	High
Probability	Definite	Definite
Significance of Impact	**High**	**High**
Mitigation	Keep the project surface footprint as small as possible	
Cumulative Impact	Yes	

10.2.1.2 Operational Phase

Table 10-10: Soil compaction impact assessment matrix before and after mitigation

Impact Description	Soil compaction	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Moderate -
Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	Medium
Probability	Definite	Definite
Significance of Impact	**High**	**Medium**
Mitigation	Restrict traffic to the demarcated areas and existing haul roads	
Cumulative Impact	No	

Table 10-11: Soil pollution impact assessment matrix before and after mitigation

Impact Description	Soil chemical pollution	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Moderate -

Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	Medium
Probability	Definite	Definite
Significance of Impact	**High**	**Medium**
Mitigation	Manage surface water run-off around the coal loading and storage facilities. Use topsoil stockpiles as berms along the road and around the infrastructure areas to prevent pollution from the site from spreading into surrounding crop fields	
Cumulative Impact	No	

10.2.1.3 Decommissioning and Closure Phase

Table 10-12: Soil compaction impact assessment matrix before and after mitigation

Impact Description	Soil compaction	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major -	Moderate -
Duration	Long Term > 5 years	Long Term > 5 years
Spatial Scale	Site or Local	Site or Local
Consequence	High	Medium
Probability	Definite	Definite
Significance of Impact	**High**	**Medium**
Mitigation	Restrict traffic to areas where decommissioning is taking place as well as existing haul roads	
Cumulative Impact	No	

10.2.2 Surface Water

10.2.2.1 Construction Phase

Table 10-13: Significance rating of construction impact 1

NATURE OF IMPACT 1: The removal of vegetation will expose soils to water erosion that may lead to a deterioration in water quality of surrounding surface water in terms of increased TSS and turbidity		
	Before Mitigation	**After Mitigation**
Spatial Scale	Regional	Local
Duration	Short term (construction phase period)	Short term (construction phase period)
Magnitude	Moderate	Minor
Probability	Possible	Possible
Significance of Impact	**Medium**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	

NATURE OF IMPACT 1: The removal of vegetation will expose soils to water erosion that may lead to a deterioration in water quality of surrounding surface water in terms of increased TSS and turbidity
Residual impacts ❖ None foreseen
Mitigation measures • Temporary erosion control measures that reduce flow velocity (e.g. runoff berms) should be implemented around construction areas; • Clearance of vegetation must be limited as far as possible; and • Water quality sampling must be implemented upstream and downstream of construction sites.

Table 10-14:Significance rating of construction impact 2

NATURE OF IMPACT 2: Lay down of impermeable areas is likely to result in increased velocity in surface water runoff, that may lead to erosion and consequent increase in TSS of surface water resources		
	Before Mitigation	**After Mitigation**
Spatial Scale	Regional	Local
Duration	Short term (construction phase period)	Short term (construction phase period)
Magnitude	Moderate	Minor
Probability	Possible	Possible
Significance of Impact	**Medium**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Residual impacts ❖ None foreseen		
Mitigation measures • Measures (energy dissipaters, detention dams, swales, etc.) that reduce flow velocity from impermeable areas should be implemented. The goal of all stormwater management should be that the post-development runoff is the same or does not exceed the pre-development runoff; • Impermeable areas must not be constructed unnecessarily; and • Water quality sampling must be implemented upstream and downstream of construction sites. Specific parameters that should be monitored include TSS and turbidity. They should be kept within the baseline water quality range.		

Table 10-15 Significance rating of construction impact 3

NATURE OF IMPACT 3: Changes in the topography are likely to result in an alteration in surface water drainage patterns leading to erosion and a consequent increase in TSS of surface water resources		
	Before Mitigation	**After Mitigation**
Spatial Scale	Regional	Local
Duration	Short term (construction phase period)	Short term (construction phase period)
Magnitude	Moderate	Minor
Probability	Possible	Possible

NATURE OF IMPACT 3: Changes in the topography are likely to result in an alteration in surface water drainage patterns leading to erosion and a consequent increase in TSS of surface water resources		
Significance of Impact	**Medium**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Residual impacts ❖ None foreseen		
Mitigation measures • Stormwater management measures around the shaft, dumps, plant area, etc. as proposed under section 5. must be implemented; and • Water quality sampling must be implemented upstream and downstream of construction sites. Specific parameters that should be monitored include TSS and turbidity. They should be kept within the baseline water quality range.		

10.2.2.2 Operational Phase

Table 10-16: Significance rating of operational impact 1

NATURE OF IMPACT 1: The excavation of the shaft portals and the implementation of the SWMP will result in a loss of contributing catchment area to stream flows		
	Before Mitigation	**After Mitigation**
Spatial Scale	Regional	No mitigation
Duration	Long term	No mitigation
Magnitude	Minor	No mitigation
Probability	Definite	No mitigation
Significance of Impact	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Residual impacts ❖ Although the shafts will be infilled at closure, it is unlikely that the entire shaft area that was excavated will be backfilled. This will remain an impact post mine closure.		
Mitigation measures • No mitigation.		

10.2.2.3 Closure Phase

Table 10-17: Significance rating of closure impact 1

NATURE OF IMPACT 1: Loosening of soil during demolition of infrastructure and rehabilitation processes is likely to be washed into nearby surface water resources leading to deteriorated water quality		
	Before Mitigation	**After Mitigation**
Spatial Scale	Regional	Local

NATURE OF IMPACT 1: Loosening of soil during demolition of infrastructure and rehabilitation processes is likely to be washed into nearby surface water resources leading to deteriorated water quality		
Duration	Short term (construction phase period)	Short term (construction phase period)
Magnitude	Moderate	Minor
Probability	Possible	Possible
Significance of Impact	**Medium**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Residual impacts ❖ None foreseen		
Mitigation measures • Stormwater management structures should be left in place until rehabilitation is complete; • Temporary erosion control measures that reduce flow velocity (e.g. runoff berms) should be implemented around rehabilitation activities; and • Water quality monitoring must continue upstream and downstream of the Mine for at least five years post mine closure and rehabilitation.		

10.2.2.4 Cumulative Impacts

Table 10-18: Cumulative impact rating for surface water quality

NATURE OF IMPACT: The establishment of the three proposed mines in the vicinity of Leandra, has the potential to cumulatively impact on the surface water quality of the area, specifically on pH, TDS and metal concentrations		
	Before Mitigation	**After Mitigation**
Spatial Scale	Regional	Local
Duration	Long term	Long term
Magnitude	Major	Moderate
Probability	Possible	Possible
Significance of Impact	**Major**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Residual impacts ❖ Possible that residual impacts can occur in the long term.		
Mitigation measures • Effective stormwater management that captures and contains all runoff from mine impacted areas; • Treatment of decant water by effective passive or active treatment methods; and		

NATURE OF IMPACT: The establishment of the three proposed mines in the vicinity of Leandra, has the potential to cumulatively impact on the surface water quality of the area, specifically on pH, TDS and metal concentrations
• Water quality monitoring upstream and downstream of mining activities.

Table 10-19: Cumulative impact rating for surface water quantity

NATURE OF IMPACT: Loss of surface water quantity as a result of seepage into underground voids and subsidence		
	Before Mitigation	**After Mitigation**
Spatial Scale	Local	Local
Duration	Long term	Long term
Magnitude	Moderate	Minor
Probability	Possible	Possible
Significance of Impact	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Residual impacts ❖ Possible that residual impacts can occur in the long term.		
Mitigation measures • Prevention of underground mining beneath watercourses; and • High extraction mining (pillar mining) should be prevented.		

10.2.3 Groundwater

Table 10-20: Drawdown impacts rating. (0-1 m)

Impact Description	Lowering of groundwater levels due to mine dewatering: Borehole falling in the 0 – 1 m drawdown zone	
	Before Mitigation	**After Mitigation**
Spatial Scale	Local	Local
Duration	Long-term	Long-term
Magnitude	Minor -	Minor -
Probability	Unlikely	Unlikely
Calculated Significance Rating	**Low**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Reversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	No	
Residual impacts ❖ Groundwater levels may take more than 100 years to recover post closure		
Mitigation measures ❖ Identify all boreholes within each mining area, as well as in a 3 km radius of the boundary of each mining area prior to the commencement of any mining.		

❖ Monitor groundwater levels in all boreholes falling in this zone. Plan for and provide sufficient budget to implement the groundwater monitoring programme before any mining starts. ❖ Should monitoring results indicate a loss of groundwater to private user, the Applicant must supply the user with an equal water resource. ❖ Adjust the mine plan and surface layout to avoid areas with shallow groundwater tables, including wetlands.

Table 10-21: Drawdown impacts rating. (1-5 m)

Impact Description	Lowering of groundwater levels due to mine dewatering: Borehole falling in the 1 – 5 m drawdown zone	
	Before Mitigation	**After Mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Minor -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Reversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	No	
Residual impacts ❖ Groundwater levels may take more than 100 years to recover post closure		
Mitigation measures ❖ Identify all boreholes within each mining area, as well as in a 3 km radius of the boundary of each mining area prior to the commencement of any mining. ❖ Monitor groundwater levels in all boreholes falling in this zone. Plan for and provide sufficient budget to implement the groundwater monitoring programme before any mining starts. ❖ Should monitoring results indicate a loss of groundwater to private user, the Applicant must supply the user with an equal water resource. ❖ Adjust the mine plan and surface layout to avoid areas with shallow groundwater tables, including wetlands.		

Table 10-22: Drawdown impacts rating. (5-10 m)

Impact Description	Lowering of groundwater levels due to mine dewatering: Borehole falling in the 5 –10 m drawdown zone	
	Before Mitigation	**After Mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Moderate -	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Reversible in the long-term	
Irreplaceable loss of resources:	Yes	
Can impacts be enhanced:	No	
Residual impacts		

❖ Groundwater levels may take more than 100 years to recover post closure
Mitigation measures ❖ Identify all boreholes within each mining area, as well as in a 3 km radius of the boundary of each mining area prior to the commencement of any mining. ❖ Monitor groundwater levels in all boreholes falling in this zone. Plan for and provide sufficient budget to implement the groundwater monitoring programme before any mining starts. ❖ Should monitoring results indicate a loss of groundwater to private user, the Applicant must supply the user with an equal water resource. ❖ Adjust the mine plan and surface layout to avoid areas with shallow groundwater tables, including wetlands.

Table 10-23: Drawdown impacts rating. (>10 m)

Impact Description	Lowering of groundwater levels due to mine dewatering: Borehole falling in the >10 m drawdown zone	
	Before Mitigation	**After Mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Major -	Major -
Probability	Possible	Possible
Calculated Significance Rating	**High**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Reversible in the long-term (100 years)	
Irreplaceable loss of resources:	Yes	
Can impacts be enhanced:	No	
Residual impacts ❖ Groundwater levels may take more than 100 years to recover post closure		
Mitigation measures ❖ Identify all boreholes within each mining area, as well as in a 3 km radius of the boundary of each mining area prior to the commencement of any mining. ❖ Monitor groundwater levels in all boreholes falling in this zone. Plan for and provide sufficient budget to implement the groundwater monitoring programme before any mining starts. ❖ Should monitoring results indicate a loss of groundwater to private user, the Applicant must supply the user with an equal water resource. ❖ Adjust the mine plan and surface layout to avoid areas with shallow groundwater tables, including wetlands.		

Table 10-24: Groundwater quality impacts rating (250 – 500 mg/L SO_4 impact zone).

Impact Description	Contamination of groundwater: Boreholes in the 250 – 500 mg/L SO_4 impact zone	
	Before Mitigation	**After Mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Minor -	Minor -
Probability	Unlikely	Unlikely
Calculated Significance Rating	**Low**	**Low**
Impact Status:	Negative	Negative

Reversibility:	Reversible
Irreplaceable loss of resources:	No
Can impacts be enhanced:	No
Residual impacts ❖ Groundwater contamination will continue post closure over the long-term	
Mitigation measures ❖ Identify all boreholes within each mining area, as well as in a 3 km radius of the boundary of each mining area prior to the commencement of any mining. ❖ Monitor groundwater quality in all boreholes falling in this zone. Plan for and provide sufficient budget to implement the groundwater monitoring programme before any mining starts. ❖ Should monitoring results indicate a loss of groundwater to private user, the Applicant must supply the user with an equal water resource. ❖ Develop sound surface runoff management plans to ensure that all dirty runoff is contained and diverted to the PCDs. ❖ Ensure that PCDs are designed to contain all dirty water generated to prevent overflows and spillages.	

Table 10-25: Groundwater quality impacts rating (500 – 1 000 mg/L SO_4 impact zone).

Impact Description	Contamination of groundwater: Boreholes in the 500 –1 000 mg/L impact zone	
	Before Mitigation	**After Mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Moderate -	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Low**
Impact Status:	Negative	Negative
Reversibility:	Reversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	No	
Residual impacts ❖ Groundwater contamination will continue post closure over the long-term		
Mitigation measures ❖ Identify all boreholes within each mining area, as well as in a 3 km radius of the boundary of each mining area prior to the commencement of any mining. ❖ Monitor groundwater quality in all boreholes falling in this zone. Plan for and provide sufficient budget to implement the groundwater monitoring programme before any mining starts. ❖ Should monitoring results indicate a contamination of groundwater to private user, the Applicant must supply the user with an equal water resource. ❖ Develop sound surface runoff management plans to ensure that all dirty runoff is contained and diverted to the PCDs. ❖ Ensure that PCDs are designed to contain all dirty water generated to prevent overflows and spillages.		

Table 10-26: Groundwater quality impacts rating (>1 000 mg/L SO_4 impact zone).

Impact Description	Contamination of groundwater: Boreholes in the >1 000 mg/L impact zone	
	Before Mitigation	**After Mitigation**

Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Major -	Major -
Probability	Possible	Possible
Calculated Significance Rating	**High**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Reversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	No	
Residual impacts ❖ Groundwater contamination will continue post closure over the long-term		
Mitigation measures ❖ Identify all boreholes within each mining area, as well as in a 3 km radius of the boundary of each mining area prior to the commencement of any mining. ❖ Monitor groundwater quality in all boreholes falling in this zone. Plan for and provide sufficient budget to implement the groundwater monitoring programme before any mining starts. ❖ Should monitoring results indicate a contamination of groundwater to private user, the Applicant must supply the user with an equal water resource. ❖ Develop sound surface runoff management plans to ensure that all dirty runoff is contained and diverted to the PCDs. ❖ Ensure that PCDs are designed to contain all dirty water generated to prevent overflows and spillages.		

10.2.4 Biodiversity

The following list provides a framework for the anticipated major impacts associated with the project.

- ❖ Loss / degradation of ecosystems
  - o Project activities that can cause loss of habitat (especially in regard to the two proposed infrastructure areas):
    - Physical removal of vegetation
    - Access roads and servitudes
    - Construction camps & laydown areas
    - Infrastructure development (buildings)
    - Linear trench excavation and berm creation
    - Soil dust precipitation
    - Coal dust precipitation
    - Stochastic events such as fire (cooking fires or cigarettes from staff)
  - o Secondary impacts anticipated
    - Loss of shallow recharge zones
    - Displacement/loss of flora & fauna (including SCC)
    - Increased potential for soil erosion (in conjunction with alterations in hydrological regimes)
    - Habitat fragmentation & loss of habitat corridors
    - Increased potential for establishment of alien & invasive vegetation
    - Loss of stored carbon & carbon sequestration potential

- Loss of ecosystem services

❖ Spread and/or establishment of alien and/or invasive species
  - Project activities that can cause the spread and/or establishment of alien and/or invasive species
    - Vegetation removal
    - Soil excavations and soil transportation
    - Transportation vehicles potentially spreading seed while moving on, to and from mining areas
    - Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents
    - Creation of infrastructure suitable for breeding activities of alien and/or invasive birds
  - Secondary impacts anticipated
    - Habitat loss for native flora & fauna (including SCC)
    - Reduced forage quality of grazing habitat
    - Spreading of potentially dangerous diseases
    - Alteration of fauna assemblages due to habitat modification

❖ Direct mortality of fauna
  - Project activities that can cause direct mortality of fauna
    - Clearing of vegetation
    - Roadkill due to vehicle collision
    - Earth moving (removal and storage of topsoil and overburden)
    - Blasting and excavation
    - Pollution of water resources due to dust effects, chemical spills, acid mine drainage etc.
    - Intentional killing of fauna for food (hunting) or otherwise (killing of snakes)
    - Bird collisions with electrical lines and infrastructure guide wires
  - Secondary impacts anticipated
    - Loss of ecosystem services
    - Explosion of rodent populations and associated disease risk

❖ Reduced dispersal/migration of fauna
  - Project activities that can cause reduced dispersal/migration of fauna
    - Linear trenches and berms
    - Compacted roads
    - Removal of vegetation
  - Secondary impacts associated with reduced dispersal/migration of fauna
    - Loss of ecosystem services
    - Reduced plant seed dispersal

❖ Environmental pollution due to increased sedimentation and chemical runoff in watercourses
  - Project activities that can cause pollution in water courses
    - Chemical (organic/inorganic) spills
    - Erosion
    - Acid mine drainage (decanting)

        - Untreated runoff or effluent
    - Secondary impacts associated with pollution in water courses
        - Faunal mortality (direct and indirectly e.g. algal blooms)
        - Groundwater pollution
        - Loss of ecosystem services
- Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise
    - Project activities that can cause disruption/alteration of ecological life cycles due to noise
        - Blasting
        - Operation of machinery (generators, crushers, vehicles)
    - Secondary impacts associated with disruption/alteration of ecological life cycles due to noise
        - Loss of ecosystem services
- Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to dust
    - Project activities that can cause disruption/alteration of ecological life cycles due to dust
        - Blasting
        - Operation of vehicles (generators, crushers, vehicles)
        - Coal crushing and transportation
        - Uncovered soil and coal stockpiles
    - Secondary impacts associated with disruption/alteration of ecological life cycles due to dust
        - Loss of ecosystem services
- Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to light
    - Project activities that can cause disruption/alteration of ecological life cycles due to light
        - External lighting to enable project activities at night
        - Vehicles operating at night
    - Secondary impacts associated with disruption/alteration of ecological life cycles due to light
        - Loss of ecosystem services
- Staff interacting directly with potentially dangerous fauna
    - Project activities that can cause staff to interact directly with potentially dangerous fauna
        - All activities outdoors

10.2.4.1 Construction Phase

Biodiversity

Table 10-27: Construction Phase Impacts on biodiversity

Affected Environment	Activity	Impact Description	Significance	Mitigation measures / Recommendations	Significance after Mitigation
Biodiversity	Site clearance for infrastructure and associated access roads as well as disturbances such as noise and dust.	Loss of areas classified as CBA and wetlands of importance	High	• Avoid CBA areas and implement buffer zones.	Moderate
		Loss of area of plant endemism	High	• Avoid areas of remaining indigenous vegetation, restrict infrastructure areas to brownfield areas only.	Moderate
		Loss of Endangered & Vulnerable habitat	High	• Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones.	Moderate
Flora	Site clearance for infrastructure and associated access roads as well as disturbances such as noise and dust.	Loss of plant species of conservation importance	High	• Avoid areas in which plant species of conservation concern occur; • If some areas cannot be avoided implement rescue of plant species of conservation concern.	Moderate
		Encroachment of alien invasive plant species	High	• An alien invasive plant management plan needs to be compiled	Moderate

Affected Environment	Activity	Impact Description	Significance	Mitigation measures / Recommendations	Significance after Mitigation
				and implemented during construction to prevent the growth of invasive species on cleared areas.	
Fauna	Site clearance for infrastructure and associated access roads as well as disturbances such as noise and dust.	Loss of habitat for species of conservation concern	High	• Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones.	Medium
		Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise)	High	• Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones; • Implement training to ensure that all staff are aware of faunal sensitivity. Put protocols in place to deal with fauna that are encountered during construction.	High

Aquatic

Table 10-28: Construction Phase Impacts on Aquatic Biodiversity

Affected Environment	Activity	Impact Description	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Aquatic Ecology	Site Clearing for Surface Infrastructure	Alteration of catchments hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	Medium	• Erosion Risk Assessment and Management Plan • The establishment of a clearly marked buffer zone • Compilation of a stormwater management plan • Careful management of vegetation removal and sedimentation control	Low
Aquatic Ecology	Construction of Surface Infrastructure		Medium		Medium
Aquatic Ecology	Construction of underground access portals (shafts)		Medium		Medium
Aquatic Ecology	The placement of waste (overburden) and topsoil stockpiles		Medium		Low

Wetland

Table 10-29: Construction Phase Impacts on Wetlands

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
The removal of vegetation, ground compaction and infrastructure placement.	Destruction of wetland systems	Medium	• Minimise footprint area of infrastructure. • Avoid wetland areas and adhere to recommended buffer areas.	Low
Placement of infrastructure within the catchment area	Loss / reduced catchment water yield	Medium	• Minimise infrastructure footprint area. • Incorporate soft / green engineering where feasible. • Separate clean and dirty water.	Low

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
			• Implement best practice storm water management. • Avoid wetland areas and adhere to recommended buffer areas.	
Vegetation removal and altered surface flow dynamics	Increase in suspended solid concentrations	Low	• Implement phased vegetation clearing to minimise the extent of bare areas. • Concurrent rehabilitation. • Separate clean and dirty water. • Implement best practice storm water management. • Stay clear of the recommended buffer zones.	Low
Onsite mixing, fuelling and use of machines and vehicles. Erosion of the cleared footprint areas.	Contamination of surface water resources	Medium	• Separate clean and dirty water. • Implement best practice storm water management. • No cleaning of vehicles, machines and equipment in water resources. • Servicing of machines, vehicles and equipment in designated areas. • Storage of potential contaminants in bunded areas. • All contractors must have spill kits available and be trained in the correct use thereof.	Low
Disturbances caused by noise, traffic, machines and human movement	Loss of species diversity	Medium	• Minimise footprint area of infrastructure. • Make use of existing access routes. • Avoid wetland areas and adhere to buffer areas.	Low

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
			• Minimise noise disturbance. • Implement dust suppression. • Implement waste management.	
Introduction of "pests" and weeds into the area.	Change in species abundances	Low	• Minimise footprint area of infrastructure. • Make use of existing access routes. • Avoid wetland areas and adhere to buffer areas. • Minimise noise disturbance. • Implement dust suppression. • Implement waste management.	Low
Construction of underground mine (shaft)	Loss of wetland systems	Medium	• Sinkholes are likely to occur in such areas which might drain wetlands in some cases. Stay well clear of such areas (if present) and ensure that the layout of components that directly impact upon the surface stay clear of the recommended buffer zones. A rock engineering report is recommended for further mitigation measures.	Low
Construction of associated infrastructure	Loss of wetland systems	High	• Avoid wetland areas and adhere to recommended buffer areas.	Low
Construction of associated infrastructure	Loss of sub-surface flows	High	• The loss of sub-surface flows is imminent. A hydropedology study is recommended to further improve mitigation and recommendations.	Medium

10.2.4.2 Operational Phase

Biodiversity

Table 10-30: Operational Phase Impacts on Biodiversity

Affected Environment	Activity	Impact Description	Significance	Mitigation measures / Recommendations	Significance after Mitigation
Flora	Operation of underground mining activities.	Encroachment of alien invasive plant species	High	• Implementation of alien invasive plant management plan needs to be continued during operation to prevent the growth of invasive species on cleared areas.	Low
Fauna	Operation of underground mining activities.	Loss of species of conservation concern and their habitat	High	• Mitigation measures can be added to infrastructure such as powerlines to avoid bird impacts; • Monitoring impacts of operational activities on fauna so that adaptive management practises can be implemented if required; • Implement speed control measures on all roads to prevent road kill; • Restrict access to high biodiversity areas (drainage lines, wetlands etc) in the vicinity of mining operations. • Implement training to ensure that all staff are aware of faunal	Moderate

Affected Environment	Activity	Impact Description	Significance	Mitigation measures / Recommendations	Significance after Mitigation
				sensitivity. Put protocols in place to deal with fauna that are encountered during operation.	

Aquatic

Table 10-31: Operational Phase Impacts on Aquatic Biodiversity

Affected Environment	Activity	Impact Description	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Aquatic Ecology	Operation of surface infrastructure (roads, conveyors, offices, coal wash plants and workshops)	Alteration of catchments hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	Medium	• Erosion Risk Assessment and Management Plan • The establishment of a clearly marked buffer zone • Compilation of a stormwater management plan • Careful management of vegetation removal and sedimentation control	Low
Aquatic Ecology	Storage of Run of Mine Coal	Water quality deterioration in the Vaal and Olifants Water Management Area	Medium		Low
Aquatic Ecology	Storage of coal mineral Discard	Water quality deterioration in the Vaal and Olifants Water Management Area	High		Medium
Aquatic Ecology	Storage of contaminated water in Pollution Control Dam's (PCD's)	Alteration of catchments hydrology and water quality deterioration in the Vaal and Olifants Water	High		Medium

Affected Environment	Activity	Impact Description	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		Management Area			
Aquatic Ecology	Active underground mining	Alteration of catchments hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	High		Medium

Wetland

Table 10-32: Operational Phase Impacts on Wetlands

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
Operation of underground mine	Destruction. of wetland systems	Low	• The operation of underground mines is unlikely to have a direct impact on wetlands.	Low
Operation of the supporting infrastructure	Reduced catchment water yield	High	• Minimise the footprint area of supporting infrastructure. Any loss of surface water to the catchment must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed.	Medium
Operation of the supporting infrastructure	Los of sub-surface flows	High	• The loss of sub-surface flows is imminent. A hydropedology study is recommended to further improve mitigation and recommendations.	Medium
Operation of the supporting infrastructure	Increased in suspended solid concentrations	Medium	• Separate clean and dirty water. Implement best practice storm water management.	Low

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
Operation of underground mine	Mine water discharge from dewatering of underground mining area	High	• Contain waste water in a PCD. Contaminated water must not be discharged into the watercourses. Clean and dirty water must be separated. This water could be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydro-dynamics.	Medium
Operation of ROM and overburden stockpiles	AMD and salinization	High	• The introduction of oxygen and water should be limited as much as possible for these systems. Specific amelioration should additionally be applied for the overburden stockpile. Impermeable layers, seepage pumps and other mitigation measures should be part of the stockpile layout.	Medium
Operations of the washplant and the Eskom plant	Contamination of surface- and ground water	Medium	• Proper drainage systems should be part of this layout, clean and dirty water should be separated and continued monitoring should be involved to monitor possible contamination. The surface and groundwater reports must be considered for further mitigation measures.	Low

10.2.4.3 Closure and Decommissioning Phase

Biodiversity

Table 10-33: Closure Phase Impacts on Biodiversity

Affected Environment	Activity	Impact Description	Significance	Mitigation measures / Recommendations	Significance after Mitigation
Flora	Decommissioning activities, including removal of infrastructure and rehabilitation of waste stockpiles.	Further impacts due to the spread and/or establishment of alien and/or invasive species	High	• Implementation of alien invasive plant management plan needs to be continued during decommissioning to prevent the growth of invasive species on rehabilitated areas; • Rehabilitation of site with indigenous vegetation that occurs in the vicinity of Project area.	Moderate
Fauna	Decommissioning activities, including removal of infrastructure and rehabilitation of waste stockpiles.	Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust, poaching and noise)	High	• All infrastructure that could have a negative impact on faunal species (powerlines etc) needs to be decommissioned and removed.	Moderate

Aquatic

Table 10-34: Closure Phase Impacts on Aquatic Biodiversity

Affected Environment	Activity	Impact Description	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Decommissioning and Closure					
Aquatic Ecology	Removal of infrastructure	Alteration of catchments hydrology and water quality deterioration in the Vaal and Olifants Water	Low	• Removal of infrastructure and rehabilitation • Re-establishment of natural vegetation • Erosion control	Low

Affected Environment	Activity	Impact Description	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
		Management Area			
Aquatic Ecology	Rehabilitation of waste stockpiles	Alteration of catchments hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	Low		Low
Post- Closure					
Aquatic Ecology	Acid Mine Drainage decant	Water quality deterioration in the Vaal and Olifants Water Management Area	High	• Water monitoring and management of pollution plumes and possible decant	Medium
Aquatic Ecology	Seepage from permanent waste stockpiles	Water quality deterioration in the Vaal and Olifants Water Management Area	High		Medium
Aquatic Ecology	Subsidence of undermined areas	Alteration of catchments hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	High		Medium

Wetland

Table 10-35: Closure Phase Impacts on Wetland

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
Backfill of voids, removal of infrastructure	Restored catchment water yield	Low	• All voids must be backfilled, and surface infrastructure must be removed from the site. Compacted areas must be ripped (perpendicularly) to a depth of 300mm. • A seed mix must be applied to rehabilitated and bare areas. • Any gullies or dongas must also be backfilled. • The area must be shaped to a natural topography. • Trees (or vegetation stands) removed must be replaced. • No grazing must be permitted to allow for the recovery of the area. • Attenuation ponds may be created in channels to retain water in the catchment.	Low
Backfill of voids	Rehabilitated topography and surface flow dynamics (including subsidence)	Low	• All voids must be backfilled, and surface infrastructure must be removed from the site. • Compacted areas must be ripped (perpendicularly) to a depth of 300mm • . A seed mix must be applied to rehabilitated and bare areas. • Any gullies or dongas must also be backfilled. • The area must be shaped to a natural topography.	Low
Backfill of void, and shaping of	Increased in suspended solid concentrations	Low	• Decommission cut-off berms and drains last.	Low

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
catchment area			• Debris must be placed in preferential flow paths. • Compacted areas must be ripped (perpendicularly) to a depth of 300mm. • A seed mix must be applied to rehabilitated and bare areas. • Any gullies or dongas must also be backfilled. • The area must be shaped to a natural topography.	
Backfill of voids	Restoration of shallow recharge	Low	• The mining of the hard plinthic layer is not likely to be restored (by means of a "plug"), and this recharge will be lost. Mitigation is therefore not possible.	Low
Degradation of soil resources by means of vehicle transportation causing leaks and compaction	Contamination of surface water resources	Medium	• Ensure vehicles and machines are maintained and serviced off-site. • Implement concurrent rehabilitation, applying a proven seed mix to rehabilitated and bare areas. • Debris must be placed in preferential flow paths.	Low
AMD decant	AMD discharge from mine areas	High	• Determine the likelihood of AMD, and proactively implement measures to prevent or reduce this. • Priority would be to ensure the treatment of this water to suitable standards for aquatic ecology. • Rehabilitation of the area and shaping of the topography must minimise the ingress of water into the mining area.	Low

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
			• Additionally, measures must also be considered to implement constructed wetlands at likely decant areas, and the planting of tree reduce groundwater recharge.	
Ripping of compacted areas	Improving soil quality	Low	• Monitor the footprint area to make note of compacted areas. These areas should be ripped, ameliorated and revegetated.	Low

10.2.4.4 Cumulative Impacts

Aquatic

Table 10-36: Cumulative Impact of the Proposed Project

Impact Description	Water and Habitat Quality Deterioration in the Olifants and Vaal Water Management Area	
	Cumulative impact should the project not go ahead	**Cumulative impacts should the project go ahead**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Major	Major
Probability	Definite	Definite
Calculated Significance Rating	High	High
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Mitigation measures • Project specific mitigation actions • Salt load investigation for the Olifants and Vaal Water Management Areas in line with respective catchment management strategies.		

The cumulative impact to the local aquatic ecology prior to the project go-ahead was rated as high. The impact after the go-ahead will remain high due to baseline catchment wide modifications. Despite the go-ahead of the Proposed Project, it is unlikely that catchment wide modification will cease and therefore a high rating after the project go-ahead was derived.

An important consideration for cumulative regional scale impacts includes the assessment of the salt loading potential of the anticipated Acid Mine Drainage should it enter into the Vaal or Olifants Water Management Area. It is likely salt loads in the watercourses will be altered should this occur. This modification will have an influence on the management decisions for water resource objectives.

10.2.5 Air Quality

The following table provides a framework for the anticipated major impacts associated with the Proposed Project.

Table 10-37: Activities and related atmospheric emissions identified for the operational phase of the proposed Leslie 1 Project

Emission	Source	Activity
Generation of TSP, PM_{10} and $PM_{2.5}$	Materials handling operations	Soil removal by shovel and truck.
		Overburden removal by shovel and truck.
		Offloading of topsoil and overburden.
		Conveyor transfer points.
		Tipping onto waste rock stockpile.
		Loading of coal into crushers.
		Tipping of ore from crushers onto storage piles.
		Stockpiling of product.
	Vehicle activity on unpaved roads	Haul trucks transporting topsoil to stockpiles.
		Haul trucks transporting overburden/waste from the mine to waste rock dumps or stockpiles.
		Haul trucks transporting coal from the CHPP off site.
	Wind erosion	Soil storage piles.
		Waste/overburden rock dumps.
		Conveyors.
		Coal storage piles.
	Crushing and screening	Crushing and screening activities.
NO_2	Vehicle activity	Tailpipe emissions from haul vehicles, and vehicles for mine personnel movement.
SO_2	Vehicle activity	Tailpipe emissions from haul vehicles, and vehicles for mine personnel movement.
SO_2, NO_X, H_2S, CO	Spontaneous combustion	Stockpiles, underground workings and waste dumps.

Table 10-38: Air Quality Impact Assessment Matrix before and after mitigation Leslie 1A

Impact Assessment Matrix Leslie 1A Year 4 and Year 6		
Impact Description	Mining activities cause the emission of particulate matter into the air, thus increasing existing ambient air concentrations of criteria pollutants (both PM_{10} and $PM_{2.5}$) at receptors.	
Acceptable rating level	**PM_{10}** • 24-hour Average Concentrations: National Ambient Air Quality Standard of 75µg/m^3 • Annual Average Concentrations: National Ambient Air Quality Standard of 40µg/m^3 **$PM_{2.5}$** • 24-hour Average Concentrations: National Ambient Air Quality Standard of 40µg/m^3 • Annual Average Concentrations: National Ambient Air Quality Standard of 20µg/m^3	
Activity	**Before Mitigation**	**After Mitigation (Mitigation measures implemented on all unpaved haul roads, conveyor transfer points and on crushing and screening activities at the CHPP)**
Magnitude	**Moderate negative:** Exceedances of the NAAQS are predicted over farmsteads and the Springboklaagte Colliery which may be a health risk to people living in those areas (4 exceedances are permissible).	**Moderate negative:** Even with mitigation measures in place, worst-case conditions may lead to the NAAQS being exceeded over farmsteads, which may be a health risk to people living in those areas (4 exceedances are permissible).
Duration	**Long Term:** There is a possibility of the ambient air concentrations exceeding the NAAQS for the duration of mining activities taking place (more than 5 years).	**Long Term:** There is a possibility of the ambient air concentrations exceeding the NAAQS for the duration of mining activities taking place (more than 5 years).
Spatial Scale	**Local:** Worst-case conditions may lead to the NAAQS being exceeded over long distances (up to 7 km) from the above-ground mining activities.	**Local:** With mitigation measures in place, worst-case conditions may lead to the NAAQS being exceeded over long distances (up to 5.5 km) from the above-ground mining activities.
Consequence	**Medium**	**Medium**
Probability	**Definite:** There are rural areas beyond the prospecting right area that are predicted to exceed the annual average NAAQS (No exceedances are permissible). Furthermore, under worst-case conditions, exceedances of the 24-hour NAAQS are probable over farmsteads and the Springboklaagte Colliery.	**Definite:** There are rural areas beyond the prospecting right area that are predicted to exceed the annual average NAAQS (No exceedances are permissible). Furthermore, even with mitigation measures in place, under worst-case conditions, exceedances of the 24-hour NAAQS are probable over farmsteads and the Springboklaagte Colliery.
Significance of Air Quality Impact	**Medium**	**Medium**
Mitigation	Modelled: Either chemical or wet suppression on haul roads. Mitigation of both crushing and screening at the CHPP.	

	Recommended: Use of conveyor belts for on-site transport of materials as much as possible and implementation of rail transport for off-site transportation if feasible.
Cumulative Impact	Emissions from Leslie 1A are predicted to increase ambient concentrations of PM_{10} and $PM_{2.5}$ up to 25% of the NAAQS over the residential areas of Leandra under worst-case conditions. This indicates that air quality impacts will be increased in these areas due to the cumulative effect of the combined emissions of all sources in the area.

Table 10-39: Air Quality Impact Assessment Matrix before and after mitigation at Leslie 1C

Impact Assessment Matrix Leslie 1C		
Impact Description	Mining activities cause the emission of particulate matter into the air, thus increasing existing ambient air concentrations of criteria pollutants (both PM_{10} and $PM_{2.5}$) at receptors.	
Acceptable rating level	**PM_{10}** • 24-hour Average Concentrations: National Ambient Air Quality Standard of 75µg/m^3 • Annual Average Concentrations: National Ambient Air Quality Standard of 40µg/m^3 **$PM_{2.5}$** • 24-hour Average Concentrations: National Ambient Air Quality Standard of 40µg/m^3 • Annual Average Concentrations: National Ambient Air Quality Standard of 20µg/m^3	
Activity	**Before Mitigation**	**After Mitigation (Mitigation measures implemented on all unpaved haul roads, conveyor transfer points and on crushing and screening activities at the CHPP/elimination of the CHPP)**
Magnitude	**Major negative:** Worst-case conditions may lead to the 24-hour NAAQS being exceeded over the residential areas of Lebohang, Leslie and Eendracht. This is a significant health risk to people living in those areas (4 exceedances are permissible, but ambient concentrations are already high).	**Major negative:** Even with mitigation measures in place and elimination of the CHPP, worst-case conditions may lead to the 24-hour NAAQS being exceeded over the residential areas of Lebohang. This is a significant health risk to people living in those areas (4 exceedances are permissible, but ambient concentrations are already high).
Duration	**Long Term:** There is a possibility of the ambient air concentrations exceeding the NAAQS for the duration of mining activities taking place (more than 5 years).	**Long Term:** There is a possibility of the ambient air concentrations exceeding the NAAQS for the duration of mining activities taking place (more than 5 years).
Spatial Scale	**Local:** Worst-case conditions may lead to the 24-hour NAAQS being exceeded over long distances (up to 8 km) from the above-ground mining activities.	**Local:** With mitigation measures in place, worst-case conditions may lead to the 24-hour NAAQS being exceeded over long distances (up to 4.5 km) from the above-ground mining activities
Consequence	**High**	**High**
Probability	**Definite:** There are rural areas beyond the prospecting right area that are predicted to	**Definite:** There are rural areas beyond the prospecting right area that are predicted to

	exceed the annual average NAAQS (No exceedances are permissible). Furthermore, under worst-case conditions, exceedances of the 24-hour NAAQS are probable over the residential areas of Lebohang, Leslie and Eendracht.	exceed the annual average NAAQS (No exceedances are permissible). Furthermore, even with mitigation measures in place, under worst-case conditions, exceedances of the 24-hour NAAQS are probable over the southern parts of Lebohang.
Significance of Air Quality Impact	**High**	**High**
Mitigation	Modelled: Either chemical or wet suppression on haul roads. Mitigation of both crushing and screening at the CHPP / Elimination of the CHPP. Recommended: Use of conveyor belts for on-site transport of materials as much as possible and implementation of rail transport for off-site transportation if feasible. Elimination of the CHPP if feasible. Locate the above-ground mining activities further south.	
Cumulative Impact	There are several large emitters of particulate matter in the area, thus background ambient air concentrations are expected to be elevated. This indicates that air quality impacts will be increased in the residential areas of Lebohang, Leslie and Eendracht due to the cumulative effect of the combined emissions of all sources in the area.	

10.2.6 Noise

10.2.6.1 Construction Phase

The significance of the potential noise impacts are defined in Table 10-40 for the daytime scenario for Leslie 1A, while Table 10-41 defines the significance of the potential noise impact for the night-time scenario for Leslie 1A.

Table 10-40: Impact Assessment: Construction Activities at Leslie 1A – daytime scenario

Activity:	Numerous simultaneous construction activities during the day	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,D}$ of 50 dBA	
	Before Mitigation	**After Mitigation**
Magnitude	Daytime noise levels are expected to be higher than typical ambient sound levels at NSD23, especially when the topsoil dump is developed close to this receptor. **Major negative**	Daytime noise levels may be audible to the closest NSD. **Minor negative**
Duration	Noise levels will be high for a portion of the construction phase. **Short Term**	Noise levels will be high for a portion of the construction phase. **Short Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	The project will not impact on the ambient sound levels further than 1,000 m from the activity during the day. **Site or Local**	The project will not impact on the ambient sound levels further than 1,000 m from the activity during the day. **Site or Local**

Consequence of Noise Impact	Medium	Low
Probability	Daytime ambient sound levels were more than 60% of the measurements, less than 50 dBA (KLPLTAS01) and around 40% in the 50 – 55 dBA range. It is **possible** that the closest NSD will hear and be disturbed by the noises from construction activities. **Possible**	Daytime ambient sound levels were more than 60% of the measurements, less than 50 dBA (KLPLTAS01) and around 40% in the 50 – 55 dBA range. It is **possible** that the closest NSD will hear and be disturbed by the noises from construction activities. **Unlikely**
Significance of Noise Impact	Low	Low
Degree of Confidence	High	
Cumulative	No	
Mitigation:	Significance of the noise impact is Low and no additional mitigation measures are required.	

Table 10-41: Impact Assessment: Construction Activities at Leslie 1A – night-time scenario

Activity:	Numerous simultaneous construction activities at night	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,N}$ of 40 dBA	
	Before Mitigation	After Mitigation
Magnitude	Night-time noise levels are expected to be significantly higher than typical ambient sound levels at NSD23, and expected to be higher than ambient sound levels at NSD20. Noises might be audible at NSD21, 22, 24, 25, 30 and 34. **Major negative**	Night-time noise levels might be audible at the closest NSD. **Minor negative**
Duration	Noise levels will be high for a portion of the construction phase. **Short Term**	Noise levels will be high for a portion of the construction phase. **Short Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	Mining activities are unlikely to impact on the ambient sound levels further than 1 000 m from the activity at night, though the mining activities might be audible up to 2 000m during quieter periods. **Site or Local**	Mining activities are unlikely to impact on the ambient sound levels further than 1 000 m from the activity at night, though the mining activities will be audible up to 2 000m during quieter periods. **Site or Local**
Consequence of Noise Impact	Medium	Low
Probability	Night-time ambient sound levels were less than 40 dBA for more than 65% of the measurements and less than 45 dBA for most of the measurements at location KLPLTAS01.	Night-time ambient sound levels were less than 40 dBA for more than 65% of the measurements and less than 45 dBA for most of the measurements at location KLPLTAS01.

	It is **definite** that the NSD23 will hear the noises and be disturbed by the noises from construction activities. It is possible that **NSD20** be affected. **Definite**	With appropriate mitigation measures, it is **unlikely** that the closest receptors be impacted by high noise levels. **Unlikely**
Significance of Noise Impact	**Medium**	**Low**
Degree of Confidence	**High**	
Cumulative	No	
Mitigation:	❖ Minimise night-time construction activities closer than approximately 700m from the closest potential noise-sensitive receptors if the activities is not taking place behind a sound barrier (temporary or as formed by a residue or topsoil berm). ❖ Minimise the use of simultaneous construction activities closer than 1 000m when operating at night. Ensure that equipment is fitted with the correct and appropriate noise-abatement measures. ❖ Eliminate the use of equipment that generates an impulsive noise when operating within 1,000m of potential receptors. Also see section 9.1.	

The significance of the potential noise impacts for the Leslie 1C mine are defined in Table 10-42 for the daytime scenario and Table 10-43 for the night-time scenario.

Table 10-42: Impact Assessment: Construction Activities at Leslie 1C – daytime scenario

Activity:	Numerous simultaneous construction activities during the day	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,D}$ of 50 dBA.	
	Before Mitigation	**After Mitigation**
Magnitude	Daytime noise levels are expected to be higher than typical ambient sound levels at NSD01, 02, 03 and 07 and could be at disturbing levels. **Major negative**	Daytime noise levels may be clearly audible and potentially disturbing to the closest NSD at times. **Major negative**
Duration	Noise levels will be high for a portion of, to the full duration of the construction phase. **Medium Term**	Noise levels will be high for a portion of the construction phase. **Short Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	The project will not impact on the ambient sound levels further than 1 000 m from the activity during the day. **Site or Local**	The project will not impact on the ambient sound levels further than 1 000 m from the activity during the day. **Site or Local**
Consequence of Noise Impact	**Medium**	**Medium**
Probability	Daytime ambient sound levels were more than 70% of the measurements, less than 50 dBA (KLPLTAS03) and 44% of the time, less than 50	Daytime ambient sound levels were more than 70% of the measurements, less than 50 dBA (KLPLTAS03) and 44% of the time, less than 50

	dBA at KLPLTAS04. It is generally quieter than 55 dBA at these locations. It is **definite** that the closest NSD will hear and be disturbed by the noises from construction activities. **Definite**	dBA at KLPLTAS04. It is generally quieter than 55 dBA at these locations. It is **possible** that the closest NSD will hear and be disturbed by the noises from construction activities. **Possible**
Significance of Noise Impact	**Medium**	**Medium**
Degree of Confidence	**High**	
Cumulative	No	
Mitigation:	Unless the closest receptors are relocated (NSDs 02, 03, 07 and 16), there is a possibility that noise levels will be high at some time during the construction phase. Mitigation may reduce the noise level, duration of impact as well as the probability of a noise impact occurring, but, due to the proximity of the closest receptors the significance of a noise impact would remain medium.	

Table 10-43: Impact Assessment: Construction Activities at Leslie 1C – night-time scenario

Activity:	Numerous simultaneous construction activities at night	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,N}$ of 40 dBA	
	Before Mitigation	**After Mitigation**
Magnitude	Night-time noise levels are expected to be higher than typical ambient sound levels at NSD01, 02, 03, 07, 08 and 13. The noise levels could be disturbing, especially if an impulsive component is present in the noise. **Major negative**	Night-time noise levels may be audible to the closest NSD at times. **Minor negative**
Duration	Noise levels will be high for a portion of, to the full duration of the construction phase. **Medium Term**	Noise levels will be high for a portion of the construction phase. **Short Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	Due to the topography, mining activities may impact on the ambient sound levels further than 1 000 m from the activity at night. The noises may be audible up to 2 000m during quieter periods. **Regional**	Due to the topography, mining activities may impact on the ambient sound levels further than 1 000 m from the activity at night. The noises may be audible up to 2 000m during quieter periods. **Regional**
Consequence of Noise Impact	**Medium**	**Medium**
Probability	Night-time ambient sound levels were more than 73% of the measurements, less than 40 dBA at KLPLTAS03, a location quite far from the N17 and R50. Modelling indicated that the roads could impact on the ambient sound levels up to 1 000m away from the roads.	Night-time ambient sound levels were more than 73% of the measurements, less than 40 dBA at KLPLTAS03, a location quite far from the N17 and R50. Modelling indicated that the roads could impact on the ambient sound levels up to 1 000m away from the roads.

	Even with the impact from the existing road traffic, it is considered **definite** that the closest NSD will hear and be disturbed by the noises from construction activities. **Definite**	With mitigation it is **possible** that the closest NSD will hear and be disturbed by the noises from construction activities. **Possible**
Significance of Noise Impact	**Medium**	**Medium**
Degree of Confidence	**High**	
Cumulative	No	
Mitigation:	❖ Minimise night-time construction activities closer than approximately 700m from the closest potential noise-sensitive receptors if the activities are not taking place behind a sound barrier (temporary or as formed by a residue or topsoil berm). ❖ Minimise the use of simultaneous construction activities closer than 1,000m when operating at night. Ensure that equipment is fitted with the correct and appropriate noise-abatement measures. ❖ Eliminate the use of equipment that generates an impulsive noise when operating within 1 000m of potential receptors.	

10.2.6.2 Operational Phase

The significance of the potential noise impacts are defined in Table 10-44 for the daytime scenario. Table 10-45 define the significance of the potential noise impact for the night-time scenario using the same criteria.

Table 10-44: Impact Assessment: Operational Activities – daytime scenario at Leslie 1A

Activity:	Numerous simultaneous operational activities during the day	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,D}$ of 50 dBA	
	Before Mitigation	**After Mitigation**
Magnitude	Operational activities in the vicinity of the Leslie 1A section are unlikely to significantly impact on ambient sound levels. Daytime noise levels may be audible at the closest NSD. **Minor negative**	Operational activities in the vicinity of the Leslie 1A section are unlikely to significantly impact on ambient sound levels. Daytime noise levels may be audible at the closest NSD. **Minor negative**
Duration	Noise levels may be higher for the duration of the project. **Long Term**	Noise levels may be higher for the duration of the project. **Long Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	The project will not impact on the ambient sound levels further than 1,000 m from the activity during the day. **Site or Local**	The project will not impact on the ambient sound levels further than 1,000 m from the activity during the day. **Site or Local**

Consequence of Noise Impact	**Medium**	**Medium**
Probability	Daytime ambient sound levels were more than 60% of the measurements, less than 50 dBA (KLPLTAS01) and around 40% in the 50 – 55 dBA range. It is **unlikely** that the closest NSD will hear and be disturbed by the noises from the operational activities. **Unlikely**	Daytime ambient sound levels were more than 60% of the measurements, less than 50 dBA (KLPLTAS01) and around 40% in the 50 – 55 dBA range. It is **possible** that the closest NSD will hear and be disturbed by the noises from the operational activities. **Unlikely**
Significance of Noise Impact	**Low**	**Low**
Degree of Confidence	**High**	
Cumulative	Yes	
Mitigation:	Significance of the noise impact is Low and no additional mitigation measures are required.	

Table 10-45: Impact Assessment: Operational Activities – night-time scenario at Leslie 1A

Activity:	Numerous simultaneous operational activities at night	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,N}$ of 40 dBA	
	Before Mitigation	**After Mitigation**
Magnitude	Night-time noise levels are expected to be slightly higher than typical ambient sound levels at NSD23. Noises might be audible at NSD23, 30 and 34 during quieter periods. **Minor negative**	Night-time noise levels are expected to be slightly higher than typical ambient sound levels at NSD23. Noises might be audible at NSD23, 30 and 34 during quieter periods. **Minor negative**
Duration	Noise levels may be higher for the duration of the project. **Long Term**	Noise levels may be higher for the duration of the project. **Long Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	Mining activities are unlikely to impact on the ambient sound levels further than 1 000 m from the activity at night, though the mining activities might be audible up to 2 000m during quieter periods. **Site or Local**	Mining activities are unlikely to impact on the ambient sound levels further than 1 000 m from the activity at night, though the mining activities will be audible up to 2 000m during quieter periods. **Site or Local**
Consequence of Noise Impact	**Medium**	**Medium**
Probability	Night-time ambient sound levels were less than 40 dBA for more than 65% of the measurements and less than 45 dBA most of the measurements at location KLPLTAS01. It is **possible** that the NSD23 will hear the noises and be disturbed by the noises from	Night-time ambient sound levels were less than 40 dBA for more than 65% of the measurements and less than 45 dBA most of the measurements at location KLPLTAS01. With appropriate mitigation it would be possible to reduce the noise levels at **NSD20** to prevent the noise level to be disturbing.

	construction activities. It is possible that **NSD20** be affected. **Possible**	**Unlikely**
Significance of Noise Impact	**Medium**	**Low**
Degree of Confidence	**High**	
Cumulative	Yes	
Mitigation:	❖ Locate the plant and associated infrastructure further than 700m from NSD20. ❖ Develop the waste dump or a topsoil dump between NSD20 and the mining portal and plant infrastructure to ensure that the line of sight is broken between this NSD and noise-generating mining infrastructure.	

The potential significance of noise impacts are estimated in Table 10-46 (daytime) and Table 10-47 (night-time). It must be noted that there are a number of receptors that stay within the potential impact zone due to noise from road traffic.

Table 10-46: Impact Assessment: Operational Activities – daytime scenario at Leslie 1C

Activity:	Numerous simultaneous operational activities during the day	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,D}$ of 50 dBA.	
	Before Mitigation	**After Mitigation**
Magnitude	Daytime noise levels are expected to be slightly higher than typical ambient sound levels at NSD02. The level might be disturbing. **Moderate negative**	Daytime noise levels are expected to be slightly higher than typical ambient sound levels at NSD02. **Minor negative**
Duration	Noise levels may be higher for the duration of the project. **Long Term**	Noise levels may be higher for the duration of the project. **Long Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	The project will not impact on the ambient sound levels further than 1,000 m from the activity during the day. **Site or Local**	The project will not impact on the ambient sound levels further than 1,000 m from the activity during the day. **Site or Local**
Consequence of Noise Impact	**Medium**	**Medium**
Probability	Daytime ambient sound levels were more than 70% of the measurements, less than 50 dBA (KLPLTAS03) and 44% of the time, less than 50 dBA at KLPLTAS04. It is generally quieter than 55 dBA at these locations. It is **possible** that NSD02 will hear and may be disturbed by the noises from operational activities (mainly hauling activities).	Daytime ambient sound levels were more than 70% of the measurements, less than 50 dBA (KLPLTAS03) and 44% of the time, less than 50 dBA at KLPLTAS04. It is generally quieter than 55 dBA at these locations. It is **possible** that NSD02 will hear and may be disturbed by the noises from operational activities (mainly hauling activities).

	Possible	**Possible**
Significance of Noise Impact	**Medium**	**Medium**
Degree of Confidence	**High**	
Cumulative	Yes	
Mitigation:	❖ If viable, the haul road could be relocated further than 200m from NSD02 (moved further south, passing between waste rock dump and the co-disposal dump). ❖ Develop a berm between NSD02 and the haul road.	

Table 10-47: Impact Assessment: Operational Activities – night-time scenario at Leslie 1C

Activity:	Numerous simultaneous operational activities at night	
Impact Description:	Increased total noise levels in the area, changing existing ambient sound levels at receptors	
Acceptable Rating Level	Sub-urban area. Use $L_{Req,N}$ of 40 dBA	
	Before Mitigation	**After Mitigation**
Magnitude	Night-time noise levels are expected to be higher than typical ambient sound levels at NSD02, 03, 07 and 13. **Major negative**	Night-time noise levels may be clearly audible to the closest NSD at times. **Moderate negative**
Duration	Noise levels may be higher for the duration of the project. **Long Term**	Noise levels may be higher for the duration of the project. **Long Term**
Extent ($\Delta L_{Aeq,D}$>7dBA)	Mining activities will not impact on the ambient sound levels further than 1,000 m from the activity at night. The noises may be audible up to 2,000m during quieter periods. **Site or Local**	Mining activities will not impact on the ambient sound levels further than 1,000 m from the activity at night. The noises may be audible up to 2,000m during quieter periods. **Site or Local**
Consequence of Noise Impact	**High**	**Medium**
Probability	Night-time ambient sound levels were more than 73% of the measurements, less than 40 dBA at KLPLTAS03, a location quite far from the N17 and R50. Modelling indicated that the roads could impact on the ambient sound levels up to 1,000m away from the roads. Even with the impact from the existing road traffic, it is considered **possible** that the closest NSD (such as NSD02 and 07) will hear and be disturbed by the noises from operational activities. **Possible**	Night-time ambient sound levels were more than 73% of the measurements, less than 40 dBA at KLPLTAS03, a location quite far from the N17 and R50. Modelling indicated that the roads could impact on the ambient sound levels up to 1,000m away from the roads. With mitigation it is **possible** that the closest NSD will hear and be disturbed by the noises from construction activities. **Possible**
Significance of Noise Impact	**High**	**Medium**

Degree of Confidence	**High**
Cumulative	Yes
Mitigation:	The potential noise impact of high significance is due to the potential noise level at NSD02 and NSD07. The following measures will reduce the noise level or the probability of a noise impact occurring: ❖ If viable, the haul road could be relocated further than 200m from NSD02 (moved further south, passing between waste rock dump and just north of the co-disposal dump); ❖ Develop a berm between NSD02 and the haul road; ❖ Minimize night-time operational activities within 500m of NSD02 at the waste rock and the co-disposal dump; ❖ If viable, construct the dumps approximately 700m from the closest potential noise-sensitive receptors if the activities are not taking place behind a sound barrier (temporary or as formed by a residue or topsoil berm); ❖ Remove topsoil to reduce the level of the plant infrastructure in terms of the surrounding surface level; ❖ Increase the height of the topsoil berm between NSD07 and mining infrastructure.

10.2.6.3 Decommissioning and Closure Phase Noise Impact

Final decommissioning activities will have a noise impact lower than either the construction, operational or first stage decommissioning phases. This is because decommissioning activities normally take place during the day using minimal equipment (due to the decreased urgency of the project). While there may be various activities, there is a smaller risk for a noise impact, typically less than the noise impacts associated with the construction phase.

10.2.7 Blasting and Vibration

10.2.7.1 Construction Phase

Table 10-48: Ground vibration impacts on roads impact assessment matrix before and after mitigation

Impact Description	Ground vibration impacts on roads	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Moderate negative	Minor negative
Duration	Short Term < 18 months	Short Term < 18 months
Spatial Scale	Site or Local	Site or Local
Consequence	Medium	Low
Probability	Definite	Possible
Significance of Air Quality Impact	**Medium**	**Low**
Mitigation	❖ Reduce charge mass per delay ❖ Changed or re-define blast design ❖ Site location changes or road diversion	
Cumulative Impact	No	

Table 10-49: Fly rock impacts on houses impact assessment matrix before and after mitigation

Impact Description	Fly rock Impact on houses	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major negative	Major negative
Duration	Short Term < 18 months	Short Term < 18 months
Spatial Scale	Site or Local	Site or Local
Consequence	Medium	Medium
Probability	Possible	Possible
Significance of Air Quality Impact	**Medium**	**Medium**
Mitigation	❖ Stemming control and audit ❖ Use proper stemming materials ❖ Re-design blasts ❖ Re-locate households	
Cumulative Impact	No	

Table 10-50: Fly rock impacts on roads impact assessment matrix before and after mitigation

Impact Description	Fly rock Impact on roads	
Activity	**Before Mitigation**	**After Mitigation**
Magnitude	Major negative	Moderate negative
Duration	Short Term < 18 months	Short Term < 18 months
Spatial Scale	Site or Local	Site or Local
Consequence	Medium	Low
Probability	Definite	Possible
Significance of Air Quality Impact	**Medium**	**Low**
Mitigation	❖ Stemming control and audit ❖ Use proper stemming materials ❖ Re-design blasts	
Cumulative Impact	No	

10.2.7.2 Operational Phase

The operation of the underground workings will be done mechanically with continuous miners. No specific influences for drilling and blasting is applicable.

10.2.7.3 Closure Phase: Impact Assessment and Mitigation Measures

During the closure phase no mining, drilling and blasting operations are expected. It is uncertain if any blasting will be done for demolition. If any demolition blasting will be required, it will be reviewed as civil blasting and addressed accordingly.

10.2.8 Visual

10.2.8.1 Construction Phase

Table 10-51: Potential construction Impacts of Leslie 1 A and C Mine Areas

Activity	Negative Impact	Positive Impact
Site clearance	The removal of the current vegetation which will alter the current landscape scenery and leave bare ground. This will have an effect on the sense of place currently enjoyed by the farming community and residents of the area.	This may aid in removal of invasive species.
Upgrading and construction of access roads	Construction of roads will generate dust, soil disturbance, and introduce the traffic of heavy construction vehicles to the view of the landscape	The surrounding community will have structural benefit from upgrading if the R50 road is upgraded.
Transporting of construction material and equipment to the site	This will result in the increase of traffic and noise due to the Heavy vehicles on the roads	None
Construction of surface infrastructure	Visual intrusion to the scenic view of the area by introduction of informal /temporal accommodation for construction workers and noise from construction machinery	Job creation for the local community
Construction of surface infrastructure	Introduction of light illuminating the construction site and temporal accommodation. This may result in the change the night sky view by the introducing artificial lighting.	None

10.2.8.2 Operational Phase

Table 10-52: Potential operational Impacts of Leslie 1 A and C Mine Areas

Activity	Negative Impact	Positive Impact
Access to U/G Portal	Removal of vegetation to create an underground access portal which will alter the current topography and landscape of the area	Job creation for the local community
Soil stockpiling	This will alter the current topography of the area and introduce new ridge line in the currently flat landscape	
Co-Disposal Discard Dumps	This will alter the current topography of the area and introduce new ridge line in the currently flat landscape	

Surface Infrastructure	Visual Intrusion and increase of man-made structure to the current rural setting of the place, changing the sense of place of the area.	
Increase Traffic by hauling trucks on the roads and loading bay.	Visual Intrusion and increase traffic on the roads	

10.2.8.3 Closure and Decommissioning Phase

Table 10-53: Potential closure and decommissioning Impacts of Leslie 1 A and C Mine Areas

Activity	Negative Impact	Positive Impact
Removal of infrastructure	Visual intrusion by working decommissioning machinery and stockpiling of metal rubble before collection	Identify infrastructure items that may be of use to the future land users
Removal of berms	Visual intrusion of working decommissioning machinery and dust	Removal of intrusive berms
Underground access portal rehabilitation	Visual intrusion of working decommissioning machinery and dust	
ROM stockpile, Co-disposal Discard Dump removal	Visual intrusion of working decommissioning machinery and dust	Removal of intrusive stockpiles
Rehabilitation	Introduction of alien vegetation	Sloping to return original topography where possible. Landform re-creation to meet land capability commitments. Revegetation and biodiversity re-establishment.

10.2.8.4 Cumulative impacts

This assessment of cumulative visual effects deals with the effects of a proposed development interacting with the effects of other development currently available in the area. (SNH, 2012: 4) defines cumulative effects as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together. This is to recognise that the overall combined landscape and visual effects of a number of similar developments concentrated in one area may be greater than the sum of the effects from the same developments if considered individually.

The project as a whole would be adding five new underground mines to the region over a LOM of 35 years. This will create a new precedent and bring notable change in the landscape, sense of place and visual scenery of the immediate proposed site as well as the region. Currently, between Leslie 1A and Leslie 1C is the town of Leandra and the township Lebohang. There is evidence of town decay with desolate-looking buildings across the town and a mixture of the informal and formal settlement patterns in the township area. Due the addition of the new mining developments, it may bring an influx of people looking for

employment opportunities which may add to the already existing informal settlement along the R50 and /or due to the economic improvement brought about by the developments, there may be upgrades to the settlement and housing patterns and the buildings in town. The possibility of addition of more people and upgrading of the town may change the sense of place from the rural sense of place to an industrial/ mining area.

In addition, the majority of the coal mines are concentrated on the southeast of the Proposed Project in the towns Evander where Sasol's Secunda mines and chemical refinery are also located. On the north eastern side of the proposed mining area is the Eskom power station Matla with its colliery next to the Kriel colliery Kendal PowerStation which is located approximately 22km directly north of the proposed Leslie 1 project can been seen in the horizon from the site. On the western side travelling on the R50 mine excavations, overburden dumps and infrastructure are prominent on the flat terrain of the area. Although rehabilitation is anticipated to occur, the landscape will have a new view depending on the success rate of the rehabilitation and post mining landcover. With this not being the only project anticipated for this area, the change in the sense of place and scenery of the area is inevitable.

10.2.9 Traffic

10.2.9.1 Construction Phase

Table 10-54: Construction phase traffic impacts

Affected Environment	Activity	Impact Description	Before Mitigation Significance	Cumulative Impact	Mitigation measures / Recommendations	After Mitigation Significance
Road network	Construction materials being transported to site	Added traffic on the road network	Medium	No	Vehicles to adhere to traffic laws Mine to motivate local authority to upgrade main roads. This can be done in conjunction with other mines in the area.	Medium
Road network	Employees and labourers transported to/ from site	Added traffic on the road network	Medium	No	Mine to investigate providing bulk transport for employees	Medium
Air quality	Vehicles travelling on gravel roads	Dust will increase with increased traffic flow	Medium	No	Ensure that gravel roads are kept watered to prevent dust (other dust	Low

		along gravel roads			suppression measures may also be used).	
Access roads	Construction of access roads	New access roads	Medium	No	Access roads to be tarred and maintained. Ensure 4-way stops are constructed for ease of access.	Medium

10.2.9.2 Operational Phase

Table 10-55: Operational phase traffic impacts

Affected Environment	Activity	Impact Description	Before Mitigation Significance	Cumulative Impact	Mitigation measures / Recommendations	After Mitigation Significance
Road network	Coal haulage to/ from site; and mine staff to/from site	Added traffic on the road network	Medium	No	Vehicles to adhere to traffic laws Mine to investigate providing bulk transport for employees	Medium
Air quality	Vehicles travelling on gravel roads	Dust will increase with increased traffic flow along gravel roads	Medium	No	Ensure that gravel roads are kept watered to prevent dust (other dust suppression measures may also be used).	Medium
Noise	Coal haulage to/ from site; and mine staff to/from site	Noise levels affecting sensitive areas including residential areas	High	No	Speed limits to be kept low, and define routes away from residential areas.	Medium

10.2.9.3 Closure and Decommissioning Phase

Table 10-56: Closure phase traffic impacts

Affected Environment	Activity	Impact Description	Before Mitigation Significance	Cumulative Impact	Mitigation measures / Recommendations	After Mitigation Significance
Road network	Rubble and other materials being removed from site	Added traffic on the road network	Medium	No	Road network able to support additional trucks.	Low

10.2.10 Heritage and Palaeontology

Nineteen burial grounds have been identified during the field work, with two burial sites identified during the stakeholder engagement process (**LES029, LES030**). Due to the social and cultural significance of burial grounds and graves, a high heritage significance is given to all these sites.

The impact of the proposed project on the burial grounds located at sites LES002, LES003, and LES007 is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance. The remaining sites, LES001, LES005, LES006, LES008, LES009, LES010, LES029, LES030 should not be impacted on by mining activity as they occur outside the footprint area, however, caution is still advised as some of the sites (LES005, LES006, LES008, LES009) are situated particularly close to the edge of the proposed layout.

Area 1B

The impact of the proposed project on the burial ground at site LES015 is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance. It is difficult to tell if this site is situated directly on the proposed layout for the 1B shaft entrance due to the resolution of the layout, but it is close enough to the shaft entrance and any probable access roads to the shaft entrance that a high impact rating is warranted.

Area 1C

The impact of the proposed project on the burial grounds at sites LES019, LES022 and LES025 is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance. The remaining sites LES014, LES016, LES021, LES024 and LES028 should not be impacted on by mining activity as they occur outside the footprint area, however, caution is still advised as some of the sites (LES014, LES016, LES021) are situated particularly close to the edge of the proposed layout.

Impact on living heritage resources

The only living heritage site identified is site LES031 located near area 1A. This site is an Ndebele Initiation ceremony site and is rated as having a high significance. Depending on the local community, relocation /destruction of the site may be possible with stakeholder engagement and consent. The recommendation would be to allow the site to be retained in situ and avoided if possible, but mitigation or destruction may be possible (with stakeholder engagement). However, even though the site is located outside the proposed layout, the resulting mining activities might make access to this site difficult, thus a proper stakeholder engagement process will be necessary.

Impact on Palaeontological Resources

According to the palaeontological sensitivity map accessed via the SAHRIS database, the study areas fall within 'VERY HIGH', 'MODERATE' and 'INSIGNIFICANT' rated sensitivity zones. Even though there are 'MODERATE' and 'INSIGNIFICANT' ratings, the highest rating being 'VERY HIGH' will have to be adhered to and therefore a palaeontological field assessment will be required before development can continue.

10.2.10.1 Construction Phase

Table 10-57: Construction Phase Heritage Impacts

Activity	Impact Description	Significance Pre- Mitigation	Mitigation measures / Recommendations	Significance Post-Mitigation
1B - Construction Activities	Endangerment of graves at LES015	High	Demarcate sites with a 50-metre buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	Low
1A & 1C - Construction Activities	Unknown nature of heritage resources on un-surveyed portions of updated layout footprint	High		Low
1C - Construction Activities	Destruction of historical structures LES013	Medium		Low

10.2.10.2 Operational Phase

Table 10-58: Operational phase Heritage Impacts

Activity	Impact Description	SIGNIFICANCE Pre- Mitigation	Mitigation measures / Recommendations	SIGNIFICANCE Post-Mitigation
Overall	Impact on palaeontology	High	The EAP and ECO must be informed that a Very High Palaeontological Sensitivity is allocated to the whole study area. A Phase 1 PIA document and "Chance Find Protocol" must be completed during the first month of excavation. These recommendations must be incorporated in the EMPr of this project.	Medium

10.2.10.3 Closure and Decommissioning Phase

No impacts were identified in this phase.

10.2.11 Social

10.2.11.1 Construction Phase

Table 10-59: Construction phase employment opportunities impact rating

Nature of the impact: Employment opportunities		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Medium term	Long term
Magnitude	Moderate +	Major +
Probability	Definite	Definite
Calculated Significance Rating	Medium	High
Impact Status:	Positive	Positive
Reversibility:	Not applicable	
Irreplaceable loss of resources:	Not applicable	
Can impacts be enhanced:	Yes	
Residual impacts ❖ The residual impacts associated with the creation of employment and business opportunities and training during the construction phase is that the workers can improve their skills by gaining more experience.		
Mitigation measures ❖ Establish targets for the employment and training; ❖ Adopt recruitment strategies that ensure local people are given employment preference; ❖ Effective implementation of training and skills development initiatives; ❖ The recruitment process has to be transparent and equitable.		

Table 10-60: Construction phase economic multiplier impact rating

Nature of the impact: Multiplier impacts on the local economy		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Medium term	Long term
Magnitude	Low +	Major +
Probability	Definite	Definite
Calculated Significance Rating	Medium	High
Impact Status:	Positive	Positive
Reversibility:	N/A	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	Yes	
Residual impacts ❖ Developed local economy;		
Mitigation measures ❖ Preference should be given to capable subcontractors who based within the local municipal area ; and ❖ Align skills development to build capacity of SMMEs;		

Table 10-61: Construction phase community development impact rating

Nature of the impact: Community development through LED projects		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Medium term	Long term
Magnitude	Minor +	Major +
Probability	Possible	Definite
Calculated Significance Rating	Low	High
Impact Status:	Positive	Positive
Reversibility:	N/A	
Irreplaceable loss of resources:	N/A	
Can impacts be enhanced:	Yes	
Residual impacts ❖ Improved economic development; ❖ Increased capacity to develop and maintain livelihood strategies		
Mitigation measures ❖ Conduct needs assessments to understand local demand and community priorities ❖ Ensure that there is stakeholder buy-in; ❖ Aligning LED projects with those of other development role-players- focus on projects that empower vulnerable groups within the study area. ❖ Consider partnering with local government to work together and set common goals and objectives for the communities; ❖ Ensure that LED projects included in the SLP are sustainable post mining operations-this should reduce the negative impacts post mine closure.		

Table 10-62: Construction phase change in movement patterns impact rating

Nature of the impact: Change in movement patterns		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Moderate -	Minor -
Probability	Definite	Definite
Calculated Significance Rating	Medium	Medium
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	N/A	
Can impacts be enhanced:	No	
Residual impacts ❖ Altered sense of place and breakdown of existing social networks		
Mitigation measures ❖ Where possible ensure that access to fields and grazing areas are uninterrupted by providing alternative access routes and/or temporary access points during construction activities; ❖ Leslie Coal Mine should ensure that residents are kept informed on a day-to-day basis of construction progress and of when access will be blocked.		

Table 10-63: Construction phase displacement impact rating

Nature of the impact: Physical and economic displacement		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Medium term
Magnitude	Major -	Moderate
Probability	Possible	Possible
Calculated Significance Rating	High	Medium
Impact Status:	Negative	Negative
Reversibility:	Irreversible, impact cannot be reversed for the affected household	
Irreplaceable loss of resources:	Yes	
Can impacts be enhanced:	No	
Residual impacts ❖ Displaced farm workers; ❖ Loss of livelihoods.		
Mitigation measures ❖ Suitable mitigation measures should be defined that protect the farm workers and ensure that they are adequately provided for and supported should they be moved or lose their employment. ❖ A Resettlement Action Plan and associated Livelihood Restoration Plan may be required.		

- Implement surface lease agreements with all community members who have grazing or ploughing land, this will minimise the impact of economic displacement.
- Implement a Grievance Mechanism to ensure ongoing, proactive engagement and effective management of grievances.

Table 10-64: Construction phase cultural impact rating

Nature of the impact: Disturbance of cultural, spiritual and religious sites		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Medium term
Magnitude	Major -	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	High	Medium
Impact Status:	Negative	Negative
Reversibility:	Partly reversible	
Irreplaceable loss of resources:	Marginal loss	
Can impacts be enhanced:	No	
Residual impacts ❖ Restricted or limited access to spiritual sites/grave yards.		
Mitigation measures ❖ Ensure that the community is included in decisions regarding cultural, spiritual and religious sites; ❖ Establish specific clan landowner protocols for activities that have spatial proximity to known sacred sites. ❖ Recommendations as indicated in the heritage impact assessment study should be implemented		

Table 10-65: Construction phase pressure on municipal services impact rating

Nature of the impact: Increased pressure on municipal services		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Major-	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	High	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Partly reversible	
Irreplaceable loss of resources:	Yes, strain on infrastructure and services is likely to persist.	
Can impacts be enhanced:	No	
Residual impacts ❖ Strain on the existing infrastructure which is already inadequate.		
Mitigation measures ❖ To limit, as far as reasonably possible, additional pressure on existing infrastructure and services;		

- To work in partnership with government, industry, and relevant organisations to enhance the existing infrastructure and services;
- To liaise openly and frequently with affected stakeholders to ensure they have information about the proposed Project; and
- To make available, maintain and effectively implement a grievance/complaint register that is easily accessible to all neighbours and affected stakeholders.

Table 10-66: Construction phase social pathologies impact rating

Nature of the impact: Increased social pathologies linked to influx of workers and job seekers		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Major -	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	**High**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Partly reversible	
Irreplaceable loss of resources:	This impact can result in consequences that will have irreplaceable losses of a physical and psychological nature.	
Can impacts be enhanced:	No	
Residual impacts ❖ The impact may be reversible over time as workers and job-seekers leave the area, consequences such as HIV/AIDS and unwanted pregnancies will be permanent.		
Mitigation measures ❖ Limit, as far as reasonably possible, social ills caused by influx of workers and job-seekers; ❖ Liaise openly and frequently with affected stakeholders to ensure they have information about the Project; ❖ Consider establishing clear rules and regulations for access to the mine area and the surrounding areas. The mine must work closely with the local South African Police Services and establish standard operating procedures for the control and removal of loiterers. ❖ It should be noted that Leslie Coal Mine has no control over activities related to workers' behaviour, however It is recommended that HIV/AIDS campaigns are conducted within the affected area.		

Table 10-67: Construction phase nuisance factor impact rating

Nature of the impact: The increase in nuisance factors and associated changed sense of place will be negative, and direct as a result of project activities, and indirect as a result of migrant job-seekers		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Medium term	Short Term
Magnitude	Moderate-	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Low**
Impact Status:	Negative	Negative

Reversibility:	Irreversible
Irreplaceable loss of resources:	This impact can result in consequences that will have irreplaceable losses of a physical and emotional nature
Can impacts be enhanced:	No
Residual impacts ❖ Altered sense of place	
Mitigation measures ❖ Minimise all nuisance factors such as noise, air quality, traffic, and visual-Implement all mitigation measures as specified in the relevant specialist studies; ❖ Make available, maintain and effectively implement a grievance/complaint register that is easily accessible to all neighbours and affected stakeholders; ❖ Liaise openly and frequently with affected stakeholders to ensure they have information about activities that will generate nuisance factors.	

10.2.11.2 Operational Phase

Table 10-68: Operational phase employment opportunities impact rating

Nature of the impact: Employment opportunities		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Moderate +	Major+
Probability	Possible	Definite
Calculated Significance Rating	Medium	High
Impact Status:	Positive	Positive
Reversibility:	Not applicable	
Irreplaceable loss of resources:	Not applicable	
Can impacts be enhanced:	Yes	
Residual impacts ❖ The residual impacts associated with the creation of employment and business opportunities and training during the operational phase is that it benefits the local economy; ❖ Acquired transferable skills that could potentially be used with other businesses		
Mitigation measures ❖ If possible a training and skills development programme for the local workers should be initiated prior to the operational phase. ❖ Effective implementation of training and skills development initiatives; ❖ Recruitment should be formalised and co-ordinated through the Department of Labour- avoid appointments at the gate of the mining operation.		

Table 10-69: Operational phase economic multiplier impact rating

Nature of the impact: Multiplier impacts on the local economy		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Medium term	Long term
Magnitude	Minor +	Major +
Probability	Possible	Definite
Calculated Significance Rating	Low	High
Impact Status:	Positive	Positive
Reversibility:	Not applicable	
Irreplaceable loss of resources:	Not applicable	
Can impacts be enhanced:	Yes	
Residual impacts ❖ Local suppliers will have gained experience and exposure to meeting standards of quality and scale that could be transferrable to business opportunities		
Mitigation measures ❖ Preference should be given to capable subcontractors who based within the local municipal area ; and ❖ Measures recommended to maximise benefits from local employment, skills and economic development.		

Table 10-70: Operational phase community development impact rating

Nature of the impact: Community development through led projects		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Medium term	Long term
Magnitude	Minor +	Major +
Probability	Possible	Definite
Calculated Significance Rating	Low	High
Impact Status:	Positive	Positive
Reversibility:	N/A	
Irreplaceable loss of resources:	N/A	
Can impacts be enhanced:	Yes	
Residual impacts ❖ Developed local economy; ❖ Increased capacity to develop and maintain livelihood strategies		
Mitigation measures ❖ Maximise benefits from local employment, skills and economic development; ❖ Consider partnering with local government to work together and set common goals and objectives for the communities; ❖ Ensure that LED projects included in the SLP are sustainable post mining operations-this should reduce the negative impacts post mine closure		

Table 10-71: Operational phase change in movement patterns impact rating

Nature of the impact: Change in movement patterns		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Minor -	Moderate -
Probability	Definite	Definite
Calculated Significance Rating	High	Medium
Impact Status:	Negative	Negative
Reversibility:	N/A	
Irreplaceable loss of resources:	N/A	
Can impacts be enhanced:	No	
Residual impacts ❖ Altered sense of place and breakdown of existing social networks		
Mitigation measures ❖ Where possible ensure that access to fields and grazing areas are uninterrupted by providing alternative access routes and/or temporary access points during construction activities; ❖ Leslie should ensure that residents are kept informed on a day-to-day basis of construction progress and of when access will be blocked.		

Table 10-72: Operational phase displacement impact rating

Nature of the impact: Physical and economic displacement		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Major -	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	High	Medium
Impact Status:	Negative	Negative
Reversibility:	Irreversible, impact cannot be reversed for the affected households	
Irreplaceable loss of resources:	Yes	
Can impacts be enhanced:	No	
Residual impacts ❖ Displaced farm workers; ❖ Loss of livelihoods.		
Mitigation measures ❖ Suitable mitigation measures should be defined that protect the farm workers and ensure that they are adequately provided for and supported should they be moved or lose their employment. ❖ A Resettlement Action Plan and associated Livelihood Restoration Plan may be required. ❖ Implement surface lease agreements with all community members who have grazing or ploughing land, this will minimise the impact of economic displacement. ❖ Implement the Grievance Mechanism to ensure ongoing, proactive engagement and effective management of grievances.		

Table 10-73: Operational phase cultural impact rating

Nature of the impact: Disturbance of cultural, spiritual and religious sites		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	*Major -*	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	High	Medium
Impact Status:	Negative	Negative
Reversibility:	Partly reversible	
Irreplaceable loss of resources:	Marginal loss	
Can impacts be enhanced:	No	
Residual impacts: ❖ Restricted or limited access to spiritual sites/grave yards.		
Mitigation measures ❖ Ensure that the community is included in decisions regarding cultural, spiritual and religious sites; ❖ Recommendations as indicated in the heritage impact assessment study should be implemented		

Table 10-74: Operational phase pressure on municipal services impact rating

Nature of the impact: Increased pressure on municipal services		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Major-	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	High	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Partly reversible	
Irreplaceable loss of resources:	Yes, strain on infrastructure and services is likely to persist.	
Can impacts be enhanced:	No	
Residual impacts ❖ Strain on the existing infrastructure which is already inadequate.		
Mitigation measures ❖ To limit, as far as reasonably possible, additional pressure on existing infrastructure and services; ❖ To work in partnership with government, industry, and relevant organisations to enhance the existing infrastructure and services; ❖ To liaise openly and frequently with affected stakeholders to ensure they have information about the proposed Project; and ❖ to make available, maintain and effectively implement a grievance/complaint register that is easily accessible to all neighbours and affected stakeholders.		

Table 10-75: Operational phase social pathologies impact rating

Nature of the impact: Increased social pathologies linked to influx of workers and job seekers		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Medium term	Medium Term
Magnitude	Major -	Moderate -
Probability	Possible	Possible
Calculated Significance Rating	**High**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Partly reversible	
Irreplaceable loss of resources:	This impact can result in consequences that will have irreplaceable losses of a physical and psychological nature.	
Can impacts be enhanced:	No	
Residual impacts ❖ The impact may be reversible over time as workers and job-seekers leave the area, consequences such as HIV/AIDS and unwanted pregnancies will be permanent.		
Mitigation measures ❖ Limit, as far as reasonably possible, social ills caused by influx of workers and job-seekers; ❖ Liaise openly and frequently with affected stakeholders to ensure they have information about the Project; ❖ Consider establishing clear rules and regulations for access to the mine area and the surrounding areas. The mine must work closely with the local South African Police Services and establish standard operating procedures for the control and removal of loiterers. ❖ Maintain and effectively implement a grievance/complaint register that is easily accessible to all neighbours and affected stakeholders.		

Table 10-76: Operational phase nuisance factor impact rating

Nature of the impact: The increase in nuisance factors and associated changed sense of place will be negative, and direct as a result of project activities, and indirect as a result of migrant job-seekers		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Medium-	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	This impact can result in consequences that will have irreplaceable losses of a physical and emotional nature	

Can impacts be enhanced:	No
Residual impacts ❖ Altered sense of place.	
Mitigation measures ❖ To minimise all nuisance factors such as noise, air quality, traffic, and visual; ❖ Implement all mitigation measures as specified in the relevant specialist studies; ❖ To make available, maintain and effectively implement a grievance/complaints register that is easily accessible to all neighbours and affected stakeholders; ❖ To liaise openly and frequently with affected stakeholders to ensure they have information about activities that will generate nuisance factors.	

10.2.11.3 Decommissioning Phase

Closure will involve large scale downscaling and retrenchment of the workforce over a number of years. Although there will be downscaling during this phase, some community members would have worked on the mine, and will constitute a reserve of trained workforce.

The closure of the mine will result in the termination of procurement contracts associated with operations. This may have significant implications for businesses that have become dependent on the mine. It is expected that there will be a moderate negative impact on the affected population during closure.

Closure of the Project is expected to significantly reduce economic development and diversification. Some people will have increased capacity to continue to develop and maintain livelihood strategies while others may struggle with the transition. As such, it is expected that there will be a moderate to major negative impact on the affected population during closure.

During the decommissioning and closure phases, it is possible that the land will be rehabilitated and continue in some form of agricultural land. As such, new farm workers may be employed and potentially housed on the land.

During the decommissioning and closure phases, it is likely that workers will remain in the area as they may seek employment locally and are likely to have established networks and become connected after a long period of time. Given the high levels of uncertainty regarding the actions of people or nature of the socio-economic environment, it is not possible to assess this project phase.

During the decommissioning and closure phases, the majority of the Proposed Project aspects that resulted in a changed sense of place will no longer exist, the community is likely to have adapted to the existence of migrants in the area. Given the high levels of uncertainty regarding the actions of people or nature of the future socio-economic environment, it is not possible to assess this project phase; however, it is expected that the impact will largely be mitigated.

10.2.11.4 Cumulative Impacts

There are various mine related projects which are currently being undertaken and some are currently being investigated in the area. This includes Evander Gold Mines Prospecting activities, Sasol and South 32 mining developments. The presence of these developments will increase the environmental and social impacts.

From a social perspective, some of the most significant cumulative impacts relate to the following aspects:

- The cumulative impacts associated with the creation of employment and business opportunities and training during the construction phase, are that there is an opportunity for employment seekers to improve their skills;
- The cumulative impacts associated with the influx of job seekers include the long-term impacts on family structures and social networks of communities. In the case of HIV/AIDS or unwanted pregnancies the impacts might be permanent and have permanent cumulative impacts on the affected individuals, families and the community;
- An influx of workers (direct) and job-seekers (indirect) may lead to increased pressure on infrastructure and services and an increase in social pathologies. Leslie Coal Mine should make every effort to discourage influx by communicating early and widely that local residents will be given preference for employment. Leslie Coal Mine must ensure that it collaborates with the relevant local authorities and mining operations to identify and actively participate in initiatives/ projects to improve capacity where required. While the potential impacts linked to influx can have negative consequences, this is a common and anticipated phenomenon that cannot be a reason for preventing further development; and
- An increase in direct project nuisance factors; namely, noise, air pollution, traffic and visual disturbances could further impact negatively on the sense of place for some receptors. Implementation of suitable mitigation measures will be proposed to reduce and manage these nuisance factors.

10.2.12 Community Health

It should be noted that only the impacts relevant to the Project have been assessed in the section below. In this instance, EHA #1 (vector-related diseases) and EHA #3 (veterinary medicine and zoonotic diseases) have been discussed but have not been evaluated and rated as, during the field visit and analysis, these EHAs were deemed immaterial in the PACs.

10.2.12.1 EHA #2: Acute Respiratory Infections and Respiratory Effects from Housing

Table 10-77: Communicable diseases impact rating

EHA #2 Communicable Diseases Linked to Housing Design		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Site or Local	Site or Local
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Moderate -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Cumulative:	Yes	
Irreplaceable loss of resources:	Yes –impact can result in the loss of human life.	
Can impacts be enhanced:	No	
Residual impacts ❖ Change in the rates of respiratory diseases such as influenza and pneumonia ❖ Influx during active operational periods of the Leslie 1 Project may lead to an increase in prevalence of respiratory illnesses if household is overcrowded ❖ Loss of income due to retrenchment (during decommissioning phase of the Project may lead to loss of income may result in more people in a house, exacerbating the prevalence of respiratory diseases ❖ Increasing prevalence of respiratory health outcomes, including TB		
Mitigation measures ❖ Support community-based information campaigns related to TB symptoms and the need to seek care. The campaign should address the risk of co-infection between HIV and TB; ❖ Influx management and advice with regards to town planning to prevent overcrowding; and ❖ Develop partnerships to support the community-based TB control programs in conjunction with the DoH and any NGOs. This needs to include case detection, management and surveillance activities under the national TB program policy and strategy.		

10.2.12.2 EHA #4: Sexually Transmitted Infections, including HIV/AIDS

Table 10-78: STI impact rating

EHA #4: Sexually Transmitted Infections, including HIV/AIDS		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Regional	Regional
Duration (	Long Term > 5 years	Long Term > 5 years
Magnitude	Major -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**High**	**Medium**
Impact Status:	Negative	
Reversibility:	Irreversible	
Cumulative:	Yes	

EHA #4: Sexually Transmitted Infections, including HIV/AIDS		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Irreplaceable loss of resources:	Yes –irreversible loss of human life.	
Can impacts be enhanced:	No	
Residual impacts ❖ Change in the rates of STI such as gonorrhoea, chlamydia, Hepatitis C, and HIV. ❖ Increasing the number of orphans and child headed households ❖ The likely effect of the project employing a number of relatively well-paid employees may also increase the risk for transactional sex ❖ Loss of income during closure and decommissioning phase of the Project may cause people to get involved in prostitution		
Mitigation measures ❖ Develop a 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. TB and STI must be integrated into this; ❖ Support (financial or otherwise) NGO groups active in the area on gender-based sexual violence; and ❖ Support community-based condom distribution centres. These should be linked to other initiatives and not be run in isolation.		

10.2.12.3 EHA #5: Soil-, Water- and Waste-related Diseases

Table 10-79: Soil, water and waste related diseases impact rating

EHA #5: Soil-, Water- and Waste-related Diseases		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Regional	Regional
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Major -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**High**	**Medium**
Impact Status:	Negative	
Reversibility:	Irreversible	
Cumulative:	Yes	
Irreplaceable loss of resources:	Yes	
Can impacts be enhanced:	No	
Residual impacts ❖ Influx of people may put a burden on water and sanitation infrastructure –change in % of households served with water and sanitation services ❖ Potential contamination with hydrocarbons and chemicals during construction and operations ❖ Unplanned developments may influence environmental health conditions and further contaminate surface water bodies ❖ Increase in income improves ability to afford basic environmental health services. This may result in a decline in cases of soil, water and sanitation-related diseases		
Mitigation measures ❖ Groundwater and surface water quality must be monitored; ❖ Restrict access to project-created water bodies; ❖ Conduct baseline water and sanitation studies;		

EHA #5: Soil-, Water- and Waste-related Diseases		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
❖ Ensure proper disposal of human waste generated from the project; and ❖ Ensure proper waste management.		

10.2.12.4 EHA #6: Food and Nutrition-Related Issues

Table 10-80: Food and nutrition impact rating

EHA #6: Food and Nutrition-Related Issues		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent *(Local, Regional, International)*	Site or Local	Site or Local
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Moderate -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Partially reversible	
Cumulative:	No	
Irreplaceable loss of resources:	No	
Can impacts be enhanced:	No	
Residual impacts ❖ Change in regional food cost expressed as a % of median household income ❖ Influx of people may result in food inflation, increasing food deprivation, nutrition-related diseases ❖ Poor food hygiene and quality of food services may increase food-related illnesses ❖ Long-term food inflation may increase food deprivation, nutrition-related effects, affecting especially vulnerable groups such as children and marginalised groups ❖ More consumption of fast food related to increased income may increase non-communicable (lifestyle) diseases		
Mitigation measures ❖ Reduce project-related communicable diseases that may impact nutrition; ❖ Food inflation management as part of social program – meat, fruit and vegetables remain expensive items, but lower bread and cereal prices offer relief. Perhaps Leslie Coal Mine may assist in training selected individuals to bake bread on a semi-commercial scale and sell from their homes, or assist in the establishment community gardens growing fruits and vegetables; and ❖ Support local procurement of food items in combination with incentives to increase local production.		

10.2.12.5 EHA #7: Accidents/Injuries

Table 10-81: accidents and injuries impact rating

EHA*#7: Accidents/Injuries*		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Regional	Regional
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Major -	Minor -
Probability	Possible	Possible

EHA*#7: Accidents/Injuries*		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Calculated Significance Rating	**High**	**Medium**
Impact Status:	Negative	
Reversibility:	Irreversible	
Cumulative:	Yes	
Irreplaceable loss of resources:	Yes –irreversible loss of human life.	
Can impacts be enhanced:	No	
Residual impacts ❖ Change in morbidity and mortality data related to commercial motor vehicle (CMV) traffic on roadways related to the Leslie 1 Mining Project and coal transport. ❖ Change in morbidity and mortality data related to non-commercial motor vehicle crashes.		
Mitigation measures ❖ Engage the Local Municipality and interested and affected parties to assist with programmes targeted at improving traffic management and road safety in the study area; ❖ Develop a clear policy for the management of emergencies or accidents in the community as a direct result of the projects activities; ❖ Support with local safety and security as addressed in these specialist studies.		

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

Table 10-82: Hazardous materials exposure impact rating

EHA #8: Exposure to Potentially Hazardous Materials, Noise and Malodours		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Site or Local	Site or Local
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Moderate -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Cumulative:	Yes	
Irreplaceable loss of resources:	Yes	
Can impacts be enhanced:	No	
Residual impacts ❖ Change in morbidity and mortality data from poor air quality events (exceedances) through exacerbation of chronic respiratory diseases, or cardiovascular diseases ❖ Pollutants and emissions released by construction and operational activities may increase the prevalence of related respiratory illnesses and water related illnesses ❖ Influx of people into the area may increase domestic activities, including the use of domestic fuel, pesticides resulting in increased air pollution and associated Increases in the prevalence of related respiratory illnesses		
Mitigation measures ❖ Conveyor belts should be used instead of haul trucks for the on-site transport of materials and rail transport should be used for off-site transport of ROM coal, thus reducing the use of haul trucks by the mines to an absolute minimum.		

EHA #8: Exposure to Potentially Hazardous Materials, Noise and Malodours		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
❖ All coal processing should be moved off site for Leslie 1C, and if possible, also for Leslie 1A. ❖ A comprehensive mitigation programme should be implemented on any remaining haul roads. ❖ If off-site rail transport is used together with on-site conveyor belts at Leslie 1A, and the coal processing plant is kept, all possible mitigation measures must be undertaken to limit the emissions of PM2.5 and PM10 from the coal processing plant. ❖ A comprehensive, continuous air quality monitoring programme must be undertaken to ensure that mitigation measures are applied at all times to keep ambient air concentrations of PM10 and PM2.5 within the NAAQS over residential areas; ❖ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective; ❖ Environmental noise monitoring; ❖ Develop and implement a Storm Water Management Plan; and ❖ Undertake groundwater and surface water monitoring.		

10.2.12.7 EHA #9: Social Determinants of Health

Table 10-83: Social health determinants impact rating

EHA #9: Social Determinants of Health		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Regional	Regional
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Major -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	High	**Medium**
Impact Status:	Negative	
Reversibility:	Partially Irreversible	
Cumulative:	Yes	
Irreplaceable loss of resources:	Yes	
Can impacts be enhanced:	Positive impacts such as employment gain can be enhanced	
Residual impacts ❖ Change in morbidity and mortality data related to psychosocial distress such as depression, anxiety, substance abuse, and changes to family structure. ❖ Change in median household income ❖ Change in unemployment ❖ Change in the percentage of households living below poverty line ❖ Change in educational attainment ❖ Increase in xenophobia, violence, crime, prevalence of substance abuse and gender violence resulting from an influx of individuals without appropriate social infrastructure ❖ With the expected population growth and influx of job seekers, who may bring their families along, household size may increase resulting in overcrowding ❖ Construction workers and an influx of national and international people in search of economic opportunities are expected to put enormous pressure on the South African Police Services and immigration control		

EHA #9: Social Determinants of Health		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
❖ Increase in psychosocial problems, including depression as a result of retrenchment at decommissioning phase ❖ A positive impact on poverty status for a small number of people employed at the Leslie 1 Project site ❖ Influx of people and increased income may result in illegal substances being available more freely		
Mitigation measures ❖ Social management plans and recommendations as part of the SIA; ❖ Reduce substance-abuse and improve social cohesion; ❖ Supporting education programs with a gender equity focus; ❖ Plan for mine closure; ❖ Identify and support vulnerable groups; and ❖ Support graduate training programs for the youth in the community		

10.2.12.8 EHA #10: Cultural Health Practices

Table 10-84: Cultural health practices impact rating

EHA #10: Cultural Health Practices		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Site or Local	Site or Local
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Moderate -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	No	
Cumulative:	No	
Irreplaceable loss of resources:	Yes – Unscrupulous practices by traditional healers may result in loss of human life.	
Can impacts be enhanced:	No	
Residual impacts ❖ More people are practicing and using traditional medicine which may contribute to reducing the health burden if they are trained and knowledgeable ❖ Negative health outcomes		
Mitigation measures ❖ Develop a disease-prevention plan that involves traditional healers.		

10.2.12.9 EHA #11: Health Systems Issues

Table 10-85: Health system impact rating

EHA #11: Health Systems Issues		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Site or Local	Site or Local
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Moderate -	Minor -

EHA #11: Health Systems Issues		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Partially reversible	
Cumulative:	Yes	
Irreplaceable loss of resources:	Yes –increased pressure on infrastructure and services is expected to continue	
Can impacts be enhanced:	No	
Residual impacts ❖ Change in ratio of people to health care providers ❖ Change in time needed for emergency response ❖ Influx of people resulting in overburdened health facilities with inadequate health service ❖ Overburdened community health facilities, inadequate health service resulting from more people in the area		
Mitigation measures ❖ Influx management and supporting health facilities to cope with the increased population if related to project; and ❖ Support community volunteer programs through expansion of the community-based peer health educator group.		

10.2.12.10 EHA #12: Non-Communicable Diseases

Table 10-86: Non-communicable diseases impact rating

EHA #12: Non-Communicable Diseases		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Extent	Site or Local	Site or Local
Duration	Long Term > 5 years	Long Term > 5 years
Magnitude	Moderate -	Minor -
Probability	Possible	Possible
Calculated Significance Rating	**Medium**	**Medium**
Impact Status:	Negative	Negative
Reversibility:	Irreversible	
Irreplaceable loss of resources:	Yes	
Cumulative:	No	
Can impacts be enhanced:	No	
Residual impacts ❖ Change in mortality and morbidity data due to non-communicable diseases. ❖ Influx of people with chronic diseases putting a burden on health service delivery ❖ Behavioural changes at the household level such as alcohol use, smoking, or dietary changes that may contribute to a rise in non-communicable disease outcomes affecting health service delivery ❖ Social and environmental factors that increase stress and unhealthy behaviours		

EHA #12: Non-Communicable Diseases		
	Impact Rating Without Mitigation	**Impact Rating With Mitigation**
Mitigation measures ❖ Support health education programs as part of a community-based peer health educator program; ❖ Support the local healthcare personnel with training on disease-management programs and the recognition of NCD symptoms and management thereof; ❖ Support healthcare facilities with diagnostic medical hardware, where feasible.		

10.2.12.11 Cumulative Impacts

Cumulative impacts are contextual and encompass a broad spectrum of impacts at different spatial and temporal scales (IFC, 2013) i.e. cumulative impacts can result from individually minor but collectively significant activities taking place over a period of time (Dutta, et al., 2012). These are not new types of impacts but recognition that impacts from individual projects and activities can combine together in time and space. In some cases, cumulative impacts occur because a series of projects of the same type are being developed. In other cases, cumulative impacts occur from the combined effects over a given resource of a mix of different types of projects; for example, the development of a mine site, access roads, transmission lines, and other adjacent land uses.

The following cumulative impacts are expected:

- The cumulative impacts associated with the influx of job seekers include the long-term impacts on family structures and social networks of communities. In the case of HIV/AIDS or unwanted pregnancies the impacts might be permanent and have permanent cumulative impacts on the affected individuals, families and the community;
- An influx of workers (direct) and job-seekers (indirect) may lead to increased pressure on infrastructure and services and an increase in social pathologies. Leslie Coal Mine should make every effort to discourage influx by communicating early and widely that local residents will be given preference for employment. Leslie must ensure that it collaborates with the relevant local authorities and mining operations to identify and actively participate in initiatives/ projects to improve capacity where required. While the potential impacts linked to influx can have negative consequences, this is a common and anticipated phenomenon that cannot be a reason for preventing further development;
- An increase in direct project nuisance factors; namely, noise, air pollution, traffic and visual disturbances could further impact negatively on the sense of place for some receptors. Implementation of suitable mitigation measures has been proposed by the relevant specialist to reduce and manage these nuisance factors
- The other mines may contribute to the pollutant load on surface water systems. These changes may be substantial, affecting the regional water quality, though some mitigation is possible with practicable management systems. Changes in surface water quality impacts on the health various surface water users –drinking and recreational users. The development of the proposed Leslie 1 Coal Mining Project may place pressures on existing sanitation and water supply systems because of the anticipated increase in population in the area.

- Ground water extraction at other mines may affect groundwater availability in the area. The change may be substantial, extend regionally, affect many people, and may be cumulative in nature causing an overall shortage of drinking water as majority of the healthcare facilities and settlements depend on borehole water.
- With regards to noise and vibration, some of Leslie, Eendracht and the surrounding settlements s will be exposed to noise from the operations of various machines on the mine and trucks on the road. Extraction and transport operations of other mines will affect some the receptors. Though blasting will be carried out at other mines, the effects are not synergistic. With modern blasting technologies, the effects are likely to be small, localised, easy to mitigate, and non-cumulative.
- Changes in income level; education; health care; change in existing cultural pattern; alteration of location or distribution of human population in the area; change in housing.
- Potential health hazards; risk of accidents from explosion, release of oil, radioactive materials, toxic substances etc.

10.2.13 Climate Change

Table 10-87: Summary of the climate change impacts of the estimated GHG emissions from the proposed Leslie 1 Coal Mine during the construction phase.

Nature: The Greenhouse gas emissions produced as a result of constructing the proposed Leslie 1 Coal Mine contribute to the global phenomenon of anthropogenic climate change. Numerous global changes are likely to manifest as a consequence of climate change, although none that can be attributed directly or indirectly to the specific greenhouse gas emissions of any individual source, such as the proposed Leslie 1 Coal Mine. The annual emissions from the construction of mine represent less than 0.01% of global emissions (based on 2015 figures) and less than 0.01% of South Africa's National Greenhouse Gas Inventory (based on 2010 figures).		
	Without Mitigation	**With Mitigation**
Spatial Scale	National/International	National/International
Duration	Permanent	Permanent
Magnitude	Minor -	Minor -
Probability	Definite	Definite
Significance	**Medium**	**Medium**
Status of impact	Negative	Negative
Reversibility	None	None
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	-
Mitigation: The major mitigation action related to the Leslie 1 Coal Mine is the selection of mining method. In this regard the proposed Leslie 1 Coal Mine has selected underground mining as mining method which, in comparison to open pit mining, is a much less emission intensive option.		
Cumulative impacts: The emissions from the project are cumulative with the emissions from the construction of other coal mines in the area. Due to the global scope of climate change and the long durations that greenhouse gas emissions are expected to remain in the atmosphere, the emissions from the construction phase of the mine are globally cumulative in their impact. Climate change is likely to be accelerated and sustained as emissions accumulate in the atmosphere.		
Residual risks: The risks associated with climate change will still be prevalent even with efforts to mitigate the project's greenhouse gas emissions during the construction phase. This is due to the vast number of other		

sources of greenhouse gas emissions around the world, and the specific concentration of coal mining activities, both current and planned, within the Mpumalanga Region. .

Table 10-88: Summary of the climate change impacts of the estimated GHG emissions from the proposed Leslie 1 Coal Mine during the operational phase and combustion of coal.

Nature: The Greenhouse gas emissions produced as a result of both the mine and the coal combustion contribute to the global phenomenon of anthropogenic climate change. Numerous global environmental changes are likely to manifest as a consequence of climate change, although none that can be attributed directly to the specific greenhouse gas emissions of any individual source, such as the proposed Leslie 1 Coal mine. The annual emissions from the operational phase of the mine only represent less than 0.001% of global emissions (based on 2015 figures) and 0.03% of South Africa's National Greenhouse Gas Inventory (based on 2010 figures). The emissions from the combustion of the coal will add an additional 4.5 million tonnes of CO2e to the mine's direct emissions which would then equate to approximately 0.014% of global emissions.		
	Without Mitigation	**With Mitigation**
Spatial Scale	National/International	National/International
Duration	Permanent	Permanent
Magnitude	Minor + (Combustion Major +)	Minor +
Probability	Definite	Definite
Significance	High	High
Status of impact	Negative	Negative
Reversibility	None	None
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	-
Mitigation: The proposed coal mine would need to mitigate its greenhouse gas emissions to reduce its contribution to national emissions and climate change. The report discusses options for mitigating the power plant's greenhouse gas emissions which primarily involve hybridising the power plant by substituting the source of thermal energy away from coal towards more carbon neutral sources. However, the project's major source of emissions relates to the downstream combustion of coal. The sale and the use of coal in Eskom power station is governed by the Integrated Resource Plan and is not a result of this project.		
Cumulative impacts: The emissions from the project are cumulative with the emissions from other greenhouse gas emitting installations globally. As with the surrounding coal mines the emissions from the project will contribute to South Africa's national greenhouse gas inventory. Due to the global scope of climate change and the long duration that carbon emissions are expected to remain in the atmosphere, the greenhouse gas emissions from the power plant are globally cumulative in their impact. Climate change is likely to be accelerated and sustained as emissions accumulate in the atmosphere.		
Residual risks: The risks associated with climate change will still be prevalent even with efforts to mitigate the project's greenhouse gas emissions. This is due to the large amount of accumulated greenhouse gas in the atmosphere and the vast number of other sources of greenhouse gas emissions around the world.		

10.3 Assessment of each Identified Impact and Risk

The potential impacts per activity and per phase are detailed in the following sections of this Subchapter below.

10.3.1 Soil, Land Capability and Agricultural Potential

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Soil	Stripping of topsoil and stockpiling it	Disturbance of in situ horizon organisation	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Keep the surface disturbance footprint as small as possible.	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High
Soil	Stripping of topsoil and stockpiling it	Loss of soil fertility through impacts on nutrient cycles	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Soil nutrient cycles can somehow be maintained by revegetation of topsoil stockpiles and through proper ecological land rehabilitation	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium
Soil	Vehicle traffic and construction of infrastructure	Soil compaction	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ The project footprint should be kept as small as possible. ❖ Traffic should be restricted to haul roads only. ❖ Topsoil stripping and stockpiling should not be conducted during wet periods. ❖ Soil moisture should be below a pre-determined level.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium
Soil	Trucks and equipment on site and waste generation by construction activites	Soil chemical pollution	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Proper soil contamination prevention measures as outlined in the Soil Management Plan.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Soil	Vegetation clearance exposing soil surface to energy of wind and water movement	Soil erosion	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Control soil erosion through the use of geotextiles and revegetation of exposed soil surfaces where possible.	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Land capability	Soil stripping and construction of infrastructure	Loss of arable land capability	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Current soil rehabilitation techniques are not able to restore the arable land capability and the loss is therefore permanent	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Land capability	Soil stripping and construction of infrastructure	Loss of grazing land capability	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Rehabilitation of land can restore the grazing capacity to a large extent.	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium
Land capability	Soil stripping and construction of infrastructure	Loss of wetland land capability	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	-	❖ Avoid wetland areas as far as possible and do not include in areas of surface disturbance.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Land use	Establishment of mining infrastructure	Change in land use from agriculture to mining	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Keep the project surface footprint as small as possible.	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High
Operation																
Soil	Daily traffic on haul roads especially trucking of coal from site	Soil compaction	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Restrict traffic to the demarcated areas and existing haul roads.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium
Soil	Dust from coal stockpiles and transporting of coal cause soil pollution and acidification. Trucks and equipment on site and waste generation by construction activities	Soil chemical pollution	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	-	❖ Manage surface water run-off around the coal loading and storage facilities. ❖ Use topsoil stockpiles as berms along the road and around the infrastructure areas to prevent pollution spreading into surrounding crop fields	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Soil	Areas that remain unvegetated during operations are at risk of soil erosion	Soil erosion	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Use geo-textiles and contours to prevent and minimise soil erosion from exposed surfaces	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium
Decommissioning and Closure																
Soil	Heavy vehicle traffic to remove infrastructure from site and return topsoil	Soil compaction	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Restrict traffic to areas where decommissioning is taking place as well as existing haul roads	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium
Soil	Possible oil and fuel spills from vehicles and	Soil chemical pollution	*Moderate -*	*Medium Term > 18*	*Site or Local*	Medium	*Possible*	Medium	-	❖ Check vehicles and equipment entering the site	*Minor -*	*Short Term <*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
	equipment used for decommissioning			*months < 5 years*						for oil and fuel leaks and inspect site for possible spillages		*18 months*				
Post- Closure																
Soil	Areas where revegetation has not been successful will be exposed to wind and water energy	Soil erosion	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Conduct regular monitoring and use geo-textiles to protect bare soil surfaces or alternative seed mixes to establish vegetation cover	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

10.3.2 Surface Water

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Surface water Quality	Vegetation removal	The removal of vegetation will expose soils to water erosion that may lead to a deterioration in water quality of surrounding surface water in terms of increased TSS and turbidity	*Moderate -*	*Short Term < 18 months*	*Regional*	Medium	*Possible*	Medium	-	❖ Temporary erosion control measures that reduce flow velocity (e.g. runoff berms) should be implemented around construction areas; ❖ Clearance of vegetation must be limited as far as possible; and ❖ Water quality sampling must be implemented upstream and downstream of construction sites.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Surface water quality	Impermeable areas	Lay down of impermeable areas is likely to result in increased velocity in surface water runoff, that may lead to erosion and consequent	*Moderate -*	*Short Term < 18 months*	*Regional*	Medium	*Possible*	Medium	-	❖ Measures (energy dissipaters, detention dams, swales, etc.) that reduce flow velocity from impermeable areas should be implemented. The goal of all stormwater	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		increase in TSS of surface water resources								management should be that the post-development runoff is the same or does not exceed the pre-development runoff; ❖ Impermeable areas must not be constructed unnecessarily; and ❖ Water quality sampling must be implemented upstream and downstream of construction sites. Specific parameters that should be monitored include TSS and turbidity. They should be kept within the baseline water quality range.						
Surface water quality	Topography changes	Changes in the topography are likely to result in an alteration in surface water drainage patterns leading to erosion and a consequent increase in TSS of surface water resources	*Moderate -*	*Short Term < 18 months*	*Regional*	Medium	*Possible*	Medium	-	❖ • Stormwater management measures around the shaft, dumps, plant area, etc. as proposed under section 5 must be implemented; and ❖ Water quality sampling must be implemented upstream and downstream of construction sites. Specific parameters that should be monitored include TSS and turbidity. They should be kept within the baseline water quality range.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Operation																

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Surface water quantity	Excavation of the shaft portals and implementation of a SWMP (closed system) around the plant area and dumps	Loss of contributing catchment area to stream flows	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Definite*	Medium	-	❖ No mitigation.	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Definite*	Medium
Surface water quality	The establishment of the three proposed mines in the vicinity of Leandra	Surface water quality impact	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Effective stormwater management that captures and contains all runoff from mine impacted areas; ❖ Treatment of decant water by effective passive or active treatment methods; and ❖ Water quality monitoring upstream and downstream of mining activities.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Surface water quantity	Seepage into underground voids and subsidence	Loss of surface water quantity	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Prevention of underground mining beneath watercourses; and ❖ High extraction mining (pillar mining) should be prevented.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Decommissioning and Closure																
Surface water quality	Loosening of soil during demolition of infrastructure and rehabilitation processes	Erosion and consequent increase in TSS of surface water resources leading to deteriorated water quality	*Moderate -*	*Short Term < 18 months*	*Regional*	Medium	*Possible*	Medium	-	❖ Storm water management structures should be left in place until rehabilitation is complete; ❖ Temporary erosion control measures that reduce flow velocity (e.g. runoff berms) should be implemented around rehabilitation activities; and	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										❖ Water quality monitoring must continue upstream and downstream of the Mine for at least five years post mine closure and rehabilitation.						

10.3.3 Groundwater

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Groundwater quantity	Site clearing and infrastructure development	Establishment of hard surface areas during infrastructure and road construction reduces recharge to the shallow weathered aquifers due to increased runoff.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	No	❖ Implement a surface water management plan to minimise the volume of dirty water produced thereby reducing the probability of contamination of groundwater from infiltration of dirty surface water. ❖ The hard surfaces on site will increase runoff, but the collection of this water for use on site will reduce the need to pump water from boreholes or the municipal supply; can be used for e.g. watering of gardens, wash bays and dust suppression. ❖ Restrict areas that must be cleared of vegetation to the minimum. ❖ Allow clean water to bypass the dirty areas and flow into the natural environment.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Groundwater Quantity	Site clearing and infrastructure development	Site clearing or excavation below the water table depth will have a potential impact on the groundwater quantity and quality.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low	No	❖ The incline shafts must be sealed / grouted to minimise inflow of groundwater and negative impacts associated with cone of dewatering. ❖ Ensure that there are no geological structures that act as preferred groundwater flow paths in the decline areas.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Groundwater Quantity	Mine development	❖ Groundwater will seep into the box cut workings and may lead to minor drawdown cones. ❖ The numerical model indicated that the zone of influence will not extend further than 300 m from the box cut. ❖ Private borehole Spr01 is however situated in the anticipated zone of influence delineated for the construction phase of the incline shaft, at the Leslie 1A East incline shaft. This borehole is	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Pumped water to be contained in PCDs. Treatment of the pumped groundwater will be required for human consumption and construction activities. ❖ Use the water collected on site to minimise the use of clean borehole water or water from the municipality. ❖ Time-series groundwater monitoring is required to predict the dewatering cone and related impacts. ❖ Should it be found that the dewatering activities do impact on private boreholes then it is recommended that the mine should supply equal/better quality water to affected parties that rely on groundwater.	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		the only source of water to this farm. ❖ Private borehole Wat7 is situated within the anticipated zone of influence at the Leslie 1C incline shaft. This borehole is the only source of water to this property.														
Groundwater Quality	Mine development	❖ Incline shafts and box cuts will expose the shallow, weathered aquifer and may allow contaminants to enter the groundwater environment; likely after rainfall. ❖ Deterioration in groundwater quality due to the increased suspended solids seeping in from cut plus pyrite starting to react due to exposure to oxygen and water. ❖ Quality impacts are suspected to be low	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low	Yes	❖ Local groundwater quality contains various naturally elevated element concentrations such as nitrate, sodium and sulphate that already exceed the maximum allowable safe drinking water standards. Regular groundwater monitoring must be implemented to assess current status versus baseline qualities. ❖ Site specific geochemical tests are recommended on the various geological horizons to identify the leach potential for each geological formation. This should be done before construction starts to assist with waste, coal and	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		during Construction.								discard placement on surface.						
Operation																
Groundwater Quantity	Mine dewatering	❖ Excavation of the incline and underground will create a cone of depression with a hydraulic gradient towards the mine. This will have an impact on groundwater levels. ❖ The cone of depression will affect many boreholes with levels dropping by 10m plus. ❖ Because water levels in the shallow weathered aquifer are not expected to be lowered because of mine dewatering, it is unlikely that any of the springs will be affected by mine dewatering.	*Major +*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	❖ A detailed assessment of impacted boreholes should be undertaken before the construction phase to determine borehole depths and yields. This info will assist with a detailed assessment on impacts and if a borehole will be destroyed by mining. ❖ Should it be found that the dewatering activities do impact on private boreholes then it is recommended that the mine should supply equal/better quality water to affected parties that rely on groundwater.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Groundwater Quality	Mine water contamination	❖ Rainwater infiltrating through the overburden stockpiles and/or backfilled	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ The initial acidification will be neutralized by the natural buffering capacity in the overlying rock. This can take place for	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		material into the groundwater environment could pollute the aquifers, by means of an increased salt load and metal precipitation. ❖ AMD from stock piles, waste rock and discard in rehabilitated areas. Water quality in the mine will slowly start deteriorating, which can be magnified with the oxidation of pyrite: high concentrations of sulphate suspected. ❖ Contaminant migration away from the mining area is expected to be limited as groundwater flow direction will be towards the mine.								years, until the neutralizing potential is depleted. Acidification is expected to be more of a problem post-closure. Mitigation that should be considered includes the management of the stockpile shape to control the ease with which water can run off from the facility. ❖ Avoid placement of the pollution control dams on areas with the potential for increased infiltration to groundwater, such as over fault of geology contact zones. ❖ The relevant technological options for the treatment and discharge of water during the operational phase should be further investigated to determine the most feasible end water use. ❖ Impacts associated with infiltration can be further mitigated by: o Vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and						

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										mobilisation of dissolved metals. o Implementation of a lime cover on overburden stockpiles to neutralise acidity. ❖ The coal should be stored for less than 2 months and thus the time required for seepage to occur will be minimal. ❖ The coal should be compacted and the potential for the coal stockyard to generate acid will be greatly reduce. The compaction would be required not only to reduce the through flow oxygen, but also to prevent spontaneous combustion. ❖ Install seepage collectors underneath the stockyards and monitor the quality of the collected water. ❖ The floor of the coal stockpile should be well-prepared flat surface. This would be designed for the ease of operation and coal recovery, but also to prevent seepage to the groundwater by incorporating clay into the liner.						
Groundwater Quality	Mine water contamination	❖ The potential incorrect disposal of	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Implementation of an effective storm water	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
	/ infrastructure	hazardous wastes, workshop effluent, as well as spills and leaks at the maintenance workshops. ❖ The potential incorrect disposal of domestic waste at the offices and ablutions. ❖ Contamination from the Leslie 1A West area will spread towards the tributary of the Wilge River. A plume with sulphate concentrations exceeding 1 000 mg/L may reach this tributary over a distance of 200 m. ❖ Sulphate contamination from the discard facility and associated infrastructure at the Leslie 1C mining area may also migrate up to 400 m during the operational phase. Simulations suggest that the plume								management plan is required to contain all waste water and/or volatile organic compounds for treatment and recycling. ❖ All contaminant, storm water, waste and hazardous waste storage facilities and other contaminated water storage areas (pollution control dams) should be lined to pro-actively prevent infiltration of contaminated seepage water. ❖ Domestic waste disposal facilities should be located within the immediate vicinity of other wastes. ❖ Concentration of waste on small sites, using the cell concept should be practised. ❖ Effective covering of the waste to minimise oxygen ingress, thus creating anaerobic conditions within the waste and eliminating acidification. ❖ Ensure that coal discards are not placed within the domestic waste dump because of the acid-generating potential of the coal. ❖ Ensure that domestic wastes are fenced,						

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		will not reach the tributary of the Klipspruit during the operational phase, situated to the west of the site. The plume may reach the non-perennial stream to the east, but sulphate concentrations are not expected to increase significantly above 250 mg/L during this time.								equipped with groundwater monitoring facilities and licensed according to the relevant regulations.						
Decommissioning and Closure																
Groundwater Quantity	No abstraction	❖ Once the mine is closed and dewatering ceases, groundwater will start to recover to its pre-mining level. ❖ Post closure, groundwater levels will take more than 100 years to recover after mining ceases. ❖ Rising water levels in the mine will remove oxygen and effectively stop oxidation	*Moderate +*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Mine is completely flooded, sulphide oxidation will essentially stop and the primary processes affecting water quality will be the dissolution of stored secondary mineral and available base minerals. Complete flooding is therefore advantageous from a geochemical and water quality viewpoint. ❖ Monitor the water table recovery and ensure that it is maintained below the regional water level so that the contamination plume is always directed towards	*Moderate +*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		reactions that could lead to acid mine drainage conditions. ❖ With the available dataset and mine plan, it is concluded that the risk of decant from the underground workings is very low.								the mine and decant is avoided. Abstracted water (if required) must be treated on site and re-used.						
Groundwater Quality	No abstraction	❖ Groundwater level recovery in the underground workings is not expected to affect movement of contamination in the weathered aquifer post closure. The spread of contamination in the weathered aquifer will most probably occur under natural groundwater flow conditions. ❖ Leslie 1A West - plume from the shaft is expected to move in a north-westerly direction to the tributary	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	❖ Ensure that the water table within the mine is maintained below the regional water level so that the contamination plume is always directed towards the mine. ❖ Infiltration to groundwater should be controlled and can be achieved through installation of liners, sufficient surface drainage and surface capping to insulate against infiltration. ❖ Grout curtains or scavenger wells could intercept seepage moving towards a sensitive receptor. ❖ Sulphate concentrations in the mine would reduce to half of the initial concentrations in the long-term. This could be achieved if the	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		of the Kromdraaispruit. Sulphate concentrations may increase to 1 700 mg/L in groundwater reaching this stream. Leslie 1A East - plume from the discard dump will migrate in a westerly direction towards the same tributary of the Kromdraaispruit. This portion of the plume is not expected to reach the stream during the 100-year simulation period. The plume from the discard dump will also continue to spread in an easterly direction towards tributary of the Wilge River and sulphate concentrations may increase to 3 500 mg/L in groundwater reaching this stream over the 100-year								mine is flooded and oxygen is eliminated from the system and in turn eliminate acid mine drainage inside the mine or if rehabilitation of the dumps left on surface is done to the highest standards to reduce or eliminate the influx of water into the backfill and waste material. ❖ Surface runoff must be diverted around the dumps and backfilled decline back into the catchment post closure. ❖ Time-series groundwater monitoring is required to predict the rate of groundwater recovery more accurately. ❖ Intercept trenches of wells should be positioned downstream from the dump areas to collect any possible discharge water. This water should be pumped and stored in PCDs.						

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		simulation period. ❖ Leslie 1C - plume from the discard dump expected to move in southerly direction towards the Klipspruit and reach the stream in the 100-year simulation period. Sulphate concentrations exceeding 1 000 mg/L may be recorded at this position. The plume will migrate towards the tributary of the Klipspruit and sulphate concentrations are expected to increase to around 1 300 mg/L in this area.														
Post- Closure																
Groundwater Quantity	No abstraction	❖ Once the mine is closed and dewatering ceases, groundwater will start to recover to its pre-mining level. ❖ Post closure, groundwater levels will take more than 100 years to	*Moderate +*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Mine is completely flooded, sulphide oxidation will essentially stop and the primary processes affecting water quality will be the dissolution of stored secondary mineral and available base minerals. Complete flooding is therefore advantageous from a geochemical and	*Major +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		recover after mining ceases. ❖ Rising water levels in the mine will remove oxygen and effectively stop oxidation reactions that could lead to acid mine drainage conditions. ❖ With the available dataset and mine plan, it is concluded that the risk of decant from the underground workings is very low.								water quality viewpoint. ❖ Monitor the water table recovery and ensure that it is maintained below the regional water level so that the contamination plume is always directed towards the mine and decant is avoided. Abstracted water (if required) must be treated on site and re-used.						
Groundwater	No abstraction	❖ Quality - Groundwater level recovery in the underground workings is not expected to affect movement of contamination in the weathered aquifer post closure. The spread of contamination in the weathered aquifer will most probably occur under natural groundwater	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	❖ Ensure that the water table within the mine is maintained below the regional water level so that the contamination plume is always directed towards the mine. ❖ Infiltration to groundwater should be controlled and can be achieved through installation of liners, sufficient surface drainage and surface capping to insulate against infiltration. ❖ Grout curtains or scavenger wells could intercept seepage moving	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		flow conditions. ❖ Leslie 1A West - plume from the shaft is expected to move in a north-westerly direction to the tributary of the Kromdraaispruit. Sulphate concentrations may increase to 1 700 mg/L in groundwater reaching this stream. Leslie 1A East - plume from the discard dump will migrate in a westerly direction towards the same tributary of the Kromdraaispruit. This portion of the plume is not expected to reach the stream during the 100-year simulation period. The plume from the discard dump will also continue to spread in an easterly direction towards								towards a sensitive receptor. ❖ Sulphate concentrations in the mine would reduce to half of the initial concentrations in the long-term. This could be achieved if the mine is flooded and oxygen is eliminated from the system and in turn eliminate acid mine drainage inside the mine or if rehabilitation of the dumps left on surface is done to the highest standards to reduce or eliminate the influx of water into the backfill and waste material. ❖ Surface runoff must be diverted around the dumps and backfilled decline back into the catchment post closure. ❖ Time-series groundwater monitoring is required to predict the rate of groundwater recovery more accurately. ❖ Intercept trenches of wells should be positioned downstream from the dump areas to collect any possible discharge water. This water should be pumped and stored in PCDs.						

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
		tributary of the Wilge River and sulphate concentrations may increase to 3 500 mg/L in groundwater reaching this stream over the 100-year simulation period. ❖ Leslie 1C - plume from the discard dump expected to move in southerly direction towards the Klipspruit and reach the stream in the 100-year simulation period. Sulphate concentrations exceeding 1 000 mg/L may be recorded at this position. The plume will migrate towards the tributary of the Klipspruit and sulphate concentrations are expected to increase to around 1 300 mg/L in this area.														

10.3.4 Biodiversity

10.3.4.1 Biodiversity

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
Construction																
Biodiversity	Site clearance for infrastructure and associated access roads as well as disturbances such as noise and dust.	Loss of areas classified as CBA (MTPA, 2014) and wetlands of importance	*Major -*	*Long Term > 5 years*	*National/International*	High	*Definite*	High	Yes	• Avoid CBA areas and implement buffer zones	*Severe*	*Long Term > 5 years*	*National/International*	High	*Possible*	High
		Loss of area of plant endemism (Mucina & Rutherford, 2006)	*Major -*	*Long Term > 5 years*	*National/International*	High	*Definite*	High	Yes	• Avoid areas of remaining indigenous vegetation, restrict infrastructure areas to brownfield areas only	*Moderate*	*Long Term > 5 years*	*National/International*	Moderate	*Possible*	Moderate
		Loss of Endangered & Vulnerable habitat (NBA, 2011)	*Major -*	*Long Term > 5 years*	*National/International*	High	*Definite*	High	Yes	• Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones.	*Moderate -*	*Short Term*	*National/International*	Moderate	*Possible*	Moderate
Flora	Site clearance for infrastructure and associated access roads as well as disturbances such as noise and dust.	Loss of plant species of conservation importance	*Major -*	*Long Term > 5 years*	*National/International*	High	*Definite*	High	Yes	• Avoid areas in which plant species of conservation concern occur; • If some areas cannot be avoided implement rescue of plant species of conservation concern.	*Moderate -*	*Short Term*	*National/International*	Moderate	*Possible*	Moderate
		Encroachment of alien invasive plant species	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Definite*	High	Yes	• An alien invasive plant management plan needs to be compiled and implemented during construction to prevent the	*Moderate -*	*Short Term*	*Regional*	Moderate	*Possible*	Moderate

										growth of invasives on cleared areas						
Fauna	Site clearance for infrastructure and associated access roads as well as disturbances such as noise and dust.	Loss of habitat for species of conservation concern (NBA, 2011)	*Major -*	*Long Term > 5 years*	*National/International*	High	*Definite*	High	Yes	• Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones.	*Severe*	*Long Term > 5 years*	*National/International*	High	*Possible*	High
		Loss of species of conservation concern. Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise)	*Major -*	*Long Term > 5 years*	*National/International*	High	*Possible*	High	Yes	• Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones; • Implement training to ensure that all staff are aware of faunal sensitivity. Put protocols in place to deal with fauna that are encountered during construction.	*Severe*	*Long Term > 5 years*	*National/International*	High	*Possible*	High
Operation																
Flora	Operation of underground mining activities.	Encroachment of alien invasive plant species	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Definite*	High	Yes	• Implementation of alien invasive plant management plan needs to be continued during operation to prevent the growth of invasives on cleared areas.	*Minor -*	*Short Term*	*Regional*	Low	*Possible*	Low

Fauna	Operation of underground mining activities.	Loss of species of conservation concern and their habitat. Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust, poaching and noise)	*Major -*	*Long Term > 5 years*	*National/International*	High	*Definite*	High	Yes	• Mitigation measures can be added to infrastructure such as powerlines to avoid bird impacts; • Monitoring impacts of operational activities on fauna so that adaptive management practises can be implemented if required; • Implement speed control measures on all roads to prevent road kill; • Restrict access to high biodiversity areas (drainage lines, wetlands etc) in the vicinity of mining operations. • Implement training to ensure that all staff are aware of faunal sensitivity. Put protocols in place to deal with fauna that are encountered during operation.	*Minor -*	*Long Term > 5 years*	*Regional*	Moderate	*Possible*	Moderate
Decomissioning and Closure																
Flora	Decomissioning activities.	Encroachment of alien invasive plant species	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Definite*	High	Yes	• Implementation of alien invasive plant management plan needs to be continued during decommisioning	*Minor -*	*Long Term > 5 years*	*Regional*	Moderate	*Possible*	Moderate

										to prevent the growth of invasives on rehabilitated areas; • Rehabilitation of site with indigenous vegetation that occurs in the vicnity of project area.					
Fauna	Decomissioning activities.	Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust, poaching and noise)	*Major -*	*Long Term > 5 years*	*National/International*	High	*Definite*	High	Yes	• All infrastructure that could have a negative impact on faunal species (powerlines etc) needs to be decommissioned and removed.	*Moderate -*	*Short Term < 18 months*	*National/International*	Moderate	*Possible*	Moderate

10.3.4.2 Aquatic Fauna

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
Construction																
Aquatic Ecology	Site Clearing for Surface Infrastucture	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. See section 8.4 in aquatic ecology report for further details.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low

Aquatic Ecology	Construction of Surface Infrastructure	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. See section 8.4 in aquatic ecology report for further details.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Aquatic Ecology	Construction of underground access portals (shafts)	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. See section 8.4 in aquatic ecology report for further details.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Aquatic Ecology	The placement of waste (overburden) and topsoil stockpiles	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. The implementation of lining material to reduce seepage. See section 8.4 in aquatic ecology report for further details.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Operation																
Aquatic Ecology	Operation of surface infrastructure (roads, conveyors, offices, coal wash plants and workshops)	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. See section 8.4 in aquatic ecology report for further details.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low

Aquatic Ecology	Storage of Run of Mine (RoM) Coal	Water quality deterioration in the Vaal and Olifants Water Management Area	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	See section 8.4.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Aquatic Ecology	Storage of coal mineral Discard	Water quality deterioration in the Vaal and Olifants Water Management Area	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. See section 8.4 in aquatic ecology report for further details.	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Unlikely*	Medium
Aquatic Ecology	Storage of contaminated water in Pollution Control Dam's (PCD's)	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. Lining of PCD's to reduce seepage. See section 8.4 in aquatic ecology report for further details.	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Unlikely*	Medium
Aquatic Ecology	Active underground mining	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. Implement subsidence risk assessment. See section 8.4 in aquatic ecology report for further details.	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Unlikely*	Medium
Decomissioning and Closure																

Aquatic Ecology	Removal of infrastructure	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. See section 8.4 in aquatic ecology report for further details.	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Unlikely*	Low
Aquatic Ecology	Rehabilitation of waste stockpiles	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water Management Area	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low	Yes	Effective stormwater management. Adhere to specific buffer requirements. Implement clean and dirty water seperation. See section 8.4 in aquatic ecology report for further details.	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Unlikely*	Low
Post- Closure															
Aquatic Ecology	Acid Mine Drainage decant	Water quality deterioration in the Vaal and Olifants Water Management Area	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	Investigate and imlpement water treatment options.	*Major -*	*Long Term > 5 years*	*Regional*	High	*Unlikely*	Medium
Aquatic Ecology	Seepage from permanent waste stockpiles	Water quality deterioration in the Vaal and Olifants Water Management Area	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	Investigate and imlpement water treatment options.	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Unlikely*	Medium
Aquatic Ecology	Subsidence of undermined areas	Alteration of cathcment hydrology and water quality deterioration in the Vaal and Olifants Water	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	Investigate subsidence further to impelement mitigation actions.	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Unlikely*	Medium

		Management Area															

10.3.4.3 Wetlands

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
Construction																
Wetlands	The removal of vegetation, ground compaction and infrastructure placement.	Destruction of wetland systems	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	Minimise footprint area of infrastructure. Avoid wetland areas and adhere to recommended buffer areas.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Placement of infrastructure within the catchment area	Loss / reduced catchment water yield	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Minimise infrastructure footprint area. Incorporate soft / green engineering where feasible. Separate clean and dirty water. Implement best practice storm water management. Avoid wetland areas and adhere to recommended buffer areas.	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low
Wetlands	Vegetation removal and altered surface flow dynamics	Increased in suspended solid concentrations	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low	-	Implement phased vegetation clearing to minimise the extent of bare areas. Concurrent rehabilitation. Separate clean and dirty water. Implement best practice storm water management. Stay clear of the recommended buffer zones.	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low
Wetlands	Onsite mixing, fuelling and use of machines and vehicles. Erosion of the cleared	Contamination of surface water resources	*Major -*	*Medium Term > 18 months < 5 years*	*Regional*	Medium	*Possible*	Medium	Yes	Separate clean and dirty water. Implement best practice storm water management. No cleaning of vehicles, machines and equipment in water resources. Servicing of machines, vehicles and equipment	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
	footprint areas.									in designated areas. Storage of potential contaminants in bunded areas. All contractors must have spill kits available and be trained in the correct use thereof.						
Wetlands	Disturbances caused by noise, traffic, machines and human movement	Loss of species diversity	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	-	Minimise footprint area of infrastructure. Make use of existing access routes. Avoid wetland areas and adhere to buffer areas. Minimise noise disturbance. Implement dust suppression. Implement waste management.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Introduction of "pests" and weeds into the area.	Change in species abundances	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low	-	Minimise footprint area of infrastructure. Make use of existing access routes. Avoid wetland areas and adhere to buffer areas. Minimise noise disturbance. Implement dust suppression. Implement waste management.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Construction of underground mine	Loss of wetland systems	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium	Yes	Sinkholes are likely to occur in such areas which might drain wetlands in some cases. Stay well clear of such areas (if present) and ensure that the layout of components that directly impact upon the surface stay clear of the recommended buffer zones. A rock engineering report is recommended for further mitigation measures.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Construction of associated infrastructure	Loss of wetland systems	*Major -*	*Long Term > 5 years*	*Regional*	High	*Definite*	High	Yes	Avoid wetland areas and adhere to recommended buffer areas.	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low
Wetlands	Construction of associated infrastructure	Loss of sub-surface flows	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	The loss of sub-surface flows is imminent. A hydropedology study is recommended to further improve mitigation and recommendations.	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High
Operation																

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
Wetlands	Operation of underground mine	Destruction. of wetland systems	*Moderate -*	*Medium Term > 18 months < 5 years*	*Regional*	Medium	*Unlikely*	Low	-	The operation of underground mines is unlikely to have a direct impact on wetlands. A rock engineering report is recommended for further mitigation measures.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Operation of the opencast's supporting infrastructure	Loss / reduced catchment water yield	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	Minimise the footprint area of supporting infrastructure. Any loss of water to the catchment must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed.	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Wetlands	Operation of the opencast's supporting infrastructure	Los of sub-surface flows	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	The loss of sub-surface flows is imminent. A hydropedology study is recommended to further improve mitigation and recommendations.	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High
Wetlands	Operation of the opencast's supporting infrastructure	Increased in suspended solid concentrations	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	Separate clean and dirty water. Implement best practice storm water management.	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low
Wetlands	Operation of opencast and underground mine	Mine water discharge from dewatering of underground mining area	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	Contain waste water in a PCD. Contaminated water must not be discharged into the watercourses. Clean and dirty water must be separated. This water could be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydro-dynamics.	*Moderate -*	*Medium Term > 18 months < 5 years*	*Regional*	Medium	*Possible*	Medium
Wetlands	Operation of ROM and overburden stockpiles	AMD and salinization	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	The introduction of oxygen and water should be limited as much as possible for these systems. Specific amelioration should additionally be applied for the overburden stockpile. Impermeable layers, seepage pumps and other mitigation measures should be part of the stockpile layout.	*Moderate -*	*Medium Term > 18 months < 5 years*	*Regional*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
Wetlands	Operations of the washplant and the Eskom plant	Contamination of surface- and ground water	*Moderate -*	*Medium Term > 18 months < 5 years*	*Regional*	Medium	*Possible*	Medium	Yes	Proper drainage systems should be part of this layout, clean and dirty water should be seperated and continued monitoring should be involved to monitor possible contamination. The surface and groundwater reports must be considered for further mitigation measues.	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low
Decomissioning and Closure																
Wetlands	Removal of infrastructure	Restored catchment water yield	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low	-	All voids must be backfilled, and surface infrastructure must be removed from the site. Compacted areas must be ripped (perpendicularly) to a depth of 300mm. A seed mix must be applied to rehabilitated and bare areas. Recommendations for a suitable seed mix is made in “10.2-Recommendations”. Any gullies or dongas must also be backfilled. The area must be shaped to a natural topography. Trees (or vegetation stands) removed must be replaced. No grazing must be permitted to allow for the recovery of the area. Attenuation ponds may be created in channels to retain water in the catchment.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Backfill of voids	Rehabilitated topography and surface flow dynamics (including subsidence)	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low	-	All voids must be backfilled, and surface infrastructure must be removed from the site. Compacted areas must be ripped (perpendicularly) to a depth of 300mm. A seed mix must be applied to rehabilitated and bare areas. Any gullies or dongas must also be backfilled. The area must	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
										be shaped to a natural topography.						
Wetlands	Backfill of void, and shaping of catchment area	Increased in suspended solid concentrations	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low	-	Decommission cut-off berms and drains last. Debris must be placed in preferential flow paths. Compacted areas must be ripped (perpendicularly) to a depth of 300mm. A seed mix must be applied to rehabilitated and bare areas. Any gullies or dongas must also be backfilled. The area must be shaped to a natural topography.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Backfill of voids	Restoration of shallow recharge	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low	-	The mining of the hard plinthic layer is not likely to be restored (by means of a "plug"), and this recharge will be lost. Mitigation is therefore not possible.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Wetlands	Erosion of bare areas, soils and leaks from machines and equipment, waste disposal	Contamination of surface water resources	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium	-	Ensure vehicles and machines are maintained and serviced off-site. Implement concurrent rehabilitation, applying a proven seed mix to rehabilitated and bare areas. Debris must be placed in preferential flow paths.	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low
Wetlands	AMD decant	AMD discharge from mine areas	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	-	Determine the likelihood of AMD, and proactively implement measures to prevent or reduce this. Priority would be to ensure the treatment of this water to suitable standards for aquatic ecology. Rehabilitation of the area and shaping of the topography must minimise the ingress of water into the mining area. Additionally, measures must also be considered to implement constructed wetlands at	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
										likely decant areas, and the planting of tree reduce groundwater recharge.						
Wetlands	Ripping of compacted areas	Improving soil quality	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low	-	Monitor the footprint area to make note of compacted areas. These areas should be ripped, ameliorated and revegetated.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

10.3.5 Air Quality

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Air quality	❖ Site clearance ❖ Construction activities	$PM_{2.5}$ and PM10	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	No	❖ Minimise areas to be cleared ❖ Implement dust suppression on access and haul roads	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Operation																
Air quality	❖ Processing activities Leslie 1A ❖ Vehicles on access and hail roads	$PM_{2.5}$ and PM_{10}	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Either chemical or wet suppression on haul roads. ❖ Mitigation of both crushing and screening at the CHPP. ❖ Re-design of mine layout to reduce haul road distances. ❖ Use of conveyor belts for on-site transport of materials and implementation of rail transport for off-site transportation.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium

Air quality	❖ Processing activities Leslie 1C ❖ Vehicles on access and hail roads	$PM_{2.5}$ and PM_{10}	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Either chemical or wet suppression on haul roads. ❖ Mitigation of both crushing and screening at the CHPP / Elimination of the CHPP. ❖ Re-design of mine layout to reduce haul road distances. ❖ Use of conveyor belts for on-site transport of materials and implementation of rail transport for off-site transportation. ❖ Elimination of the CHPP. ❖ Locate the above-ground mining activities further south.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	Medium
Decommissioning and Closure																
Air quality	❖ Removal of infrastructure and rehabilitation	$PM_{2.5}$ and PM10	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	No	❖ Rehabilitate and vegetate co-disposal facility ❖ Rehabilitation and revegetation of site roads	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

10.3.6 Noise

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Noise - Leslie 1A	Numerous simultaneous construction activities during the day	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	-	❖ Significance of the noise impact is Low and no additional mitigation measures are required	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Unlikely*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Noise - Leslie 1A	Numerous simultaneous construction activities at night	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	-	❖ Minimise night-time construction activities closer than approximately 700m from the closest potential noise-sensitive receptors if the activities is not taking place behind a sound barrier (temporary or as formed by a residue or topsoil berm). ❖ Minimise the use of simultaneous construction activities closer than 1,000m when operating at night. ❖ Ensure that equipment is fitted with the correct and appropriate noise-abatement measures. ❖ Eliminate the use of equipment that generates an impulsive noise when operating within 1,000m of potential receptors.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Noise - Leslie 1C	Numerous simultaneous construction activities during the day	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	-	❖ Unless the closest receptors are relocated (NSDs 02, 03, 07 and 16), there is a possibility that noise levels will be high at some time during the	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										construction phase. ❖ Mitigation may reduce the noise level, duration of impact as well as the probability of a noise impact occurring, but, due to the proximity of the closest receptors the significance of a noise impact would remain medium.						
Noise - Leslie 1C	Numerous simultaneous construction activities at night	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Major -*	*Medium Term > 18 months < 5 years*	*Regional*	Medium	*Definite*	Medium	-	❖ Minimise night-time construction activities closer than approximately 700m from the closest potential noise-sensitive receptors if the activities are not taking place behind a sound barrier (temporary or as formed by a residue or topsoil berm). ❖ Minimise the use of simultaneous construction activities closer than 1 000m when operating at night. ❖ Ensure that equipment is fitted with the correct and appropriate noise-abatement measures.	*Minor -*	*Short Term < 18 months*	*Regional*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										❖ Eliminate the use of equipment that generates an impulsive noise when operating within 1 000m of potential receptors.						
Operation																
Noise - Leslie 1A	Numerous simultaneous operational activities during the day	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low	-	❖ Significance of the noise impact is Low and no additional mitigation measures are required	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Noise - Leslie 1A	Numerous simultaneous operational activities at night	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	-	❖ Relocate the plant and associated infrastructure further than 700m from NSD20. ❖ Develop the waste dump or a topsoil dump between NSD20 and the mining portal and plant infrastructure to ensure that the line of sight is broken between this NSD and noise-generating mining infrastructure.	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Noise - Leslie 1C	Numerous simultaneous operational activities during the day	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	-	❖ If viable, the haul road could be relocated further than 200m from NSD02 (moved further south, passing between waste rock dump and	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										the co-disposal dump). ❖ Develop a berm between NSD02 and the haul road.						
Noise - Leslie 1C	Numerous simultaneous operational activities at night	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	-	❖ If viable, the haul road could be relocated further than 200m from NSD02 (moved further south, passing between waste rock dump and just north of the co-disposal dump); ❖ Develop a berm between NSD02 and the haul road; ❖ Minimize night-time operational activities within 500m of NSD02 at the waste rock and the co-disposal dump; ❖ If viable, construct the dumps in closer than approximately 700m from the closest potential noise-sensitive receptors if the activities are not taking place behind a sound barrier (temporary or as formed by a residue or topsoil berm); ❖ Remove topsoil to reduce the level of the plant	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										infrastructure in terms of the surrounding surface level; ❖ Increase the height of the topsoil berm between NSD07 and mining infrastructure.						
Decommissioning and Closure										❖						
Noise - Leslie 1A	Numerous simultaneous demolition activities during the day	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Moderate* -	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low	-		*Moderate* -	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Noise - Leslie 1C	Numerous simultaneous demolition activities during the day	Increased total noise levels in the area, changing existing ambient sound levels at receptors	*Moderate* -	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low	-		*Moderate* -	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

10.3.7 Blasting and Vibration

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Neighbouring areas	Blasting	Ground vibration Impact on houses	*Moderate* -	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low	-	❖ Reduce charge mass per delay, changed or re-define blast design	*Minor* -	*Short Term < 18 months*	*Site or Local*	Low	*Unlikely*	Low
Neighbouring areas	Blasting	Ground vibration Impact on Boreholes	*Minor* -	*Short Term < 18 months*	*Site or Local*	Low	*Unlikely*	Low	-	❖	*Minor* -	*Short Term < 18 months*	*Site or Local*	Low	*Unlikely*	Low
Neighbouring areas	Blasting	Ground vibration Impact on graves / heritage	*Moderate* -	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	-	❖ Reduce charge mass per delay, changed or re-define blast design	*Minor* -	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

Neighbouring areas	Blasting	Ground vibration Impact on Roads	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	-	❖ Reduce charge mass per delay ❖ Changed or re-define blast design ❖ Site location changes ❖ Road diversion	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Neighbouring areas	Blasting	Air blast Impact on houses	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	-	❖ Stemming control and audit, ❖ Use proper stemming materials, ❖ Re-design blasts, ❖ Re-locate households.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Neighbouring areas	Blasting	Air Blast Impact on Boreholes	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	-	-	-		*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	-	-
Neighbouring areas	Blasting	Air Blast Impact on graves / heritage	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	-	-	-		*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	-	-
Neighbouring areas	Blasting	Air Blast Impact on Roads	-	*Short Term < 18 months*	*Site or Local*	-	-	-	-		-	*Short Term < 18 months*	*Site or Local*	-	-	-
Neighbouring areas	Blasting	Fly rock Impact on houses	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	-	❖ Stemming control and audit, ❖ Use proper stemming materials, ❖ Re-design blasts, ❖ Re-locate households.	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Possible*	Medium
Neighbouring areas	Blasting	Fly rock Impact on Boreholes	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	-		*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Neighbouring areas	Blasting	Fly rock Impact on graves / heritage	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	-	❖ Stemming control and audit, ❖ Use proper stemming materials, ❖ Re-design blasts, ❖ Re-locate households.	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Neighbouring areas	Blasting	Fly rock Impact on Roads	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	-	❖ Stemming control and audit, ❖ Use proper stemming materials, ❖ Re-design blasts, ❖ Re-locate households.	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Operation																
None			-	-	-	-	-	-	-		-	-	-	-	-	-
Decommissioning and Closure																
None			-	-	-	-	-	-	-		-	-	-	-	-	-
Post- Closure																
None			-	-	-	-	-	-	-		-	-	-	-	-	-

10.3.8 Visual

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Vegetation	Site clearance	loss of vegetation / Loss of visual screening	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Clearly define areas to be cleared. Do not clear past designated areas. ❖ Retain natural vegetation outside of clearance zone	*Moderate +*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium
Air	Site clearance and construction of and access roads	Dust generated from site clearance	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Implement daily dust suppression and pave roads where possible to avoid transport related dust pollution	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium
Visual	Site Preparation	Soil stripping and topsoil stockpiling	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Vegetate and maintain stockpiles to the recommended minimum height.	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium
Visual	Construction of surface infrastructure	Visual intrusion to the scenic view	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Use material with colours that will visually blend with the natural environment	*Moderate +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium
Visual	Construction sites	Visual intrusion to the scenic view	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Screen construction sites with mesh fence covers (in natural green colour).	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium
Visual	Mobilisation of excavators for construction	Visual intrusion on the scenic view	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Screening of mobile equipment might not be possible either than to screen the whole construction site via fence cover	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium
Soil	Soil stripping and topsoil stockpiling	loss of topography of the area	*Major -*	*Medium Term > 18 months < 5 years*	*Regional*	Medium	*Definite*	Medium	Yes	❖ Remove minimum amount of existing topsoil as possible and only remove where necessary. ❖ All soil stripping should be done according to the soils management guidelines as prescribed by soil scientist. ❖ Place soils as close as possible to the access portal and avoid relocation.	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium
Operation																

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Vegetation	Underground access portal at Leslie 1 A and Leslie 1C	removal of vegetation	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Only remove vegetation within the designated boundary	*Moderate +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium
Visual	Soil Stockpiling	Change in the topography of the site	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Place topsoil and subsoil stockpiles on the edge of the site boundary to create visual screening into the access portal. ❖ Revegetate stockpiles to avoid erosion.	*Moderate +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium
Visual	Co-disposal Discard Dump	Visual intrusion on the scenic view	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Place Co-disposal Discard Dump behind topsoil stockpile	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Visual	ROM stockpile	Visual intrusion on the scenic view	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Keep ROM stockpile to the minimum height recommended	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Night Sky	Lighting	Light pollution at night	*Major -*	*Long Term > 5 years*	*Regional*	High	*Definite*	High	Yes	❖ Keep lighting to minimum. ❖ Direct light downwards to avoid illumination to the sky. ❖ Use motion light sensor to avoid lighting unused places.	*Moderate -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High
Topography	Underground access portal at Leslie 1 A and Leslie 1C	Loss of natural slope and contour line	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Encourage concurrent rehabilitation. ❖ Employ surveyor when shaping the subsoil and topsoil	*Minor +*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Visual	Topsoil and subsoil stockpile	Topsoil erosion and drainage pattern	*Major -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Revegetate soon after stockpiling to avoid erosion and a drainage patterns forming on the stockpile.	*Minor +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low
Visual	Coal transportation	Visual intrusion by dust	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	❖ Implement daily dust suppression procedures	*Minor +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low
Visual	Truck hauling on the roads and queuing on the loading bay	Visual Intrusion	*Major*	*Long Term > 5 years*	*Regional*	High	*Definite*	High	Yes	❖ Avoid long queueing of trucks in the loading bay	*Moderate -*	*Long Term > 5 years*				
Decommissioning and Closure										❖						

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Topography	Removal of infrastructure	loss of natural slope and topography	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Dismantle and remove all infrastructure. Revegetation and rehabilitation plan in consultationwith landscape architect / botanist.	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Topography	Removal of berms	loss of natural slope and topography	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Remove all berms and revegetate all disturbed areas	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Topography	Underground access portal	loss of natural slope and topography	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Backfill and reshape with a surveyor. ❖ Reshape to create a gently-slope which is free-draining topography	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Topography	ROM stockpile, Co-disposal Discard Dump removal	loss of natural slope and topography	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	❖ Reshape and create a gentle slope which is free- draining to meet the final land use or land capability commitments and water management objectives	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Topography	Rehabilitation	Landform stability	*Moderate +*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	❖ Institute a rehabilitation monitoring program with a rehabilitation specialist	*Moderate +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

10.3.9 Traffic

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
Construction																
Road network	Construction materials being transported to site	Added traffic on the road network	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Definite*	Medium	No	Road network able to support additional trucks .	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Definite*	Medium
Road network	Employees and laborourers transported to/ from site	Added traffic on the road network	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Definite*	Medium	No	Road network able to support additional commuter trips.	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Definite*	Medium
Air quality	Vehicles travelling on gravel roads	Dust will increase with increased traffic flow	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	No	Ensure that gravel roads are kept watered to prevent dust (other dust	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low

		along gravel roads								suppression measures may also be used).					
Access roads	Construction of access roads	New access roads	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	No	As per EMP	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium
Operation																
Road network	Coal haulage to/ from site; and mine staff to/from site	Added traffic on the road network	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	No	Road network able to support additional trucks.	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Air quality	Vehicles travelling on gravel roads	Dust will increase with increased traffic flow along gravel roads	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	No	Ensure that gravel roads are kept watered to prevent dust (other dust suppression measures may also be used).	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Noise	Coal haulage to/ from site; and mine staff to/from site	Noise levels affecting sensitive areas including residential areas	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	Speed limits to be kept low, and define routes away from residential areas.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Decommissioning and Closure																
Road network	Rubble and other materials being removed from site	Added traffic on the road network	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Definite*	Medium	No	Road network able to support additional trucks.	*Minor -*	*Medium Term > 18 months < 5 years*	*Regional*	Low	*Unlikely*	Low

10.3.10 Heritage

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Heritage	1A - Mining Activities	Destruction of graves at LES002, LES003 and LES007	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	No	❖ Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Heritage	1B - Mining Activities	Endangerment of graves at LES015	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	❖ Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										relocation process must be implemented as required under the NHRA and National Health Act regulations						
Heritage	1C - Mining Activities	Destruction of graves at LES019, LES022 and LES025	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	No	❖ Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Heritage	1A - Mining Activities	Destruction of historical structures LES004, LES011 and LES012	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	No	❖ Demarcate sites with a 50-meter buffer and avoid them if possible. If this is not possible, the sites may be destroyed following a destruction permit from SAHRA.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Heritage	1C - Mining Activities	Destruction of historical structures LES017, LES020 and LES023	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	No	❖ Demarcate sites with a 50-meter buffer and avoid them if possible. If this is not possible, the sites may be destroyed following a destruction permit from SAHRA.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Operation																
Heritage	Overall	Impact on palaeontology	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	No	❖ The EAP and ECO must be informed that a Very High Palaeontological Sensitivity is allocated to the whole study area. ❖ A Phase 1 PIA document and "Chance Find Protocol" must be completed during the first month of excavation. These recommendations must be incorporated in the EMPr of this project.	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

10.3.11 Social

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Economic	Project commencement	Employment opportunities	*Moderate +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Establish targets for the employment and training; Adopt recruitment strategies that ensure local people are given employment preference; Effective implementation of training and skills development	*Major +*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										initiatives; The recruitment process has to be transparent and equitable.						
Economic	Project commencement	Multiplier impacts on the local economy	*Minor +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Definite*	Medium	Yes	Preference should be given to capable subcontractors who based within the local municipal area ; Align skills development to build capacity of SMMEs	*Major +*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High
Economic	Project commencement	Community development through LED projects	*Minor +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low	Yes	Ensure that there is stakeholder buy-in; Aligning LED projects with those of other development role-players	*Major +*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High
Geographic/Socio-Cultural	Project commencement	Change in movement patterns	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	No	Where possible ensure that access to fields and grazing areas are uninterrupted by providing alternative access routes and/or temporary access points during construction activities; Leslie Coal mine should ensure that residents are kept informed on a day-to-day basis of construction progress and of when access will be blocked.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium
Geographic	Project commencement	Loss of and/or Damage to Agricultural Land and Infrastructure	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	No	ensure that the project design and associated layout seeks to minimise the project footprint, thus minimising the loss of agricultural land; will engage with each directly affected landowner with the intention to acquire only the required servitude area; Should Leslie Coal Mine acquire the full farm and the project footprint only affects a portion of the land, the surrounding usable land should be utilised	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										for agricultural purposes – potentially as part of a lease agreement; Where damage is incurred, suitable compensation must be negotiated with the affected farmer; Prepare a site Rehabilitation Plan that will be implemented as part of the decommissioning phase.						
Economic	Project commencement	Physical and economic displacement	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	Suitable mitigation measures should be defined that protect the farm workers and ensure that they are adequately provided for and supported should they be moved or lose their employment; a Resettlement Action Plan and associated Livelihood Restoration Plan may be required. No affected farm worker should be left without secure tenure or income; Implement surface lease agreements with all community members who have grazing or ploughing land, this will minimise the impact of economic displacement; Implement a Grievance Mechanism to ensure ongoing, proactive engagement and effective management of grievances.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Socio-cultural wellbeing	Project commencement	Disturbance of cultural, spiritual and religious sites	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	Ensure that the community is included in decisions regarding cultural, spiritual and religious sites; Establish specific clan landowner protocols for activities that have	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										spatial proximity to known sacred sites; recommendations as indicated in the heritage impact assessment study should be implemented						
Institutional, Legal, Political and Equity	Project commencement	Increased pressure on municipal services	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	To limit, as far as reasonably possible, additional pressure on existing infrastructure and services; To work in partnership with government, industry, and relevant organisations to enhance the existing infrastructure and services; To liaise openly and frequently with affected stakeholders to ensure they have information about the proposed Project; and to make available, maintain and effectively implement a grievance/complaints register that is easily accessible to all neighbours and affected stakeholders.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Demographic Change/Socio-Cultural Wellbeing	Project commencement	Increased social pathologies linked to influx of workers and job seekers	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	To limit, as far as reasonably possible, social ills caused by influx of workers and job-seekers; to liaise openly and frequently with affected stakeholders to ensure they have information about the Project	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Socio-Cultural Wellbeing	Project commencement	Increased Nuisance Factors and Changed Sense of Place	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	Minimise all nuisance factors such as noise, air quality, traffic, and visual-Implement all mitigation measures as specified in the relevant specialist studies; Make available, maintain and effectively implement a grievance/complaints	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										register that is easily accessible to all neighbours and affected stakeholders; To liaise openly and frequently with affected stakeholders to ensure they have information about activities that will generate nuisance factors.						
Operation																
Economic	Mining	Employment opportunities	*Moderate +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	If possible a training and skills development programme for the local workers should be initiated prior to the operational phase; Effective implementation of training and skills development initiatives; Recruitment should be formalised and co-ordinated through the Department of Labour- avoid appointments at the gate of the mining operation;	*Major +*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High
Economic	Mining	Multiplier impacts on the local economy	*Minor +*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Possible*	Low	Yes	Preference should be given to capable subcontractors who based within the local municipal area ; and Align skills development to build capacity of SMMEs	*Major +*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High
Economic	Mining	Community development through LED projects	*Minor -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Low	*Definite*	Medium	Yes	Maximise benefits from local employment, skills and economic development	*Major +*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High
Geographic/Socio-Cultural	Mining	Change in movement patterns	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	Where possible ensure that access to fields and grazing areas are uninterrupted by providing alternative access routes and/or temporary access points during construction activities; Leslie Coal mine should	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										ensure that residents are kept informed on a day-to-day basis of construction progress and of when access will be blocked.						
Geographic	Mining	Loss of and/or Damage to Agricultural Land and Infrastructure	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	Yes	Ensure that the project design and associated layout seeks to minimise the project footprint, thus minimising the loss of agricultural land; will engage with each directly affected landowner with the intention to acquire only the required servitude area; should Leslie Coal Mine acquire the full farm and the project footprint only affects a portion of the land, the surrounding usable land should be utilised for agricultural purposes – potentially as part of a lease agreement; Where damage is incurred, suitable compensation must be negotiated with the affected farmer; prepare a site Rehabilitation Plan that will be implemented as part of the decommissioning phase.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium
Economic	Mining	Physical and economic displacement	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	Suitable mitigation measures should be defined that protect the farm workers and ensure that they are adequately provided for and supported should they be moved or lose their employment; a Resettlement Action Plan and associated Livelihood Restoration Plan may be required.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										No affected farm worker should be left without secure tenure or income; implement surface lease agreements with all community members who have grazing or ploughing land, this will minimise the impact of economic displacement; implement a Grievance Mechanism to ensure ongoing, proactive engagement and effective management of grievances.						
Socio-cultural wellbeing	Mining	Disturbance of cultural, spiritual and religious sites	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	Ensure that the community is included in decisions regarding cultural, spiritual and religious sites; establish specific clan landowner protocols for activities that have spatial proximity to known sacred sites; recommendations as indicated in the heritage impact assessment study should be implemented	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Institutional, Legal, Political and Equity	Mining	Increased pressure on municipal services	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	Limit, as far as reasonably possible, additional pressure on existing infrastructure and services; work in partnership with government, industry, and relevant organisations to enhance the existing infrastructure and services; liaise openly and frequently with affected stakeholders to ensure they have information about the proposed Project; and make available, maintain and effectively implement	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
										a grievance/complaints register that is easily accessible to all neighbours and affected stakeholders.						
Demographic Change/Socio-Cultural Wellbeing	Mining	Increased social pathologies linked to influx of workers and job seekers	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	Yes	Limit, as far as reasonably possible, social ills caused by influx of workers and job-seekers; liaise openly and frequently with affected stakeholders to ensure they have information about the Project. It should be noted that Leslie Coal Mine has no control over activities related to workers' behaviour, however it is recommended that HIV/AIDS campaigns are conducted within the affected area.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Socio-Cultural Wellbeing	Mining	Increased Nuisance Factors and Changed Sense of Place	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	Minimise all nuisance factors such as noise, air quality, traffic, and visual-Implement all mitigation measures as specified in the relevant specialist studies; make available, maintain and effectively implement a grievance/complaints register that is easily accessible to all neighbours and affected stakeholders; liaise openly and frequently with affected stakeholders to ensure they have information about activities that will generate nuisance factors.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

10.3.12 Community Health

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Soil-, Water- and Waste-related Diseases	Influx of workers Mining activities	❖ Potential contamination with hydrocarbons and chemicals during construction	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Groundwater and surface water quality must be monitored; ❖ Restrict access to project-created water bodies; ❖ Conduct baseline water and sanitation studies; ❖ Ensure proper disposal of human waste generated from the project; ❖ Ensure proper waste management.	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Accidents/Injuries	Transport of goods and personnel Transport of staff Light vehicle traffic	❖ Change in morbidity and mortality data related to commercial motor vehicle (CMV) traffic on roadways ❖ Change in morbidity and mortality data related to non-commercial motor vehicle crashes.	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Engage the Local Municipality and interested and affected parties to assist with programmes targeted at improving traffic management and road safety in the study area; ❖ Develop a clear policy for the management of emergencies or accidents in the community as a direct result of the projects activities; ❖ Support with local safety and security as addressed in these specialist studies.	*Minor +*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Exposure to Potentially Hazardous Materials, Noise and Malodours	Diesel Particulate Matter Noise Blasting Exposure to noxious fumes Hazardous chemicals	❖ Pollutants and emissions released by construction activities may increase the prevalence of related respiratory illnesses and	*Moderate +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Conveyor belts should be used where possible instead of haul trucks for the on-site transport of materials and rail transport should be considered where possible for off-site transport of ROM coal. ❖ All coal processing should be moved off	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low

		water related illnesses								site for Leslie 1C, and if possible, also for Leslie 1A. ❖ A comprehensive mitigation programme should be implemented on any remaining haul roads. ❖ A comprehensive, continuous air quality monitoring programme must be undertaken to ensure that mitigation measures are applied at all times to keep ambient air concentrations of PM_{10} and $PM_{2.5}$ within the NAAQS over residential areas; ❖ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective; ❖ Environmental noise monitoring; ❖ Develop and implement a Storm Water Management Plan; ❖ Undertake groundwater and surface water monitoring.						
Operation																
Acute Respiratory Infections and Respiratory Effects from Housing	Influx of workers	❖ Change in the rates of respiratory diseases ❖ Increase in prevalence of respiratory illnesses if household is overcrowded ❖ Increasing prevalence of respiratory health outcomes.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Support community-based information campaigns related to TB symptoms and the need to seek care. ❖ Influx management and advice with regards to town planning to prevent overcrowding; ❖ Develop partnerships to support the community-based TB control programs in	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

										conjunction with the DoH and any NGOs.						
Sexually Transmitted Infections, including HIV/AIDS	Influx of workers	❖ Change in the rates of STI ❖ Increasing the number of orphans and child headed households ❖ Increase the risk for transactional sex.	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Develop a 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. ❖ Support (financial or otherwise) NGO groups active in the area on gender-based sexual violence; ❖ Support community-based condom distribution centres.	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Soil-, Water- and Waste-related Diseases	Influx of workers Mining activities	❖ Burden on water and sanitation infrastructure ❖ Potential contamination with hydrocarbons and chemicals during operations ❖ Unplanned developments may influence environmental health conditions and further contaminate surface water bodies ❖ Increase in income improves ability to afford basic environmental health services. This may result in a decline in cases of soil,	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Groundwater and surface water quality must be monitored; ❖ Restrict access to project-created water bodies; ❖ Conduct baseline water and sanitation studies; ❖ Ensure proper disposal of human waste generated from the project; ❖ Ensure proper waste management.	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium

		water and sanitation-related diseases														
Food and Nutrition-Related Issues	Changes in Income and Expenditure Consumption Water Quality and Quantity Influx Change of Livelihoods and Practices	❖ Change in regional food cost ❖ Food inflation, increasing food deprivation, nutrition-related diseases ❖ Poor food hygiene and quality of food services may increase food-related illnesses ❖ More consumption of fast food related to increased income may increase non-communicable (lifestyle) diseases	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Reduce project-related communicable diseases that may impact nutrition; ❖ Food inflation management as part of social program ❖ Support local procurement of food items in combination with incentives to increase local production.	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Accidents/Injuries	Transport of goods and personnel Transport of staff Light vehicle traffic	❖ Change in morbidity and mortality data related to commercial motor vehicle (CMV) traffic on roadways ❖ Change in morbidity and mortality data related to non-commercial motor vehicle crashes.	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Engage the Local Municipality and interested and affected parties to assist with programmes targeted at improving traffic management and road safety in the study area; ❖ Develop a clear policy for the management of emergencies or accidents in the community as a direct result of the projects activities; ❖ Support with local safety and security as addressed in these specialist studies.	*Minor +*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Exposure to Potentially Hazardous Materials,	Diesel Particulate Matter Noise	❖ Change in morbidity and mortality data from	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Conveyor belts should be used where possible instead of haul trucks for the on-	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low

Noise and Malodours	Blasting Exposure to noxious fumes Hazardous chemicals	poor air quality events ❖ Pollutants and emissions released by construction and operational activities may increase the prevalence of related respiratory illnesses and water related illnesses ❖ Influx of people into the area may increase domestic activities, including the use of domestic fuel, pesticides resulting in increased air pollution and associated Increases in the prevalence of related respiratory illnesses								site transport of materials; ❖ All coal processing should be moved off site for Leslie 1C, and if possible, also for Leslie 1A if possible. ❖ A comprehensive mitigation programme should be implemented on any remaining haul roads. ❖ If off-site rail transport is used together with on-site conveyor belts at Leslie 1A, and the coal processing plant is kept, all possible mitigation measures must be undertaken to limit the emissions of PM2.5 and PM10 from the coal processing plant. ❖ A comprehensive, continuous air quality monitoring programme must be undertaken to ensure that mitigation measures are applied at all times to keep ambient air concentrations of PM10 and PM2.5 within the NAAQS over residential areas; ❖ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective; ❖ Environmental noise monitoring; ❖ Develop and implement a Storm Water Management Plan; ❖ Undertake groundwater and surface water monitoring.					

Social Determinants of Health	Influx of persons into surrounding communities	❖ Change in morbidity and mortality data related to psychosocial distress ❖ Change in median household income ❖ Change in unemployment ❖ Change in the percentage of households living below poverty line ❖ Change in educational attainment ❖ Increase in xenophobia, violence, crime, prevalence of substance abuse and gender violence ❖ With the expected population growth and influx of job seekers, who may bring their families along, household size may increase resulting in overcrowding ❖ Construction workers and an influx of national and international people in search of economic opportunities are expected to put	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Social management plans and recommendations as part of the SIA; ❖ Reduce substance-abuse and improve social cohesion; ❖ Supporting education programs with a gender equity focus; ❖ Plan for mine closure; ❖ Identify and support vulnerable groups; ❖ Support graduate training programs for the youth in the community	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium

		enormous pressure on the South African Police Services and immigration control ❖ Increase in psychosocial problems, as a result of retrenchment at decommissioning phase A positive impact on poverty status for a small number of people employed at the Leslie 1 Project site ❖ Influx of people and increased income may result in illegal substances being available more freely														
Cultural Health Practices	Influx of persons into surrounding communities	❖ More people are practicing and using traditional medicine which may contribute to reducing the health burden if they are trained and knowledgeable ❖ Negative health outcomes	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Develop a disease-prevention plan that involves traditional healers.	*Minor +*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Health Systems Issues	Influx of persons into surrounding communities	❖ Change in ratio of people to health care providers	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Influx management and supporting health facilities to cope with the increased population if related to project; a	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

		❖ Change in time needed for emergency response ❖ Influx of people resulting in overburdened health facilities with inadequate health service ❖ Overburdened community health facilities, inadequate health service resulting from more people in the area								❖ Support community volunteer programs through expansion of the community-based peer health educator group.						
Non-Communicable Diseases	creased incomes increased availability of tobacco, alcohol and narcotic drugs	❖ High costs associated with absenteeism due to ill health; ❖ Loss of trained or skilled people from the workforce as a result of disease. ❖ Impact on the family unit with potential social and behavioural impacts.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	-	❖ Support health education programs as part of a community-based peer health educator program; ❖ Support the local healthcare personnel with training on disease-management programs and the recognition of NCD symptoms and management thereof; ❖ Support healthcare facilities with diagnostic medical hardware, where feasible.	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
Closure and Decommissioning			-	-	-	-	-	-	-		-	-	-	-	-	-
Acute Respiratory Infections and Respiratory Effects from Housing	Influx of workers	❖ Loss of income due to retrenchment	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	❖ Support community-based information campaigns related to TB symptoms and the need to seek care. ❖ Influx management and advice with regards to town planning to prevent overcrowding;	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

										❖ Develop partnerships to support the community-based TB control programs in conjunction with the DoH and any NGOs.						
Sexually Transmitted Infections, including HIV/AIDS	Influx of workers	❖ Loss of income during closure and decommissioning phase of the Project may cause people to get involved in prostitution	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Develop a 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. ❖ Support (financial or otherwise) NGO groups active in the area on gender-based sexual violence; and ❖ Support community-based condom distribution centres.	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium
Social Determinants of Health	Influx of persons into surrounding communities	❖ Increase in psychosocial problems, as a result of retrenchment at decommissioning phase A positive impact on poverty status for a small number of people employed at the Leslie 1 Project site	*Major -*	*Long Term > 5 years*	*Regional*	High	*Possible*	High	Yes	❖ Social management plans and recommendations as part of the SIA; ❖ Reduce substance-abuse and improve social cohesion; ❖ Supporting education programs with a gender equity focus; ❖ Plan for mine closure; ❖ Identify and support vulnerable groups; and ❖ Support graduate training programs for the youth in the community	*Minor -*	*Long Term > 5 years*	*Regional*	Medium	*Possible*	Medium

10.3.13 Climate Change

Affected Environment	Activity	Impact Description	Before Mitigation						Cumulative Impact	Mitigation measures / Recommendations	After Mitigation					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance			Magnitude	Duration	Spatial Scale	Consequence	Probability	Significance
Construction																
Climate	Construction of the Leslie 1 Project	Greenhouse Gas Emissions	*Minor -*	*Short Term < 18 months*	*National/International*	Medium	*Definite*	Medium	Yes	The major mitigation action related to the Leslie 1 Coal Mine is the selection of mining	*Minor -*	*Short Term < 18 months*	*National/International*	Medium	*Definite*	Medium

										method. In this regard the proposed Leslie 1 Coal Mine has selected underground mining as mining method which, in comparison to open pit mining, is a much less emission intensive option.						
Operational																
Climate	Mining of coal	Greenhouse Gas Emissions	*Minor -*	*Permanent*	*National/International*	Medium	*Definite*	Medium	Yes	The major mitigation action related to the Leslie 1 Coal Mine is the selection of mining method. In this regard the proposed Leslie 1 Coal Mine has selected underground mining as mining method which, in comparison to open pit mining, is a much less emission intensive option.	*Minor -*	*Permanent*	*National/International*	Medium	*Definite*	Medium
Climate	Mining of coal and combustion of coal	Greenhouse Gas Emissions	*Major -*	*Permanent*	*National/International*	High	*Definite*	High	Yes	The proposed coal mine would need to mitigate its greenhouse gas emissions to reduce its contribution to national emissions and climate change. Hybridising the power plant by substituting the source of thermal energy away from coal towards more carbon neutral sources.	*Minor -*	*Permanent*	*National/International*	Medium	*Definite*	High

10.4 Summary of Specialist Reports

A summary of the specialist reports has been provided in Chapter 8, Subchapter 9.2, Subchapter 9.3, and in the specialist reports in Appendix D. Table 10-89 provides a high-level summary of the specialist reports.

Table 10-89: Specialist report summary.

List of Studies Undertaken	Recommendations of Specialist Studies	Specialist recommendations included in the EMPr	Cross reference in the report (subchapters)
Soil, Land Use and Land Capability	All recommendations and mitigation/management measures contained in the specialist reports have been included in Subchapter 9.3 of this report.	All feasible recommendations and mitigation/management measures contained in the specialist reports have been included in the EMPr	❖ 8.4 ❖ 9.2.1 ❖ 9.3.1
Surface Water			❖ 8.5 ❖ 9.2.2 ❖ 9.3.2
Groundwater			❖ 8.6 ❖ 9.2.3 ❖ 9.3.3
Biodiversity			❖ 8.7 ❖ 9.2.4 ❖ 9.3.4
Air quality			❖ 8.8 ❖ 9.2.5 ❖ 9.3.5
Noise			❖ 8.9 ❖ 9.2.6 ❖ 9.3.6
Blasting and Vibration			❖ 8.10 ❖ 9.2.7 ❖ 9.3.7
Visual			❖ 8.11 ❖ 9.2.8 ❖ 9.3.8
Traffic			❖ 8.12 ❖ 9.2.9 ❖ 9.3.9
Heritage and Palaeontology			❖ 8.13 ❖ 9.2.10 ❖ 9.3.10
Social			❖ 8.14 ❖ 9.2.11 ❖ 9.3.11
Community Health			❖ 8.15 ❖ 9.2.12 ❖ 9.3.12
Climate Change			❖ 8.16 ❖ 9.2.13 ❖ 9.3.13

10.5 Unplanned Events, Risks and Management Measures

Risks have been identified in Subchapter 9.2 and addressed in Subchapter 9.3.

10.6 Environmental Impact Statement

A detailed description of the methodology utilised to determining the environmental impacts and their respective probability, magnitude and severity is provided in Subchapter 9.3 as well as in the specialist reports contained in Appendix D.

During the risk assessment process, it was found that the proposed project would result in a number of impacts with a "**High Negative**", as well as a "**High Positive**", significance rating post-mitigation. Only these impacts have been discussed Table 10-90.

Table 10-90: Key Findings with high Impacts

Specialist Studies	Environmental Aspect	Finding	Significance After Mitigation
Negative Impacts			
Soil, Land Capability and Agricultural Potential	Soil	Disturbance of in situ horizon organisation	High
	Land Capability	Loss of arable land capability	High
	Land Use	Change in land use from agriculture to mining	High
Visual	Visibility	Light pollution at night	High
Positive Impacts			
Social	Project commencement Mining Activities	Employment opportunities	High
		Multiplier impacts on the local economy	High
		Community development through LED projects	High

It must be noted that although there are high negative impacts post mitigations, these do not constitute fatal flaws.

11 Information for Consideration and Inclusion

11.1 Assumptions, Uncertainties and Gaps in Knowledge

The following assumptions and limitations are applicable to this EIA report:

- All information provided to Kongiwe Environmental, by AOL and I&AP's, was correct at the time it was provided;
- It is assumed that the 5 mining areas identified by AOL and its engineers represent technically feasible sites for the establishment of the underground mining operations;
- This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other mining alternatives;
- The assumptions and/or limitations and/or gaps in knowledge have been extracted from the specialist reports and are included below;
- The impact of overlapping mineral rights of the Leslie 1 Project and Pan African Resources (PAR)Evander Gold project could not be assessed due to the fact that no information was provided by PAR, even though multiple requests for this information were made. It must be noted that the MPRDA allows for the overlap of mineral rights for different mineral resources over the same area, and thus the overlapping rights of the Leslie 1 Project and PAR's prospecting and mining activities is not a fatal flaw. This is further demonstrated by the successful mining of coal and gold simultaneously over the same areas in the Evander area over a period of the last 80 years. It is the view of the EAP that the DMR must instruct applicant and PAR to set up a working forum prior to the commencement of any mining activity where there are overlapping rights to ensure that there is understanding between the parties as to where surface infrastructure is to be placed, who is mining where and when, where intersecting boreholes are, and management of water and environmental liabilities between the parties.

11.1.1 Soil, Land Capability and Land Use

A study of this nature will inherently contain various assumptions and limitations. The following **assumptions** were made during the assessment and reporting phases:

- It is assumed that the Applicant, Engineers and representative EAP have concluded site investigations that are project-specific. Consequently, this study did not evaluate any other mining alternatives;
- It is assumed that the project layout, installation and operation procedures have been designed to minimise environmental impacts as far as possible;
- It is assumed that the seasonality of the assessment was adequate to assess the present soil forms, and did not affect the outcome of the agricultural potential of the land. Fieldwork was undertaken from 3rd April 2018 to 6th April 2018 and 11th April to 13th April, during the region's Autumn months;
- It is assumed that all the information provided by the Applicant, EAP and consulted farmers / landowners is accurate and current to the Leslie 1 Project;

- It is assumed that the laboratory analysis conducted on the soil samples was undertaken by a SANS accredited laboratory, and that the testing and analysis of the samples was completed by a competent professional with the relevant experience;
- It is assumed that soil nutrient deficiencies or toxicity will be rectified through liming and/or fertilisation, therefore fertility status was not considered as a limitation to the current agricultural potential of the land; and
- It is assumed that the databases (GIS and survey data) used for the compilation of this report represent the most accurate and up-to-date information available at the time.

The following **limitations and gaps in knowledge** exist with regard this study. Cognisance of the following limitations and gaps in knowledge have been taken into account when assessing and formulating the conclusions of the soil report:

- Since mining of the Leslie 1 Project is expected to be by means of underground methods, the detailed soil survey was focused on the surface infrastructure areas of Leslie 1A and 1C. Boxcuts in Leslie 1B, 1D and 1E were also investigated.
- While predictive soil mapping techniques can be applied for soil assessment of larger areas (such as those of the underground mining areas), it is not appropriate for the Leslie 1 project area as the area is known for great heterogeneity in soil forms.
- Sampling by definition means that not all areas are assessed, and therefore some aspects of soil and land capability may have been overlooked in this assessment. However, it is the opinion of the professional specialist that this assessment was carried out with sufficient sampling and in sufficient detail to enable the applicant, the EAP and the regulating authorities to make an informed decision regarding the proposed activities;
- A 150m X 150m intense grid soil survey was conducted on those portions of the Project Area where surface infrastructure, as originally defined by the client, is to be located. Any changes in the project boundary subsequent to the provided information may negatively impact the robustness of this report;
- For the Boxcut areas, haul roads design and placements were not provided and therefore could not be sampled;
- The soil profiles were observed using a 1500mm hand-held soil auger. A description of the soil characteristics deeper than 1500mm cannot be given;
- A few landowners and farmers shared information on crop yields during the site visit. This data has not been verified by assessment of precision harvester yields, etc. as these were not available;
- As it was not possible to conduct an intense grid survey on the entire project areas, it is unlikely that the soil map units have been delineated with 100% accuracy. Soil map units could include other soil type(s) as the boundaries between the mapped soils are not absolute, but rather a continuum of a gradual change from one form to another.

11.1.2 Surface Water

None

11.1.3 Groundwater

The numerical modelling is based on the following assumptions:

- Aquifer parameters were inferred from studies completed at the adjacent Springboklaagte mine. No site-specific data is available for the project area at present.
- The source characterisation used for the project was inferred from a study completed at Springboklaagte mine in the absence of site-specific information.
- Only advective transport of contaminants was simulated. Assumptions made regarding advection, are discussed below. While it is acknowledged that attenuation will take place in the soils, there is currently insufficient information available to quantify the extent to which this takes place. As such, simulations are based on the precautionary principle and take the worst-case scenario into consideration
- The extent of the numerical model is based on natural groundwater barriers, as discussed below. These include water divides, as well as rivers and streams.
- The extent and timing of mining was obtained from the Mine Works Programme.

Uncertainties with the numerical groundwater modelling are approached conservatively, based on the precautionary principle, to ensure that the predictions and impact assessment in this report addresses the maximum potential impact of the proposed development. The uncertainties in the model include:

- **Uncertainties regarding aquifer conditions within the Leslie 1 project area:** The impact assessment is based on aquifer conditions identified for the adjacent Springboklaagte mine. It cannot be confirmed with certainty that the same conditions will prevail at the Leslie 1 project.
- U**ncertainties regarding borehole depth, construction and geology intersected:** This information is not available for the hydrocensus boreholes. For this reason, it was assumed that all hydrocensus boreholes target the fractured rock aquifer.
- **Uncertainties regarding the borehole elevations: T**he elevations used for the hydrocensus boreholes during simulations were inferred from hand-held GPS measurements and inaccuracies may occur. It is however thought that the error in elevation will not exceed the calibration error of 5 m.
- **Mathematical modelling uncertainties:** It is not possible with the available information to quantify the heterogeneity present in the aquifers simulated. For this reason, there are inherent uncertainties in the model. The level of confidence in the model can be improved with the incorporation of additional monitoring data.

11.1.4 Biodiversity

11.1.4.1 Terrestrial

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised one assessment

only, that was conducted during the wet season. This study has not assessed any temporal trends for the respective seasons;

- The scope of work for the project did not include blasting as a potential impact during the construction or operational phase. However, if such action is to be taken the authors of this report must be contacted to consult on further mitigation measures which will need to be taken to prevent undue disturbance to fauna in the area;
- The assessments were conducted on those portions of the Project area as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report;
- No detailed activity list for the Proposed Project was provided and therefore the risk assessment has been completed based on presumptions for standard underground mining operations;
- The impact assessment was completed for the proposed mining areas and supporting infrastructure for the Project area. The impact assessment has considered these layouts to be final, and have not considered the No Go alternative; and
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.

11.1.4.2 Aquatic

The following limitations should be noted for the study:

- A single aquatic ecology survey was completed for this assessment. Thus, temporal trends were not investigated.
- No wetlands were considered in this study.
- Due to the rapid nature of the assessment and the survey methods applied, fish diversity and abundance was likely to be under estimated.
- Invertebrates were only considered to the Family level and thus a defined species list for aquatic invertebrates was not completed.
- Only sites in proximity to proposed activity (project area) were selected for this assessment.
- Access within the project area was limited to areas where access by local land owners had provided consent. Sites were selected with this considered. An additional survey has been recommended to cover gaps in this study.
- Sites where raw sewage was observed were not considered for assessment due to health risks to the aquatic ecology practitioner.
- The proposed activities listed in this study are based on the assessment of several existing underground coal mine activities. A number of assumptions have been made through the compilation of the activity list.

11.1.4.3 Wetland

The following aspects were considered as limitations:

- Most of the project area is characterised by sub-surface flows which in some cases seep out and

subsequently contribute to the formation of wetland conditions within the first 50cm (from ground level). Given the size of the areas characterised by these sub-surface flows and the lack of wetland indicators throughout the project area, limitations exist in the accuracy of the delineation of seeps;

- Delineations have only been assigned to wetlands within the vicinity of the proposed infrastructure. These delineations end abruptly once the infrastructure area is outside of the wetland's reach;
- Limitations did exist regarding access of some of the areas. Therefore, some of the delineations have been completed at a desktop level only, with extrapolations from field surveys; and
- The GPS used for water resource delineations is accurate to within five metres. Therefore, the wetland delineation plotted digitally may be offset by at least five m to either side.

11.1.5 Air Quality

As the proposed Leslie 1 Project is still in the planning phase, many of the parameters required for the modelling were unavailable. Furthermore, no site-specific particle size fraction data, moisture content or clay content information was available. Therefore, use was made of averages from similar processes (US EPA, 1995) for many of the parameters, and in some cases, conservative estimates and 'worst-case' values were used in the model.

Although CHPPs were planned for both Leslie 1A and 1C, the location and size of these was not included in the proposed infrastructure diagrams in the DSR for the mine (Kongiwe , 2018). For the purposes of modelling, an area equivalent to the proposed mine infrastructure was used for these CHPPs, and it was assumed that they would be located in the area of the ROM stockpiles positions indicated i. It was assumed that primary crushing will take place in the mine to reduce the ROM to a size suitable for transport on the conveyor belt. Secondary and tertiary crushing and screening was included in the modelling of the CHPP.

It was assumed that the conveyor belt for transportation of ROM coal from the Leslie 1A western block to the CHPP on Leslie 1A eastern block will be in place from the first year of production i.e. coal will not be trucked from the western block to the eastern block at all.

It was assumed that the waste dumps indicated on the mine layout plan (Kongiwe , 2018) were to be used for storage of overburden, and that all discard from the CHPPs would be removed to the co-disposal discard dumps. The amount of discard was calculated as 386 Mt tons of coal produced less the 124.696 Mt product coal (Kongiwe , 2018) divided over the 32 years of expected production.

Whilst care has been taken to assess the potential air pollution impact from the proposed mining, more accurate input data may result in different conclusions.

The closest weather station to the proposed project is the Eskom monitoring station in Leandra. However, upper air soundings are not available from this weather station, and data is only available up to the end of 2014. For this reason, WRF modelled data was used for the modelling.

It should be noted that isopleth plots reflecting the 24-hour averaging periods contain only the highest predicted ground level concentrations for that averaging period, over the entire three-year period for which simulations were undertaken. It is therefore possible that, even though a high average daily concentration is predicted to occur at certain locations, this may only be true for one day during the entire period.

Tailpipe emissions were not included. Although the activities at the proposed Leslie 1 Project would emit gases, primarily by haul trucks and mining vehicles, the impact of these compounds were not included in this assessment. The sulphur content of South African diesel is too low (0.05% for Sasol TurbodieselTM) and mining equipment is too widely dispersed over mine sites to cause sulphur dioxide (SO2) levels to be exceeded even in mines that use large quantities of diesel.

The scope of the work only covers ambient concentration impacts beyond the mine's boundaries, occupational health issues were not addressed.

11.1.6 Noise

11.1.6.1 Measurements of Ambient Sound Levels

- This study collected measurements at three locations for more than 100 hours in 10-minute bins. It is assumed that the measurement locations represent other residential dwellings in the area (similar environment), yet, in practice this can be highly erroneous as there are numerous factors that can impact on ambient sound levels, including:
  - the distance to closest trees, number and type of trees as well as the height of trees;
  - available habitat and food for birds and other animals;
  - distance to residential dwelling, type of equipment used at dwelling (compressors, air-conditioners, pumps, etc.);
  - general maintenance condition of house (especially during windy conditions); and
  - number and type of animals kept in the vicinity of the measurement locations.
- This study found that traffic in the area was very low, yet it cannot be assumed that it is always low.
- While the windshields used limits the effect of fluctuating pressure across the microphone diaphragm, the effect of wind-induced noises in the trees in the vicinity of the microphone did impact on the ambient sound levels. The site visits unfortunately coincided with a relatively windy period

11.1.6.2 Calculating Noise Emissions – Adequacy of Predictive Methods

The noise emissions into the environment from the various sources as defined will be calculated for the operational phase in detail, using the sound propagation model described in ISO 9613-2. The following was considered:

- The octave band sound pressure emission levels of processes and equipment;
- The distance of the receiver from the noise sources;
- The impact of atmospheric absorption;

- The operational details of the proposed project, such as projected areas where activities will be taking place;
- Topography and conceptual layouts,
- Acoustical characteristics of the ground. 50% soft ground conditions were modelled, as the area where the mining activity would be taking place is well vegetated and sufficiently uneven to allow the consideration of relatively soft ground conditions. This is because the use of hard ground conditions could represent a too precautionary situation.

The noise emission into the environment due to additional traffic were calculated using the sound propagation model described in SANS 10210. Corrections such as the following were considered:

- Distance of receptor from the road;
- Road construction material;
- Average speeds of travel;
- Types of vehicles used;
- Ground acoustical conditions

Sound or noise levels generally refers to a sound pressure level as measured using an instrument, whereas the noise rating level refers to a calculated sound exposure level to which various corrections and adjustments was added. These noise rating levels are further processed into a 3D map illustrating noise contours of constant rating levels or noise isopleths. In this project it illustrates the potential extent of the calculated noises of the complete project and not noise levels at a specific moment in time. It is used to define potential issues of concern and not to predict a noise level at a potential noise-sensitive receptor. For this the selected model is internationally recognised and considered adequate.

11.1.6.3 Adequacy of Underlying Assumptions

There are a number of assumptions that is important to note, including:

- Mitigation (specifically the relocation of the closest NSD) will be implemented during the construction phase, before the start of the operational phase;
- The mine will use available topsoil and overburden to develop berms around the mining operation. There will be a berm of at least 3 metre height around certain mining infrastructure limiting the line of sight to the mining operation.

11.1.6.4 Uncertainties of Information Provided

While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels), it is difficult to model noise levels accurately at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. Assumptions include:

- At the time this report was written, the potential locations of ventilation fans were not defined. This study will locate ventilation fans close to the access portals (at each portal);

- The octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of this processes/equipment. The determination of these levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
- Sound power emission levels from processes and equipment change depending on the load the process and equipment is subject too. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load. Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worse-case scenario;
- As it is unknown which processes and equipment will be operational (and when operational and for how long), modelling considers a scenario where all processes and equipment are under full load for a set time period. Modelling assumptions complies with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely over-estimate noise levels;
- Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor;
- XYZ topographical information is derived from the ASTER Global DEM data, a product of METI and NASA. There are known inaccuracies and artefacts in the data set, yet this is still one of the most accurate data sets to obtain 3D-topographical information;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify;
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. 50% soft ground conditions will be modelled as the area where the operation is taking place is well vegetated and sufficiently uneven to allow the consideration of soft ground conditions.

11.1.7 Blasting and Vibration

The following assumptions have been made:

- The project is a greenfields project with no drilling and blasting operations currently active.
- The anticipated levels of influence estimated in this report are calculated using standard accepted methodology according to international and local regulations.
- The assumption is made that the predictions are a good estimate with significant safety factors to ensure that expected levels are based on worst case scenarios. These will have to be confirmed with actual measurements once the operation is active.
- The limitation is that no data is available from this operation for a confirmation of the predicted values as it is a greenfields site with no current blasting activities.
- The project is at a stage where specific portal designs are not yet available. Possible locations were indicated and these locations used. To establish possible influences a portal layout similar to the client's Leslie 2 project was used. The information from this layout is best estimates.

- Blast Management & Consulting was not involved in the blast design.
- The work done is based on the author's knowledge and information provided by the project applicant.

11.1.8 Visual

Only a preliminary mine layout was available. Detailed dimensions, such as the vertical offset of proposed surface infrastructure above ground level, were however not available, and were assigned based on consultation with the Environmental Project Manager and experience from similar infrastructure in previous projects. All viewsheds were based off terrain level. As such these viewsheds do not incorporate distractive views in the form of vegetation or land use (infrastructure, buildings, etc.).

The validity of third party data, such as elevation, land use and vegetation cannot be guaranteed as no ground-truthing or data validation procedures were used. This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. For example, localized visual perceptions of the economically depressed communities may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project; and the major limitation of this study is the unavoidable subjectivity relating to the assessment of the visual impact. Findings will also be restricted to information on hand, as well as the quality of spatial data.

11.1.9 Traffic

None.

11.1.10 Heritage and Palaeontology

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must be contacted immediately.

11.1.11 Social

- The study is based on data obtained from the community survey, 2016, which may not reflect accurate information;
- Not every individual in the community could be interviewed therefore only key people in the community were approached for discussion;
- It should be noted that the social environment is a dynamic, constantly changing entity. It is therefore not always possible to predict all social impacts to a very high level of accuracy. Care has been taken to identify the most likely and significant impacts in the most appropriate way for the current local context;
- Social impacts can be experienced by affected communities on an actual or a perceptual level. It

is therefore not always possible to quantify social impacts properly;

- It should be noted that predictions concerning the characteristics of the receiving socio-economic environment at the time of decommissioning are subject to a large margin of error, thus significantly reducing the accuracy of impact assessment- the specialist has attempted to assess (where possible) the impact during the decommissioning phase.

11.1.12 Community Health

The following are the recognised limitations of the study:

- The specialist team was denied access into healthcare facilities (by the Department of Health) to conduct interviews with key informants at the time of field visit. At this point in time Niara is still awaiting written approval from the DoH –email correspondence between Niara HIA Specialist and the relevant DoH personnel has been appended to this Report (Appendix C)
- The 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 and it is likely that the recording may lack required accuracy. However, this information is invaluable in understanding the health challenges in the area, although the limitation must be considered when evaluating information, as its ability to be used as a robust baseline and to monitor relevant health impacts is limited; 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;
- As the proposed Leslie 1 Project is still in the planning phase, many of the parameters required for the Air Quality Modelling were unavailable. Average values from the literature were used for many of the parameters, and in some cases, conservative estimates and 'worst-case' values were used in the model. Whilst care has been taken to assess the potential air pollution impact from the proposed mining activities, more accurate input data may result in different conclusions.

This study must be viewed as a prospective / predictive study as the Project is still in the Environmental Application Phase.

The study does not address classic occupational health concerns (e.g., physical hazards or environmental hazards encountered by workers), which are referred to as 'inside the fence' and are addressed by federally mandated health and safety protocols enforced by the department of Labour and Occupational Health and Safety Act 85 of 1993.

11.1.13 Climate Change

None.

11.2 Aspects for inclusions as considerations of the Environmental Authorisation

Should the DMR grant EA for this project, it should be subject to the following conditions:

- The project may not commence prior to the EA being issued;
- The project should remain in full compliance with the requirements of the EMPr and with all regulatory requirements;
- The EMPr should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the EMPr. Such persons must be issued with a written mandate by Leslie Coal Mine management to provide guidance and instructions to employees and contractors;
- Leslie Coal Mine should conduct annual internal auditing of environmental performance and annual reporting to the DMR;
- Leslie Coal Mine must undertake annual external auditing of the environmental performance and provide the DMR with a copy of the auditing report;
- Stakeholder engagement must be maintained during the construction, operational and closure/rehabilitation phases of the project, with the emphasis on the continuing provision of information; and
- The EMPr and EIA are dynamic documents. Since the Leslie 1 project is being implemented in phases over a number of years (35 years), it is recommended that the EMPr and the EIA be updated prior to the start of activities in the new mining areas, specifically for Leslie 1B, 1C and 1D, which will only be mined years after the start of the project.

Furthermore, should the EnEA be granted, the following conditions should be included and / or taken into account:

- Compilation of a Mine Area and species-specific Biodiversity Monitoring and Action Plan to be implemented for the duration of the life of mine;
- Compilation of a Closure & Rehabilitation Plan to be implemented for the duration of the life of mine. This plan must make provision for continuous rehabilitation as well as the rehabilitation upon closure of the mine.
- Compilation of a plant Search and Rescue plan for Species of Conservation Concern.
- Permits for removal of protected plant species need to be obtained from the DAFF.
- Compilation of an Alien and Invasive Species Plan to be implemented for the duration of the life of mine;
- Compilation of an Erosion and Sediment Control Programme during the life of mine;
- A spill containment plan is required to be in place prior to construction.
- Compilation of a Water Management Plan aimed at reducing and/or eliminating adverse impacts on the receptors identified. These include existing private groundwater users, wetlands, rivers and streams
- Water Management Plan to include the compilation of a Water Quality Monitoring programme should be implemented before construction of the Pit to assess the impact on the surrounding water bodies
- A Chance Find procedure for heritage resources and artefacts needs to be in place.

- Compilation of a Community Development Programme to be implemented through the life of mine;
- Implement design elements to exclude the burial grounds with a 50-metre buffer. If this is not possible, a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations.
- Confirm the depth of private boreholes, as well as the pump installation depth of boreholes currently in use. Record the pre-mining safe yield and groundwater demand associated with each hydrocensus borehole identified, even those outside the zone of impact during the Construction Phase. It is important to record this information prior to mining to ensure that baseline information is available for each private borehole that is in use;
- Undertake a baseline structural survey within the blasting zone of influence;
- Prior to undermining any area, and with specific reference to the existing overlap of Lebogang Township with the MRA, possible future extensions to Lebogang Township and the potential development at Grootlaagte portion 7, it is deemed that a land survey be undertaken to determine surface features and infrastructure and then a geotechnical assessment be performed. These assessments must inform the Life of Mine plan and the mine plan must be evolve and be revised to ensure that these structures are secure and safe from any form of surface subsidence or distortion. The applicant must demonstrate competence to the DMR in the ability to undermine these areas, as well as abide by all legislation relating to underground mining.

11.3 Proposed Management objectives and outcomes for inclusion in the EMPr

The EMPr is compiled with the aim of achieving a required end state that, as far as possible, ensures that environmental quality is maintained. The EMPr describes how activities that have, or could have, an adverse impact on the environment will be mitigated, controlled and monitored. Moreover, the EMPr will address the environmental impacts during the construction, operational, decommissioning (where applicable post-closure) phases of the Project. Due regard must be given to environmental protection during the entire Leslie 1 Project, and a number of environmental recommendations are made in this regard. These recommendations are aimed at ensuring that the contractor maintains adequate control over the Project to:

- Minimise the extent of an impact during the life of the Leslie 1 Project;
- Maintain a state of Environmental Quality following completion of the Leslie 1 Project;
- Ensure appropriate restoration of areas affected by the Leslie 1 Project; and
- Prevent long term environmental degradation.

The impact management objectives and outcomes for the Leslie 1 Project are as follows:

- To minimise the negative environmental impacts as far as feasible;
- To maximise the positive and minimise the negative socio-economic impacts;
- To capture, contain, treat and recycle all contaminated water arising from the mining operations on site and to prevent the discharge of contaminated water to the environment;
- To minimise the safety and congestion impacts of traffic due to the mining operation by limiting coal trucking to daylight hours, strict enforcement of traffic regulations and road rules, avoiding

trucking during peak hours and addressing road maintenance needs in cooperation with the road authorities;
- To soften the visual impact of the project by applying the recommended mitigation measures; and
- To maintain cordial relationships with local residents, authorities and other stakeholders via sustained open communication.

11.4 Rehabilitation Requirements

As the mine is an underground mine, there will be no concurrent rehabilitation. Final rehabilitation will be carried out once the Leslie 1 Project goes into its closure phase. This final rehabilitation will be carried out within the context of the closure plan.

The principles for proper rehabilitation, which should be followed, are:

- Preparing a comprehensive rehabilitation plan prior to the commencement of all mining areas;
- Landform design (levelling, top-soiling) and seeding;
- Maintenance management and eradication of invader species; and minimising the area cleared for mining and associated facilities to that which are absolutely necessary for the safe operation of the mine.

The objective of the final rehabilitation, decommissioning and mine closure plan, which must be measurable and auditable, is to identify a post-mining land use that is feasible through:

- Providing the vision, objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
- Outlining the design principles for closure;
- Explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;
- Detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/ or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
- Committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
- Identifying knowledge gaps and how these will be addressed and filled;
- Detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- Outlining monitoring, auditing and reporting requirements.

11.5 A reasoned opinion: Should the Leslie 1 Project be approved?

Based on the information contained in this report, it is the opinion of the EAP that the negative environmental impacts resulting from the Leslie 1 Project can be mitigated to within acceptable limits and that the project should be authorised.

This opinion holds provided all the recommendations proposed in the specialist studies and the EIA and EMP as well as legislative requirements are implemented and adhered to.

An impact assessment has been undertaken using qualified specialists, which has incorporated extensive consultation with and participation of interested and affected parties. Applying the hierarchical approach to impact management, alternatives were firstly considered to avoid negative impacts, but where avoidance was not possible, to better mitigate and manage negative impacts. Where impacts were found to be potentially significant, various mitigation measures to manage and monitor the impacts of the project have been proposed. As a final option, offset strategies should be investigated, if feasible.

The findings of the impact assessment have shown that the Leslie 1 Project would conclusively result in certain negative impacts to the environment, however, none of the specialist studies objected to the project. Moreover, the scientific specialist mitigations measures have been included into this EIA and EMP Report to reduce the significance of all the identified negative impacts. Most negative impacts can be reduced through the implementation of mitigation measures.

Leslie 1 is an underground project with minimal surface infrastructure, which thereby reduces the negative effects on agriculture, which is an important sector in the area. By avoiding areas of high agricultural potential, the two activities can co-exist.

The potential positive impacts include the creation of jobs, generation of wealth within the community and an additional coal resource towards the economy. The quality of coal makes it suitable for use in the domestic thermal market (Eskom). The Leslie 1 Project will thus facilitate the planned mining activities and will have rollover benefits in terms of local employment, local economic development and, increased government revenue and taxes.

11.6 Period for which Environmental Authorisation is required

The EA is required for a period of 30 years.

11.7 Other information requirements

These have been discussed throughout the EIA report. For each additional information requirement, the applicable Chapter and/or Subchapter will be referenced.

11.8 Oath Undertaking

The EAP hereby confirms:

- The correctness, to the best of his knowledge, of the information provided in the specialist reports and on information provided by Leslie Coal Mine (Pty) Ltd. The information was accepted as being as reliable as information generated during an EIA and a feasibility study, and provided in good faith, can be;
- The inclusion of comments and inputs from stakeholders and I&APs;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

12 Financial Provision

The Rehabilitation, Decommissioning and Mine Closure Report is included in Appendix D17.

12.1 Closure Cost Methodology

The closure cost calculation has been performed in accordance with NEMA GN R1147 of 2015 Financial Provision Regulations. The methodology employed to calculate the closure costs is detailed in Section 15.1.3 of the Rehabilitation, Decommissioning and Mine Closure Report. Section 15.1.3.1 presents the potential unplanned closure costs (worst case scenario) for year 1 of the Project. Rehabilitation spend (excluding concurrent rehabilitation) will be greatest during the latter part of the mine lifecycle (decommissioning phase) as this is when infrastructure will be demolished, the laydown area rehabilitated and the entire mining footprint prepared for the submission of a closure certificate.

Note that only cost associated with the closure and rehabilitation of Leslie 1A Mining Area will be considered in this report as the Leslie 1C Mining Area will only commence mining activities following Year 11. Furthermore, costs associated with the areas identified for possible MRF Expansion, PCD and dirty water trench have not been included in this report. Should mining continue to Leslie 1C Mining Area, this will be included in future closure and rehabilitation costs.

Due to the current uncertainty surrounding the change in the Financial Provision Regulations, this report has utilised the current existing regulations and has only determined a provision for Year 1 of the potential operations. If the Mining Right granted by the DMR, the financial provision will require updating annually, and as such any future disturbances post Year 1 will be determined and closure provisions made accordingly.

It must be noted that the amounts presented in this section are nominal and undiscounted, the calculation does not include the time-value of money.

12.2 Concurrent Annual Environmental Cost

Concurrent annual environmental costs will be included into the operating budget of the mine. The operation has not been initiated and a Zero (R 0.00) rand concurrent annual environmental cost is reported.

12.3 Unplanned Closure Cost Year 1

The closure costs of the aspects linked with the project have been determined using the DMR Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provisions Provided by a Mine (2005). The closure costs are based solely on the premature closure of **Leslie 1A Mine Area**, as this would be the only area that would have been impacted upon within one year of operation.

The approach to calculating the closure quantum as specified in the DMR Guideline is summarised as follows and is reported in Table 2-2 of the guideline:

- Step 1: Determine the Mineral Mined which will be Coal.
- Step 2A: Determine Primary Risk Class which is determined as High Risk.
- Step 3: Determine Environmental Sensitivity has been determined by reference to Table B.4 of the DMR Guideline as "High"
- Step 4.1: Determine level of information – Limited information is available at this stage of the project and as such Option 3 a rule based approach will be followed.
- Step 4.2: Determine the closure components and associated rates; Table 12-1 details the rates which have been escalated with the Consumer Price Index since the inception of the guidelines. These increase in rates are detailed in Appendix B.

Table 12-1: Rates associated with closure components 2018

Main Description	Included in Project	Unit	Rate 2018
1. Dismantling of processing plant and related structures (including overland conveyors and powerlines)	Yes	m^3	R14.39
2(A). Demolition of steel buildings and structures	Yes	m^2	R200.51
2(B). Demolition of reinforced concrete buildings and structures	Yes	m^2	R295.49
3. Rehabilitation of access roads	Yes	m^2	R35.89
4(A). Demolition and rehabilitation of electrified railway lines	No	m	R348.26
4(B). Demolition and rehabilitation of non-electrified railway lines	No	m	R189.96
5. Demolition of housing and facilities	No	m^2	R401.02
6. Open pit rehabilitation including final voids and ramps	No	Ha	R204,099.12
7. Sealing of shafts, adits and inclines	Yes	m^3	R107.65
8(A). Rehabilitation of overburden and spoils	Yes	Ha	R140,146.65
8(B). Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	Yes	Ha	R174,550.12
8(C). Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	No	Ha	R506,976.31
9. Rehabilitation of subsided areas	No	Ha	R117,351.71
10. General surface rehabilitation, including grassing of all denuded areas	Yes	Ha	R111,019.79
11. River diversions	No	Ha	R111,019.79
12. Fencing	No	Ha	R126.64
13. Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	No	Ha	R42,212.85
14. 2 to 3 years of maintenance and aftercare	Yes	Ha	R14,774.49

- Step 4.3: Determine the unit rates for closure components. The rates used in the assessment are based on the original 2005 rates included in the guideline, with these rates inflated by the Consumer Price Index (CPI) as published by Inflation World Wide until 2018.
- Step 4.4: Determination of weighting factors:

- Weighting Factor 1: The nature of the terrain where the operation is located is **Flat**.
- Weighting Factor 2: The proximity of the operation to an urban centre. In this instance the Project is considered **Peri urban**.

❖ Step 4.5: Identify areas of disturbance. Table 12-2 details the areas of disturbance measured for proposed infrastructures, as disturbed in Year 1 of operation. Note that the areas have been calculated based on the mine plan; however, opinions of the EAP have been taken to adequately calculate mining structures and infrastructure associated with similar operating mines. Therefore, areas covered hereunder may not correspond with the areas as detailed in the mine plan for Leslie 1A Mining Area. Additionally, as this cost is based on Year 1, only one incline shaft will have been sunk and a portion of the MRF would have been constructed.

Table 12-2: Areas of Disturbance

Infrastructure	Year 1 of Operation
Incline Shaft Rehabilitation	
Incline Shaft 1	3.5 ha
Sub Total	**3.5 ha**
Rehabilitation of Overburden and Spoils	
Topsoil Stockpile	1.4 ha
Product Stockpile	1.78 ha
ROM Pad	2.24 ha
ROM Buffer for Incline Shaft 1	2.76 ha
ROM Buffer for Incline Shaft 2	1.61 ha
MRF Co-disposal (Estimated that 20% of the 28.3 ha would be used in Year 1)	5.66 ha
Sub Total	**15.45 ha**
Demolition of Steel Buildings and Structures	
Coal Washing Plant	0.1 ha
Pump Station at PCD	0.01 ha
Sub Total	**0.11 ha**
Dismantling of Overland Conveyors and Powerlines	
Overland Conveyors (4,104.12 m x 1.5 m)	0.62 ha
Sub Total	**0.62 ha**
Demolition of Reinforced Concrete Buildings and Structures	
Mine Infrastructure/ Offices	0.08 ha
Heavy and Light Vehicle Workshop	0.1 ha
Temporary Workshops at Incline Shaft 1	0.01 ha
Temporary Change House and Offices ad Incline Shaft 1	0.01 ha
Sub Total	**0.2 ha**
Demolition of Dams	
Pollution Control Dam	1.36 ha
Sub Total	**1.36 ha**
Rehabilitation Access Roads	
Access Road for Heavy Vehicles (1,141.58 m x 15 m)	1.7 ha
Access Road for Light Vehicles (977.53 m x 8 m)	0.78 ha
Sub Total	**2.48 ha**
Total Area ha	**23.72 ha**

- Step 4.6: Identify closure costs from Specialists. At this stage of the project no specific closure costs have surfaced based on specialist studies completed to date. However the identification of closure costs from further specialist studies will be incorporated into future drafts of the rehabilitation, decommissioning and mine closure plan.
- Step 4.7: Proposed closure costs for the Project.

Table 12-3: Year 1 Unplanned Closure Cost

Risk Class	**High Risk A**						
Environmental Sensitivity	**High**						
Nature of Terrain (Weighting Factor 1)	**Flat**						
Proximity to Urban Area (Weighting Factor 2)	**Peri Urban**						
Main Description	**Units**	**Quantity**	**DMR Master Rate 2018**	**Multiplication Factor**	**Weighing Factor 1**	**Amounts**	**Comments**
1. Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m^3	6,200	R 14.39	1	1.05	R 89,218.00	Coveyors
2(A). Demolition of steel buildings and structures	m^2	1,100	R 200.51	1	1.05	R 220,561.00	Wash Plant and Pump Station
2(B). Demolition of reinforced concrete buildings and structures	m^2	2,000	R 295.49	1	1.05	R 590,980.00	Mine Infrastructure and Workshops, incl temporary offices
3. Rehabilitation of access roads	m^2	24,944	R 35.89	1	1.05	R 895,240.16	Haul and access roads
7. Sealing of shafts, adits and inclines	m^3	35,000	R 107.65	1	1.05	R 3,767,750.00	Sealing of Incline Shafts
8(A). Rehabilitation of overburden and spoils	ha	15.45	R 140,146.65	1	1.05	R 2,165,265.74	Spoils and Topsoil
8(B). Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	1.36	R 174,550.12	1	1.05	R 237,388.16	PCD
10. General surface rehabilitation, including grassing of all denuded areas	ha	23.72	R 111,019.79	1	1.05	R 2,633,389.42	General rehabilitation
	Sub Total 1					R 10,599,792.48	
Preliminary and Generals	12,5% of Sub Total 1					R 1,324,974.06	
Administration and Supervision	6% of Sub Total 1					R 635,987.55	
Contingency	10% of Sub Total 1					R 1,059,979.25	
	Sub Total 2					R 13 620 733.34	
VAT @ 15%						R 2 043 110.00	
Grand Total - Sub Total 3						**R15 663 843.34**	

Table 12-4: Post Closure Costs

Risk Class	**High Risk A**						
Environmental Sensitivity	**High**						
Nature of Terrain (Weighting Factor 1)	**Flat**						
Proximity to Urban Area (Weighting Factor 2)	**Peri Urban**						
Main Description	**Units**	**Quantity**	**DMR Master Rate 2017**	**Multiplication Factor**	**Weighing Factor 1**	**Amounts**	**Comments**
Year 1 of operations post closure costs for 2 to 3 years of maintenance and aftercare	ha	23.72	R 14,774.49	1	1.05	R 350,450.90	Year 1
Sub Total 1						R 350,450.90	
P&Gs	12,5% of Sub Total 1					R 43,806.36	
Administration and Supervision	6% of Sub Total 1					R 21,027.05	
Contingency	10% of Sub Total 1					R 35,045.09	
Sub Total 2						R 450,329.41	
VAT @ 14%						67549.4115	
Grand Total - Sub Total 3						R517 878.82	

12.4 Total Unplanned Closure Cost

The total closure provision required for the project is detailed in the table below:

Table 12-5: Total Closure Provision

Mining Right	Closure Cost after YR1 of Operation	Post Closure Costs
Leslie 1 Mine	R15 663 843.34	R517 878.82
Total Unplanned Closure Provision		**R16 181 722.16**

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