

Transport Impact Assessment

Lukisa Mine Rystkuil, Beaufort West

Western Cape

July 2025

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This transport impact study was prepared in accordance with the South African Traffic Impact and Site Traffic Assessment Manual (TMH 16, COTO, Aug 2012), by a suitably qualified and registered professional traffic engineer. Details of any of the calculations on which the results in this report are based will be made available on request.

EXECUTIVE SUMMARY

Lukisa Invest 100 intend to mine for uranium and molybdenum on the farm Rystkuil to the south of the town of Beaufort west in the Karoo.

Innovative Transport Solutions prepared this transportation impact assessment for the proposed Lukisa Rystkuil Mine in the Beaufort West district. This report summarises the existing transportation conditions within the site vicinity and provides an assessment of the transportation impacts of the proposed development on the surrounding transportation system.

Existing Traffic Conditions

The current demand on the existing road network in the site vicinity is low and the road network and intersections operate at acceptable levels of service during the typical weekday peak hours. The gravel surfaces of the Provincial Main Roads in the site vicinity are in fair condition.

2030 Background Traffic Conditions (No go Alternative)

Typically a growth rate of 3 percent per annum is applied to the existing traffic volumes to determine future traffic conditions. The road network will continue to operate at acceptable levels-of-service in the future during the typical weekday peak hours of the year without the proposed development. The surface conditions of the gravel roads will continue to deteriorate without proper maintenance. The Provincial Roads are in fair condition and these roads can accommodate the expected growth in traffic volumes for the year 2030 Background conditions.

Construction Phase

It is expected that the construction phase of the proposed development could generate approximately 120 vehicular trips during the average weekday of which approximately 20 percent will be heavy truck traffic. Regional transport routes were identified via the N1 through the town of Beaufort West. Rail transport is also possible via the existing Beaufort West Station.

Access to the mine is proposed via existing farm access roads and there are no access spacing or shoulder sight distance issues.

During construction it is expected that gravel road surfaces will require maintenance at regular intervals and it is recommended that the gravel roads be sprayed with water on a regular basis (once a day) during the peak construction period. Non potable water should be sourced for this purpose.

Operational Phase

It is expected that the mine will generate approximately 120 new daily truck trips during the peak operational phase. The impact of the additional truck trips as a result of the mining operation will be insignificant in terms of capacity and operation of the intersections along the surrounding road network. The Roads Authority has implemented speed over distance measurement along sections of the R61, which has reduced speeding along the road and improved safety. The speed differential between the trucks along the R61 at the haul route access points and the through traffic along the R61 in a possible concern. However, the sections of the R61 at the access points are straight and flat and there is sufficient stopping sight distance along the R61 for through traffic along the R61 to see trucks way in advance. Proper warning signs should be erected along the section of the R61 at the access points to warn motorists of slow moving

and turning trucks.

A gravel road can accommodate between 300 and 400 vehicles per day, which means that surfacing of these roads may not be required. However, the truck traffic will have an impact on the gravel road surfaces and it is recommended that the gravel roads be watered once or twice a day to reduce gravel loss. Non potable water should be sourced for this purpose.

Alternative Development Proposal

There is no viable project alternative since Lukisa Invest 100 is considering the only economically and technically viable mining methods to extract the commercially viable uranium and molybdenum deposits. The only other realistic alternative to the proposed mining activity is livestock farming, which is the current activity on the farms.

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Abbreviations

AMG – Access Management Guidelines (Western Cape Government)

CM – Critical Movement

DR – Divisional Road

HCM – Highway Capacity Manual

LOS – Level of Service

MOE – Measures of Efficiency

MR – Provincial Main Road

OP – Minor Road (Ondergeskikte Pad)

SDP – Site Development Plan

SSD – Shoulder Sight Distance

TIA – Traffic Impact Assessment

1.0 INTRODUCTION

Lukisa Invest 100 intend to mine for uranium and molybdenum on the farm Rystkuil to the south of the town of Beaufort west in the Karoo. The extent of the mining rights application area is approximately 69 000Ha.

2.0 LOCALITY

The mining operation and processing plant (CPP) will be located near the main ore body on the farm Rystkuil, approximately 50km to the southwest of Beaufort West. Refer to **Figure 1** below for a locality map.



Figure 1: Locality Map.

3.0 PROPOSED DEVELOPMENT

3.1 Mining Blocks

The following mining block is evaluated in this report:

- Rystkuil: This block is located approximately 40km to the southeast of Beaufort West between the N12 and the R61.

Refer to **Figure 2** below for the proposed mining infrastructure.

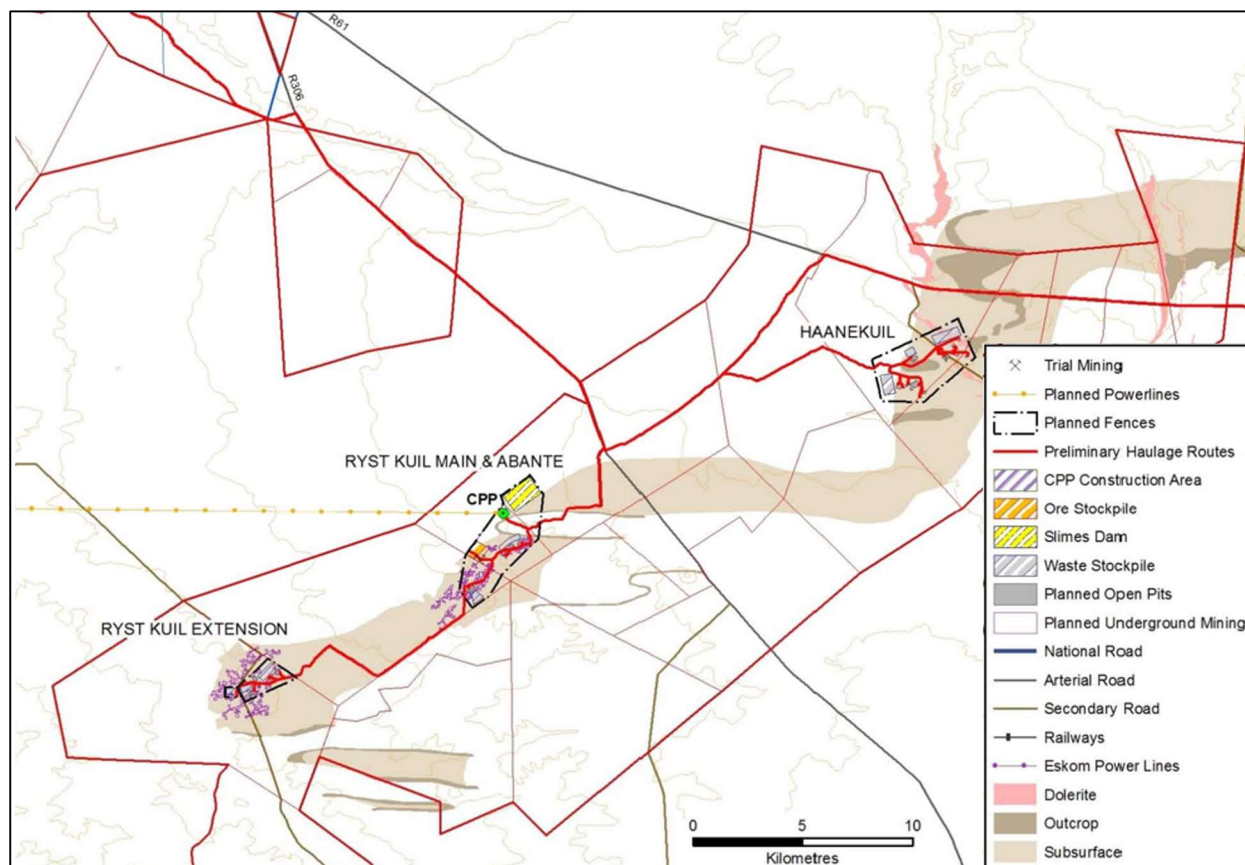


Figure 2: Mining Infrastructure and Haul Routes

3.2 Open Pit Mining

The open cast surface mining will be standard opencast pit structures with access roads to an average depth of 50 metres and not more than 112 meters below surface. Mining method will be traditional drill, blast, load and haul using trucks to deliver the material to the processing plant. Topsoil (if any) will be removed to a maximum depth of 30cm where possible from all open pit and dump areas. The hard overburden will be mined in benches of 10m. These benches will be drilled and blasted prior to an excavator and truck fleet loading and hauling to an appropriate dump site. The possible dump site consists of ex-pit overburden dumps adjacent to the open pit and old mined-out open pits from which no mining is taking place or are planned to take place in future. All mined ore will be loaded onto a truck and transported directly to the processing plant run of mine tip.

3.3 Underground Mining

Where applicable, the underground development layout will consist of the following:

- Highwall access roadways from the floor of mined out open pits;
- A twin access roadway with a conveyor that will act as a ventilation return airway; and
- Vertical ventilation shafts.

Production sections will be established off the twin roadway system as development progresses. A development section consists of two roadways which are 5 metres wide by a minimum of 2 meters high.

Once the development section has completed the on-reef development through, the stoping method will

be selected based on the seam width as to ensure the least amount of dilution is maintained.

The mining methods will consist of the following:

- Bord and pillar stoping
- Hybrid stoping.

3.4 Alternatives

There is no viable project alternative since Tasman RSA Mines is considering the only economically and technically viable mining methods to extract the commercially viable uranium and molybdenum deposits.

4.0 TRAFFIC ANALYSIS SCOPE

This report evaluates the expected traffic impact of the proposed development during the construction phase and during the operational phase. The report evaluate different alternative access routes to the site, comments on the condition of the existing roads in the site vicinity, identifies possible access points to the site and recommends road improvements to the surrounding road network.

The report is based on available information on the road network, road condition information obtained during site visits and an assessment of the expected traffic volumes generated by the construction and operational phases of the proposed Lukisa Rystkuil Mine.

5.0 Assumptions and Limitations

The study is based on a number of assumptions and is subject to certain limitations, which should be borne in mind when considering information presented in this report. The validity of the findings of the study is not expected to be affected by these assumptions and limitations:

- Maximum vertical height clearances along the haulage route is 5.2 m for abnormal loads.
- All haulage trips will occur on surfaced national and provincial roads and on existing local gravel roads.
- Material for the construction of internal access roads and foundations will be sourced locally as far as possible.
- The assessment has been based on the link volume traffic counts conducted along the roads in the site vicinity and visual assessment of road surface conditions in the site vicinity.

Other assumptions made in the report are explicitly stated in the relevant sections.

6.0 Methodology

This section provides an outline of the approach and methodology used in the study. The TIA identifies and assesses the potential traffic impact on the surrounding road network in the vicinity of the site during the construction, operational and the decommissioning phases of the proposed development. The TIA includes the following tasks:

Site Visit and Project Assessment

- Overview of project background information including location maps.
- Research of all available documentation and information relevant to the proposed development.

Correspondence with Authorities

- Correspondence with the relevant Authorities dealing with the external road network, such as the SANRAL and the Western Cape Government Department of Infrastructure.

Traffic and Road Network Assessment

- Trip generation and potential traffic impact
- Construction and maintenance (operational) vehicle trips
 - Generated vehicles trips.
 - Access requirements.
 - Possible damaging effects on road surface.
 - Scheduling of transport (i.e., during off peak periods).
 - Station data was obtained from SANRAL and RNIS for the nearest National and Provincial roads.
 - Investigation of the impact of the development traffic generated during construction and operation and decommissioning phases of the project.

Access and Internal Roads Assessment

- Assessment of the proposed access points including:
 - Feasible location of access points;
 - Motorised and non-motorised access requirements;
 - Queuing analysis and stacking requirements if required;
 - Access geometry and
 - Sight distances and required access spacing.

Report

- Reporting on all findings and preparation of the report

7.0 EXISTING CONDITIONS

The existing roadway characteristics of the major roads in the study are summarised in **Table 1**.

Table 1: Existing Roadway Facilities

Roadway	Classification	Posted Speed (km/h)	Road Surface
N1	National Road	120	Tar
N12	National Road	120	Tar
R61(TR35/1)	Provincial Trunk Road	120	Tar
R306 (MR411)	Provincial Main Road	80	Gravel
DR2302	Provincial Divisional Road	80	Gravel
DR2304	Provincial Divisional Road	80	Gravel
DR2358	Provincial Divisional Road	80	Gravel
DR2370	Provincial Divisional Road	80	Gravel

All the existing intersections are stop-controlled with stop-control on the minor roads. All the paved roads in the site vicinity are two lane roads one lane per direction.

7.1 Existing Cross Sections and Surface Conditions

The N1 has 3.7m lanes with 2m paved shoulders and the N12 has 3.3m lanes with 2m gravel shoulders. All Provincial trunk roads and main roads also has 3.3m lanes with gravel shoulders. The gravel roads are typically 8m wide with narrower sections in some areas. Refer to **Photo 1 to 4** in Appendix B for the typical cross-section of the major roads in the site vicinity.

7.2 Existing Traffic Volumes

The Annual Average Daily Traffic (AADT) and peak hour traffic volumes along the major roads in the area are summarised in **Table 2** below.

Table 2: Traffic Volumes

Road	AADT	Peak Hour Volume	% Heavy Vehicles
N1	4 200	260	60%
N12	800	60	28%
R61(TR35/1)	550	40	15%
R306 (MR411)	50	10	8%
DR2302	16	6	13%
DR2304	22	5	27%
DR2358	21	5	1%
DR2370	15	2	1%

Based on historical traffic count information along the roads in the site vicinity, the traffic volumes along

the roads in the site vicinity have not changed much over the past 10 years. See the Graphs in Appendix C for illustrations of the daily variation in traffic flow along some of the major roads

8.0 TRANSPORT ROUTES AND SITE ACCESSES

8.1 Regional Transport Routes

Regional transport routes for transporting the large equipment to the site is possible via the N1 and the Provincial Road Network around Beaufort West. The railway can also be used for regional/long distance transport of equipment and the end product. The final routes will have to be checked for compliance during the final design stages of the project. Permits will need to be obtained from the relevant road authorities for all abnormal loads and the specific route will be specified based on the characteristics of each load type.

8.2 Local Access Roads

Access is proposed mostly via existing farm access roads. Access positions along Provincial roads are identified with a kilometre marks, where kilometre marks are not available the access position is identified with Google Earth coordinates.

- *Ryst Kuil*: Access is proposed via existing farm accesses off DR2358 (KM42.18), DR2370 (KM4.85 & KM6.7/OP8842), R306 (KM81.69/OP8833 & KM79) & DR2304 (KM59.77/OP8837). **Photos 5 to 8** shows the available shoulder sight distances along the R61 and the R306 from the OP8835 intersections. The haul route is proposed via OP8835 and then along a private access roads up to the processing plant.

The required Shoulder Sight Distance (SSD) for articulated heavy vehicles along roads with a posted speed limit of 80km/h is 300 metres based on the Department of Transport's geometric design guidelines. The available SSD at all the accesses is sufficient. Refer to **Figure 2** for the initial mining infrastructure layout, which also indicates the primary haul routes between the mine sites and the processing plant.

9.0 TRAFFIC IMPACT ANALYSIS

The expected effects of traffic that would be generated by the proposed development during peak hours were analysed as follows:

- The **background traffic** volumes were determined for the study network in the vicinity of the site. These are the traffic volumes that would be on the road network in the absence of the proposed development (No-go Alternative);
- A growth factor was applied to account for regional growth
- Construction Phase Traffic
- **Site-generated trips** were estimated for the proposed development;
- The construction-phase traffic and the assigned site-generated traffic from the proposed development were added to the **background traffic** volumes to determine the **total traffic** conditions with the development completed.

9.1 Year 2030 Background Traffic Conditions (No-go alternative)

For the purposes of this study, year 2030 background traffic volumes were developed by applying a 3.0 percent annual traffic growth rate to the existing traffic volumes on the major links. This estimated growth rate was assumed to allow for the additional traffic volumes that will be generated by other in-process and future developments in the area.

Due to the low traffic volumes the current road network will continue to operate at acceptable levels-of-service during the background conditions. The surface conditions of some of the gravel roads in the site vicinity will continue to deteriorate without proper maintenance. The gravel surfaces of the Provincial Main Roads in the site vicinity are in fair condition and these roads can accommodate the expected growth in traffic volumes in the year 2030 Background conditions.

9.2 Construction Phase

It is not expected that the construction phase will generate a significant number of vehicles. Some large pieces of equipment need to be delivered to the site, which typically includes the following:

- Haul trucks (30ton),
- Face shovels,
- Wheeled loaders, Dozers, Graders, Water bowsers
- Mill, Jaw crusher, Cone crushers and
- Conveyors

Construction Site Vehicles (These vehicles and equipment will also be used during the operational phase):

- Tractor, Trailer Power Bin & KBip Bin Container
- 6 Tractor Trailer Skips
- 6ton Fork Lift
- Mobile Crane
- Telescopic Handler
- 6 Pick-up trucks
- 4 Skid Steer Loaders
- Fuel Bowser
- 2 Toyota Quantums

The following activities will probably occur during the construction phase:

- Construction of access roads,
- Stripping and moving of topsoil,
- Excavation and construction of the waste rock pads,
- Construction of the office buildings and workshops,
- Construction of the central processing plant,
- Construction of the tailings storage facility.

The access roads will be constructed mainly of local materials sourced from the mining site and borrow-pits in the area. There are existing borrow-pits in the area, but it is not known if these are open. It is possible that licences will be required to utilise these borrow-pits for the construction of the access roads.

The planned access roads are 4.5 metres wide and will have bypass areas at regular intervals to accommodate heavy vehicles. The layer works of these access roads will vary depending on the quality of the in-situ material as well as the duration of the mining activities at the respective mining areas. The typical layer work design for this type of access road is a 300 millimetre gravel layer with a 100 to 150 millimetre wearing course. The wearing course is optional, but will minimise the maintenance required on the access road. The wearing course will probably have to be sourced from a commercial source. The volume of material required for road construction purposes can only be determined during a more detailed design process, but based on the information above it can be roughly 2 000m³ gravel and 1 000m³ wearing course material per one kilometre of road.

The mining equipment and other building material will be trucked to site and it is expected that most of the construction traffic will come via the N1 through Beaufort West. It is expected that during the peak of the construction phase of the Lukisa Rystkuil Mine the number of additional trips on the road network will be less than 100 trips during an average eight hour day, which includes an estimated 20 percent truck traffic. This means that that the estimated construction traffic during the peak construction period will be approximately 12 additional vehicular trips (10 light & 2 heavy) per hour during the typical week day on the road network. These traffic volumes are low in terms of the intersection and road network operation and the impact is more related to a nuisance factor with regards to possible noise and dust pollution. A recommended mitigation measure to reduce the possible dust pollution is to spray the access roads with water on a regular basis (once a day) during the peak construction period. Non potable water should be sourced for this purpose.

9.3 Operational Phase

9.3.1 Equipment

Based on information received from the developer and information sourced from other similar projects it is estimated that the following equipment will be required on site during the operational phase.

Table 3: Mining Equipment

Description	Total
Haul Trucks (30t)	8
Face Shovels	2
Wheeled front end Loaders	3
Dozers	1
Graders	1
Jaw Crusher	1
Cone Crusher	1
Conveyors (Fixed)	3
Conveyors (Mobile)	12

9.3.2 Trip Generation

Estimates of the peak hour vehicle trips for new developments are typically based on empirical observations at similar land uses. The estimates summarised in Table 4 are based on information provided by the developer. These assumptions are based on the expected production during the operational phase and are considered the worst-case scenario.

Table 4: Expected Public Road Generated Trips during the Operational Phase

Activity/Component	Rate
Chemicals	12 trucks per month
Staff	4 buses/ 8 minibuses/ 20 private vehicles per day
Fuel	2 trucks per month
Blasting and Drilling	8 bakkies/ 8 trucks per month
End product shipment	1 truck per month
General mining vehicles	16 bakkies/ 3 minibuses per day

Based on the information above it is expected that the mine will generate approximately 120 new daily trips of which most will be truck traffic during the peak operational phase. The haul trips to/from the mining areas within the Ryst Kuil Block will all be on private roads. Based on the information above the maximum number of trips on any public road will not exceed 120 vehicles per day. Based on an average of 20-hour operational time per day it means 6 new trips on public roads during any hour of the day.

9.3.3 Trip Distribution and Assignment

It is expected that all the operational trips to/from the processing plant will come from Beaufort West and Aberdeen via the existing road network. Most of the trucks delivering the equipment and components are also expected to come via the N1 through Beaufort West. Refer to **Figure 2** for a layout indicating the initial mining infrastructure and haul routes.

9.4 Transport Impact

Based on the expected number of construction and operational trips generated by the proposed Lukisa Rystkuil Mine the existing road network has sufficient capacity to accommodate the additional trips from an operational perspective.

The ore mined in Rystkuil will not be transported on public roads. The impact of the additional truck trips as a result of the mining operation will be insignificant in terms of capacity and operation of the intersections along the surrounding road network. The current annual daily traffic volume (ADT) along the R61 is approximately 680 vehicles. The additional mining trips will result in a 15 percent increase in ADT along the R61, which is insignificant in terms of the capacity of the road. The Roads Authority has implemented speed over distance measurement along sections of the R61, which has reduced speeding along the road and improved safety. The speed differential between the trucks along the R61 at the haul route access points and the through traffic along the R61 is a possible concern. However, the sections of the R61 at the access points are straight and flat and there is sufficient stopping sight distance along the R61 for through traffic along the R61 to see trucks way in advance. Proper warning signs should be erected along the section of the R61 at the access points to warn motorists of slow moving and turning trucks.

Gravel roads such as the R306 can accommodate between 300 and 400 vehicles per day, depending on the type of vehicles. During construction and operational phases it is expected that road surface of the gravel roads will require maintenance at regular intervals. It is recommended that the access roads be sprayed with water at least once a day to reduce dust pollution. Non potable water should be sourced for this purpose.

The initial mining activity will occur over approximately 12 years. It is not expected that the cumulative impact on any section of road in the site vicinity will be more than 120 trips per day.

All the tarred National and Provincial Roads are in a fair condition and the additional traffic associated with the mining activities in the area will be well within the capacity of the roads in the area. No specific upgrades are recommended along the general road network.

9.5 Gravel Loss

Several methods are available for the prediction of gravel loss on gravel roads based on traffic volumes and wearing coarse characteristics. The guideline document TRH20 provides the following model for the estimation of gravel loss:

$$AGL = 3,65[ADT(0,059 + 0,0027N - 0,0006P26) - 0,367N - 0,0014PF + 0,0474P26]$$

Where:

- AGL = annual gravel loss
- ADT = average daily traffic (per direction)
- N = Weinert N-value = 7.5 for this area based on weather and rainfall.
- P26 = percentage passing the 26,5mm sieve
- PF = product of plastic limit and percent passing 0,075mm sieve

The average annual gravel loss was estimated based on the above model and the results are included in **Table 1**. From the results of the analysis it is evident that the increase in gravel loss along these roads will be significant.

Table 5: Gravel Loss Estimates

Measure	Existing Traffic	Total Traffic With Development	Difference
MR411:			
ADT	64	184	120
N	7.5	7.5	
P26	89%	89%	
PF	10	10	
AGL (mm)	11.3	22.7	11.32

9.6 Alternative Development Proposals

There is no viable project alternative since Lukisa Invest 100 is considering the only economically and technically viable mining methods to extract the commercially viable uranium and molybdenum deposits. The only other realistic alternative to the proposed mining activity is livestock farming, which is the current activity on the farms.

10.0 CONCLUSIONS AND RECOMMENDATIONS

This transport impact assessment was prepared for the proposed Lukisa Mine on the farm Rystkuil near the town Beaufort West in the Western Cape. This report summarises the existing transportation conditions within the site vicinity and provides an assessment of the transportation impacts of the proposed development on the surrounding transportation system.

This traffic impact analysis resulted in the following conclusions and recommendations.

Existing Traffic Conditions

- The current demand on the existing road network in the site vicinity is low and the road network and intersections operate at acceptable levels of service.
- The gravel surfaces of the Provincial Main Roads in the site vicinity are in fair condition.

2030 Background Traffic Conditions (No Go)

- A growth rate of 3 percent per annum was applied to the existing traffic volumes to determine the 2030 background traffic conditions.
- The road network will continue to operate at acceptable levels-of-service in the future during the worst peak hours of the year without the proposed development.
- The surface conditions of some of the gravel roads will continue to deteriorate without proper maintenance.
- The gravel surfaces of the Provincial Main Roads are in fair condition and these roads can accommodate the expected growth in traffic volumes on these roads in the year 2030 Background conditions.

Access

- Access is proposed via existing farm accesses.

Construction Phase

- It is expected that the construction phase of the proposed development could generate approximately 100 vehicular trips during the average weekday of which approximately 20 percent will be heavy truck traffic at the processing plant site.
- Regional transport routes are via the N1 through the town of Beaufort West and Rail transport is also possible via the existing Beaufort West Station.
- During construction it is expected that gravel road surfaces will require maintenance at regular intervals and it is recommended that the gravel roads be watered on a regular basis (once a day) during the peak construction period. Non-potable water should be sourced for this purpose.

Operational Phase

- It is expected that the mine will generate approximately 120 new daily truck trips during the peak operational phase.

- The existing road network has sufficient capacity to accommodate the additional trips from an operational perspective.
- Signage should be provided along the R61 at the access points to warn motorists of slow moving and turning trucks.
- A gravel road can accommodate between 300 and 400 vehicles per day, which means that surfacing of these roads will not be required. However, the truck will have an impact on the gravel road surfaces and it is recommended that the gravel roads be watered once or twice a day to reduce gravel loss.
- All the tarred National and Provincial Roads are in a fair condition and the additional traffic associated with the mining activities in the area will be well within the capacity of the roads in the area

Alternative Development Proposal

- There is no viable project alternative since Lukisa Invest 100 is considering the only economically and technically viable mining methods to extract the commercially viable uranium and molybdenum deposits.
- The only other realistic alternative to the proposed mining activity is livestock farming and eco tourism, which is the current activity on the farms.

Based on the evaluation as discussed in this report the existing road network has sufficient spare capacity to accommodate trip generation associated with the proposed development, without any road upgrades required to the existing road infrastructure. It is recommended that the proposed Lukisa Mine and associated infrastructure on the farm Rystkuil can be approved from a transport impact perspective.

REFERENCES

1. Highway Capacity Manual (HCM).
2. Transportation Research Board Highway Capacity Manual, Special Report No. 209. 2000
3. Committee of Transport Officials, South African Trip Data Manual, TMH 17, September 2017
4. Committee of Transport Officials, South African Impact and Site Traffic Assessment Manual, TMH 16 Volume 1, August 2012.

Annexure A

Photographs



Photo1: Westbound view along the N1 towards N12



Photo 2: Southbound view along the N12 from the N1



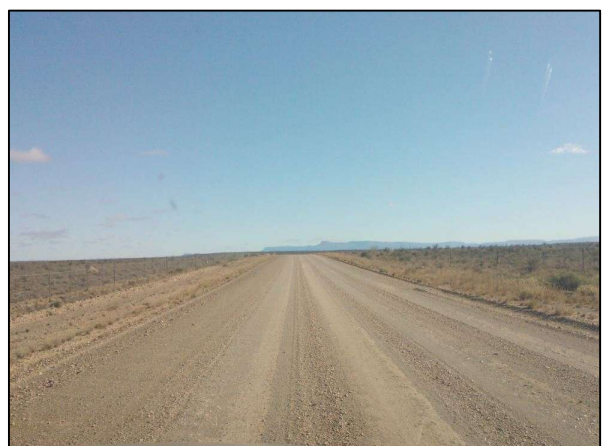
**Photo 3: Northbound view along the R61 (TR35/1) from
OP8835**



**Photo 4: Southbound view along R61 (TR35/1)
from OP8835**



**Photo 5: Eastbound view along the R61 (TR35/1) towards
the R306**



**Photo 6: Northbound view along R306 (MR411) towards
Beaufort West**



**Photo 7: Available SSD to the south along the R306 form
OP8845 (>300m)**



**Photo 8: Available SSD to the north along the R306 form
OP8845 (>300m)**

Annexure B

Traffic Information

