BEAL
CONSULTING ENGINEERING & PROJECT MANAGEMENT

REPORT

ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

TRAFFIC IMPACT ASSESSMENT FOR THE KALABASFONTEIN PROJECT

Submitted to:

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EXECUTIVE SUMMARY

Brief

Environmental Impact Management Services (EIMS) commissioned BEAL (Pty) Ltd (BEAL) to conduct a Traffic Impact Assessment for the proposed Kalabasfontein project near Bethal for Forzando Mines (Pty) Ltd.

The need for the study arose from the Scoping process conducted by EIMS in compliance with the requirements of Appendix 6 GNR982.

Development Description

The Kalabasfontein Project area extends to the south-east of the Forzando Complex, while making use of the existing access incline. Use will be made largely of the existing surface infrastructure, except that a new ventilation shaft will be provided to the north-west.

The current production output will remain effectively the same as in the past, the extraction merely moving northwards.

Impact Assessment

No increase in traffic is foreseen post construction.

Additional traffic will be generated during construction of the new mine infrastructure. The effect of the impact takes the form of dust, road surface damage, traffic impedance, and resultant reduced road safety. The extent of the impact will be notable but still well within the capacity of the access roads. The intensity of the impact is very low due to the low volumes of heavy and abnormal loads, stretched out over a long period.

A number of safety hazards related to traffic and road infrastructure were however identified that calls for mitigation measures.

Proposed mitigation measures

Proposed measures to mitigate traffic impact on the receiving environment include limiting heavy deliveries to daytime, limiting abnormal loads to daytime and dry weather, escorting of abnormal loads, and immediate repair of road surfaces where damaged.

Due to the low intensity of traffic, it is not deemed justified economically or environmentally, to provide a hard surface for the gravel access road. It is proposed that the access road be graded and water sprayed during construction.

Longer-term measures to improve road safety and operations include improvement of the access entrance and the intersection at the paved road, spot improvement and regravelling of the access road, reinstatement of cross and side drainage, and removal of road reserve encroachment of the public road passing the mine (or alternatively road closure).

Upon closure of the mine, the road must be regravelled and the mine boundary fences reinstated.

Reasoned Opinion

The proposed mining extension to the north does not pose any environmental impacts related to traffic that cannot be mitigated satisfactorily and economically. There is no reason to withhold environmental authorization from a traffic impact point of view.

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1. INTRODUCTION

1.1. SPECIALIST'S DETAILS

Two specialist engineers carried out the assessment and co-authored the report, the details of whom are as follows, and the CV's of whom are appended herewith:

- Dr Louis Johannes Grobler, ID 6404225068087, ECSA Registration Number 930519
  BEng Hons (Traffic Engineering) PhD (Civil Engineering)
  30 years' experience in Transportation Planning, Traffic Engineering, Traffic Impact Assessment
  Specific involvement in roads infrastructure and road traffic safety in a mining and industrial environment.
- Mr Riaan de Beer, ID 8806135038083 BTech Civil Engineering (Environmental Engineering) 8 years' experience in Environmental Engineering with specific focus on Mine Closure and Rehabilitation.

1.2. BRIEF

The need for the study arose from the Scoping process conducted by Environmental Impact Management Services (EIMS), and compliant with the requirements of Appendix 6 GNR982.

EIMS commissioned BEAL (Pty) Ltd (BEAL) to conduct a Traffic Impact Assessment for the proposed Kalabasfontein Mine near Bethal for Forzando Mines (Pty) Ltd. The location of the mine can be seen in Figure 1 below.

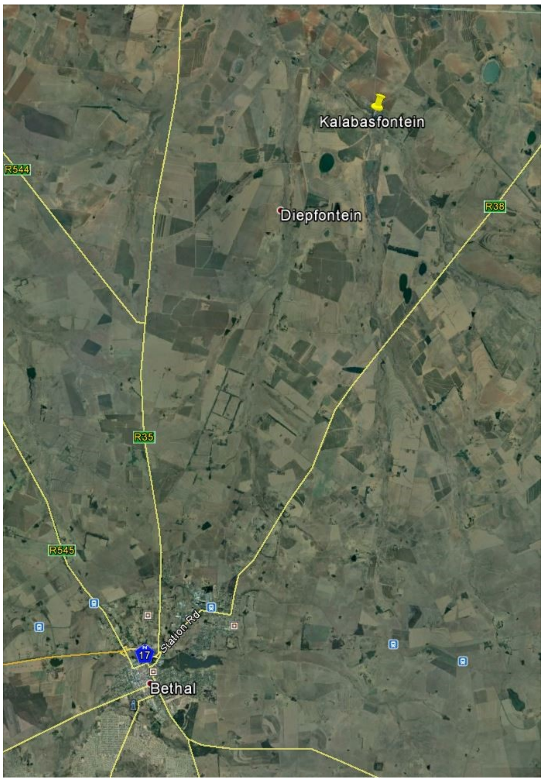


Figure 1: Locality Map

1.3. ASSESSMENT METHODOLOGY

The assessment approach is as follows:

- As will be shown in the assessment below, the intensity of the traffic generated by the mine is very low relative to the average public road
- The roads leading to the mine carries mixed traffic (public traffic and traffic generated by the mine)
- It is observed that the responsible government agency renders almost no road maintenance on the public roads leading to the mine
- It is thus not straight forward to attribute effect to cause when a particular negative road traffic incident occurs
- A number of negative road traffic impacts were nevertheless identified in the assessment that may have a high risk of occurring on the access road and mine entrance, despite the low traffic intensity
- In light of the above, the approach followed in the assessment is to not focus on the responsible party to who's activity or neglect a negative effect may be attributed, but to rather identify those mitigation measures that the Applicant can implement cost-effectively with the view to improve road traffic safety, level of service, and effective traffic operations in general.

The assessment methodology is as follows:

- The sources of information on which the assessment is based are identified
- The proposed activity is briefly described in general terms with the focus on traffic generators and transportation infrastructure
- The objectives of the assessment are defined
- The scope of the assessment is outlined in terms of subject matter, receiving environment, delimitations, and specific aspects to be included
- Assessment scenarios are defined and described in more detail with reference to the relevant activities and receiving environment
- An assessment of traffic impact is carried out for each scenario with reference to cause, effect, inter-relating mechanism, possible impact, and likelihood
- Mitigation measures are identified and evaluated per scenario and per impact
- The effectiveness of the mitigation measures are quantified using a significance rating matrix
- A reasoned opinion is formed from the assessment
- Conditions and monitoring mechanisms are proposed for consideration by the Environmental Practitioner and competent authority for inclusion in the Environmental Authorization and EMPr.

1.4. INPUT INFORMATION

The assessment is carried out based on the following information:

- Scoping Report provided by the Environmental Practitioner (dated 8 August 2018)
- Information provided by the competent authority (none provided)
- Desktop information from open sources (e.g. Google Earth and Google Maps)
- Consultations conducted with interested and affected parties (none)
- Any other minimum information required by the Minister pertaining to traffic impact specialist reports (none to the author's knowledge)

- Observations and photography from the site inspection (The site inspection was carried out on 27 September 2018 by the authors. This time of year is at the end of the dry season. It can be reasonably expected that road traffic safety, level of service and driver comfort on the gravel and dirt roads in the study area will be much improved from a visibility point of view on the one hand, but on the other hand, much reduced from a traction and overtopping point of view, in the wet season).

1.5. GENERAL DESCRIPTION OF THE PROPOSED PROJECT

The subject mine is located within the Govan Mbeki Local Municipal area in the Gert Sibande District Municipal area in Mpumalanga Province.

The Kalabasfontein Project area extends to the south-east of the Forzando Complex, while making use of the existing access incline, as shown in Figure 2 below (excerpt from Scoping Report).

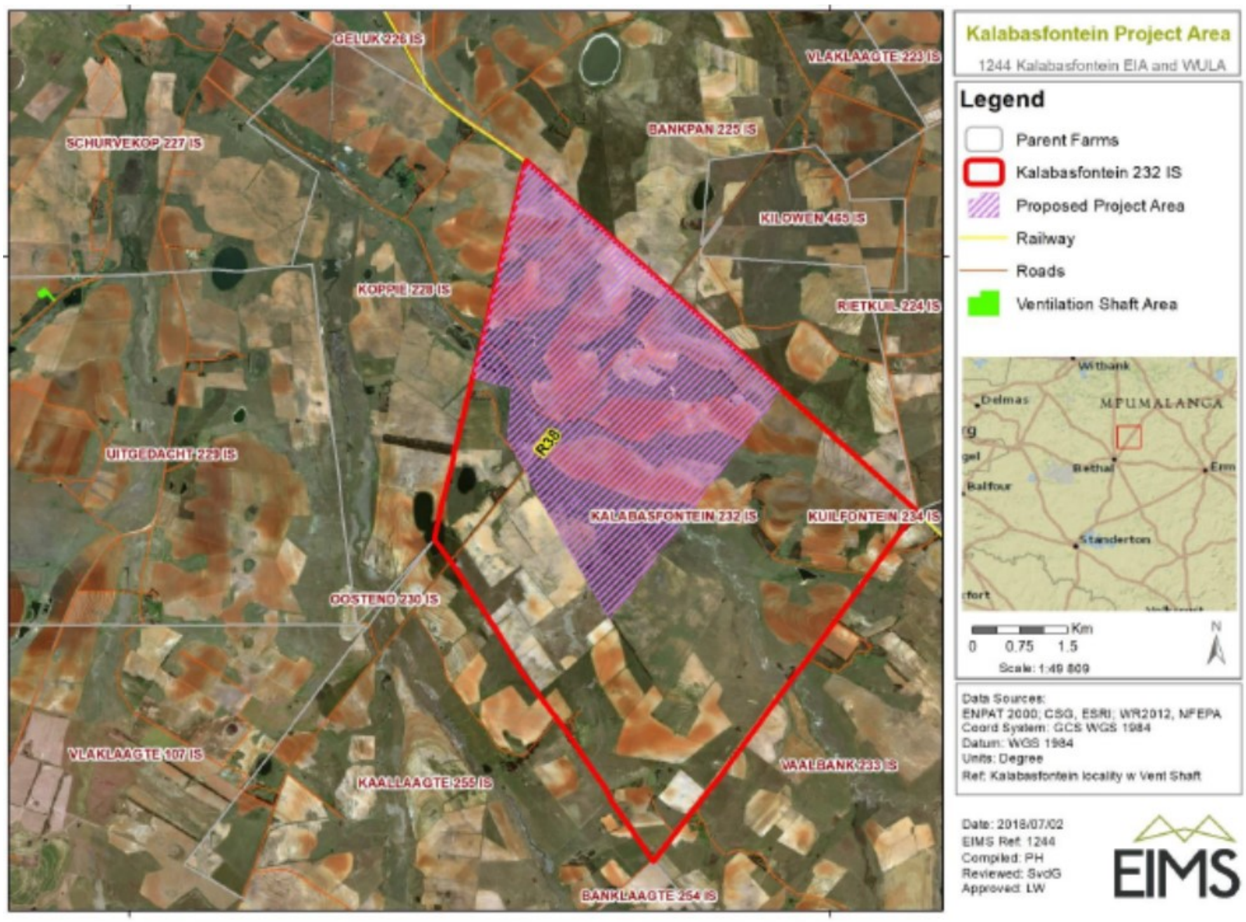


Figure 2: Kalabasfontein Mining project area

1.6. ASSESSMENT OBJECTIVES

The study aims to provide the Environmental Practitioner and competent authority with the necessary specialist evaluation of the impact of project-related traffic on the receiving environment, to propose alternative mitigation measures, and to identify any conditions for inclusion in the Environmental Authorization and EMPr.

1.7. SCOPE OF ASSESSMENT

The receiving environment - the subject of this report - is defined as being the road user, both on the internal private roads, and on the surrounding public roads. The road user in turn includes motorized traffic and non-motorized traffic. By extension, the road user also includes animals on the road and roadside. The subject traffic includes both traffic bound to the mine and through traffic.

This assessment specifically precludes the following aspects of the receiving environment that might be impacted by traffic:

- Vegetation and crops impacted by dust from the road
- Streams having been retained or deviated by road construction
- Natural storm run-off having been concentrated to road culverts
- Proposed undermining of the national road.

These aspects of the receiving environment are assumed to be covered by other relevant specialist studies e.g. biodiversity, water management, geotechnical, or as may be the case.

This assessment is limited to the following traffic and road related aspects:

- Description of critical scenarios on which the assessment will be based
- Determination of existing baseline traffic patterns
- Changes in traffic at various stages of the project
- Assessment of the traffic impact on the receiving environment for the assessment scenarios
- Proposing measures to mitigate the traffic impacts for the assessment scenarios.

2. ASSESSMENT SCENARIOS

A description is provided of assessment scenarios with distinctive impact profile. The following three scenarios are defined:

- Baseline scenario (current)
- Interim scenario (construction phase of the mine expansion/relocation)
- Sustained scenario (post-construction phase for the duration of mining)
- Closure scenario (during closure of the mine and incline, and thereafter).

The scenarios are briefly described below.

2.1. BASELINE SCENARIO

Existing mine infrastructure

The existing Forzando South mine surface infrastructure comprises of an incline providing access to the underground workings, an adjacent office complex and workshop, conveyor infrastructure, ventilation shaft, catchwater dam, other engineering and environmental infrastructure, and residential facilities, all as shown on the Figure 3 below. The proposed Kalabasfontein mine project will make use of all of these infrastructure.

Figure 3: Existing Forzando South Mine Surface Infrastructure

Site access control

The mine complex is served by the main access gate and one maintenance gate, about 500 m apart. During the site visit no access control was being applied and the maintenance gate was left open and unmanned. Photo 1 below (left) indicates the main access with spill protection infrastructure installed on the conveyor in the background. Photo 1 (right) indicates the maintenance acess gate.

Photo 1: Main Access Gate (Left) and Maintenance Gate (Right)

Photo 2 below shows the road signage at the entrance gate. It should be noted that the signs are not in accordance with the SA Road Traffic Signs Manual, and illogical. It appears that the perimeter fence was moved to allow additional space for site infrastructure, causing the re-alignment of the road to the extent that it no longer complies with geometric safety standards.

Photo 2: Realignment of and incorrect signage on public road D638

Road network

The public road network connecting the mine complex is shown in Figure 4 below. The network elements are discussed subsequently.

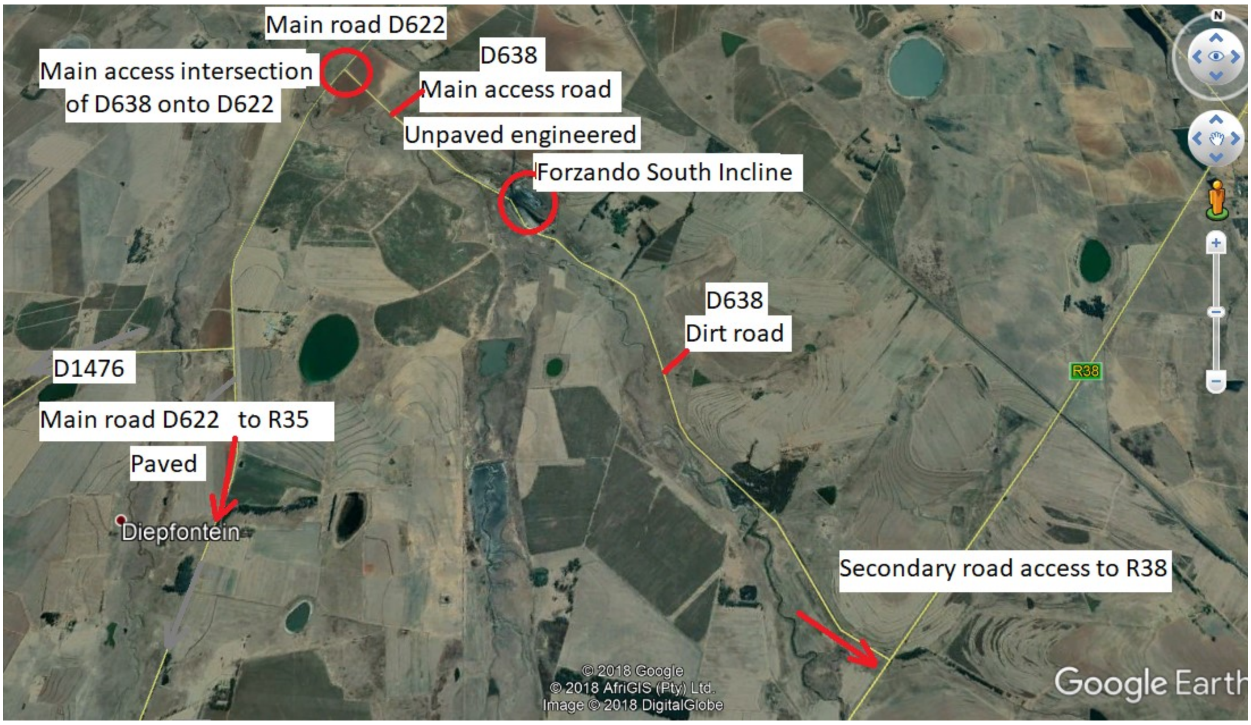


Figure 4: Public Road Network

Main access road D638

The mine complex is connected by an engineered unpaved road (D638) to the nearest paved road (D622) approximately 2.3 km to the north-west. The road reserve of D638 is 8 m wide with no low-level stream crossings (drifts) or narrow bridges that could restrict access to large vehicles (even abnormal loads). The road is being maintained by the mine despite it being a public road. The road needs spot improvement and re-gravelling to provide safe all-weather travelling.

Photo 3: Main Access Road D638 at mine entrance

From Photo 4 below it can be seen that the cross-culvert pipes are still intact but with no cover soil remaining. The culvert is also blocked on both sides by consecutive grading. Miter drains are not being maintained properly.

Photo 4: Poor Drainage on Main Access Road D638

Intersection of main access road D638 with nearest paved road D622

The photos below depict the intersection of the main access road with the paved district road to the north-west of the mine.

On Photo 5 below (left), note the restricted shoulder sight distance estimated at 250 m (guideline distance is 370 m for 100 km/h operating speed and single unit truck). Also note the incorrect use of the row of danger plates, the function of which is not clear in this context. On the contrary, these plates contribute to restricting the line of sight for the vehicle waiting to turn.

On Photo 5 below (right), note that the approaching road D638 has no paving, causing gravel to spill and damage the paved road D622.

There are no laybys for public transport at this junction, forcing taxis and buses to stop half on the surface when loading and off-loading, given the narrow gravel shoulder.

Photo 5: Intersection of Main Access Road D638 with Paved District Road D622

Secondary access road R638

It is possible from a network viewpoint to connect from the mine to the R38 in the south-east via the dirt road R638. However, this road has evidently not received any maintenance for a long time as it is in a very poor state and generally unsafe. It has no gravel wearing course left, drainage features are non-existent, and the road formation has been washed away. Photo 6 below is a typical view of Road D638 south of the mine complex.

Photo 6: Secondary Access Road D638 south of the mine complex

The road reserve has been encroached by roadside fencing along the mine complex, and guardrails restrict the road width, as shown on Photo 7 below.

Photo 7: Secondary Access Road D638 encroached by mine complex

Without significant investment and intervention, this road is not deemed safe for use by the mine and the public.

Intersection of secondary access road D638 with R38

The intersection of the dirt road D638 with the R38 is adequate in terms of acceleration and deceleration lanes. It has a 6 m wide surfaced sideroad approach and good shoulder sight distance, as shown on the photos below.

Photo 8: T-junction of secondary dirt access road D638 with R38

Photo 9: Secondary dirt access road D638 approach to R38

Main paved road D622

The public district road D622 to which the unpaved access road D638 connects, has a surfaced width of 7m and 1.5 m unpaved shoulders, with a posted speed limit of 100 km/h over the intersection zone.

In a north-easterly direction (turning right from D638) D622 ends after 2.3 km at the Forzando-north mine and conveyor-to-rail transfer terminal. In a south-westerly direction (turning left from D638) D622 ends after approximately 17 km with a T-junction at the R35 (connecting Bethal and Middelburg). The R35 intersection meets applicable SANRAL standards.

D622 was reportedly upgraded by a consortium of mines operating along the road to provide all-weather connectivity for mine traffic. From a visual drive-through it appears that the road meets appropriate geometric and safety standards for a Class C road and 100 km/h design speed.

Albeit a public road, D622 is being maintained by the Exxaro Group, of which the subject mine forms part. Photo 10 below depicts Road D622 crossing the railway line in the north-east (left) and its intersection with R35 T-junction (right).

Photo 10: Paved District Road D622 crossing the rail line (Left) and intersecting with R35 (Right)

Current traffic patterns

No product haulage is currently conveyed by road, since all haulage is undertaken by conveyor. There are also no other mines transporting coal product via the roads in the study area.

Due to the proximity to town, only very limited housing is provided on site. Residential facilities are provided on an adjacent farm to the south-east of the mine complex.

There is no school in the area and the few resident learners are transported daily by mine shuttle.

The majority of workers is shuttled by mine bus daily between Bethal and the mine. The number of white-collar workers using private transport is limited. During the site visit on Thursday 27 September 2018, less than 30 cars were observed around 12h00 in the staff car park. Another 20 cars or less were observed in the visitor's car park.

It is imagined that visitor trips are spread throughout the day. During the entire traverse by the authors from the R38 to the junction with the paved road D622 in the north, only one small car and one agricultural implement were observed using RoadD638.

Worker trips (both by shuttle and private) are expected to be concentrated in the morning and afternoon peak hours, during which an estimated 30 light vehicles and perhaps two of three taxi-buses will enter and exit the complex.

All mine traffic uses the main access road D638 to the north-west, most of which turning left onto the paved district road D622, and connecting to the R35, where most traffic turns left to Bethal.

The mine uses the secondary dirt road D638 to the south-east only as far as the adjacent residential farm goes, and very little through traffic (those trips not connected to the mine) uses this road to and from R38. Use of this road is almost exclusively limited to the few farms south of the mine that do not have an alternative access road to the main road network.

2.2. INTERIM SCENARIO

The Interim Scenario refers to the duration of the transition from the current southern mining area to the proposed northern mining area.

It is assumed that the transition will entail upgrading of the surface infrastructure and housing at the existing complex. The extent of the upgrading is however not known at this early stage.

Based on the above assumption, some additional traffic will be generated during the transition, related mostly to the construction of the upgrading of the mine infrastructure and bringing in of new mining equipment.

It is not possible to make an informed estimation of the additional traffic during this phase. It is imagined though that it would not exceed ten or so light pick-up or commercial vehicles on any particular day, three or four delivery or construction trucks on any particular day, and perhaps three or four abnormal loads over the duration of the phase.

It can be seen that while the exact numbers of additional traffic is uncertain, the extent and effect is deemed to be relatively minimal.

2.3. SUSTAINED SCENARIO

The sustained scenario refers to the post-transition phase, when all construction activities have subsided, and the northern mining area has fully substituted the current southern mining area.

The existing access incline and conveyor system will be retained in their current form. Still, no road haulage of product will be done.

The proposed new ventilation shaft, some five kms to the west of the Forzando South mine incline, will not generate notable traffic and will thus have no traffic impact at all.

According to the Environmental Scoping Report, production will by and large remain at the current level, but with a slowdown during the start-up phase, slight above-average production during the mid-phase, and gradual slowdown towards the closure phase.

It thus follows that the sustained scenario will generate traffic volumes of the same level and patterns as currently.

No alterations are foreseen to the adjacent road network and access arrangements. The default scenario is that all access roads will remain public roads, unless the mine pursues the closure of the secondary dirt road D638 where it passes the mine complex, meaning that south of the mine it will remain a public road but that through traffic is disallowed.

2.4. CLOSURE SCENARIO

The closure scenario refers to the post-mining phase when all mining has seized.

During the closure phase the incline with associated mining infrastructure will be dismantled, and the land rehabilitated. During these operations, traffic volumes on D638 can be expected to increase temporarily to the same levels that pertain to the Interim scenario.

Upon completion of closure, traffic volumes on D638 will drop to well below current levels.

3. IMPACT ASSESSMENT

Some negative effects may be caused directly by traffic generated by the mine. These may include the road grader that grades the road, the mine bus transporting workers, and an abnormal load delivering mining equipment. In other instances however, the negative effects already exist and are caused by the current mix of mining and public traffic. It would not be possible in the event of an incident, to relate the consequence directly to mining traffic. Examples may include a collision between a mine vehicle and a public vehicle due to a slippery road or poor sight as a result of dust.

Foreseeable negative effects of traffic may take the form of dust, and road surface damage after rain. These effects are caused mainly by the access road not having an all-weather hard surface. It is well documented that the mere surfacing of a dirt road significantly improves levels of service, driving comfort and road safety of the road.

Reduced driving comfort (as measured by the International Roughness Index), is undoubtedly exacerbated by an increase in heavy traffic on an unsurfaced road. Driving comfort is reduced when rutting occurs, when the wearing course has large aggregate that come loose due to traffic or after grading, and corrugation due to infrequent grading.

The above effects all contribute to reduced road safety.

Subtle negative effects (the impact of which are not catastrophic) caused by an increase in traffic may include impedance of public traffic in the form of reduced speed while following, and reduced overtaking opportunities. Due to the very low traffic intensity, the short length of the main access road to the mine, the relatively flat topography, and the mostly straight alignment of the road, it is highly unlikely that the level of service while travelling on the access road to the mine will be impacted notably in the particular case.

The impacts foreseen in each of the scenarios are discussed further below.

3.1. INTERIM SCENARIO

Specific causes of negative effects foreseen during this stage include abnormal loads delivering mining equipment, increased visitor traffic, and increased delivery truck traffic.

Negative effects include reduced visibility due to dust, and reduced driving comfort due to increased potholes.

Negative impacts include reduced road safety and reduced driving comfort.

The intensity of the impacts remains low due to the low volumes of heavy and abnormal loads, stretched out over a long period.

The significance of incidents may however range from damage to fatality, and thus calls for the investigation of mitigation measures.

3.2. SUSTAINED SCENARIO

The causes, effects and impacts attributable to traffic under this scenario are similar to the interim scenario, although the intensity reduces due to traffic volumes reverting back to the baseline state.

Additional risks that are pertinent in a long-term context, and that could possibly be addressed economically in such context, are as follows:

1. The main entrance access on D638 is situated on an incline (on the ingress direction), making it difficult to apply gate control at that point. The concrete road surface is uneven. The road edge is not clearly defined by kerbing. Road signage is incorrect and ambiguous. The combination of these effects contribute to poor road safety and traffic operation.
2. The route alignment of the dirt road D638 where it skirts the mine perimeter fence does not comply with acceptable geometric standards. The road width is reduced so that heavy traffic from opposite directions cannot safely pass.
3. The road formation of the main access road D638 has been washed away at places, reducing driver comfort and impacting on road safety.
4. Side drainage of the main access road D638 has been lost over time, which results in overtopping damage during storms.
5. Cross drainage of the main access road D638 was rendered ineffective by the blocking of in- and outlets caused by blading off material in windrows over the pipe openings. This again results in overtopping damage during storms.
6. Shoulder sight distance of the main access road D638 at the intersection with the paved district road D622 is obstructed by the incorrect danger plates on the side of D622.
7. The gravel surface of the approach of D638 to the T-junction with D622 makes deceleration difficult, and it spills gravel onto the paved road, causing a road safety hazard and damage to the district road surface.
8. No provision is made for buses and taxis to stop for passengers at the T-junction of D638 with D622.

3.3. CLOSURE SCENARIO

The traffic impact during the closure operations is similar to that during the Interim scenario (see above).

Since the mine will seize to carry out road maintenance subsequent to mine closure, and given the low level of maintenance expected for the low-order public roads, it can be expected that road traffic safety, level of service and driver comfort will gradually reduce over time, despite the much lower traffic.

4. PROPOSED MITIGATION

It was found that the identified impacts can all be mitigated in a cost-effective manner. The proposed mitigation measures are provided per scenario below.

4.1. INTERIM SCENARIO

Immediate measures to be considered in mitigation of the identified negative impacts related to traffic in this scenario include the following:

1. Limiting heavy deliveries to daytime will largely avoid the risk of collision due to poor sight.
2. Limiting abnormal loads to daytime and dry weather, providing escort, and applying stop-go control at locations of restricted road width will largely avoid the risk of collision in these instances.
3. Having a small road maintenance team on standby under the guidance of a road inspector to immediately repair road surface damage will largely avoid the risk of loss of control due to potholes and large stones etc.
4. Regular grading of the road surface of the main access road will improve road safety and driver comfort.

4.2. SUSTAINED SCENARIO

Measures to be considered to cost-effectively mitigate the identified negative impacts on a long-term sustainable basis include the following:

1. Closing Road D638 for public through traffic just south of the mine maintenance gate will negate the necessity to realign this stretch of road. If the mine contemplates such closure, it is proposed that gated access is allowed for public through traffic during day-time. If that is not allowed by the authorities or pursued by the mine, then the road must be realigned and widened to engineering standards and the perimeter fence moved further away from the road. This is so as to remove the current hazards and width restrictions along this stretch of the road.
2. The main entrance must be re-engineered and upgraded to proper engineering standards, including consideration for traffic channelization, gate control, and signage.
3. Gate control must be moved to such position where the incline is less than 3%. These measures will improve driver clarity and overall operations at the entrance, improving road safety and security in general.
4. Spot-improvement of the main access road D638 must be done, especially at places where rock outcrops protrude into the road surface, at low points where overtopping occurs.
5. The road formation of the main access road D638 must be filled and reformed where damaged. This is so as to facilitate a safe and consistent operating speed without surprises to the driver, as well as to accommodate heavy vehicles from opposing directions.
6. The main access road D638 must be re-gravelled so as to render a wearing course for skid resistance during wet spells, prevent rutting after rain, and prolong the development of corrugations.
7. Some 100 m of the approach on D638 to the district road T-junction with D622 must be provided with a hard surface to engineering dimensions. The incorrect road signage must be replaced by compliant signage.
8. Provision is to be made for a layby on either side of the district road D622 in the vicinity of the T-junction, accompanied by road widening and shelter.

4.3. CLOSURE SCENARIO

The mitigation of traffic impact during the closure operations would be similar to those proposed for the Interim scenario (see above). Furthermore, it must be ensured that upon closure of the mine, the following measures are implemented:

1. The public gravel access road D638 between the mine entrance and D622 must be regravelled.
2. The mine property fence bordering the public road D638 must be reinstated.
3. The access gates to the mine off D638 must be removed and the gaps fenced.

It falls outside the responsibility of the Applicant to mitigate for possible traffic impacts post the closure of the mine.

5. SIGNIFICANCE RATING

The final significance of the impacts, taking into account the effectiveness of the proposed mitigation measures, is quantified using the *Significance Rating Matrix* as provided by EIMS.

The Significance Rating data sheets with inputs and calculations are attached as **Appendix 1**. The significance ratings of for the three scenarios are summarized as follows:

- Interim (Construction) Phase: The mitigation measures reduce the Environmental Risk Index from -14 to -3, with a Final Significance Rating of -3
- Operations (Construction) Phase: The mitigation measures reduce the Environmental Risk Index from -22 to -5, with a Final Significance Rating of -7
- Sustained (Post-closure) Phase: The mitigation measures reduce the Environmental Risk Index from -24 to -6, with a Final Significance Rating of -9.

6. REASONED OPINION

The proposed Kalabasfontein project that comprises the mining of the norther Forzando mining area in lieu of the current southern Forzando mining area will have a moderate impact from a road traffic safety and level of service viewpoint. Some cost-effective measures are proposed in mitigation of possible negative impacts and prevention of negative incidents during the Interim phase.

Once the upgrading works for the transition has been completed, traffic volumes will revert to the current low intensity levels. Mitigation mainly comprises monitoring and routine maintenance.

Additional measures are proposed, mostly of a capital nature, which will significantly enhance road traffic safety and levels of service on a sustainable basis, and reduce road user costs. If discounted over the life of the proposed mining activities, it is believed that these investments will be economically justified.

Due to the low intensity of traffic, it is not deemed justified environmentally to place a condition on the Applicant to surface the gravel access road, although it will be highly beneficial both to the travelling public and the mine staff and stakeholders, and should be considered by the mine.

Certain close-out measures are proposed to ensure minimal impact to the travelling public in the long-term.

Provided that the conditions and monitoring measures proposed below are adhered to, there is no reason for withholding environmental authorization from a traffic impact point of view.

7. PROPOSED CONDITIONS

Based on the assessment and conclusions, it is proposed that the following pre-conditions and accompanying monitoring mechanisms be included in the Environmental Authorization and EMPr:

1. During the implementation phase of the Kalabasfontein project:

1.1 Heavy vehicle deliveries must be limited to daylight periods.

1.2 Abnormal loads must be limited to daylight periods and dry weather, escort must be provided, and stop-go control must apply at locations of restricted road width.

1.3 A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to immediately repair road surface damage that may occur on D638.

1.4 D638 north of the mine entrance must be graded at such intervals as deemed necessary by the road inspector, so as to maintain the road surface free from large stones, potholes and corrugation.

1.5 A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to repair road surface damage that may occur on D638 north of the mine entrance.

Monitoring Conditions:

1. A dedicated Traffic Safety Officer must be assigned to monitor road traffic safety throughout the project life span.
2. A dedicated Road Inspector must be assigned to oversee the implementation of road upgrading and maintenance, if required.

8. PRE-EXISTING CONDITIONS

The effect of current traffic impact takes the form of dust on the unpaved access road, road surface damage caused by traffic, and other road safety issues. The extent of the impact is however well within the capacity of the access roads. The intensity of the impact is very low due to the low volumes of heavy and abnormal loads, stretched out over a long period.

However during the investigation a number of traffic and road infrastructure risks was identified which is pre-existing conditions and is very important to mitigate as soon as possible. The riskes can be effectively mitigated at relative low cost to the project and should have a social, safety and opex benefit.

The following is proposed:

1.1 Unless D638 is closed for public through traffic south of the mine entrance, the road must be realigned along the boundary with the mine complex and widened to engineering standards, and the perimeter fence moved further away from the road.

1.2 The main entrance must be re-engineered and upgraded to proper engineering standards, including consideration for traffic channelization, gate control, and signage.

1.3 Gate control must be moved to such position where the incline is less than 3%.

1.4 Spot-improvement of D638 must be done between the mine entrance and D622, especially at places where rock outcrops protrude into the road surface, at low points where overtopping occurs.

1.5 The road formation of D638 between the mine entrance and D622 must be filled and reformed where damaged to a consistent width of 9 m.

1.6 D638 between the mine entrance and D622 must be re-gravelled with suitable gravel 150 mm thick and 8 m wide.

1.7 Some 100 m of the approach on D638 to D622 must be provided with a hard surface to engineering dimensions. The incorrect road signage must be replaced by compliant signage.

1.8 A layby must be provided on either side of D622 in the vicinity of the T-junction of D638, accompanied by road widening and shelter, according to engineering standards.

2. During the operations phase of the Kalabasfontein project:

2.1 D638 north of the mine entrance must be graded at such intervals as deemed necessary by the road inspector, so as to maintain the road surface free from large stones, potholes and corrugation.

2.2 A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to repair road surface damage that may occur on D638 north of the mine entrance.

3. Upon mine closure of the Forzando South mine complex in future:

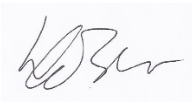
3.1 The public gravel access road D638 between the mine entrance and D622 must be regravelled.

3.2 The mine property fence bordering the public road D638 must be reinstated.

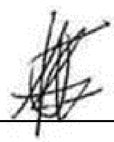
3.3 The access gates to the mine off D638 must be removed and the gaps fenced.

Monitoring Conditions:

1. A dedicated Traffic Safety Officer must be assigned to monitor road traffic safety throughout the project life span.
2. A dedicated Road Inspector must be assigned to oversee the implementation of road upgrading and maintenance.



Dr Louis Grobler (PrEng)
Traffic Engineer



Riaan de Beer
Business Unit Manager

APPENDIX 1

Significance Rating Data Sheet

Impact Name	**Road traffic safety**				
Alternative	**Alternative 1**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	1
Extent of Impact	4	3	Reversibility of Impact	5	1
Duration of Impact	2	1	Probability	4	2
Environmental Risk (Pre-mitigation)					-14.00
Mitigation Measures					
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Environmental Risk (Post-mitigation)					-3.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					-3.00

Impact Name	Road traffic safety				
Alternative	Alternative 1				
Phase	Operation				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	2
Extent of Impact	4	3	Reversibility of Impact	5	2
Duration of Impact	4	3	Probability	5	2
Environmental Risk (Pre-mitigation)					-22.50
Mitigation Measures					
Edit this once pasted into the report					
Environmental Risk (Post-mitigation)					-5.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-6.67

Impact Name	Road traffic safety				
Alternative	Alternative 1				
Phase	Rehab and closure				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	3
Extent of Impact	4	2	Reversibility of Impact	5	2
Duration of Impact	5	4	Probability	5	2
Environmental Risk (Pre-mitigation)					-23.75
Mitigation Measures					
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Environmental Risk (Post-mitigation)					-5.50
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplacable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1.67
Final Significance					-9.17

APPENDIX 2

Impact Assessment Methodology

Impact Assessment Methodology

Method of Assessing Impacts:

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). Please note that the impact assessment must apply to the identified Sub Station alternatives as well as the identified Transmission line routes.

Determination of Environmental Risk:

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R)}{4} \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 1.

Table 1: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),

Aspect	Score	Definition
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P (refer to Figure 1). Probability is rated/scored as per Table 2.

Table 2: Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER= C x P

Table 3: Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 4.

Table 4: Significance Classes

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

Impact Prioritisation:

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in the Section above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 5: Criteria for Determining Prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 11. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to Table 6).

Table 6: Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67

8	Medium	1.83
9	High	2

In order to determine the final impact significance the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 7: Final Environmental Significance Rating

Environmental Significance Rating	
Value	**Description**
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).