SPITSVALE PROJECT
Chrome Mine in Steelpoort, Limpopo Province

TRAFFIC IMPACT ASSESSMENT

January 2016

Final Report

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GLOSSARY OF TERMS

EIA	Environmental Impact Assessment
LOS	Level of Service
DoT	Department of Transport
p.a.	Per annum
TIA	Traffic Impact Assessment
v/c	Volume/capacity ratio

APPLICABLE SOURCE DOCUMENTS

Access Management Guidelines	Committee of Transportation Officials (COTO), 2002.National Guidelines for Road Access Management in South Africa.
Manual for Traffic Impact Studies	TMH 16, COTO: South African Traffic Impact and Site Traffic Assessment Standards and Requirements, Version 1.01, February 2014.
NGTC	National Department of Transport, 1996. National Guidelines for Traffic Calming.
Trip Generation Guidelines	TMH 17, COTO: South African Trip Data Manual, Version 1.01, September 2013.
UTG 1	National Department of Transport, 1986. National Urban Transport Guidelines: Geometric Design of Urban Arterials.

EXECUTIVE SUMMARY

A traffic impact assessment (TIA) was prepared as part of the environmental impact assessment (EIA) and environmental management plan (EMP) for the Spitsvale project for the proposed Chrome mine in Steelpoort.

BCR Minerals (Pty) Ltd operates an exploration and bulk sample operation in the Steelpoort area. They applied for mining rights over portions 24, 25, 26 and 28 of the farm Spitskop 333 KT and portions 8 and 22 of the farm Kennedy's Vale 361 KT. The proposed mine is within the Greater Tubatse Local Municipality which forms part of the Sekhukhune District Municipality. The proposed development area is located 17km south-west of Steelpoort town and 45km west of Burgersfort.

The operation of the mine will be based east of the D1261 Road and will be accessed from the existing access road on the D1261 Road.

ITS (Pty) Ltd was appointed by Environmental Management Assistance (PTY) LTD to carry out a Traffic Impact Assessment for the proposed Chrome mine development in accordance with the *Manual of Traffic Impact Studies* published by the *Committee of Transport Officials (COTO), 2014.*

The purpose of this report is to provide findings of the traffic impact investigation conducted to assess the impact of the proposed Chrome mine operations on the existing external road network surrounding the development area. Based on this assessment, mitigation measures are recommended to minimise the potential impact on the existing road network.

The following tasks have been carried out as part of the traffic impact investigation:

- Determination of the trip generation due to the proposed Chrome mine operations activities;
- Assessing the impact of the trips generated by the mine on the road network (capacity analysis of the affected routes including the intersection analysis);
- Safety Statement: an assessment of the access position and safety in terms of geometric standards and street lighting;
- Public transport provision for the mine employees;
- A detailed proposal of site specific mitigations, if and where applicable.

Assessment Methodology

The following assessment methodology was used:

- Baseline,
- Traffic Impact Assessment,

The main phases of the project have been identified as follows: construction phase (2014 to 2016), operational phase (2016 to 2045) and closure and decommissioning phase (2046). The critical impact in terms of the traffic generated is expected to be during the operational phase.

The following phases were considered for assessment:

  - Construction Phase: 2016 projected traffic demand,
  - Operational Phase: 2045 projected traffic demand,
  - Closure and Decommissioning Phase: 2046 projected traffic demand.
- Mitigating Measures

Findings

The findings of this investigation can be summarised as follows:

- All the analysed roads are paved and are in a fair condition .i.e the R555, R557 and the D1261.
- The existing access road does not have a traffic sign control but is treated as a two way priority controlled intersection, with priority on the D1261. It is expected that the access intersection will operate at an acceptable Level of Service (LOS) when the proposed development is fully operational, but exclusive turning lanes are proposed for safety purposes. It is further proposed that the access road be paved for at least 400m to prevent weathering of the D1261 as it is currently a gravel road.
- Three phases were analysed and it was determined that the operational phase is critical, since it generates the highest volume of additional trips. The trips generated during this phase was estimated at 76 vehicle trips per day and 41 vehicle trips per hour during both the AM and PM peak hours. Therefore the Operational phase was then further analysed to determine the impact that the proposed mine will have on the surrounding road network.
- Four scenarios were analysed, all the intersections operate at an acceptable level of service except for the R555 / D1261 intersection, during the third scenario, where the 2027 background traffic, Latent Rights and the development traffic volumes are combined. The failure in operation of the intersection is caused by the background traffic growth and not the development traffic.

- In order to ensure pedestrian safety: the mine will make provision for public transport for their staff. It is therefore proposed that there be no on-street pick up / drop offs at the D1261 / Access road intersection to the proposed mine (drop-offs / pickup should be done on site).
- For safety reasons it is proposed that sufficient street lighting be provided in the vicinity of the access intersection.
- Parking provision should be made for trucks to prevent queuing on to the adjacent roads.
- All of the above mitigation measures should be in place before or in the first to second year of the operational phase.

SPITSVALE PROJECT, PROPOSED CHROME MINE IN STEELPOORT

TRAFFIC IMPACT ASSESSMENT

1 INTRODUCTION AND BACKGROUND

ITS (Pty) Ltd was appointed by Environmental Management Assistance (Pty) Ltd to carry out a traffic impact assessment (TIA) for the proposed opencast Chrome Mine in Steelpoort (Spitsvale) in accordance with the *Manual of Traffic Impact Studies* published by the *Committee of Transport Officials (COTO), 2014*. In terms of the guideline, a fully-fledged traffic impact analysis is required to be carried out for the proposed development. This should include conducting vehicle count surveys, conflicting turning movement analysis, intersection performance analysis and road safety assessment if applicable. Measures such as level of service, delay, and volume / capacity ratio can be used to assess the performance of an intersection or a roadway facility.

BCR Minerals (Pty) Ltd operates exploration and bulk sample operation in the Steelpoort area, collectively called the Spitsvale Project (SPV) and it is situated approximately 350km north-east of Johannesburg in the vicinity of the town of Steelpoort. They applied for mining rights over portions 24, 25, 26 and 28 of the farm Spitskop 333 KT and portions 8 and 22 of the farm Kennedy's Vale 361 KT. The proposed mine is within the Greater Tubatse Local Municipality which forms part of the Sekhukhune District Municipality. The proposed development area is located 17km south-west of Steelpoort Town and 45km west of Burgersfort. Refer to Appendix A, Figure 1 for a locality plan.

An open pit mine is proposed and will mine chromite and associated minerals in particular; the MGO, MG1, MG2 package, MG3 and MG4 package chromite seams. The operation of the mine will be based east of the D1261 Road and will be accessed from the existing access road on the D1261 Road. The extent of the area required for mining is approximately 2227.97Ha and approximately 60Ha is required for infrastructure, roads and servitudes. However, exclude rivers, registered servitudes, provincial and national roads and buildings or any other structure or sensitive natural stature protected in terms of national and/or international law where not approved in terms of these laws.

The mine will consists of workshops, mobile administration offices, lighting of stockpile area and Weigh Bridge and is linked by gravel roads to the R555 and R261 road. The mining will be done by means of drilling and blasting using the single bleaching method,

2 SCOPE OF STUDY

2.1 Study Objectives

The objective and scope of study for the traffic impact investigation entailed the following:

- Collection of traffic information to determine the status quo;
- Calculation of the trip generation resulting from the activities of the proposed mine;
- Assessing the impact of transportation aspects related to the mining activities (capacity analysis of the logistics route to Maputo including the intersection analysis).
- A detailed proposal of site specific mitigations which include any road network upgrading where applicable.

Safety Statement:

- An assessment of the access position in terms of geometrical standards;
- An assessment of sufficient street lighting at the access to the mine;
- Investigation of the public transport and pedestrian activities that might be impacted by the mine traffic or activities;
- A detailed proposal of site specific mitigations, if and where applicable.

2.2 Assessment Methodology

The assessment methodology entailed the baseline assessment, traffic impact assessment and recommended mitigation measures:

Figure 2.1: Traffic Impact Assessment Methodology

2.2.1 Baseline Assessment

The baseline assessment included the identification of the affected external roads, the investigation and assessment of the status quo of the internal and external road network, existing traffic volumes, capacity analysis of the affected intersections. The baseline assessment further includes identification of the assessment variables that the basic road network investigates (i.e. condition of road, road alignment, existing signage and cross sections).

2.2.2 Traffic Impact Assessment

The traffic impact assessment was conducted in terms of the following aspects:

- Capacity analysis of the existing road network (surrounding roads)
- The investigation and assessment of the existing, future private and public transport requirements related to the proposed development.
- Assessment of road safety conditions, such as access positions and street lighting at sufficient standards.

2.2.3 Identification of mitigations

The potential impacts due to traffic generated by the proposed BCR Chrome mine was identified and assessed in accordance with the methodology presented in **Section 2.1** of this report. Where applicable, mitigating measures were proposed to attenuate the impact of the trips generated by the proposed mine.

Details on the potential impacts and mitigation measures are further addressed in section 5.

3 FINDINGS OF THE BASELINE ASSESSMENT

This section of the report provides details and findings of the baseline assessment conducted, as outlined below:

3.1 Existing external road network

The major routes in the study area are described in **Table 3.1** below, and are schematically represented in **Appendix A, Figure 1** of this report.

Table 3.1: Overview of the existing road network and jurisdiction

Road Link	Jurisdiction	Class of road	Function of the Road	Road Surfacing	Description of Road Geometry
R555	Road Agency Limpopo (RAL)	2	R555 is a provincial road that links Steelpoort town to Middelburg, Emalahleni and Burgersfort. It carries approximately 1 000vph during its peak hour period.	The road is asphalt surfaced with unpaved shoulders. The road has fair pavement conditions.	Single carriageway (2 lanes: one lane per direction)
R557	RAL	2	It is a class 2 road that links Steelpoort town to Lydenburg town. It carries approximately 1 146vph during its peak hour period.	The road is asphalt surfaced with unpaved shoulders. The road has fair pavement conditions.	Single carriageway (2 lanes: one lane per direction)
D1261	RAL	3	The D1261 Road runs in a north-south direction linking the R555 to the R557, providing access to mines along the road.	The road is paved and the surface conditions are adequate.	Single carriageway (2 lanes: one lane per direction)

The roads described in **Table 3.1** might be impacted by the new traffic generated by the proposed BCR Chrome Mine through the transportation of coal by truck from the proposed mine to Maputo and the trips by workers from neighbouring villages and towns nearby.

3.2 Access to Proposed Mine

The proposed mine will be accessed from the existing access road on the D1261 Road. The gravel access road has no traffic control sign but is treated as a priority stop control intersection whilst still allowing free flow on the D1261.

Based on visual assessment it was found that the intersection sight distance at the access to the proposed mine area and other intersections is acceptable without any constraints. In terms of the vertical and horizontal alignment, no critical sight distance obstructions were detected from the existing access position. The terrain is fairly flat and the road alignment does not impose any obvious hazardous locations along the route.

It is proposed that at least 400m of the access road from the D1261 road be paved to prevent weathering of the D1261 road.

3.3 Influence area

As mentioned in **Section 3.1** above, the following external links are within the study area and were assessed to investigate the impact that the additional trips generated by the proposed mine will have:

- R555 Road
- R557 Road
- D1261 Road

The influence area for this study was determined based on the BCR Chrome Mine logistics (the origins and destination of the mineral being mined and employees of the mine).

In addition the following intersections have been investigated in order to access the impact that the proposed mine will have on the external roads.

- ***Intersection 1***: R555 / D1261 Road*;*
- ***Intersection 2***: R557 / D1261 Road;
- ***Intersection 3***: R555 / R557 Road;
- ***Intersection 4***: D1261 Road / Access Road to the mine

These will be further discussed in **Section 4** of this report.

3.4 Status quo traffic volumes

A site visit was conducted on the 2nd December 2015 and manual classified traffic counts were carried out on the 15th of October 2015 at intersections in the vicinity of the study area. Light vehicles, heavy vehicles (typically 2-4 axels) and very heavy vehicles (typically 5 and more axels) were all counted at the various intersections. From the traffic counts surveys it was noted that Heavy vehicles account for 18% of all vehicles and Light vehicles 82%.

The AM and PM Peak Hour was determined based on the highest traffic volumes registered during the morning and afternoon periods respectively. The AM Peak Hour was recorded from 06:00 to 07:00 and the PM Peak Hour was recorded from 15:15 to 16:15.

Based on the traffic counts it can be concluded that the PM Peak Hour is the most critical period considering that during that period, the highest peak in number of vehicles on the road was registered. Both the AM and PM peak hour traffic volumes were analysed. **Appendix A, Figure 4a** and **4b** show the total number of existing traffic on the road network during the AM and PM Peak Hour.

3.5 Assessment variables

The following variables have been considered to assess the impact of the traffic generated by the proposed mine:

3.5.1 Level of Service (LOS)

A measure of intersection or roadway performance, determined based on delay for un-signalised intersections. The LOS definitions in terms of delay are shown in **Table 3.2** below.

Table 3.2: LOS definitions based on vehicle delay

LEVEL-OF-SERVICE DEFINITIONS BASED ON VEHICLES DELAY		
Level of Service	**Control Delay per vehicle in seconds**	**Level of Acceptability**
A	d≤14.5	Desirable
B	14.5 < d ≤ 28.5	Desirable
C	28.5 < d ≤ 42.5	Desirable
D	42.5 < d ≤ 56.5	Desirable
E	56.5 < d ≤ 70.5	Not Desirable
F	70.5 < d	Not Desirable

In most rural and urban areas overall rating of A to D are normally considered acceptable. Levels of service C or better are considered desirable and levels of service E and F are normally undesirable *(Committee of Transport Officials, 2014).*

3.5.2 Delay

Delay is a measure of intersection or roadway performance which is measured based on the driver discomfort, frustration, fuel consumption and lost travel time. Delay at intersections depends on various factors such as type of signal control, volume of traffic and volume/capacity ratio of each approach at an intersection (*C A O'Flaherty, 1997*).

The intersections performance have been rated based on the average delay, i.e. the LOS of the intersections under investigation (including the access to the BCR Chrome Mine) will be measured based on the intersection average delay.

3.5.3 Volume / capacity ratio

Volume / capacity ratio (v/c) is a measure of intersection or roadway performance. It is the ratio of number of vehicles on the road to the available capacity of the roadway. The road link capacity in the study area was rated based on the volume/capacity ratio, i.e. the LOS of the link roads will be measured based on the volume/capacity of the roads.

3.5.4 Road safety aspects

This variable has been subjectively assessed in terms of pedestrian and driver's safety on the road under investigation. Variables such as speed limit, road alignment and road geometry have been taken into consideration for the safety assessment.

4 FINDINGS OF THE TRAFFIC IMPACT ASSESSMENT

The impact assessment of the transportation aspects related to the proposed mine activities was determined based on the evaluation of the worst traffic scenario during the construction, operation, closure and decommissioning phases. The BCR Chrome Mine was designed for a 30 year lifespan and will reach full design capacity by 2027.

The main phases of the project have been identified as follows: construction phase (2014-2016), operational phase (2016 to 2045) and closure and decommissioning phase (2046). The critical impact in terms of the traffic generated is expected to be during the operational phase, therefore only the operational phase will be analysed.

4.1 Assessment scenarios

Based on the information above, the following scenarios were considered critical for the assessment:

- **2015 Existing AM and PM Peak Hour Traffic Volumes (Scenario 1)** - This refers to the assessment of the existing traffic on the surrounding road network, refer to **Appendix A, Figure 3a** and **3b**.
- **2017 Background AM and PM Peak Hour Traffic Volumes (Scenario 2)** – This refers to the assessment of the future traffic on the surrounding road network during the first stages of the operational phase, a growth rate of 2% per annum was applied to the 2015 existing traffic (Background traffic). Refer to **Appendix A, Figure 6a** - **6b**.
- **Operational phase - 2027 AM and PM Peak Hour Background + Latent Rights + Development traffic demand (Scenario 3)**: This scenario refers to the year in which the mining operations will reach full capacity. Refer to **Appendix A, Figure 8a** and **8b**.
- **Operational phase Upgrades - 2027 AM and PM Peak Hour Background + Latent Rights + Development traffic demand Upgraded (Scenario 4)**: This scenario refers to the year in which the mining operations will reach full capacity and the upgrades that will be required for it to operate safely and at an acceptable Level of Service. Refer to **Appendix A, Figure 9a** and **9b**.

4.2 Analysis Peak Hour

Based on the existing traffic counts, the following peak hours were considered for the capacity analysis:

- AM peak hour: 6:00 to 7:00,
- PM peak hour 15:15 to 16:15.

4.3 Expected Trip Generation

4.3.1 Assumptions

The expected trip generation during the AM and PM peak hour was determined based on assumptions made from the data supplied to the Traffic Specialists, refer to **Table 4.1,** below.

For the purpose of this study it is assumed that 80% of the semi-skilled and unskilled workers make use of public transport and the remaining 20% of the workers make use of private transport.

It is also assumed that 90% of the skilled workers will make use of private transport to travel to the proposed development, while the remaining 10% of the workers make use of public transport.

Table 4.1: **Trip Generation Calculation – Assumptions for Assessment of Traffic Impact**

Parameter	Assumptions Year : 2027	Source of information
Traffic Impact Assessment	Only traffic volumes during operational phase will be assigned to network as this will be the peak scenario	BCR Chrome Mine (Spitsvale Project)
Estimated number of employees at the mine areas	137 employees: skilled (18%), semi-skilled and unskilled (82%) 24 skilled employees and 113 semi-skilled employees.	BCR Chrome Mine (Spitsvale Project)
Number of working shifts	2 shifts (morning 06:00 to 14:00 and Night 14:00 to 22:00)	BCR Chrome Mine (Spitsvale Project)
Lifespan of the mine	30 years	BCR Chrome Mine (Spitsvale Project)
Growth Rate (applied to project the background traffic	2% p.a	Previous Studies conducted by ITS Engineers and geographical observations.
Transport Mode	• Private vehicles (mostly used by skilled employees) and • Mini Buses (used by the majority of semi-skilled to unskilled employees) • Chrome transport (heavy vehicles)	BCR Chrome Mine (Spitsvale Project)
Transport requirements	Mini bus / taxi's with a capacity of 15 passengers will transport employees to and from the mine	
Private Vehicle Occupancy rate	1.5 persons/car	Previous Studies conducted by ITS Engineers

4.3.2 Mine Transport Requirements and Expected Trip generation

The mine transport requirement will be as follows:

Construction Phase (2014 - 2016)

The construction phase is divided into 6 phases. These phase will entail surface mapping, trenching, access road and drill pad construction, surface drilling, geological modelling and rehabilitation.

Transportation of Material and Chrome: Heavy vehicle trips are expected to be generated to transport construction material to/from the mine and to transport raw material from the Spitsvale project BCR Chrome Mine to Maputo. Initially less than 20 heavy vehicle trips will be generated daily, this number will increase during the operational phase.

Commuter trips (private and public transport): Commuter trips are expected to be generated daily by the skilled, semi-skilled and unskilled construction workers, with approximately 90% of skilled workers using private transport. It is assumed that 80% of the semi and unskilled workers will use public transport and the remaining 20% will make use of private transport.

Operational Phase (2016 to 2045)

Transportation of Chrome: Chrome will be transported by tippers and tautliners from the mine in Steelspoort via the R557 route to Maputo in Mozambique. During the operational phase it is expected that about 1000 tons of Chrome will be exported each day, therefore equating to a maximum of 40 trucks a day. The transport demand will vary every day depending on the production of Chrome every day and other unforeseen circumstances.

Transportation of Goods (deliveries): Trips are expected to be generated as a result of transportation of goods or products to / from the mine.

Commuter trips (private and public transport): Commuter trips are expected to be generated daily from the origins surrounding the mine. The commuter trips will be split into private and company dedicated mini bus / taxi transport trips.

Decommissioning Phase (2046)

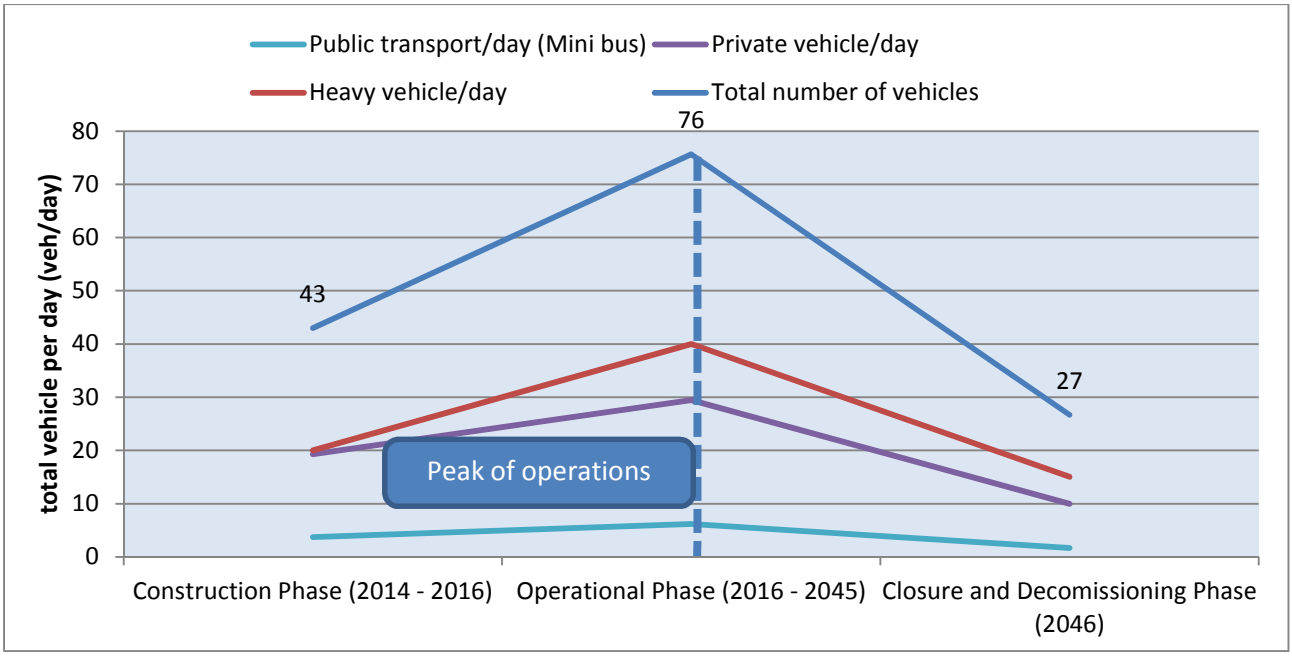
According to the estimated life span of the Spitsvale project BCR Chrome Mine the decommissioning and closure phase will start in the year 2046. Traffic volumes during this phase will be considerably lower than the operational phase and therefore it is expected that the traffic impact will be negligible.

Table 4.2 and Figure 1 below summarises the expected daily transport requirements for the proposed mine during the construction, operational and decommissioning phases.

Table 4.2: Daily Transport Requirements for all Phases of the Proposed Mine

Daily Transport Requirements			
Analysis scenario	**Construction Phase (2014 - 2016)**	**Operational Phase (2016 - 2045)**	**Closure and Decomissioning Phase (2046)**
Heavy vehicle/day	20	40	15
Private vehicle/day	19	29	10
Public transport/day (Mini bus)	4	6	2
Total number of vehicles	**43**	**76**	**27**

Figure 1: Daily Transport Requirements for all Phases of the Proposed Mine



** Refers to report acquired from the BCR Chrome Mine (*Spitsvale Project).

It is estimated that 76 additional vehicle trips will be generated daily during the operational phase. **Table 4.3 and 4.4**, below, shows the directional split of the expected trips per hour during the three phases of the project (AM and PM peak hour trip generation).

Table 4.3: Proposed Mine's trip generation during the AM Peak Hour

Expected AM Peak Hour Trip Generation										
Analysis scenario	**Assumptions**	**Construction Phase (2014 - 2016)**			**Operational Phase (2016 - 2046)**			**Closure and Decomissioning Phase (2047)**		
		Total	**In**	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**
Heavy vehicle (vph)	15% of total traffic (80/20 Split)	3	2	1	6	5	1	2	2	0
Private vehicle (vph)	2 shifts (60/40 split)	19	11	8	29	17	12	10	6	4
Public transport (vph)	2 shifts (50/50 Split)	4	2	2	6	3	3	2	1	1
Total number of vehicles		26	15	11	**41**	**25**	**16**	14	9	5

Table 4.4: Proposed Mine's trip generation during the PM Peak Hour

Expected PM Peak Hour Trip Generation										
Analysis scenario	Assumptions	Construction Phase (2014 - 2016)			Operational Phase (2016 - 2046)			Closure and Decomissioning Phase (2047)		
		Total	In	Out	Total	In	Out	Total	In	Out
Heavy vehicle (vph)	15% of total traffic (20/80 Split)	3	1	2	6	1	5	2	0	2
Private vehicle (vph)	2 shifts (40/60 split)	19	8	11	29	12	17	10	4	6
Public transport (vph)	2 shifts (50/50 Split)	4	2	2	6	3	3	2	1	1
Total number of vehicles		26	11	15	**41**	**16**	**25**	14	5	9

The proposed development generates 41vph during both the AM and PM peak hour.

4.4 Trip Distribution and Trip Assignment

The trip distribution of the additional traffic expected to be generated by the proposed mine was determined based on the expected origins and destinations of the development traffic. Refer to **Appendix A, Figure 4**.

The additional vehicle trips that are expected to be generated by the mine activities were assigned to the adjacent road network. The assignment of the trips is based on the routes identified in the baseline assessment. Refer to **Appendix A**, **Figure 5.**

4.5 Intersection Capacity Analysis

Capacity analysis of the intersections on the surrounding road network was conducted using *aaSIDRA* analytical software. The performance characteristics and expected traffic demand of every intersection were determined for the different traffic scenarios described in **Section 4.1**. The traffic volumes used for the assessment and analysis results of the traffic impact are indicated in the **Appendix A, Figure 3a, 3b, 6a, 6b, 8a, 8b, 9a and 9b**. The capacity analysis results for the scenarios under evaluation are summarised in **Table 4.5** and **Table 4.6**, below.

Table 4.5: Capacity Analysis Results during the AM Peak Hour

No	Intersection	Scenario 1: 2015 Background Traffic Demand (Fig 3)			Scenario 2: 2017 Background Traffic Demand (Fig 6)			Scenario 3: 2027 Background Traffic + Latent Rights + Development Traffic Demand (Fig 8)			Scenario 4: 2027 Background Traffic + Latent Rights + Development Traffic Demand-Upgraded (Fig 9)		
		LOS	Del (s)	v/c	LOS	Del (s)	v/c	LOS	Del (s)	v/c	LOS	Del (s)	v/c
1	R555 / D1261	C	19	0,49	C	19	0,50	C	24	0,64	No upgrades		
2	R557 / D1261	A	8	0,31	A	8	0,32	B	11	0,48	No upgrades		
3	R555 / R557	A	6	0,4	A	7	0,43	A	8	0,61	No upgrades		
4	D1261 / Access to Mine	A	2	0,04	A	2	0,04	A	3	0,05	A	3	0,03

Table 4.6: Capacity Analysis Results during the PM Peak Hour

No	Intersection	Scenario 1: 2015 Background Traffic Demand (Fig 3)			Scenario 2: 2017 Background Traffic Demand (Fig 6)			Scenario 3: 2027 Background Traffic + Latent Rights + Development Traffic Demand (Fig 8)			Scenario 4: 2027 Background Traffic + Latent Rights + Development Traffic Demand-Upgraded (Fig 9)		
		LOS	Del (s)	v/c	LOS	Del (s)	v/c	LOS	Del (s)	v/c	LOS	Del (s)	v/c
1	R555 / D1261	D	33	0,66	D	35	0,68	F	60	0,85	No upgrades		
2	R557 / D1261	A	9	0,36	A	9	0,37	B	13	0,58	No upgrades		
3	R555 / R557	A	7	0,34	A	7	0,36	A	7	0,46	No upgrades		
4	D1261 / Access to Mine	A	2	0,03	A	2	0,03	A	4	0,05	A	4	0,05

Legend:
Background: projected traffic without development traffic
Volume to capacity ratio (v/c)
Delay (in seconds)
Level of service (LOS)

A,B,C,D	*acceptable LOS*
E and F	*Unacceptable LOS*

Most intersections operate at acceptable levels of service for all scenarios except for intersection 1 Scenario 3 (2027 PM peak hour background traffic + Latent rights + Development). The intersection mentioned above operates at a LOS of F. It is further proposed that exclusive turning lanes be constructed on the D1261 / Access to the mine intersection for safety reasons. With the road upgrades, the intersection will operate at an acceptable level of service.

4.5.1 Proposed road upgrades cost estimate

D1261 / Access road to mine intersection: Refer to Appendix A, Figure 10 and Appendix B for SIDRA layout of the proposed upgrades. The cost of road upgrades at this intersection is estimated at **R4.5 million** excluding VAT, professional fees, contingencies, the relocation of major services and acquisition of land required to construct the road. Please note that the above cost estimate is based on a first order design and rates per square meter (m^2) road surface. A more accurate costing can only be done as part of a detail roads design exercise.

4.5.2 Road link capacity

The analysis results for the assessment of the road link capacity (within the area of influence) per direction are summarised in **Table 4.7** below. For the purposes of this assessment only the critical phase was considered (the operational phase).

Table 4.7: Typical Weekday AM Peak Hour link volumes and lane capacity

Road	Section of the road	Direction and Lane Requirements	Operational Phase: 2027 Background Traffic + Latent Rights +Development Traffic	Existing nr. of lanes per direction	Utilization (v/c ratio) during horizon year (2027 Traffic + Latent Rights + Development Traffic)	Available spare capacity per lane
R555 / D1261	South of the R555	Northbound	200	1.0	0.13	0.82
		Southbound	180	1.0	0.12	0.83
	North of the R555	Northbound	475	1.0	0.31	0.64
		Southbound	325	1.0	0.22	0.73
	East of the D1261	Eastbound	165	1.0	0.14	0.81
		Westbound	320	1.0	0.27	0.68
R555 / R557	South of the R555	Northbound	160	1.0	0.11	0.84
		Southbound	420	1.0	0.28	0.67
	North of the R555	Northbound	240	1.0	0.16	0.79
		Southbound	105	1.0	0.07	0.88
	East of the R557	Eastbound	70	1.0	0.05	0.90
		Westbound	465	1.0	0.31	0.64
R557 / D1261	East of the R557	Eastbound	275	1.0	0.18	0.77
		Westbound	310	1.0	0.21	0.74
	West of the R557	Eastbound	200	1.0	0.13	0.82
		Westbound	305	1.0	0.20	0.75
	North of the D1261	Northbound	245	1.0	0.20	0.75
		Southbound	240	1.0	0.20	0.75

Note 1: Lanes required to accommodate the demand on the roads, are based on a lane capacity of: 1 500 vph for the R555 and R557 roads and 1 200 vph for the D1261 road.

From **Table 4.7** it is evident that the analysed routes are expected to accommodate the existing and future traffic demand (up to the decommissioning phase) without requiring additional road upgrades. All the roads analysed in this study still have enough spare capacity.

5 IMPACT RATING AND MITIGATING MEASURES

This section of the report identifies the potential impacts associated with the trips generated by the proposed development and the mitigation measures. The significance (quantification) of traffic impacts was identified during the assessments and these were determined using a ranking scale, based on the following terminology:

Magnitude (M) refers to the degree to which the impact alters the functioning of an element of the environment. The magnitude can either be positive or negative.

Duration (D) refers to the timeframe over which the impact is expected to occur, measured relative to the lifetime of the proposed development.

The **Extent** / **Scale (S)** of the impact refer to the level to which the impact will affect the national, regional or local environment, or only that of the site.

The **Probability (P)** describes the likelihood of the impact actually occurring. Each of these factors has been assessed for the current and potential impacts using the following ranking scale values.

Refer to **Table 5.1 and 5.2** below for the status impact and Impact rating.

Table 5.1: Status Impact

Status of Impact	
+: Positive (A benefit to the receiving environment)	
N: Neutral (No cost or benefit to the receiving environment)	
-: Negative (A cost to the receiving environment)	
Magnitude:=M	***Duration:=D***
10: Very high/don't know	5: Permanent
8: High	4: Long-term (ceases with the operational life)
6: Moderate	3: Medium-term (5-15 years)
4: Low	2: Short-term (0-5 years)
2: Minor	1: Immediate
0: Not applicable/none/negligible	0: Not applicable/none/negligible
Scale:=S	***Probability:=P***
5: International	5: Definite/don't know
4: National	4: Highly probable
3: Regional	3: Medium probability
2: Local	2: Low probability
1: Site only	1: Improbable
0: Not applicable/none/negligible	0: Not applicable/none/negligible

Table 5.2: Impact Rating

The maximum value that can be achieved is 100 Significance Points (SP).
Environmental effects were rated as follows:

Significance	*Environmental Significance Points*	*Colour Code*
High (positive)	>60	H
Medium (positive)	30 to 60	M
Low (positive)	<30	L
Neutral	0	N
Low (negative)	>-30	L
Medium (negative)	-30 to -60	M
High (negative)	<-60	H

Table 5.3: Construction Phase

POTENTIAL ENVIRONMENTAL IMPACT	APPLICABLE AREA	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							ACTION PLAN	FREQUENCY	PERSON RESPONSIBLE	ANNUAL MANAGEMENT COST
			M	D	S	P	TOTAL	STATUS	SP		M	D	S	P	TOTAL	STATUS	SP				
CONSTRUCTION PHASE ACTIVITIES: ACTIVITIES REQUIRING MANAGEMENT MEASURES																					
TRAFFIC																					
Traffic Volumes	All Intersections	Surface Mapping, trenching, surface drilling, geological moddelling,re habilitation	2	1	2	2	10	-	L	No recommendations	2	1	2	2	10	-	L	No action Plan	Short Term	Engineer	Once-off
Road Safety	All intersections	Surface Mapping, trenching, surface drilling, geological moddelling,re habilitation	2	1	2	2	10	-	L	No recommendations	2	1	2	2	10	-	L	No action Plan	Short Term	Engineer	Once-off

Table 5.4: Operational Phase

POTENTIAL ENVIRONMENTAL IMPACT	APPLICABLE AREA	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							ACTION PLAN	FREQUENCY	PERSON RESPONSIBLE	ANNUAL MANAGEMENT COST
			M	D	S	P	TOTAL	STATUS	SP		M	D	S	P	TOTAL	STATUS	SP				
OPERATIONAL PHASE ACTIVITIES: MINING OF CHROME, PRODUCT STOCKPILING AND TRANSPORTATION OF CHROME																					
TRAFFIC																					
Traffic Volumes	All Intersections	Mining	4	4	5	3	39	-	M	For safety reason it is proposed that the intersection be reanalysed again after 10 years.	2	4	5	2	22	-	L	Construction of the proposed intersection road upgrades.	Long Term	Engineer	N/A
Road Safety	All Intersections	Mining	4	4	5	3	39	-	M	Providing for exclusive turning lanes on the D1261 / Access to the mine intersection. Providing for street lighting on the D1261 in the vicinity of the mine.	2	4	5	2	22	-	L	Construction of the proposed intersection road upgrades and providing for street lighting for safety purposed.	Long Term	Engineer	N/A

Table 5.5: Closure and Decommissioning Phase

POTENTIAL ENVIRONMENTAL IMPACT	APPLICABLE MINE	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							ACTION PLAN	FREQUECY	PERSON RESPONSIBLE	ANNUAL MANAGEMENT COST
			M	D	S	P	TOTAL	STATUS	SP		M	D	S	P	TOTAL	STATUS	SP				
DECOMMISSIONING AND CLOSURE PHASE ACTIVITIES: ACTIVE SURFACE REHABILITATION OF DISTURBED AREAS																					
TRAFFIC																					
Traffic Volumes	**All Intersections**	**Rehabilitation**	2	2	2	2	12	-	L	No recommendation	2	2	2	2	12	-	L	No action plan	Short Term	Engineer	N/A
Road Safety	**All Intersections**	**Rehabilitation**	2	2	2	2	12	-	L	No recommendation	2	2	2	2	12	-	L	No action plan	Short Term	Engineer	N/A

Table 5.6: Cumulative Impacts

POTENTIAL ENVIRONMENTAL IMPACT	APPLICABLE MINE	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							ACTION PLAN	FREQUECY	PERSON RESPONSIBLE	ANNUAL MANAGEMENT COST
			M	D	S	P	TOTAL	STATUS	SP		M	D	S	P	TOTAL	STATUS	SP				
CUMULATIVE IMPACTS: IMPACTS CONSIDERED ON AN INTERNARTIONAL SCALE																					
TRAFFIC																					
Traffic Volumes	**All Intersections**		4	4	5	3	39	-	M	For safety reason it is proposed that the intersection be reanalysed again after 10 years.	2	4	5	2	22	-	L	Construction of the proposed intersection road upgrades.	Long Term	Engineer	Once off
Road Safety	**All Intersections**		4	4	5	3	39	-	M	Providing for exclusive turning lanes on the D1261 / Access to the mine intersection. Providing for street light on the D1261 in the vicinity of the mine.	2	4	5	2	22	-	L	Construction of the proposed intersection road upgrades and providing for street lighting for safety purposed.	Long Term	Engineer	Once off

Based on the impact rating in **Table 5.3** to **Table 5.6** above, it is clear that the traffic volumes and traffic safety have a direct impact and an indirect impact on the external road network during the operational phase. Therefore upgrades would be required for safety reasons and also to accommodate the 2027 background traffic volumes.

It is proposed that the R555 / D1261 intersection be reanalysed after 10 to review its performance. It is further proposed that exclusive turning lanes be constructed on the D1261 / Access to the mine intersection for safety reasons.

In terms of the intersection and road link capacity, no further upgrades are recommended since the intersections and roads under investigation are expected to operate at acceptable level of service with the proposed upgrades in place.

It is therefore recommended that the following measures be adopted to mitigate the impact:

- It is proposed that the R555 / D1261 intersection be reanalysed after 10 to review its performance;
- Construction / paving of the existing access road to the proposed BCR Chrome Mine site east of the D1261 to prevent weathering on the edges of the D1261.
- Provision of lighting of sufficient standards at the intersection of the D2161 / Access Road to the BCR Chrome Mine.
- Provision of road signage and road markings;
- No on-street pick up/drop offs at the D1261 Road / Access to mine intersection should be allowed (drop-offs / pickup should be done on site).
- Parking provision should be done for trucks to prevent queuing on the national roads and the D1261. (The mine has already made arrangements for this).

6 CONCLUSIONS

- This Traffic Impact Assessment was conducted for the proposed BCR Chrome Mine, the Spitsvale Project in Steelpoort with a life span of 30 years. This was done to determine the impact that the proposed mine will have on the surrounding road network, therefore proposing mitigation measures to avoid the determined impacts.
- Three phases of the mine where determine i.e. Contraction phase, operational phase and closure and decommissioning phase. The operational phase was considered to be the critical phase, therefore leading to it being the only phase analysed.
- Four Scenarios were analysed according to the development implementation plan:
    - Scenario 1: 2015 Existing Traffic Volumes (Existing geometry);
    - Scenario 2: 2017 Background projected traffic demand (Existing geometry);
    - Scenario 3: 2027 Background projected traffic demand + Latent Rights +the proposed Mine Traffic Demand (Existing geometry).
    - Scenario 4: 2027 Background projected traffic demand + Latent Rights +the proposed Mine Traffic Demand (Proposed geometry).
- The analysis performed on the intersection proves that all intersections operate at acceptable Levels of Service, except for the R555 / R557 during Scenario 3. Upgrades were proposed and with all the proposed upgrades in place it was determined that all intersections will operate at an acceptable Level of Service.
- Proposed upgrades are as follows:
    - D1261 / Access to mine intersection: Construction of exclusive turning lanes for safety reasons.
    - Provision of street lighting for safety purposes at the access to the mine intersection.
    - Atleast 400m paving of the access road to prevent weathering on the D1261.
- The construction of road upgrades at the D1261 / Access Road to mine intersection are estimated at **R4.5 million** excluding VAT, professional fees, contingencies, the relocation of major services and acquisition of land required to construct the road. Please note that the above cost estimate is based on a first order design and rates per square meter (m2) road surface. A more accurate costing can only be done as part of a detail design.

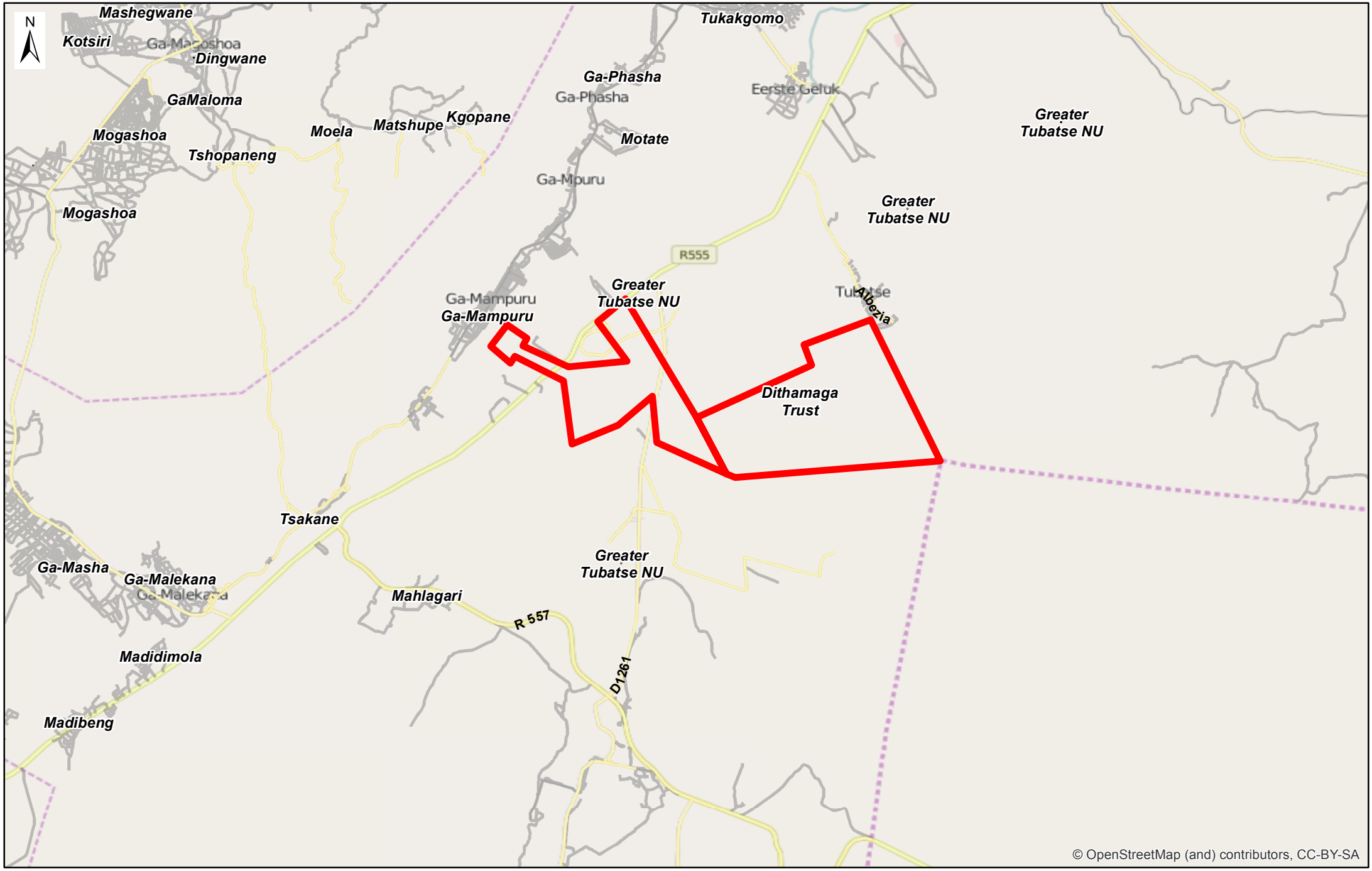
- It must be noted that the proposed road improvement is recommended to be implemented at the start of the BCR Chrome mine activities (Year 1 - 2 of operations).

7 RECOMMENDATIONS

The findings of the traffic impact assessment for proposed BCR Chrome Mine, the Spitsvale Project in Steelpoort conclude that the proposed development will not have a negative impact on the existing road networks within the project area. However, certain mitigation measures have been recommended to accommodate the background traffic demand, Latent Rights and the proposed mine's development traffic and also to ensure traffic safety principles are adhered to.

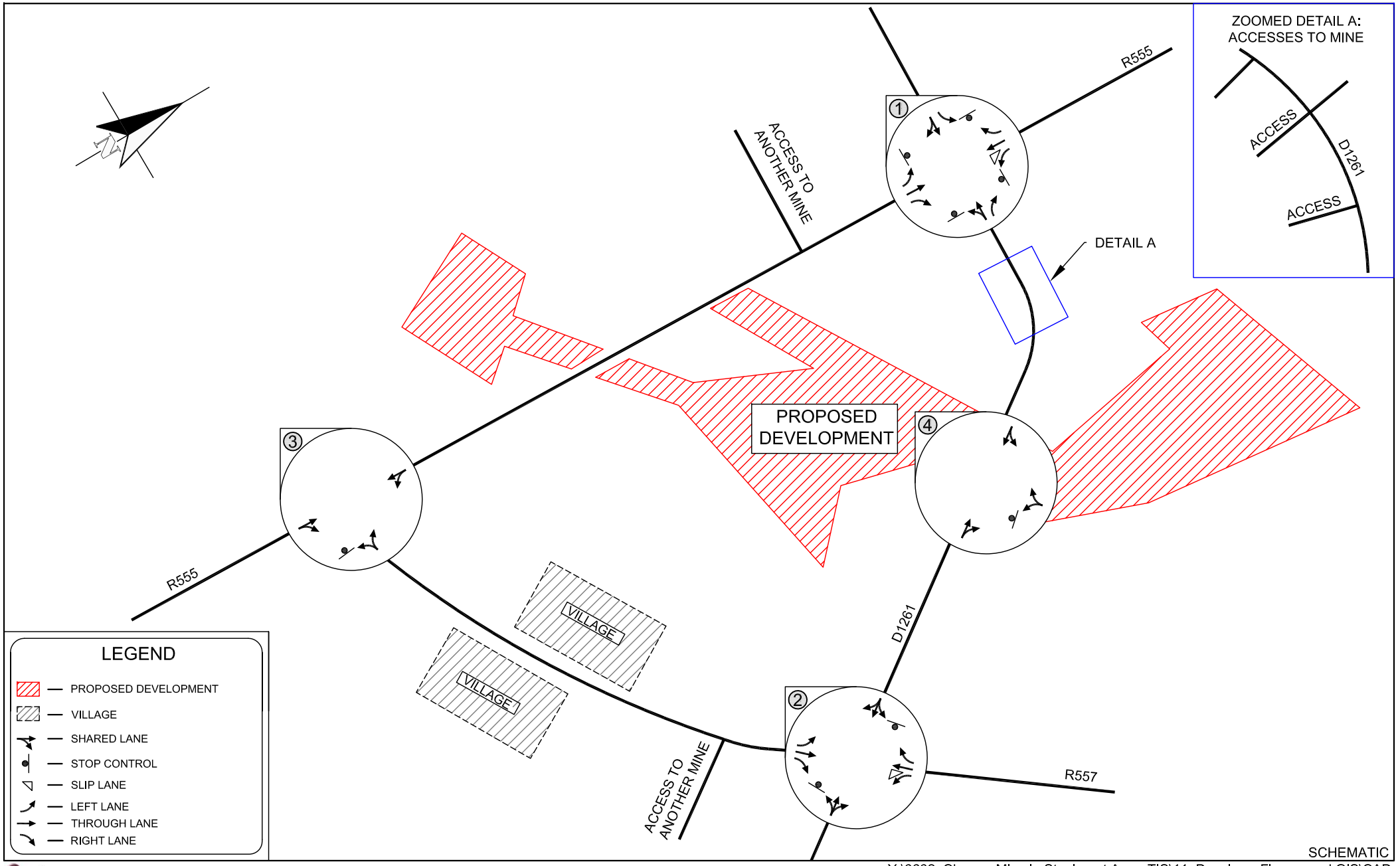
Based on the conclusions of this assessment, it is recommended that the proposed development should be favourably considered from a traffic engineering point of view by the relevant authorities.

APPENDIX A: FIGURES



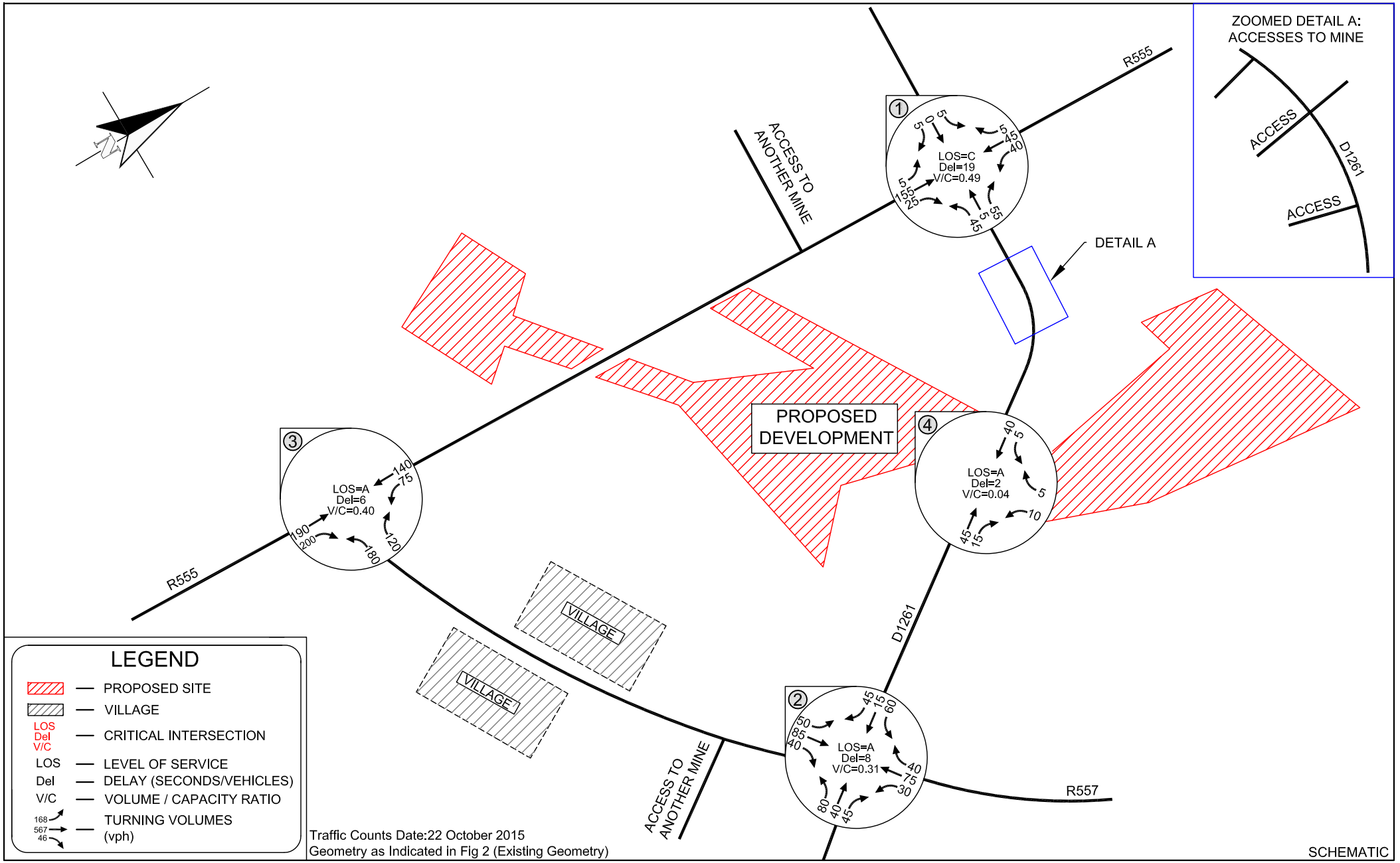
3632/Fig 1

	PROJECT:	FIGURE:	NO:
its Engineers (PTY) LTD	SPITSVALE PROJECT (CHROME MINE)	LOCALITY MAP	1



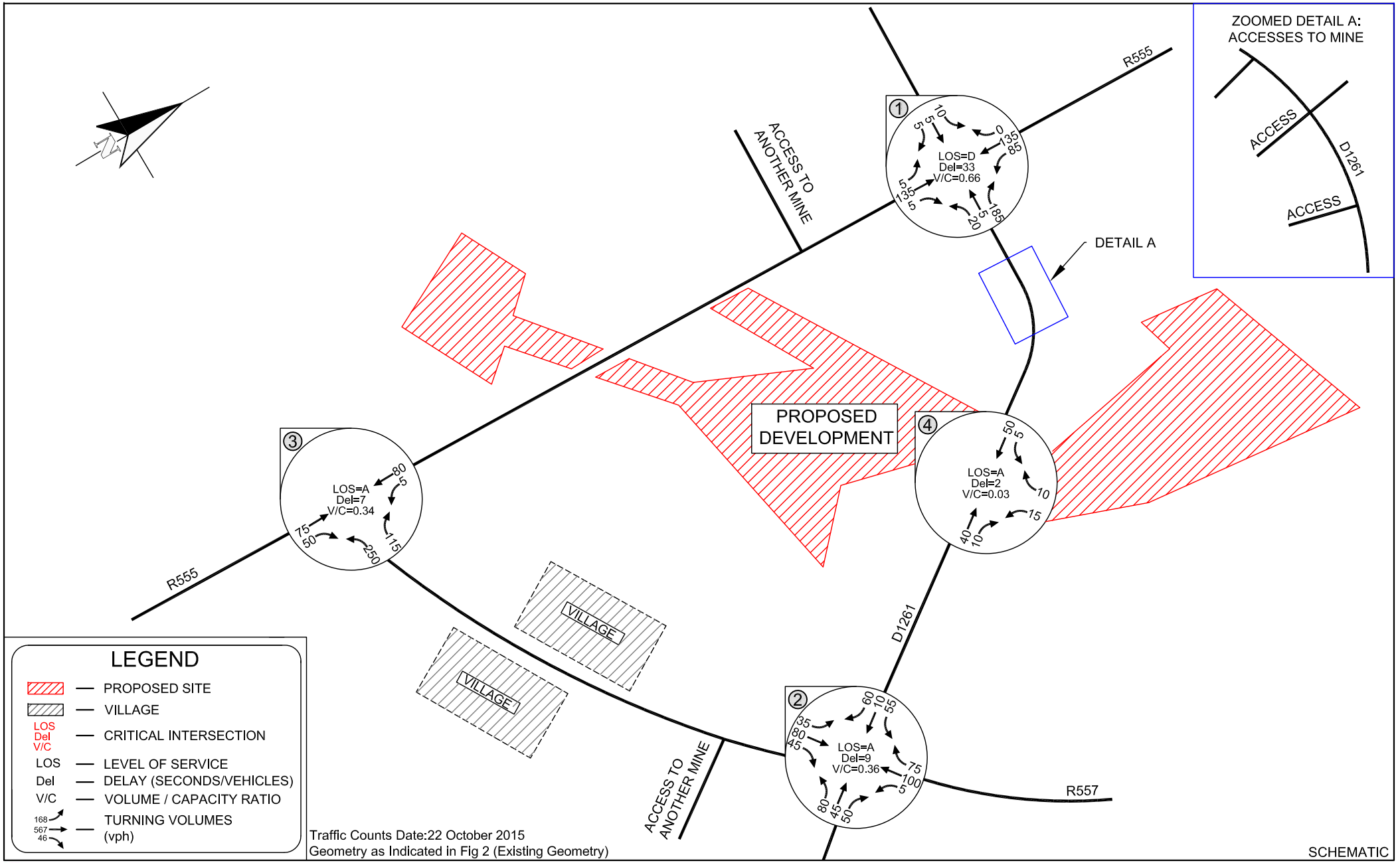
Y:\3632_Chrome Mine in Steelpoort Area_TIS\11. Drawings, Figures and GIS\CAD

PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	EXISTING GEOMETRY	2



Y:\3632_Chrome Mine in Steelpoort Area_TIS\11. Drawings, Figures and GIS\CAD

PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	SCENARIO 1 2015 AM PEAK HOUR BACKGROUND (LIGHT AND HEAVY VEHICLE) TRAFFIC VOLUMES WITH CAPACITY ANALYSIS RESULTS	3a



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PROJECT:	FIGURE:	NUMBER:
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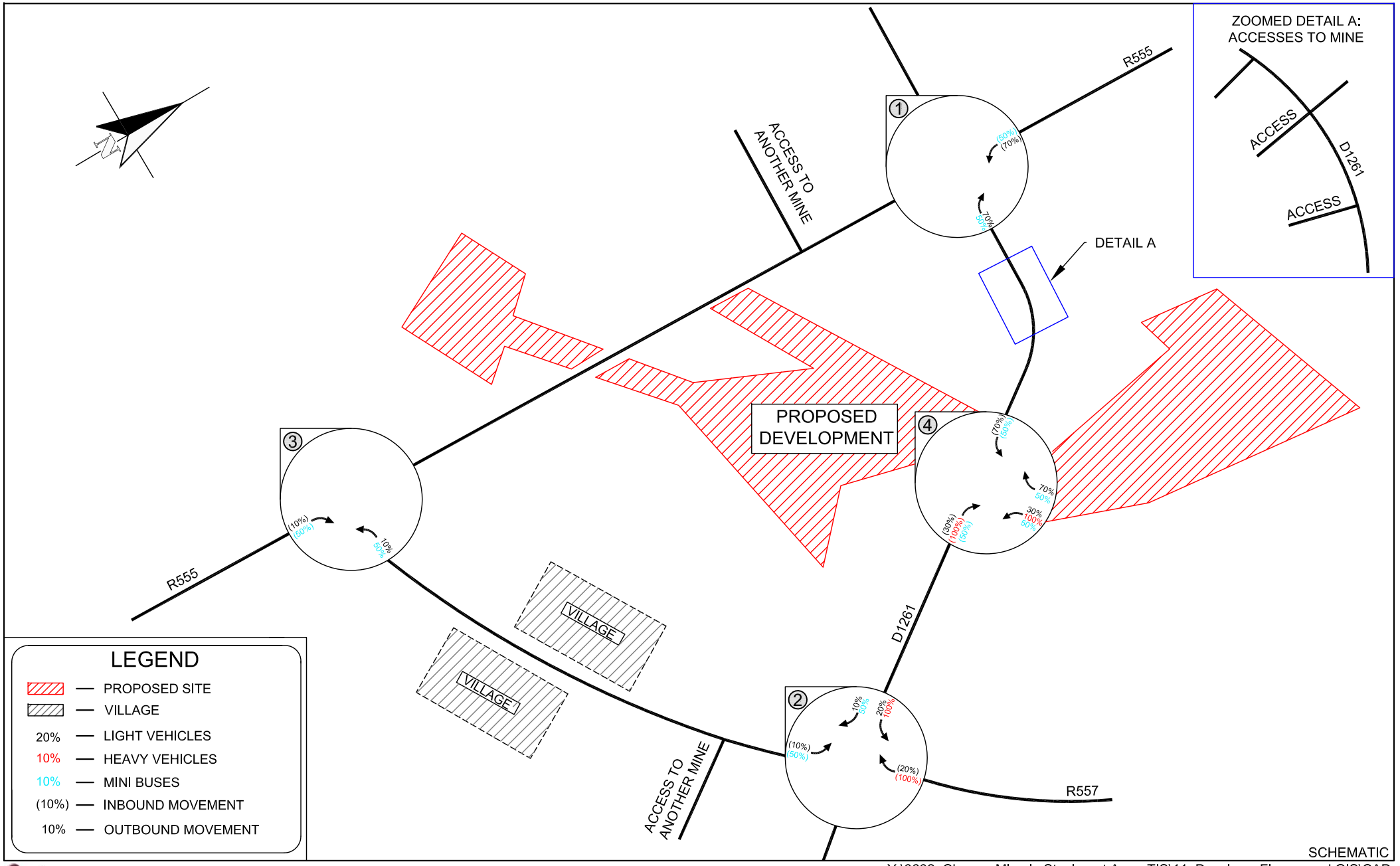

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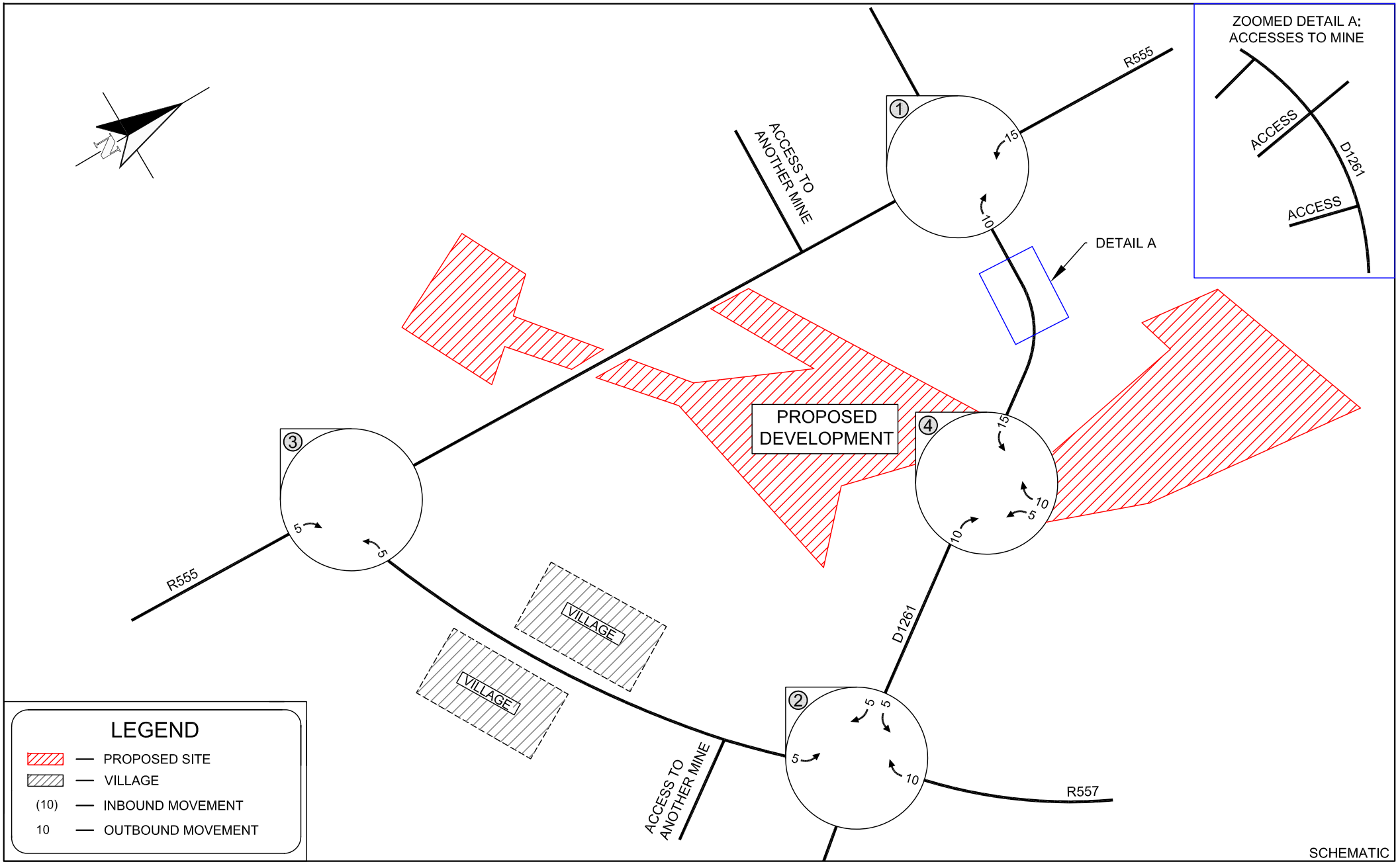
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	TRIP DISTRIBUTION	4



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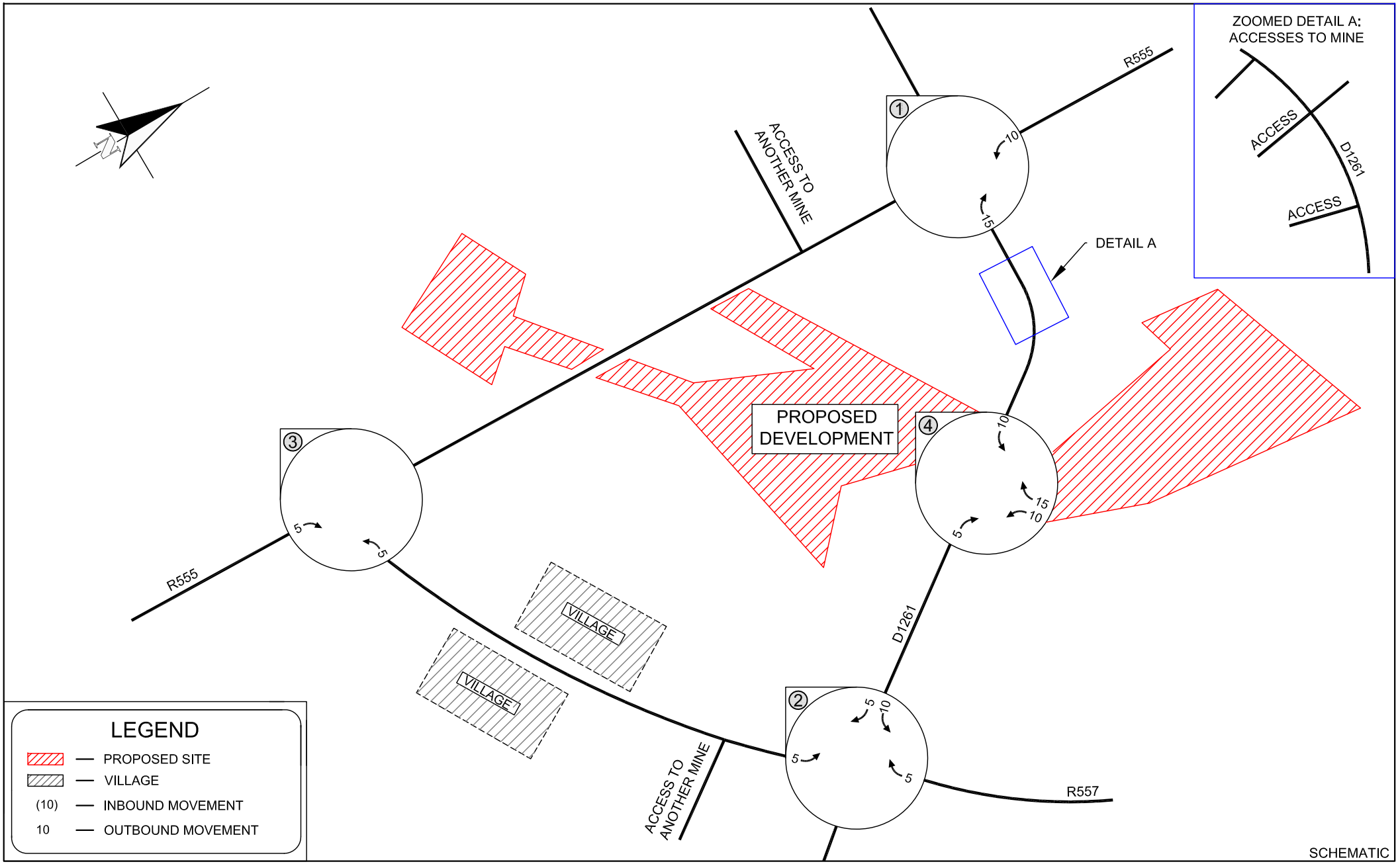
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	AM PEAK HOUR TRIP ASSIGNMENT	5a



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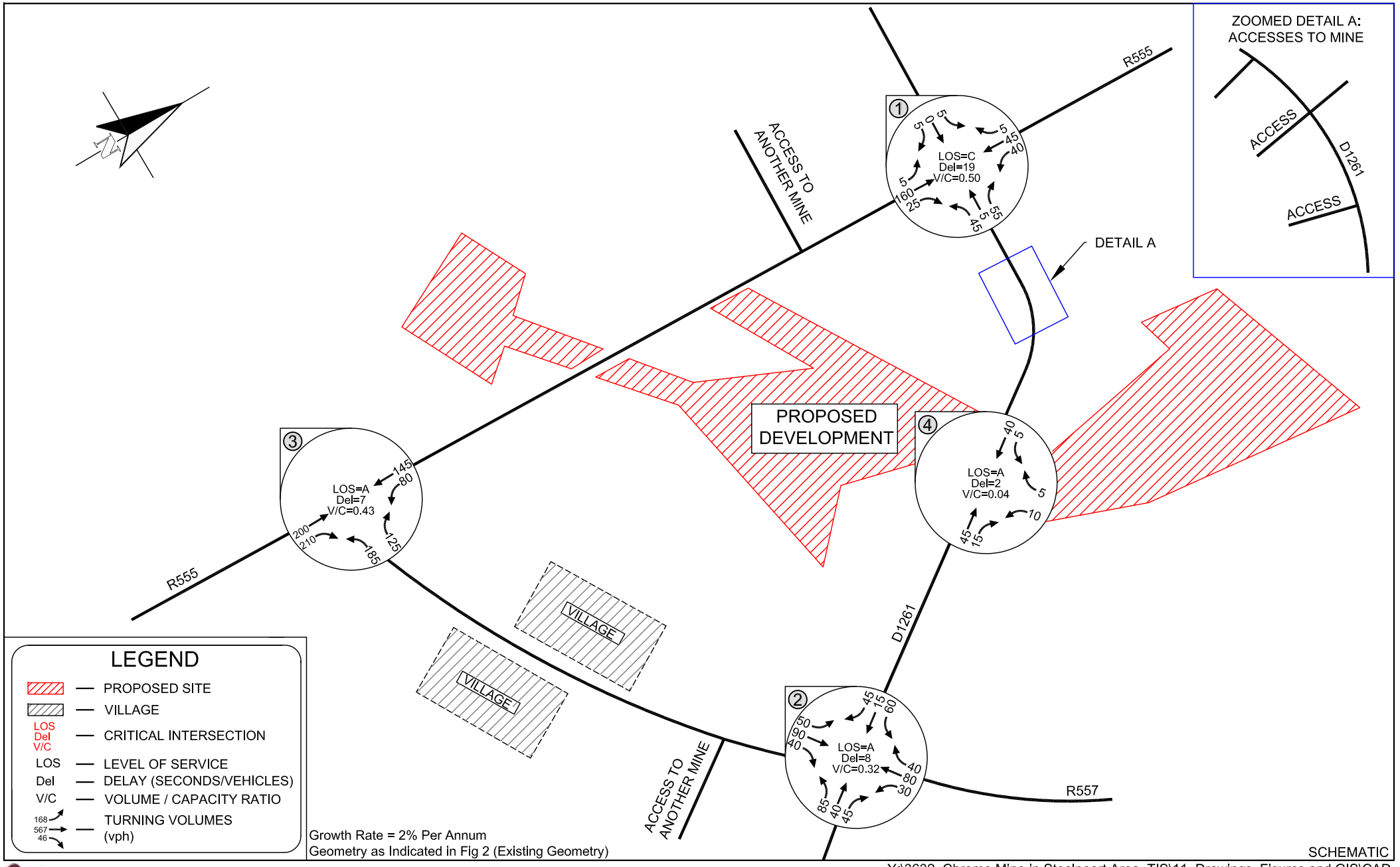
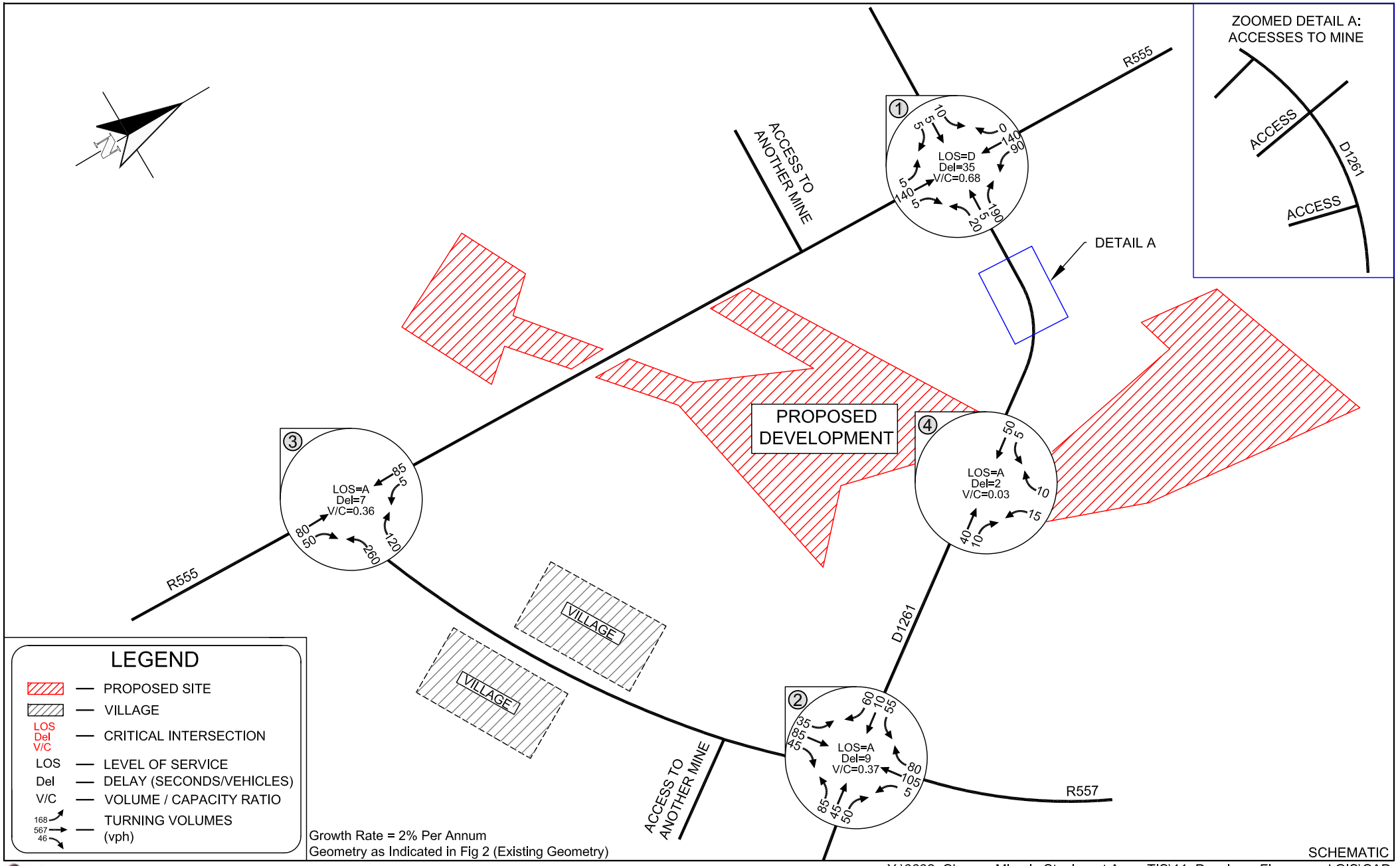
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	PM PEAK HOUR TRIP ASSIGNMENT	5b



Y:\3632_Chrome Mine in Steelpoort Area_TIS\11. Drawings, Figures and GIS\CAD

PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	SCENARIO 2 2017 AM PEAK HOUR BACKGROUND (LIGHT + HEAVY VEHICLES) TRAFFIC VOLUMES WITH CAPACITY ANALYSIS RESULTS	6a



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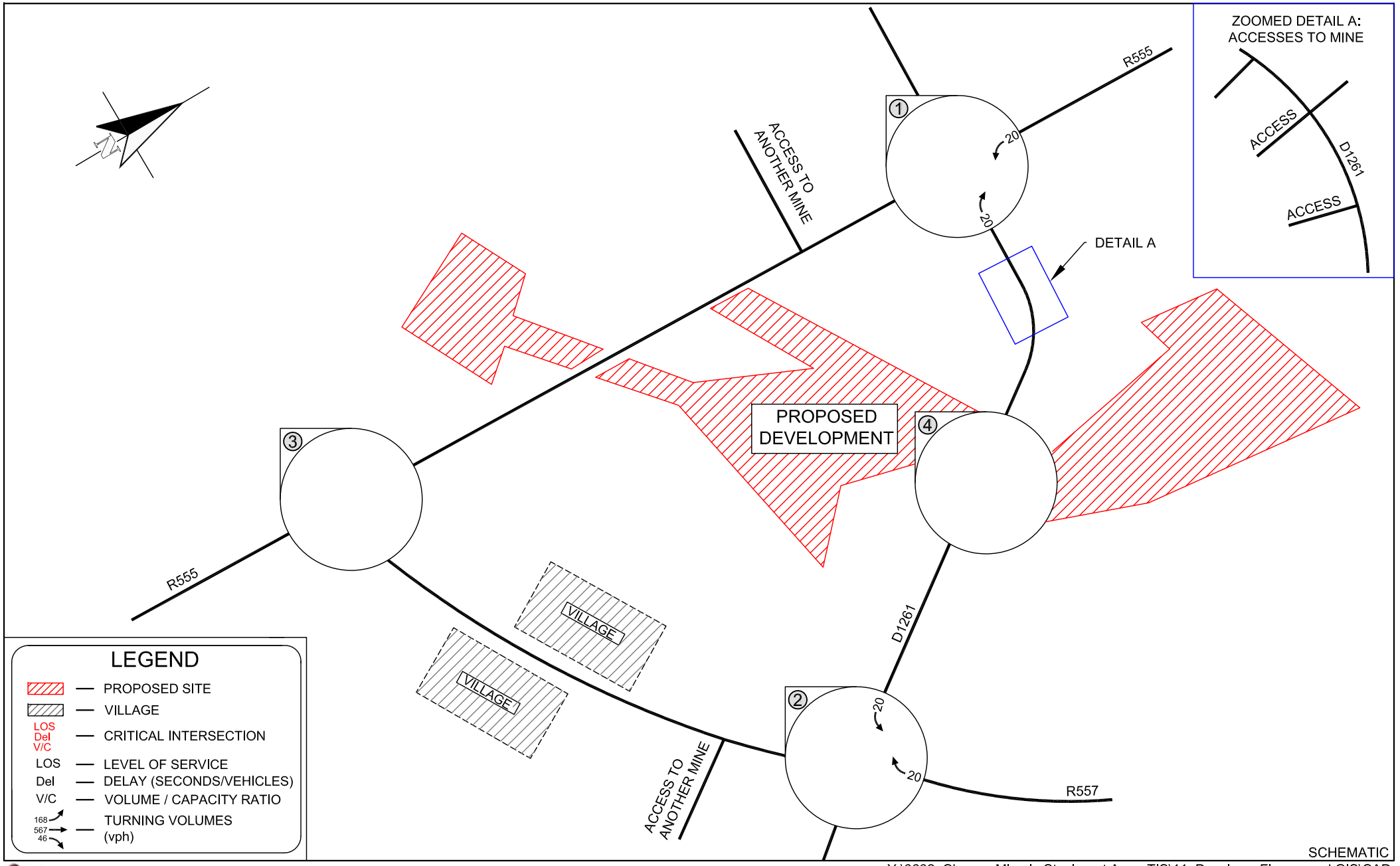
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	SCENARIO 2 2017 PM PEAK HOUR BACKGROUND (LIGHT + HEAVY VEHICLES) TRAFFIC VOLUMES WITH CAPACITY ANALYSIS RESULTS	6b



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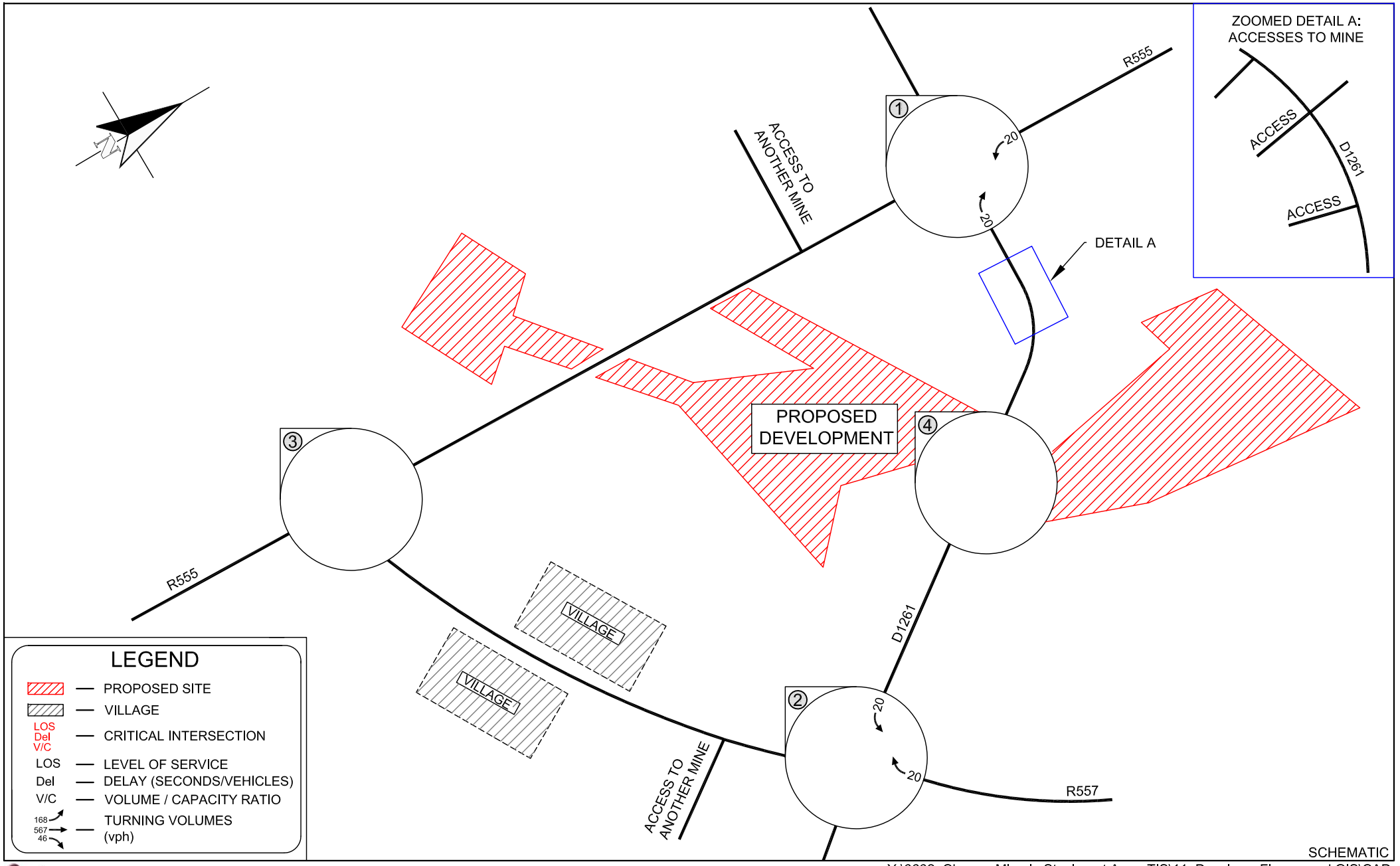
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	AM PEAK HOUR LATENT RIGHTS	7a



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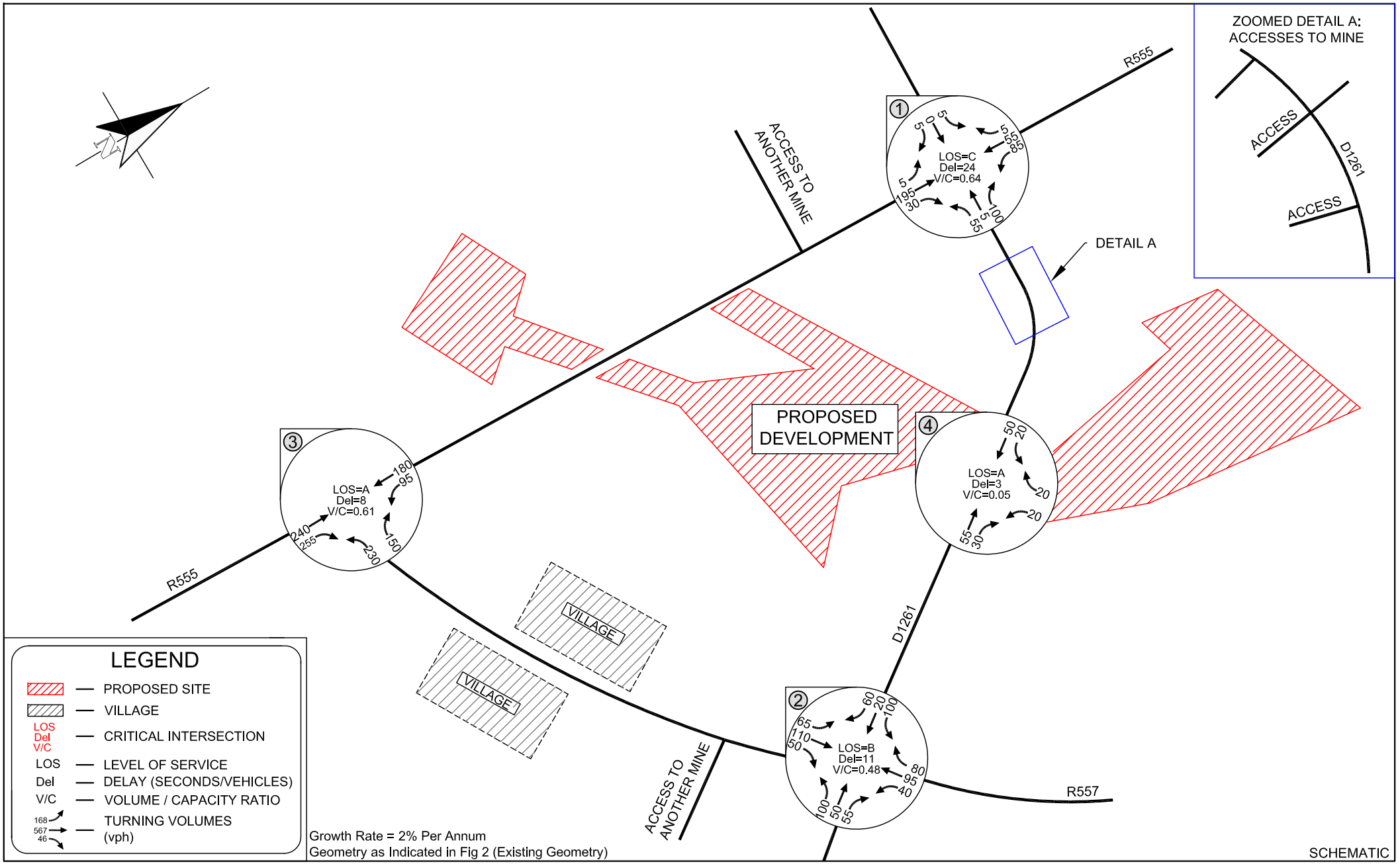
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	PM PEAK HOUR LATENT RIGHTS	7b



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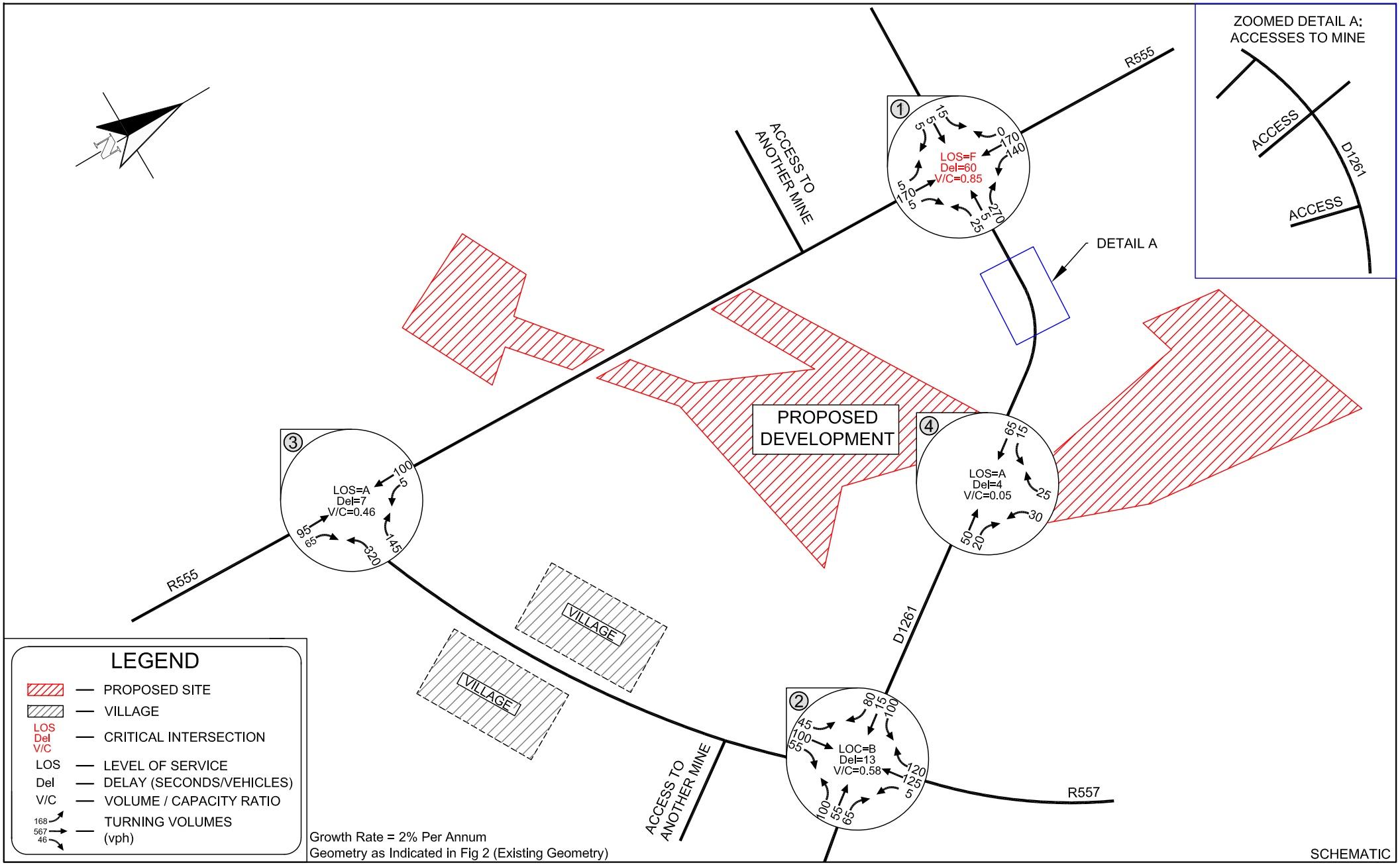
its (PTY) LTD Engineers

PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	SCENARIO 3 2027 AM PEAK HOUR BACKGROUND + LATENT RIGHTS + DEVELOPMENT TRAFFIC WITH CAPACITY ANALYSIS RESULTS (OPERATION PHASE)	8a



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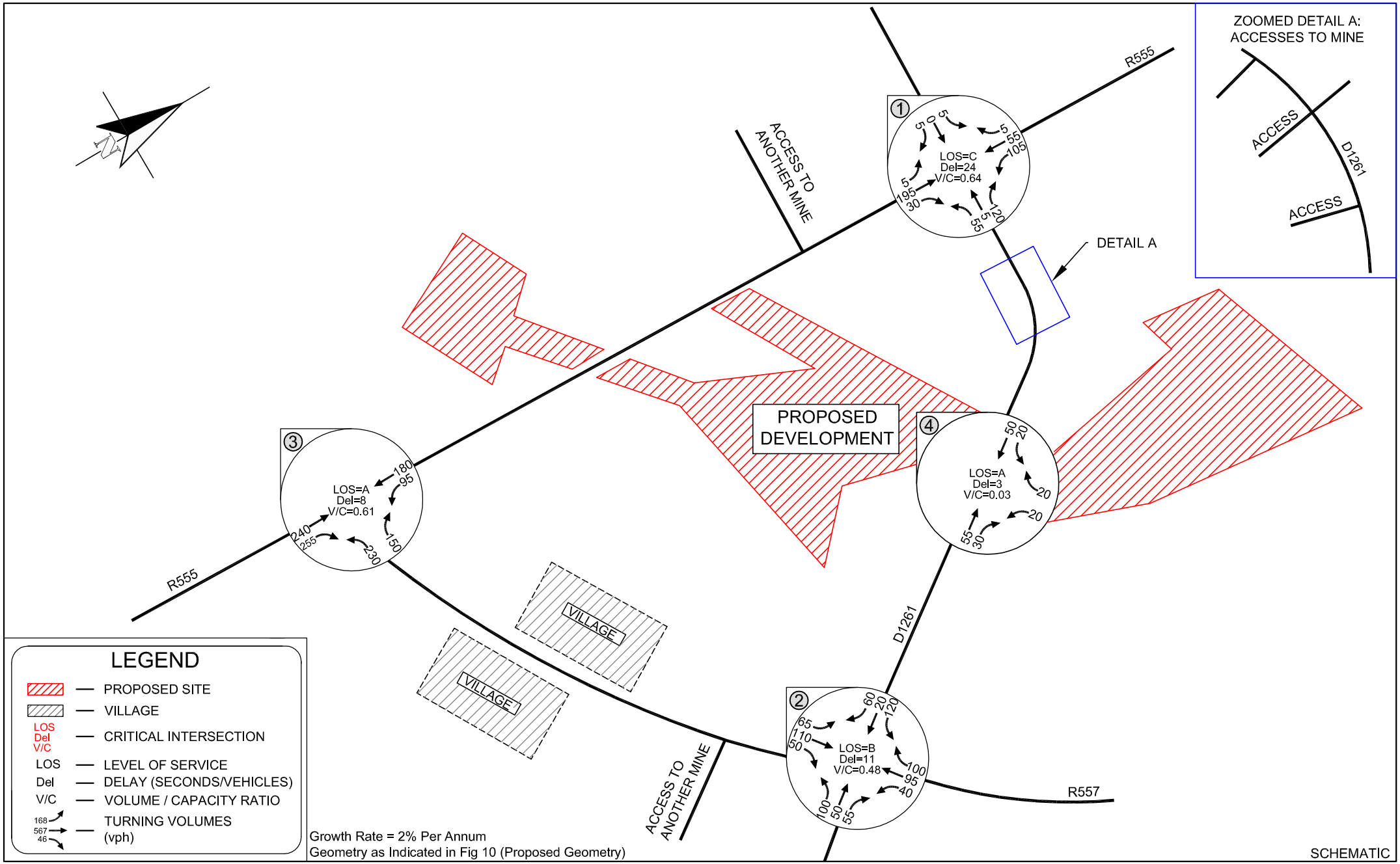
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	SCENARIO 3 2027 PM PEAK HOUR BACKGROUND + LATENT RIGHTS + DEVELOPMENT TRAFFIC WITH CAPACITY ANALYSIS RESULTS (CONSTRUCTION PHASE)	8b



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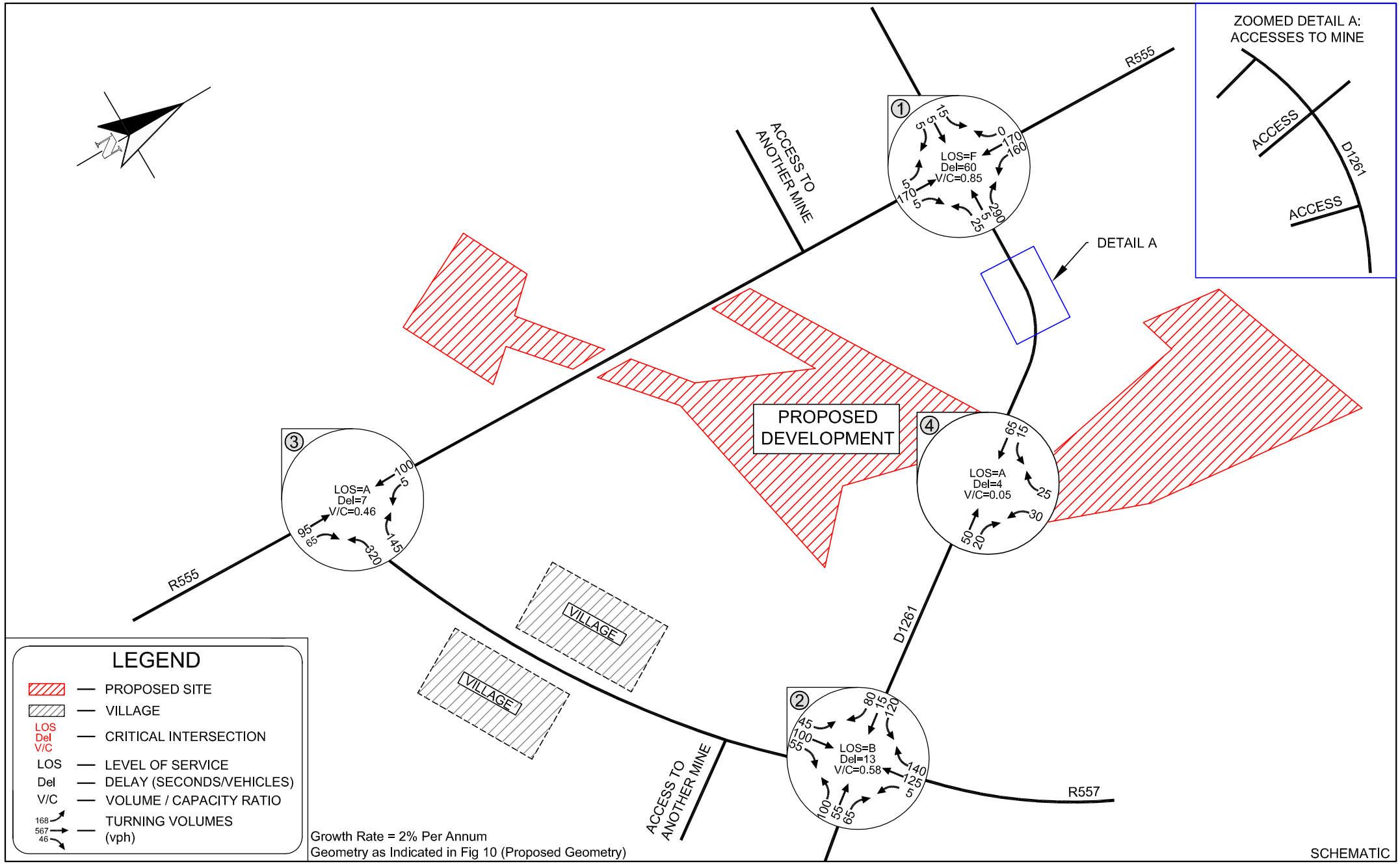
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	SCENARIO 4 2027 AM PEAK HOUR BACKGROUND + LATENT RIGHTS + DEVELOPMENT TRAFFIC WITH CAPACITY ANALYSIS RESULTS	9a



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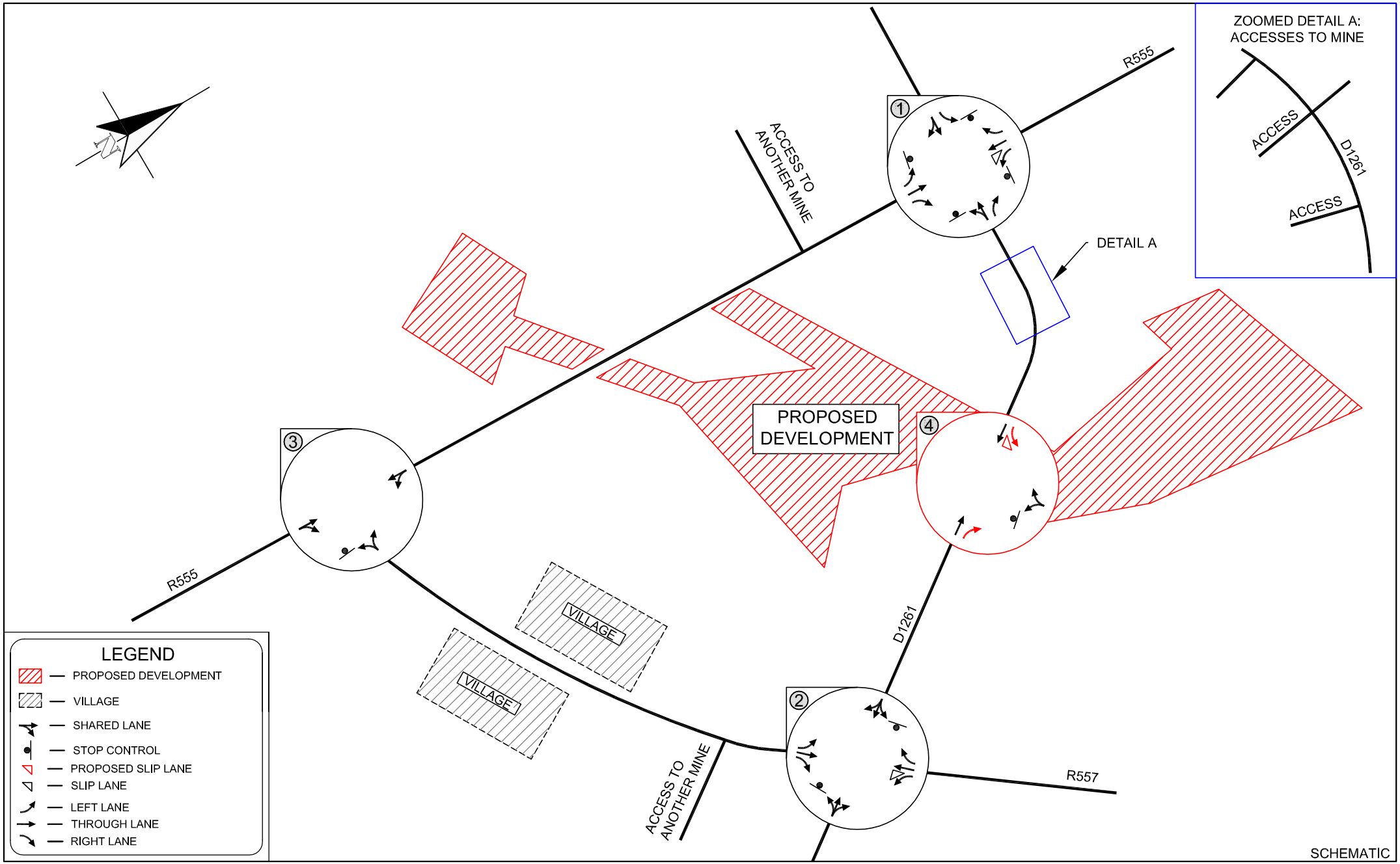
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	SCENARIO 4 2027 PM PEAK HOUR BACKGROUND + LATENT RIGHTS + DEVELOPMENT TRAFFIC WITH CAPACITY ANALYSIS RESULTS (CONSTRUCTION PHASE)	9b



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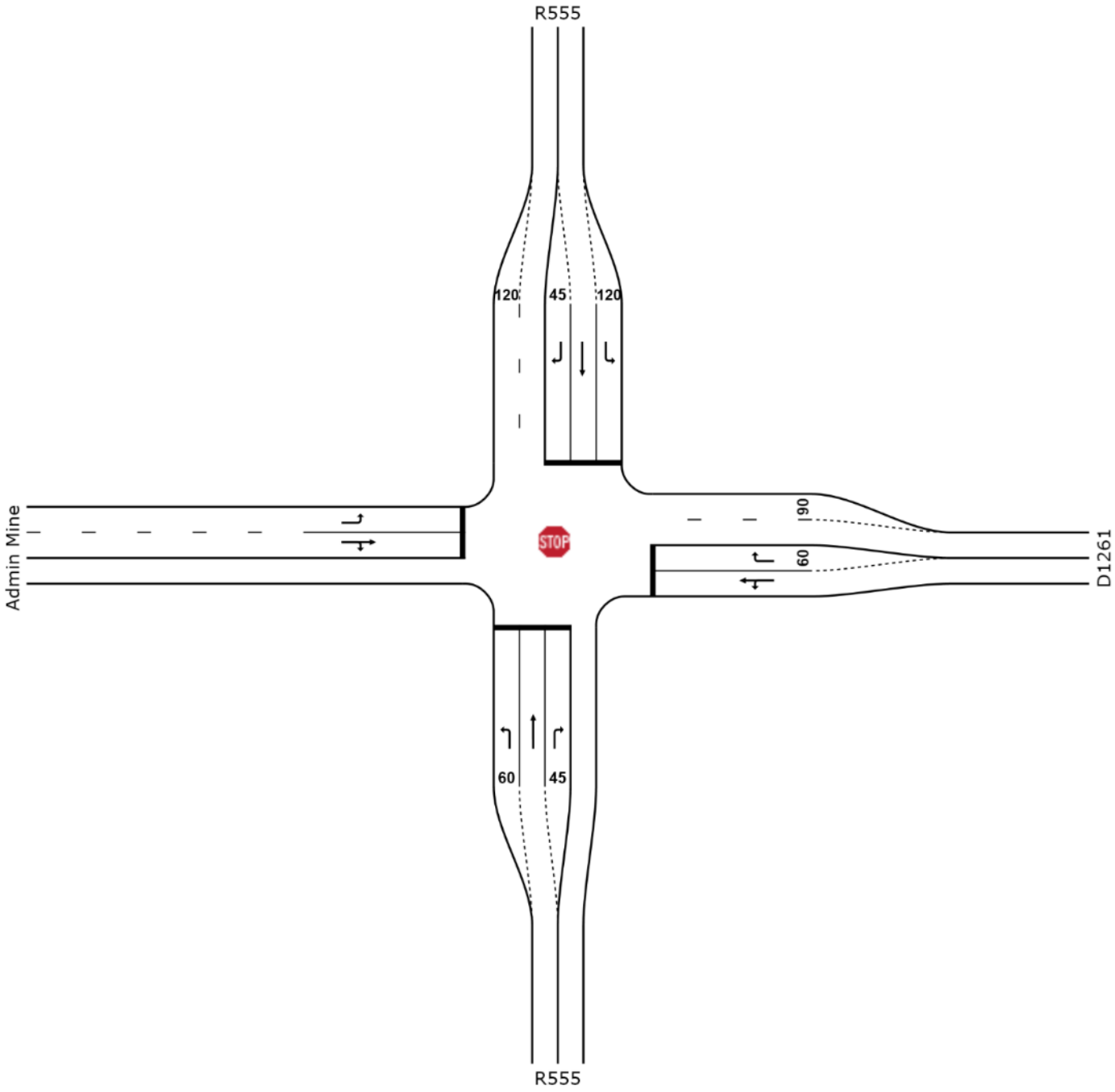
PROJECT:	FIGURE:	NUMBER:
SPITSVALE PROJECT (BCR CHROME MINE)	UPGRADED GEOMETRY	10

APPENDIX B: SIDRA LAYOUT

SITE LAYOUT

Site: R555 / D1261 _2015 PM Background Traffic Demand

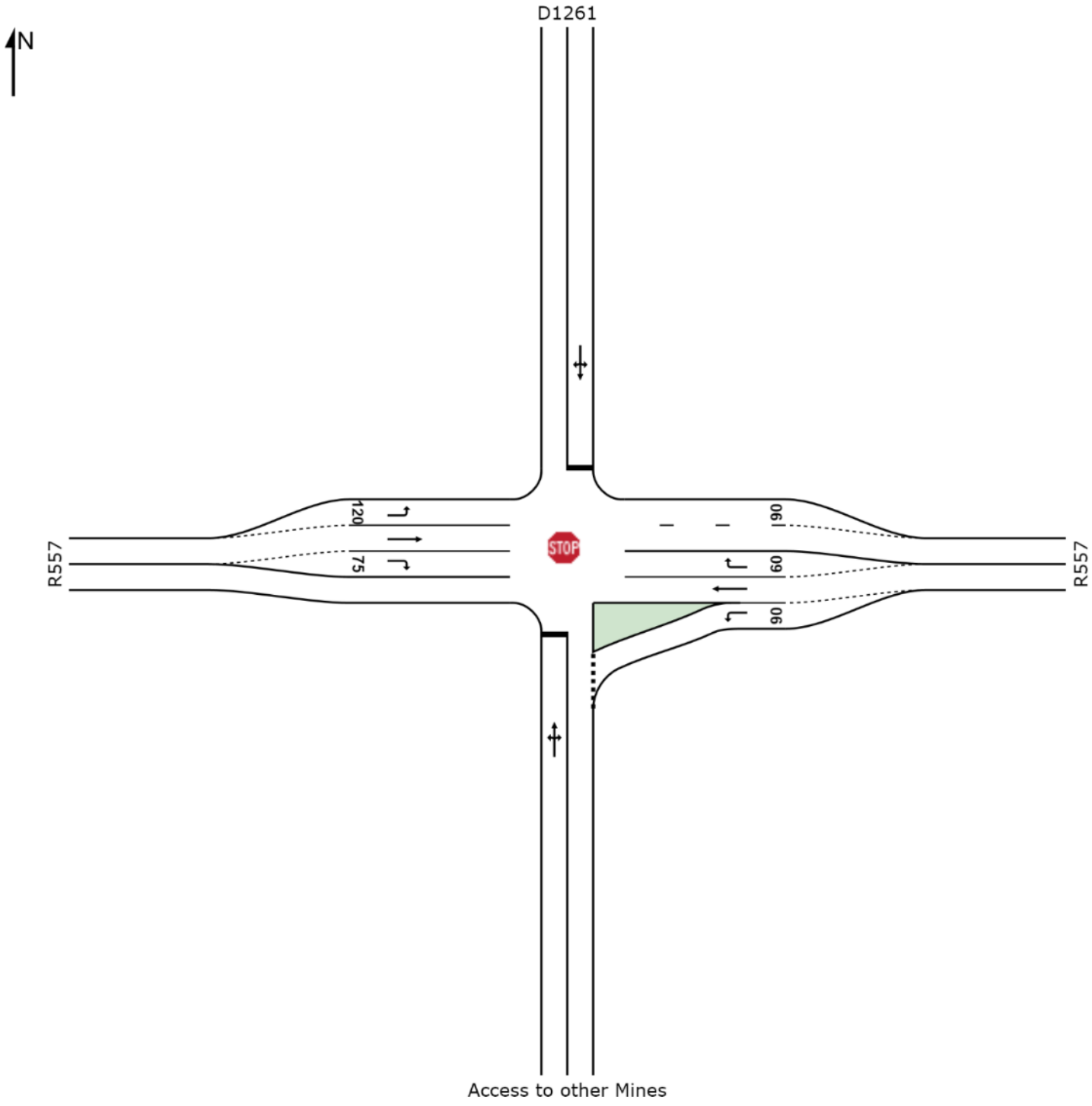
2015 PM Peak Hour
Stop (All-Way)

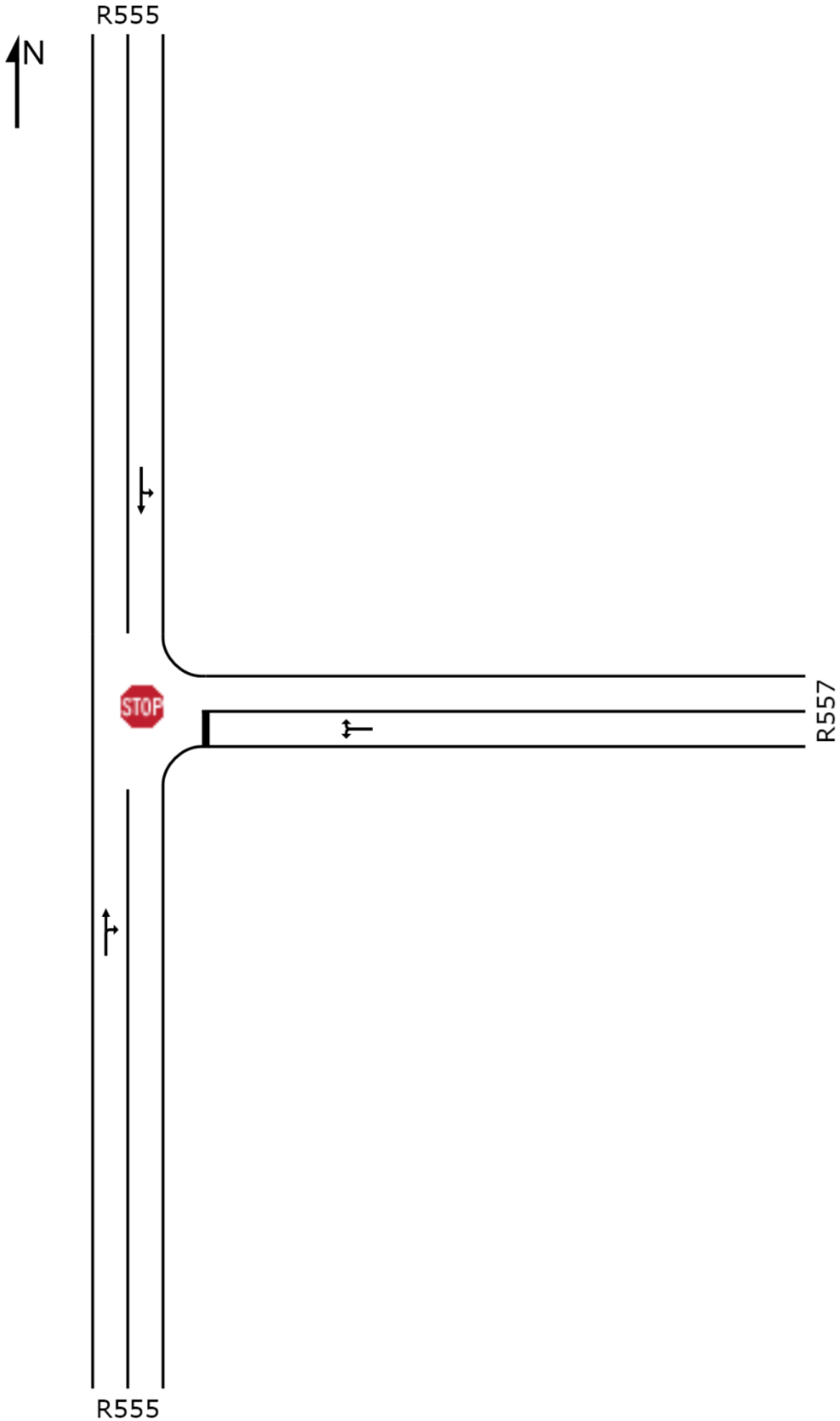


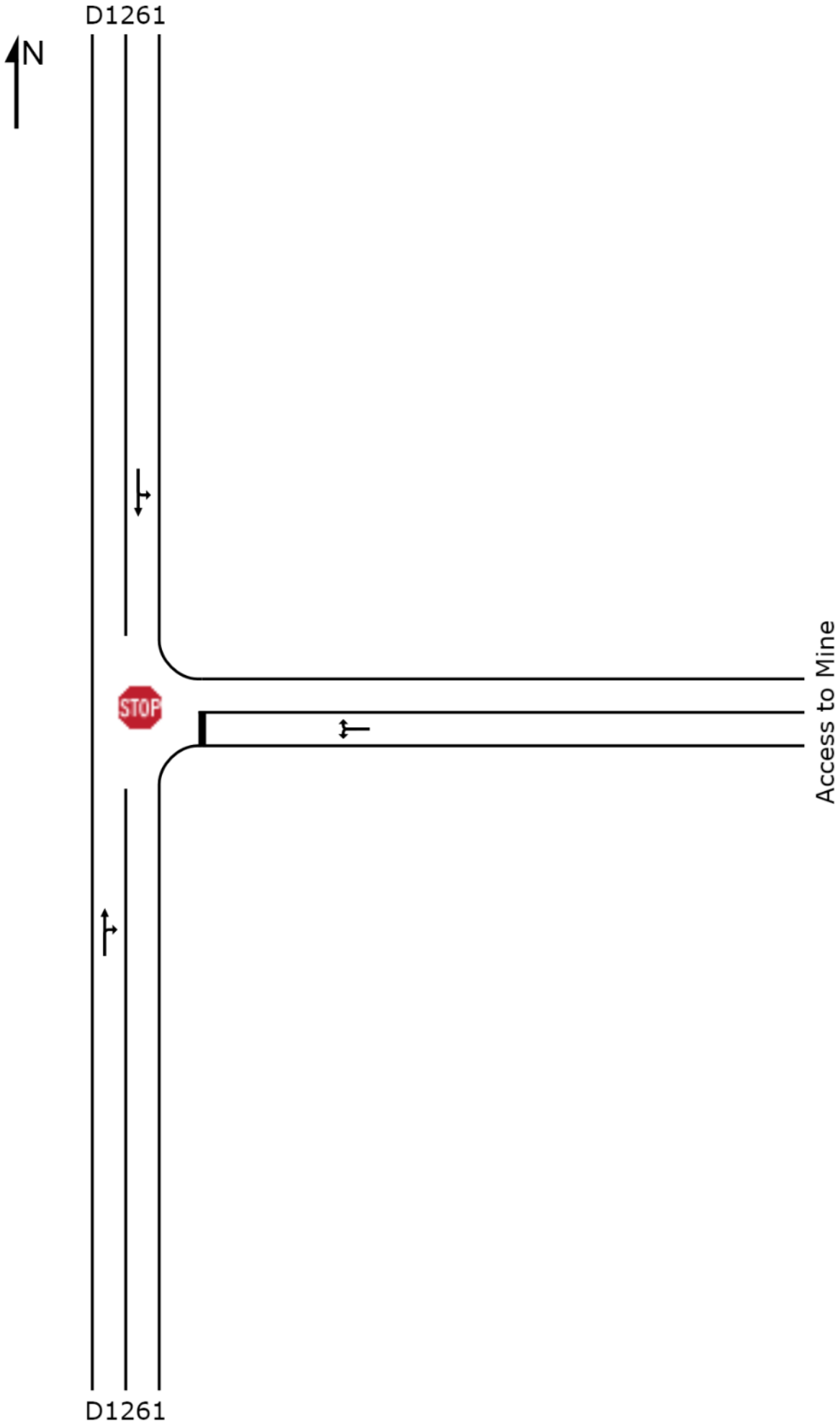
SITE LAYOUT

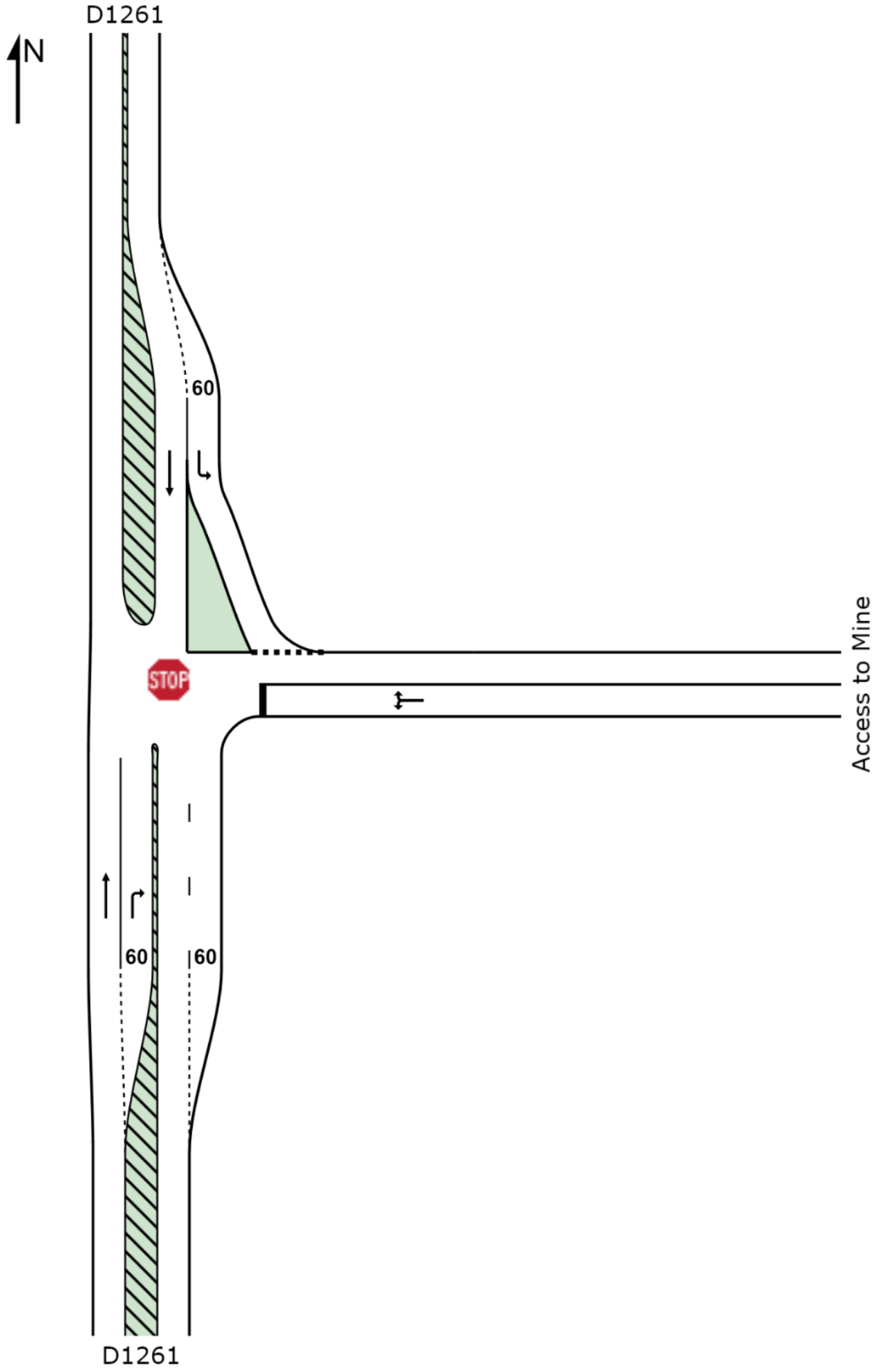
Site: R557 / D1261 _2015 AM Background Traffic Demand

2015 AM Peak Hour
Stop (Two-Way)




R555
N
STOP
R557
R555


D1261
N
STOP
Access to Mine
D1261


D1261
N
60
STOP
Access to Mine
60
60
D1261

APPENDIX C: SIDRA MOVEMENT SUMMARY

MOVEMENT SUMMARY

Site: R555 / D1261 _2015 AM Background Traffic Demand

2015 AM Peak Hour
Stop (All-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
1	L2	5	18.0	0.017	11.0	LOS B	0.1	0.4	0.92	1.25	50.8
2	T1	155	18.0	0.490	21.5	LOS C	2.4	19.4	0.99	1.47	44.4
3	R2	25	18.0	0.086	11.8	LOS B	0.3	2.3	0.93	1.27	50.1
Approach		185	18.0	0.490	19.9	LOS C	2.4	19.4	0.98	1.44	45.2
East: D1261											
4	L2	45	18.0	0.252	21.4	LOS C	1.0	8.0	1.00	1.32	44.5
5	T1	5	18.0	0.252	21.6	LOS C	1.0	8.0	1.00	1.32	44.5
6	R2	55	18.0	0.247	21.0	LOS C	1.0	7.7	0.99	1.32	45.2
Approach		105	18.0	0.252	21.2	LOS C	1.0	8.0	1.00	1.32	44.8
North: R555											
7	L2	40	18.0	0.171	14.8	LOS B	0.6	5.0	0.98	1.29	48.3
8	T1	45	18.0	0.170	14.4	LOS B	0.6	5.0	0.96	1.29	48.5
9	R2	5	18.0	0.021	12.2	LOS B	0.1	0.6	0.96	1.25	50.3
Approach		90	18.0	0.171	14.4	LOS B	0.6	5.0	0.97	1.29	48.5
West: Admin Mine											
10	L2	5	18.0	0.033	18.4	LOS C	0.1	0.9	1.00	1.25	46.2
11	T1	1	18.0	0.034	18.6	LOS C	0.1	0.9	0.99	1.25	46.2
12	R2	5	18.0	0.034	18.6	LOS C	0.1	0.9	0.99	1.25	46.3
Approach		11	18.0	0.034	18.5	LOS C	0.1	0.9	1.00	1.25	46.2
All Vehicles		391	18.0	0.490	19.0	LOS C	2.4	19.4	0.98	1.37	45.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / D1261 _2015 PM Background Traffic Demand

2015 PM Peak Hour
Stop (All-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
1	L2	5	18.0	0.025	13.1	LOS B	0.1	0.7	0.98	1.25	49.5
2	T1	135	18.0	0.609	37.0	LOS E	3.6	28.9	1.00	1.60	37.3
3	R2	5	18.0	0.025	13.0	LOS B	0.1	0.7	0.98	1.25	49.4
Approach		145	18.0	0.609	35.4	LOS E	3.6	28.9	1.00	1.57	38.0
East: D1261											
4	L2	20	18.0	0.086	13.8	LOS B	0.3	2.3	0.93	1.27	48.9
5	T1	5	18.0	0.086	14.0	LOS B	0.3	2.3	0.93	1.27	49.0
6	R2	185	18.0	0.573	27.7	LOS D	3.2	25.6	1.00	1.56	41.7
Approach		210	18.0	0.573	26.1	LOS D	3.2	25.6	0.99	1.52	42.5
North: R555											
7	L2	85	18.0	0.457	29.1	LOS D	2.2	17.6	1.00	1.44	40.7
8	T1	135	18.0	0.658	45.0	LOS E	4.2	34.0	1.00	1.67	34.5
9	R2	1	18.0	0.005	13.3	LOS B	0.0	0.1	0.99	1.24	49.6
Approach		221	18.0	0.658	38.7	LOS E	4.2	34.0	1.00	1.58	36.7
West: Admin Mine											
10	L2	10	18.0	0.067	21.4	LOS C	0.2	1.9	1.00	1.26	44.5
11	T1	5	18.0	0.078	22.3	LOS C	0.3	2.2	1.00	1.26	44.1
12	R2	5	18.0	0.078	22.3	LOS C	0.3	2.2	1.00	1.26	44.2
Approach		20	18.0	0.078	21.8	LOS C	0.3	2.2	1.00	1.26	44.3
All Vehicles		596	18.0	0.658	32.9	LOS D	4.2	34.0	1.00	1.55	39.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R557 / D1261 _2015 AM Background Traffic Demand

2015 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access to other Mines											
1	L2	80	18.0	0.308	12.9	LOS B	1.3	10.5	0.34	0.94	48.6
2	T1	40	18.0	0.308	13.6	LOS B	1.3	10.5	0.34	0.94	48.8
3	R2	45	18.0	0.308	13.2	LOS B	1.3	10.5	0.34	0.94	48.8
Approach		165	18.0	0.308	13.2	LOS B	1.3	10.5	0.34	0.94	48.7
East: R557											
4	L2	30	18.0	0.036	6.2	LOS A	0.1	0.9	0.15	0.52	53.1
5	T1	75	18.0	0.042	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	40	18.0	0.051	6.7	LOS A	0.2	1.4	0.27	0.58	52.0
Approach		145	18.0	0.051	3.1	LOS A	0.2	1.4	0.11	0.27	56.1
North: D1261											
7	L2	60	18.0	0.244	13.3	LOS B	0.9	7.5	0.35	0.93	48.3
8	T1	15	18.0	0.244	14.0	LOS B	0.9	7.5	0.35	0.93	48.6
9	R2	45	18.0	0.244	13.6	LOS B	0.9	7.5	0.35	0.93	48.6
Approach		120	18.0	0.244	13.5	LOS B	0.9	7.5	0.35	0.93	48.5
West: R557											
10	L2	50	18.0	0.030	5.8	LOS A	0.0	0.0	0.00	0.57	52.9
11	T1	85	18.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	40	18.0	0.047	6.2	LOS A	0.2	1.3	0.19	0.57	51.9
Approach		175	18.0	0.048	3.1	NA	0.2	1.3	0.04	0.29	55.8
All Vehicles		605	18.0	0.308	7.9	NA	1.3	10.5	0.20	0.59	52.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R557 / D1261 _2015 PM Background Traffic Demand

2015 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access to other Mines											
1	L2	80	18.0	0.358	14.7	LOS B	1.8	14.3	0.42	0.96	47.6
2	T1	45	18.0	0.358	15.3	LOS C	1.8	14.3	0.42	0.96	47.8
3	R2	50	18.0	0.358	14.9	LOS B	1.8	14.3	0.42	0.96	47.8
Approach		175	18.0	0.358	14.9	LOS B	1.8	14.3	0.42	0.96	47.7
East: R557											
4	L2	5	18.0	0.006	6.2	LOS A	0.0	0.1	0.15	0.51	53.1
5	T1	100	18.0	0.056	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	75	18.0	0.092	6.6	LOS A	0.3	2.6	0.25	0.58	52.0
Approach		180	18.0	0.092	2.9	LOS A	0.3	2.6	0.11	0.25	56.2
North: D1261											
7	L2	55	18.0	0.307	16.0	LOS C	1.3	10.5	0.39	0.95	46.8
8	T1	10	18.0	0.307	16.6	LOS C	1.3	10.5	0.39	0.95	47.0
9	R2	60	18.0	0.307	16.3	LOS C	1.3	10.5	0.39	0.95	47.0
Approach		125	18.0	0.307	16.2	LOS C	1.3	10.5	0.39	0.95	46.9
West: R557											
10	L2	35	18.0	0.021	5.8	LOS A	0.0	0.0	0.00	0.57	52.9
11	T1	80	18.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	45	18.0	0.054	6.4	LOS A	0.2	1.5	0.23	0.58	51.8
Approach		160	18.0	0.054	3.1	NA	0.2	1.5	0.06	0.29	55.9
All Vehicles		640	18.0	0.358	8.8	NA	1.8	14.3	0.24	0.59	51.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / R557 _2015 AM Background Traffic Demand

2015 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
2	T1	190	18.0	0.263	1.2	LOS A	1.6	13.2	0.43	0.32	55.8
3	R2	200	18.0	0.263	6.9	LOS A	1.6	13.2	0.43	0.32	53.2
Approach		390	18.0	0.263	4.1	NA	1.6	13.2	0.43	0.32	54.4
East: R557											
4	L2	180	18.0	0.400	12.6	LOS B	2.2	17.6	0.40	0.97	49.1
6	R2	120	18.0	0.400	12.2	LOS B	2.2	17.6	0.40	0.97	48.7
Approach		300	18.0	0.400	12.4	LOS B	2.2	17.6	0.40	0.97	48.9
North: R555											
7	L2	75	18.0	0.123	5.8	LOS A	0.0	0.0	0.00	0.20	55.7
8	T1	140	18.0	0.123	0.0	LOS A	0.0	0.0	0.00	0.20	58.1
Approach		215	18.0	0.123	2.0	NA	0.0	0.0	0.00	0.20	57.3
All Vehicles		905	18.0	0.400	6.4	NA	2.2	17.6	0.32	0.51	53.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / R557 _2015 PM Background Traffic Demand

2015 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
2	T1	75	18.0	0.076	0.3	LOS A	0.4	3.1	0.21	0.23	57.1
3	R2	50	18.0	0.076	6.0	LOS A	0.4	3.1	0.21	0.23	54.3
Approach		125	18.0	0.076	2.6	NA	0.4	3.1	0.21	0.23	56.0
East: R557											
4	L2	250	18.0	0.344	9.7	LOS A	1.7	13.6	0.27	0.91	50.8
6	R2	115	18.0	0.344	9.3	LOS A	1.7	13.6	0.27	0.91	50.4
Approach		365	18.0	0.344	9.6	LOS A	1.7	13.6	0.27	0.91	50.7
North: R555											
7	L2	5	18.0	0.048	5.8	LOS A	0.0	0.0	0.00	0.03	57.2
8	T1	80	18.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.03	59.7
Approach		85	18.0	0.048	0.3	NA	0.0	0.0	0.00	0.03	59.5
All Vehicles		575	18.0	0.344	6.7	NA	1.7	13.6	0.22	0.63	53.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2015 AM Backgrounf Traffic Demand

2015 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	45	18.0	0.035	0.2	LOS A	0.2	1.4	0.14	0.14	58.1
3	R2	15	18.0	0.035	5.8	LOS A	0.2	1.4	0.14	0.14	55.2
Approach		60	18.0	0.035	1.6	NA	0.2	1.4	0.14	0.14	57.4
East: Access to Mine											
4	L2	10	18.0	0.009	9.0	LOS A	0.0	0.4	0.15	0.92	51.1
6	R2	5	18.0	0.009	8.5	LOS A	0.0	0.4	0.15	0.92	50.7
Approach		15	18.0	0.009	8.8	LOS A	0.0	0.4	0.15	0.92	51.0
North: D1261											
7	L2	5	18.0	0.026	5.8	LOS A	0.0	0.0	0.00	0.07	56.9
8	T1	40	18.0	0.026	0.0	LOS A	0.0	0.0	0.00	0.07	59.4
Approach		45	18.0	0.026	0.6	NA	0.0	0.0	0.00	0.07	59.1
All Vehicles		120	18.0	0.035	2.1	NA	0.2	1.4	0.09	0.21	57.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2015 PM Backgrounf Traffic Demand

2015 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	40	18.0	0.029	0.2	LOS A	0.1	1.2	0.16	0.11	58.3
3	R2	10	18.0	0.029	5.9	LOS A	0.1	1.2	0.16	0.11	55.3
Approach		50	18.0	0.029	1.3	NA	0.1	1.2	0.16	0.11	57.7
East: Access to Mine											
4	L2	15	18.0	0.015	9.0	LOS A	0.1	0.6	0.17	0.91	51.2
6	R2	10	18.0	0.015	8.5	LOS A	0.1	0.6	0.17	0.91	50.7
Approach		25	18.0	0.015	8.8	LOS A	0.1	0.6	0.17	0.91	51.0
North: D1261											
7	L2	5	18.0	0.031	5.8	LOS A	0.0	0.0	0.00	0.05	57.0
8	T1	50	18.0	0.031	0.0	LOS A	0.0	0.0	0.00	0.05	59.5
Approach		55	18.0	0.031	0.5	NA	0.0	0.0	0.00	0.05	59.3
All Vehicles		130	18.0	0.031	2.4	NA	0.1	1.2	0.09	0.24	56.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / D1261 _2017 AM Background Traffic Demand

2017 AM Peak Hour
Stop (All-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
1	L2	5	18.0	0.017	11.0	LOS B	0.1	0.4	0.92	1.25	50.8
2	T1	160	18.0	0.503	22.0	LOS C	2.5	20.3	0.99	1.48	44.1
3	R2	25	18.0	0.085	11.8	LOS B	0.3	2.3	0.93	1.27	50.2
Approach		190	18.0	0.503	20.4	LOS C	2.5	20.3	0.98	1.45	45.0
East: D1261											
4	L2	45	18.0	0.254	21.6	LOS C	1.0	8.0	1.00	1.32	44.4
5	T1	5	18.0	0.254	21.9	LOS C	1.0	8.0	1.00	1.32	44.4
6	R2	55	18.0	0.249	21.2	LOS C	1.0	7.8	1.00	1.32	45.1
Approach		105	18.0	0.254	21.4	LOS C	1.0	8.0	1.00	1.32	44.7
North: R555											
7	L2	40	18.0	0.170	14.8	LOS B	0.6	5.0	0.98	1.29	48.4
8	T1	45	18.0	0.169	14.3	LOS B	0.6	4.9	0.96	1.29	48.6
9	R2	5	18.0	0.021	12.1	LOS B	0.1	0.6	0.96	1.25	50.3
Approach		90	18.0	0.170	14.4	LOS B	0.6	5.0	0.97	1.29	48.6
West: Admin Mine											
10	L2	5	18.0	0.033	18.5	LOS C	0.1	0.9	1.00	1.25	46.1
11	T1	1	18.0	0.034	18.7	LOS C	0.1	0.9	1.00	1.25	46.2
12	R2	5	18.0	0.034	18.7	LOS C	0.1	0.9	1.00	1.25	46.3
Approach		11	18.0	0.034	18.6	LOS C	0.1	0.9	1.00	1.25	46.2
All Vehicles		396	18.0	0.503	19.2	LOS C	2.5	20.3	0.98	1.37	45.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / D1261 _2017 PM Background Traffic Demand

2017 PM Peak Hour
Stop (All-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
1	L2	5	18.0	0.025	13.1	LOS B	0.1	0.7	0.98	1.25	49.5
2	T1	140	18.0	0.630	39.0	LOS E	3.8	31.0	1.00	1.63	36.6
3	R2	5	18.0	0.025	13.0	LOS B	0.1	0.7	0.98	1.25	49.4
Approach		150	18.0	0.630	37.3	LOS E	3.8	31.0	1.00	1.60	37.2
East: D1261											
4	L2	20	18.0	0.086	13.8	LOS B	0.3	2.4	0.94	1.27	48.9
5	T1	5	18.0	0.086	14.1	LOS B	0.3	2.4	0.94	1.27	49.0
6	R2	190	18.0	0.591	28.9	LOS D	3.4	27.2	1.00	1.58	41.2
Approach		215	18.0	0.591	27.1	LOS D	3.4	27.2	0.99	1.54	42.0
North: R555											
7	L2	90	18.0	0.482	30.6	LOS D	2.4	19.1	1.00	1.46	40.0
8	T1	140	18.0	0.680	47.9	LOS E	4.5	36.7	1.00	1.71	33.6
9	R2	1	18.0	0.005	13.2	LOS B	0.0	0.1	0.99	1.24	49.6
Approach		231	18.0	0.680	41.0	LOS E	4.5	36.7	1.00	1.61	35.9
West: Admin Mine											
10	L2	10	18.0	0.067	21.6	LOS C	0.2	1.9	1.00	1.26	44.4
11	T1	5	18.0	0.079	22.5	LOS C	0.3	2.2	1.00	1.26	44.0
12	R2	5	18.0	0.079	22.5	LOS C	0.3	2.2	1.00	1.26	44.1
Approach		20	18.0	0.079	22.0	LOS C	0.3	2.2	1.00	1.26	44.2
All Vehicles		616	18.0	0.680	34.6	LOS D	4.5	36.7	1.00	1.57	38.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R557 / D1261 _2017 AM Background Traffic Demand

2017 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access to other Mines											
1	L2	85	18.0	0.319	13.2	LOS B	1.4	11.2	0.35	0.94	48.4
2	T1	40	18.0	0.319	13.8	LOS B	1.4	11.2	0.35	0.94	48.7
3	R2	45	18.0	0.319	13.4	LOS B	1.4	11.2	0.35	0.94	48.6
Approach		170	18.0	0.319	13.4	LOS B	1.4	11.2	0.35	0.94	48.5
East: R557											
4	L2	30	18.0	0.036	6.2	LOS A	0.1	0.9	0.15	0.52	53.1
5	T1	80	18.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	40	18.0	0.051	6.8	LOS A	0.2	1.4	0.27	0.58	52.0
Approach		150	18.0	0.051	3.0	LOS A	0.2	1.4	0.10	0.26	56.2
North: D1261											
7	L2	60	18.0	0.250	13.6	LOS B	1.0	7.7	0.37	0.93	48.2
8	T1	15	18.0	0.250	14.2	LOS B	1.0	7.7	0.37	0.93	48.4
9	R2	45	18.0	0.250	13.9	LOS B	1.0	7.7	0.37	0.93	48.4
Approach		120	18.0	0.250	13.8	LOS B	1.0	7.7	0.37	0.93	48.3
West: R557											
10	L2	50	18.0	0.030	5.8	LOS A	0.0	0.0	0.00	0.57	52.9
11	T1	90	18.0	0.051	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	40	18.0	0.047	6.3	LOS A	0.2	1.3	0.20	0.57	51.9
Approach		180	18.0	0.051	3.0	NA	0.2	1.3	0.04	0.29	56.0
All Vehicles		620	18.0	0.319	7.9	NA	1.4	11.2	0.21	0.58	52.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R557 / D1261 _2017 PM Background Traffic Demand

2017 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access to other Mines											
1	L2	85	18.0	0.373	15.1	LOS C	1.9	15.3	0.44	0.97	47.4
2	T1	45	18.0	0.373	15.7	LOS C	1.9	15.3	0.44	0.97	47.6
3	R2	50	18.0	0.373	15.3	LOS C	1.9	15.3	0.44	0.97	47.6
Approach		180	18.0	0.373	15.3	LOS C	1.9	15.3	0.44	0.97	47.5
East: R557											
4	L2	5	18.0	0.006	6.2	LOS A	0.0	0.1	0.15	0.51	53.1
5	T1	105	18.0	0.059	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	80	18.0	0.099	6.7	LOS A	0.3	2.8	0.26	0.58	52.0
Approach		190	18.0	0.099	3.0	LOS A	0.3	2.8	0.11	0.26	56.1
North: D1261											
7	L2	55	18.0	0.319	16.7	LOS C	1.4	11.2	0.41	0.96	46.4
8	T1	10	18.0	0.319	17.3	LOS C	1.4	11.2	0.41	0.96	46.6
9	R2	60	18.0	0.319	17.0	LOS C	1.4	11.2	0.41	0.96	46.6
Approach		125	18.0	0.319	16.9	LOS C	1.4	11.2	0.41	0.96	46.5
West: R557											
10	L2	35	18.0	0.021	5.8	LOS A	0.0	0.0	0.00	0.57	52.9
11	T1	85	18.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	45	18.0	0.055	6.5	LOS A	0.2	1.5	0.23	0.58	51.8
Approach		165	18.0	0.055	3.0	NA	0.2	1.5	0.06	0.28	56.0
All Vehicles		660	18.0	0.373	9.0	NA	1.9	15.3	0.25	0.59	51.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / R557 _2017 AM Background Traffic Demand

2017 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
2	T1	200	18.0	0.278	1.3	LOS A	1.8	14.2	0.45	0.33	55.8
3	R2	210	18.0	0.278	7.0	LOS A	1.8	14.2	0.45	0.33	53.1
Approach		410	18.0	0.278	4.2	NA	1.8	14.2	0.45	0.33	54.4
East: R557											
4	L2	185	18.0	0.427	13.1	LOS B	2.4	19.8	0.41	0.98	48.7
6	R2	125	18.0	0.427	12.7	LOS B	2.4	19.8	0.41	0.98	48.4
Approach		310	18.0	0.427	12.9	LOS B	2.4	19.8	0.41	0.98	48.6
North: R555											
7	L2	80	18.0	0.129	5.8	LOS A	0.0	0.0	0.00	0.21	55.7
8	T1	145	18.0	0.129	0.0	LOS A	0.0	0.0	0.00	0.21	58.1
Approach		225	18.0	0.129	2.1	NA	0.0	0.0	0.00	0.21	57.2
All Vehicles		945	18.0	0.427	6.6	NA	2.4	19.8	0.33	0.51	52.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / R557 _2017 PM Background Traffic Demand

2017 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
2	T1	80	18.0	0.079	0.4	LOS A	0.4	3.3	0.22	0.22	57.2
3	R2	50	18.0	0.079	6.0	LOS A	0.4	3.3	0.22	0.22	54.4
Approach		130	18.0	0.079	2.5	NA	0.4	3.3	0.22	0.22	56.1
East: R557											
4	L2	260	18.0	0.361	9.8	LOS A	1.8	14.5	0.28	0.91	50.8
6	R2	120	18.0	0.361	9.4	LOS A	1.8	14.5	0.28	0.91	50.4
Approach		380	18.0	0.361	9.6	LOS A	1.8	14.5	0.28	0.91	50.7
North: R555											
7	L2	5	18.0	0.051	5.8	LOS A	0.0	0.0	0.00	0.03	57.2
8	T1	85	18.0	0.051	0.0	LOS A	0.0	0.0	0.00	0.03	59.7
Approach		90	18.0	0.051	0.3	NA	0.0	0.0	0.00	0.03	59.5
All Vehicles		600	18.0	0.361	6.7	NA	1.8	14.5	0.23	0.63	53.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2017 AM Backgrounf Traffic Demand

2017 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	45	18.0	0.035	0.2	LOS A	0.2	1.4	0.14	0.14	58.1
3	R2	15	18.0	0.035	5.8	LOS A	0.2	1.4	0.14	0.14	55.2
Approach		60	18.0	0.035	1.6	NA	0.2	1.4	0.14	0.14	57.4
East: Access to Mine											
4	L2	10	18.0	0.009	9.0	LOS A	0.0	0.4	0.15	0.92	51.1
6	R2	5	18.0	0.009	8.5	LOS A	0.0	0.4	0.15	0.92	50.7
Approach		15	18.0	0.009	8.8	LOS A	0.0	0.4	0.15	0.92	51.0
North: D1261											
7	L2	5	18.0	0.026	5.8	LOS A	0.0	0.0	0.00	0.07	56.9
8	T1	40	18.0	0.026	0.0	LOS A	0.0	0.0	0.00	0.07	59.4
Approach		45	18.0	0.026	0.6	NA	0.0	0.0	0.00	0.07	59.1
All Vehicles		120	18.0	0.035	2.1	NA	0.2	1.4	0.09	0.21	57.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2017 PM Backgrounf Traffic Demand

2017 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	40	18.0	0.029	0.2	LOS A	0.1	1.2	0.16	0.11	58.3
3	R2	10	18.0	0.029	5.9	LOS A	0.1	1.2	0.16	0.11	55.3
Approach		50	18.0	0.029	1.3	NA	0.1	1.2	0.16	0.11	57.7
East: Access to Mine											
4	L2	15	18.0	0.015	9.0	LOS A	0.1	0.6	0.17	0.91	51.2
6	R2	10	18.0	0.015	8.5	LOS A	0.1	0.6	0.17	0.91	50.7
Approach		25	18.0	0.015	8.8	LOS A	0.1	0.6	0.17	0.91	51.0
North: D1261											
7	L2	5	18.0	0.031	5.8	LOS A	0.0	0.0	0.00	0.05	57.0
8	T1	50	18.0	0.031	0.0	LOS A	0.0	0.0	0.00	0.05	59.5
Approach		55	18.0	0.031	0.5	NA	0.0	0.0	0.00	0.05	59.3
All Vehicles		130	18.0	0.031	2.4	NA	0.1	1.2	0.09	0.24	56.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / D1261 _2027 AM Background Traffic Demand + Latent Rights + Development

2027 AM Peak Hour
Stop (All-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
1	L2	5	18.0	0.018	11.2	LOS B	0.1	0.5	0.93	1.25	50.7
2	T1	195	18.0	0.642	31.5	LOS D	4.0	32.4	1.00	1.66	39.6
3	R2	30	18.0	0.108	12.5	LOS B	0.4	3.0	0.95	1.27	49.7
Approach		230	18.0	0.642	28.6	LOS D	4.0	32.4	0.99	1.60	40.8
East: D1261											
4	L2	55	18.0	0.274	20.7	LOS C	1.1	8.8	1.00	1.33	44.9
5	T1	5	18.0	0.274	21.0	LOS C	1.1	8.8	1.00	1.33	44.9
6	R2	100	18.0	0.408	25.0	LOS C	1.8	14.8	1.00	1.40	43.1
Approach		160	18.0	0.408	23.4	LOS C	1.8	14.8	1.00	1.38	43.7
North: R555											
7	L2	85	18.0	0.345	19.7	LOS C	1.4	11.7	1.00	1.37	45.4
8	T1	55	18.0	0.251	17.4	LOS C	1.0	7.9	1.00	1.32	46.7
9	R2	5	18.0	0.023	12.6	LOS B	0.1	0.6	0.97	1.25	50.0
Approach		145	18.0	0.345	18.6	LOS C	1.4	11.7	1.00	1.35	46.1
West: Admin Mine											
10	L2	5	18.0	0.034	18.8	LOS C	0.1	0.9	1.00	1.25	45.9
11	T1	1	18.0	0.035	19.0	LOS C	0.1	0.9	1.00	1.25	46.0
12	R2	5	18.0	0.035	18.9	LOS C	0.1	0.9	1.00	1.25	46.1
Approach		11	18.0	0.035	18.9	LOS C	0.1	0.9	1.00	1.25	46.0
All Vehicles		546	18.0	0.642	24.2	LOS C	4.0	32.4	1.00	1.46	43.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / D1261 _2027 PM Background Traffic Demand + Latent Rights + Development

2027 PM Peak Hour
Stop (All-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
1	L2	5	18.0	0.026	13.2	LOS B	0.1	0.7	0.98	1.25	49.4
2	T1	170	18.0	0.777	63.6	LOS F	6.6	53.0	1.00	1.96	29.4
3	R2	5	18.0	0.026	13.1	LOS B	0.1	0.7	0.98	1.25	49.3
Approach		180	18.0	0.777	60.8	LOS F	6.6	53.0	1.00	1.92	30.0
East: D1261											
4	L2	25	18.0	0.094	13.3	LOS B	0.3	2.6	0.92	1.27	49.2
5	T1	5	18.0	0.094	13.5	LOS B	0.3	2.6	0.92	1.27	49.3
6	R2	270	18.0	0.764	43.3	LOS E	6.4	51.5	1.00	1.96	35.5
Approach		300	18.0	0.764	40.3	LOS E	6.4	51.5	0.99	1.89	36.5
North: R555											
7	L2	140	18.0	0.769	70.9	LOS F	6.3	50.6	1.00	1.92	27.8
8	T1	170	18.0	0.847	90.5	LOS F	8.7	70.7	1.00	2.23	24.2
9	R2	1	18.0	0.005	13.4	LOS B	0.0	0.1	0.99	1.24	49.5
Approach		311	18.0	0.847	81.4	LOS F	8.7	70.7	1.00	2.09	25.7
West: Admin Mine											
10	L2	15	18.0	0.095	21.4	LOS C	0.3	2.7	1.00	1.27	44.5
11	T1	5	18.0	0.074	21.4	LOS C	0.3	2.1	1.00	1.26	44.6
12	R2	5	18.0	0.074	21.4	LOS C	0.3	2.1	1.00	1.26	44.7
Approach		25	18.0	0.095	21.4	LOS C	0.3	2.7	1.00	1.26	44.5
All Vehicles		816	18.0	0.847	59.9	LOS F	8.7	70.7	1.00	1.95	30.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R557 / D1261 _2027 AM Background Traffic Demand + Latent Rights + Development

2027 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access to other Mines											
1	L2	100	18.0	0.480	18.6	LOS C	3.0	24.1	0.45	1.01	45.3
2	T1	50	18.0	0.480	19.2	LOS C	3.0	24.1	0.45	1.01	45.5
3	R2	55	18.0	0.480	18.9	LOS C	3.0	24.1	0.45	1.01	45.5
Approach		205	18.0	0.480	18.8	LOS C	3.0	24.1	0.45	1.01	45.4
East: R557											
4	L2	40	18.0	0.049	6.3	LOS A	0.2	1.2	0.18	0.53	53.0
5	T1	95	18.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	80	18.0	0.107	7.2	LOS A	0.4	3.0	0.32	0.61	51.7
Approach		215	18.0	0.107	3.8	LOS A	0.4	3.0	0.15	0.33	55.3
North: D1261											
7	L2	100	18.0	0.432	18.1	LOS C	2.4	19.4	0.45	0.99	45.6
8	T1	20	18.0	0.432	18.7	LOS C	2.4	19.4	0.45	0.99	45.8
9	R2	60	18.0	0.432	18.3	LOS C	2.4	19.4	0.45	0.99	45.8
Approach		180	18.0	0.432	18.2	LOS C	2.4	19.4	0.45	0.99	45.7
West: R557											
10	L2	65	18.0	0.039	5.8	LOS A	0.0	0.0	0.00	0.57	52.9
11	T1	110	18.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	50	18.0	0.060	6.4	LOS A	0.2	1.6	0.22	0.58	51.8
Approach		225	18.0	0.062	3.1	NA	0.2	1.6	0.05	0.29	55.9
All Vehicles		825	18.0	0.480	10.5	NA	3.0	24.1	0.26	0.63	50.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R557 / D1261 _2027 PM Background Traffic Demand + Latent Rights + Development

2027 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access to other Mines											
1	L2	100	18.0	0.577	22.6	LOS C	4.1	32.8	0.56	1.08	43.3
2	T1	55	18.0	0.577	23.2	LOS C	4.1	32.8	0.56	1.08	43.4
3	R2	65	18.0	0.577	22.9	LOS C	4.1	32.8	0.56	1.08	43.4
Approach		220	18.0	0.577	22.9	LOS C	4.1	32.8	0.56	1.08	43.4
East: R557											
4	L2	5	18.0	0.006	6.3	LOS A	0.0	0.1	0.17	0.51	53.0
5	T1	125	18.0	0.070	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	120	18.0	0.154	7.0	LOS A	0.6	4.5	0.30	0.60	51.9
Approach		250	18.0	0.154	3.5	LOS A	0.6	4.5	0.15	0.30	55.6
North: D1261											
7	L2	100	18.0	0.567	24.6	LOS C	3.8	30.8	0.49	1.06	42.3
8	T1	15	18.0	0.567	25.2	LOS D	3.8	30.8	0.49	1.06	42.4
9	R2	80	18.0	0.567	24.8	LOS C	3.8	30.8	0.49	1.06	42.4
Approach		195	18.0	0.567	24.7	LOS C	3.8	30.8	0.49	1.06	42.3
West: R557											
10	L2	45	18.0	0.027	5.8	LOS A	0.0	0.0	0.00	0.57	52.9
11	T1	100	18.0	0.056	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	55	18.0	0.069	6.6	LOS A	0.2	1.9	0.26	0.59	51.7
Approach		200	18.0	0.069	3.1	NA	0.2	1.9	0.07	0.29	55.8
All Vehicles		865	18.0	0.577	13.1	NA	4.1	32.8	0.31	0.67	48.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / R557 _2027 AM Background Traffic Demand + Latent Rights + Development

2027 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
2	T1	240	18.0	0.349	1.8	LOS A	2.4	19.5	0.54	0.35	55.4
3	R2	255	18.0	0.349	7.5	LOS A	2.4	19.5	0.54	0.35	52.8
Approach		495	18.0	0.349	4.7	NA	2.4	19.5	0.54	0.35	54.1
East: R557											
4	L2	230	18.0	0.607	17.0	LOS C	4.7	38.0	0.52	1.08	46.5
6	R2	150	18.0	0.607	16.6	LOS C	4.7	38.0	0.52	1.08	46.1
Approach		380	18.0	0.607	16.8	LOS C	4.7	38.0	0.52	1.08	46.3
North: R555											
7	L2	95	18.0	0.158	5.8	LOS A	0.0	0.0	0.00	0.20	55.8
8	T1	180	18.0	0.158	0.0	LOS A	0.0	0.0	0.00	0.20	58.1
Approach		275	18.0	0.158	2.0	NA	0.0	0.0	0.00	0.20	57.3
All Vehicles		1150	18.0	0.607	8.1	NA	4.7	38.0	0.40	0.56	51.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: R555 / R557 _2027 PM Background Traffic Demand + Latent Rights + Development

2027 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R555											
2	T1	95	18.0	0.098	0.4	LOS A	0.5	4.2	0.24	0.23	57.0
3	R2	65	18.0	0.098	6.1	LOS A	0.5	4.2	0.24	0.23	54.2
Approach		160	18.0	0.098	2.7	NA	0.5	4.2	0.24	0.23	55.8
East: R557											
4	L2	320	18.0	0.456	10.3	LOS B	2.8	22.3	0.34	0.91	50.5
6	R2	145	18.0	0.456	9.9	LOS A	2.8	22.3	0.34	0.91	50.1
Approach		465	18.0	0.456	10.2	LOS B	2.8	22.3	0.34	0.91	50.4
North: R555											
7	L2	5	18.0	0.059	5.8	LOS A	0.0	0.0	0.00	0.03	57.2
8	T1	100	18.0	0.059	0.0	LOS A	0.0	0.0	0.00	0.03	59.7
Approach		105	18.0	0.059	0.3	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		730	18.0	0.456	7.1	NA	2.8	22.3	0.27	0.64	52.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2027 AM Backgrounf Traffic Demand + Latent Rights + Development

2027 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	55	18.0	0.051	0.3	LOS A	0.3	2.1	0.18	0.20	57.5
3	R2	30	18.0	0.051	5.9	LOS A	0.3	2.1	0.18	0.20	54.6
Approach		85	18.0	0.051	2.3	NA	0.3	2.1	0.18	0.20	56.4
East: Access to Mine											
4	L2	20	18.0	0.025	9.1	LOS A	0.1	1.0	0.17	0.92	51.2
6	R2	20	18.0	0.025	8.6	LOS A	0.1	1.0	0.17	0.92	50.7
Approach		40	18.0	0.025	8.8	LOS A	0.1	1.0	0.17	0.92	51.0
North: D1261											
7	L2	20	18.0	0.040	5.8	LOS A	0.0	0.0	0.00	0.17	56.1
8	T1	50	18.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.17	58.5
Approach		70	18.0	0.040	1.6	NA	0.0	0.0	0.00	0.17	57.8
All Vehicles		195	18.0	0.051	3.4	NA	0.3	2.1	0.11	0.34	55.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2027 PM Backgrounf Traffic Demand + Latent Rights + Development

2027 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	50	18.0	0.042	0.3	LOS A	0.2	1.7	0.20	0.16	57.7
3	R2	20	18.0	0.042	6.0	LOS A	0.2	1.7	0.20	0.16	54.8
Approach		70	18.0	0.042	1.9	NA	0.2	1.7	0.20	0.16	56.9
East: Access to Mine											
4	L2	30	18.0	0.034	9.1	LOS A	0.2	1.4	0.20	0.90	51.2
6	R2	25	18.0	0.034	8.6	LOS A	0.2	1.4	0.20	0.90	50.7
Approach		55	18.0	0.034	8.9	LOS A	0.2	1.4	0.20	0.90	51.0
North: D1261											
7	L2	15	18.0	0.046	5.8	LOS A	0.0	0.0	0.00	0.11	56.5
8	T1	65	18.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.11	59.0
Approach		80	18.0	0.046	1.1	NA	0.0	0.0	0.00	0.11	58.5
All Vehicles		205	18.0	0.046	3.5	NA	0.2	1.7	0.12	0.34	55.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2027 AM Backgrounf Traffic Demand + Latent Rights + Development - Upgraded

2027 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	55	18.0	0.031	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R2	30	18.0	0.024	5.9	LOS A	0.1	0.8	0.15	0.54	52.3
Approach		85	18.0	0.031	2.1	NA	0.1	0.8	0.05	0.19	57.0
East: Access to Mine											
4	L2	20	18.0	0.033	9.3	LOS A	0.2	1.2	0.20	0.91	51.0
6	R2	20	18.0	0.033	9.1	LOS A	0.2	1.2	0.20	0.91	50.8
Approach		40	18.0	0.033	9.2	LOS A	0.2	1.2	0.20	0.91	50.9
North: D1261											
7	L2	20	18.0	0.017	5.9	LOS A	0.1	0.5	0.10	0.51	53.2
8	T1	50	18.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		70	18.0	0.028	1.7	LOS A	0.1	0.5	0.03	0.15	57.9
All Vehicles		195	18.0	0.033	3.4	NA	0.2	1.2	0.07	0.32	55.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: D1261 / Access to mine _ 2027 PM Backgrounf Traffic Demand + Latent Rights + Development - Upgraded

2027 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: D1261											
2	T1	50	18.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R2	20	18.0	0.016	6.0	LOS A	0.1	0.5	0.17	0.54	52.2
Approach		70	18.0	0.028	1.7	NA	0.1	0.5	0.05	0.15	57.5
East: Access to Mine											
4	L2	30	18.0	0.045	9.3	LOS A	0.2	1.7	0.23	0.89	51.0
6	R2	25	18.0	0.045	9.2	LOS A	0.2	1.7	0.23	0.89	50.9
Approach		55	18.0	0.045	9.3	LOS A	0.2	1.7	0.23	0.89	50.9
North: D1261											
7	L2	15	18.0	0.013	5.9	LOS A	0.0	0.4	0.08	0.52	53.3
8	T1	65	18.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		80	18.0	0.037	1.1	LOS A	0.0	0.4	0.01	0.10	58.6
All Vehicles		205	18.0	0.045	3.5	NA	0.2	1.7	0.08	0.33	56.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Minor Road Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX D: DECLARATION FORM

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

SPITSVALE PROJECT, BCR CHROME MINE IN STEELPOORT, LIMPOPO PROVINCE

Specialist:	Traffic Engineer		
Contact person:	Dr Pieter Pretorius		
Postal address:	PO. BOX 75100, Lynnwood Ridge, Pretoria		
Postal code:	0040	Cell:	
Telephone:	0123491664	Fax:	0123491665
E-mail:	pieter@itse.co.za		
Professional affiliation(s) (if any)	Registered Professional Engineer (South Africa – 980205), Member of the Institute of Transportation Engineers, Washington, D.C, USA (Member No 27755), Member of the Chartered Institute of Transportation, London, UK (Member No 45395),Member of the South African Institution of Civil Engineering (Member No 090556)		
Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, _____ , declare that –

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

ITS ENGINEERS (Pty) Ltd

Name of company (if applicable):

2016/02/03

Date: