

MEMORANDUM

TRAFFIC IMPACT ASSESSMENT

**PROPOSED MN48 MINING DEVELOPMENT
(CONSOLIDATED LEHATING AND KHWARA MINES)
TO BE SITUATED NEAR HOTAZEL, NORTHERN CAPE
PROVINCE**



OCTOBER 2020

Prepared for:

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Siyazi Reference: 08109B



This report was prepared taking into account the requirements of Appendix 6 as set out in the NEMA Regulations (2014) as amended in 2017.

NEMA Regulations (2014) (as amended) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report	Refer to page IV and attached curriculum vitae
The expertise of that person to compile a specialist report including a curriculum vitae	
A declaration that the person is independent in a form as may be specified by the competent authority	Refer to page III
An indication of the scope of, and the purpose for which, the report was prepared	Section 1, Page 1
An indication of the quality and age of base data used for the specialist report	Section 2.1 Traffic count data
A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 3
The duration date and season of the site investigation and the relevance of the season to the outcome of the assessment	Not relevant to traffic data
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 2.1 Traffic count data
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives	Section 2.4
An identification of any areas to be avoided, including buffers	Section 2.4
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 2.4
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.1.1
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities	Section 3
Any mitigation measures for inclusion in the EMPr	Section 3
Any conditions for inclusion in the environmental authorisation	Section 3
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	None
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and regarding the acceptability of the proposed activity or activities	Section 3
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 3
A description of any consultation process that was undertaken during the course of preparing the specialist report	Not relevant
A summary and copies of any comments received during any consultation process and where applicable all responses thereto	None raised to date.
Any other information requested by the competent authority.	Not relevant

Requirements applied as part of this study when undertaking an Initial Site Sensitivity Verification for a site selected on the national web based environmental screening tool for which no specific assessment protocol related to any theme has been identified.

Requirements for initial site sensitivity verification	Comment
The Initial Site Sensitivity Verification must be undertaken by an environmental assessment practitioner or a registered specialist with expertise in the relevant environmental theme being considered.	Refer to verification page (Page V) for specialist details.
The Initial Site Sensitivity Verification must be undertaken through the use of:	
a) A desk top analysis, using satellite imagery.	Refer to section 2.4 of report.
b) A preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity	Refer to section 2.4 of report.

Declaration of Independence

I, Leon Roets, hereby declare that Siyazi Limpopo Consulting Services (Pty) Ltd, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

Consultant name: Leon Roets

Signature:

A handwritten signature in black ink, appearing to read 'Roets', written over a horizontal line.

Date: 28 October 2020

VERIFICATION PAGE


PROJECT NAME:	PROPOSED MN48 MINING DEVELOPMENT (CONSOLIDATED PROPOSED LEHATING AND KHWARA MINES) TO BE SITUATED NEAR HOTAZEL, NORTHERN CAPE PROVINCE		
<u>Project No:</u> 08109B	<u>Date:</u> October 2020	<u>Report Status:</u> Final F2-0	
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The undersigned has been appointed as the registered professional for this Traffic Impact Statement and has applied due diligence to the content of this report and endeavoured to ensure that the TIS is free of technical errors and takes full responsibility for its contents.			
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SECTION 1

1. INTRODUCTION

Siyazi Gauteng Consulting Services (Pty) Ltd was appointed by SLR Consulting (South Africa) (Pty) Ltd to conduct a traffic impact assessment for the proposed Lehating and Khwara mining developments which are proposing to be consolidated into one mining development under the name MN48 (Pty) Ltd.

Lehating Mining (Pty) Ltd (Lehating) holds a mining right and approved Environmental Management Programme report (EMPr) for the development of a new underground manganese mining operation near Black Rock, Northern Cape Province. The approved mine will be located on Portion 1 of the farm Lehating 741.

Immediately adjacent and to the south of Lehating, Khwara Manganese (Pty) Ltd (Khwara) holds an approved EMPr for underground mining of manganese on portion 2 of the farm Wessels 227 and the remaining extent and portion 3 and 4 of the farm Dibiaghomo 226. The Khwara underground resource will be accessed using Lehating's approved surface infrastructure. In this regard, no surface infrastructure will be established as part of the Khwara Mine. No infrastructure has been developed to date.

Khwara and Lehating have entered into an agreement which combines the two adjacent, mineral resources and surface rights comprising the Khwara and Lehating Mines into a single, high-grade manganese mining company known as Mn48 (Pty) Ltd (Mn48). Mn48 is now proposing to consolidate the Lehating and Khwara mining right areas and associated EMPrs. In addition, Lehating needs to amend the approved infrastructure layout for infrastructure planned on the farm Lehating 741.

The vehicle traffic related impact of the proposed operations as part of the MN48 mining development was assessed as part of this report as follows:

- a) Proposed Lehating mining component with the proposed processing plant, without the proposed production from the Khwara mining component;
- b) Proposed Khwara mining component with the proposed processing plant, without the proposed production from the Lehating mining component; and
- c) Production from the Lehating and Khwara mining components with the proposed processing plant.

The purpose of this study is to assess the implications of the vehicular traffic that could potentially be generated due to the proposed MN48 mining development and:

- a) The traffic impact that the change in land use would have on the road and transport-related infrastructure;
- b) Whether it is possible to accommodate the proposed MN48 mining development within acceptable norms from a traffic engineering point of view; and
- c) The mitigating measures required to accommodate the proposed MN48 mining development within acceptable traffic engineering norms.

Figure 1.1 provides the locality of the proposed MN48 mining development in relation to other activities in the vicinity, including the location of the intersections under investigation as part of this study. **Figure 1.2** provides a graphical presentation of the proposed MN48 mining development site layout as provided by SLR Consulting (South Africa) (Pty) Ltd.

Table 1.1 provides a summary of information of the proposed MN48 mining development in terms of the planned production rates and timelines. It is important to take note that the anticipated timeline as depicted by the last-mentioned table provides an estimated timeline in terms of months and/ or years that mining is planned for and does not depict the exact month and/or year that mining is planned.

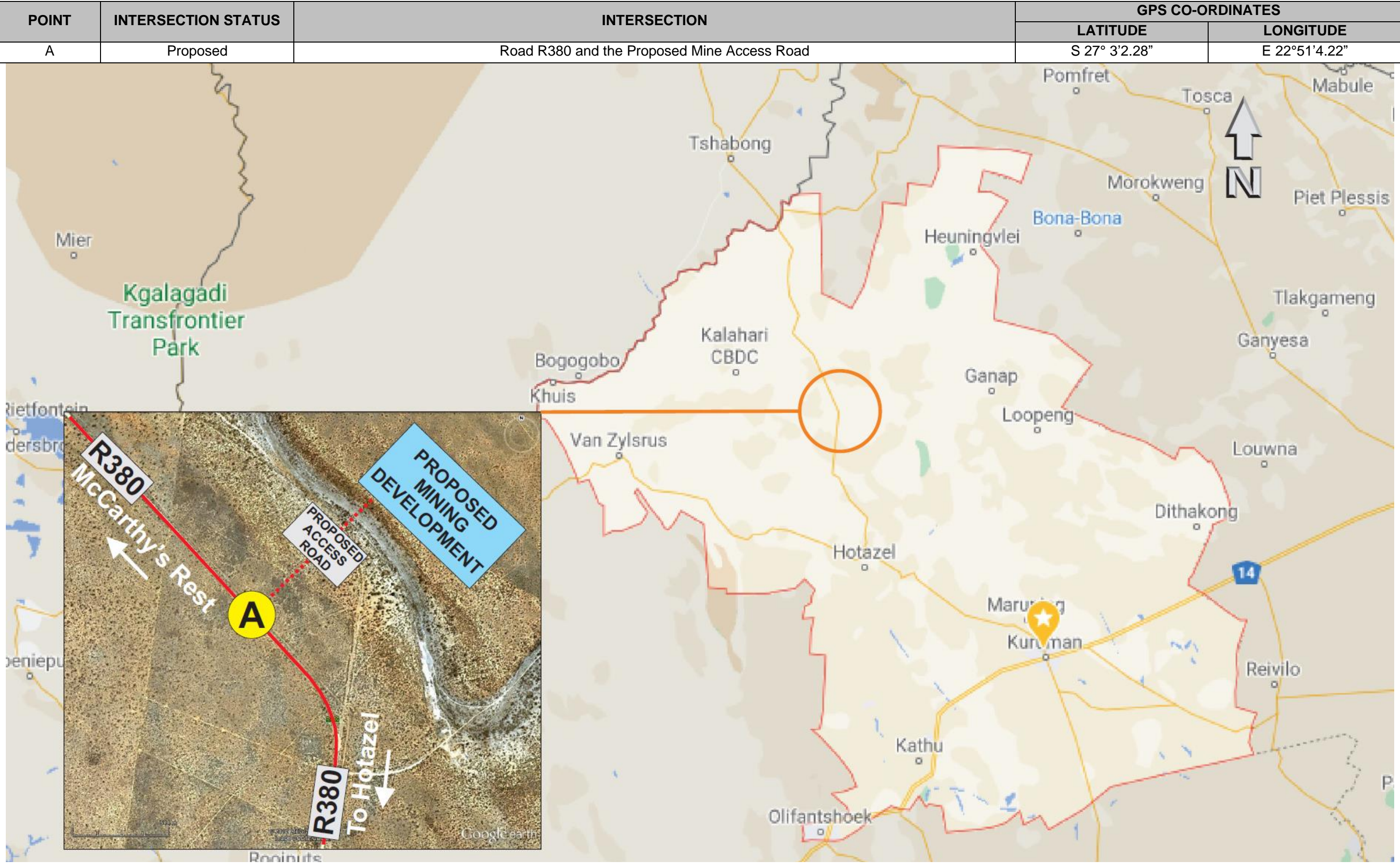


FIGURE 1.1: LOCALITY OF THE PROPOSED MN48 MINING DEVELOPMENT AND RELEVANT INTERSECTIONS UNDER INVESTIGATION

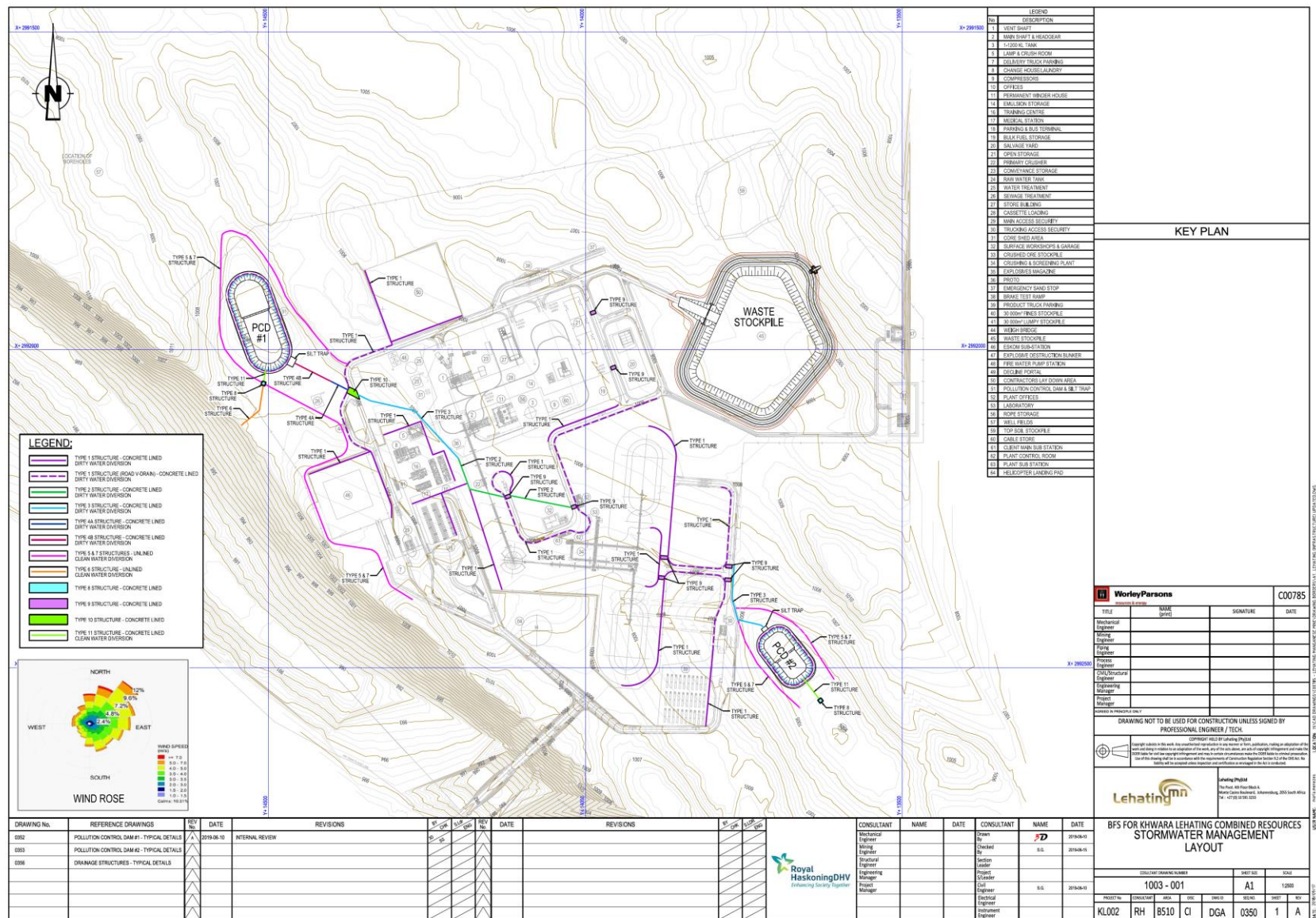


FIGURE 1.2: GRAPHICAL PRESENTATION OF THE PROPOSED MN48 MINING DEVELOPMENT SITE LAYOUT

Source: SLR Consulting (South Africa) (Pty) Ltd

TABLE 1.1: SUMMARY OF THE EXTENT OF THE PROPOSED MN48 MINING DEVELOPMENT FOR THE RESPECTIVE PHASES

DESCRIPTION	PHASE					
	CONSTRUCTION		OPERATIONAL		DECOMMISSIONING	CLOSURE
Production (tonnes of manganese product for export)	Not relevant.		Lehating – 480 000 tonnes per annum Khwara – 480 000 tonnes per annum Combined – 960 000 tonnes per annum		Not relevant. (Activities include the demolition of all infrastructures and the rehabilitation of the site.)	Not relevant. (All activities on the site, although limited, are planned to be completed and the mining company will leave the site.)
Duration	± 4 years		± 16 years		± 1 year	Part of the decommissioning phase
Relevant time frame	2020 to 2024		2025 to 2041		2041 to 2042	2042
Number of construction workers	±1000 at peak of construction		Not relevant		Less than the construction phase	Less than the construction phase
Assumed maximum % of construction workers transport that will occur during peaks respectively	100%		Not relevant		Not relevant	Not relevant
Location from where workers are expected to come	Kuruman, Hotazel, Kathu (all south of proposed MN48 mining development)	100%	Kuruman, Hotazel, Kathu (all south of the proposed MN48 mining development)	100%	Not relevant	Not relevant

TABLE 1.1: SUMMARY OF THE EXTENT OF THE PROPOSED MN48 MINING DEVELOPMENT FOR THE RESPECTIVE PHASES (Continue...)

DESCRIPTION	PHASE			
	CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Mining workers (day shift)	Not relevant	Lehating: 15 per day Khwara: 15 per day	Not relevant	Not relevant
Mining workers (two shifts per day)	Not relevant	Lehating: 180 per day (60 per shift) Khwara: 180 per day (60 per shift) Note: Three teams, of which only two teams will work per day	Not relevant	Not relevant
Processing plant workers (day shift)	Not relevant	Lehating: 14 per day Khwara: 14 per day	Not relevant	Not relevant
Processing plant workers (two shifts per day)	Not relevant	Lehating: 36 per day (9 per shift) Khwara: 36 per day (9 per shift) Note: Four teams, of which only two teams will work per day	Not relevant	Not relevant
Operational staff (day shift) (management, admin, HR, HSEC, engineering, etc.)	Not relevant	Lehating: 38 per day Khwara: 38 per day	Not relevant	Not relevant
Operational staff (Two shifts per day) (management, admin, HR, HSEC, engineering, etc.)	Not relevant	Lehating: 36 per day (12 per shift) Khwara: 36 per day (12 per shift) Note: Three teams, of which only two teams will work per day	Not relevant	Not relevant
Expected number of heavy vehicles delivering consumables per day	4	Lehating: 9 per day Khwara: 9 per day	Limited, occasionally	Limited, occasionally

TABLE 1.1: SUMMARY OF THE EXTENT OF THE PROPOSED MN48 MINING DEVELOPMENT FOR THE RESPECTIVE PHASES (Continue...)

DESCRIPTION	PHASE			
	CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Assumed maximum % of heavy vehicles during AM or PM peak respectively	20%	Heavy vehicles transporting processed product to railway siding: 100% Heavy vehicles transporting processed product to sea port: 10% Heavy vehicles delivering consumables: 10%	Limited, occasionally	Limited, occasionally
Heavy vehicle distribution	See Figure B-2 of Appendix B	See Figure B-2 of Appendix B	Same as for operational phase	Same as for operational phase
Heavy vehicle trips per day transporting processed product from plant to railway siding	Not relevant	13 (3 during vehicle peak hour)	Not relevant	Not relevant
Heavy vehicle trips per day transporting processed product from plant to sea port	Not relevant	25 (5 during vehicle peak hour)	Not relevant	Not relevant
Abnormal vehicles delivering large components related to the proposed MN48 mining development	Once-off events	Once-off events	Once-off events	Once-off events
Access road	Access from Road R380	Same as for Construction Phase	Same as for construction phase	Same as for construction phase
Calculated number of vehicle trips to be generated per AM or PM peak hours	81 (See Table 2.6)	Lehating only - 86 Khwara only - 86 Combined MN48 – 119 (See Tables 2.7 to 2.10)	Fewer than construction and operational phases	Fewer than construction and operational phases

The following scenarios were investigated as part of the traffic impact assessment:

- a) **Scenario 1:** 2020 peak hour traffic **without** the proposed MN48 mining development (Status Quo);
- b) **Scenario 2:** 2020 peak hour traffic **with** production from the proposed Lehating mining development **without** production from the proposed Khwara mining development;
- c) **Scenario 3:** 2020 peak hour traffic **with** production from the proposed Khwara mining development **without** production from the proposed Lehating mining development;
- d) **Scenario 4:** 2020 peak hour traffic **with** production from **both** proposed mining developments (MN48 mining development);
- e) **Scenario 5:** 2030 peak hour traffic **without** the proposed MN48 mining development;
- f) **Scenario 6:** 2030 peak hour traffic **with** production from the proposed Lehating mining development **without** production from the proposed Khwara mining development;
- g) **Scenario 7:** 2030 peak hour traffic **with** production from the proposed Khwara mining development **without** production from the proposed Lehating mining development;
- h) **Scenario 8:** 2030 peak hour traffic **with** production from **both** proposed mining developments (MN48 mining development);

The following sections of the report elaborate on the detailed information related to data collected and investigations conducted and the findings and recommendations:

- a) **Section 2:** Detailed information related to data collected and investigations.
- b) **Section 3:** Findings and recommendations

Section 2

2. DETAILED INFORMATION RELATED TO DATA COLLECTED AND INVESTIGATIONS

The purpose of **Section 2** is to provide detailed information related to the data collected and investigations and consists of:

- a) The *status quo* of the land use and road network characteristics of roads relevant to the proposed MN48 mining development which consists of the following information;
 - i. Existing land use information;
 - ii. Existing road characteristics and modal distribution; and
 - iii. Traffic counts as a basis for making traffic-engineering calculations.
- b) The future land use and road network characteristics relevant to the proposed MN48 mining development which consists of the following information;
 - i. Land use information, including existing and proposed approved future developments in the area; and
 - ii. Determination of vehicle trips expected to be generated due to the proposed MN48 mining development.
- c) Access to and from the proposed MN48 mining development.
- d) The current and future levels of service at the relevant intersections under investigation.
- e) Other traffic-related matters.

2.1 STATUS QUO OF LAND USE, AS WELL AS ROAD NETWORK CHARACTERISTICS

The following information is discussed in terms of the *status quo* of the existing land use and road characteristics:

- a) Existing land use information;
- b) Existing road characteristics and modal distribution; and
- c) Traffic counts conducted as a basis for making traffic calculations.

2.1.1 EXISTING LAND USE INFORMATION


The relevant property of the proposed MN48 mining development is currently utilised for agricultural purposes. For the purpose of this TIA, the following assumptions are made:

- a) That the average rate of growth of vehicle traffic in the area under investigation that is not relevant to the proposed MN48 mining development (background traffic) between the 2020 to 2030 scenarios was anticipated at 3% per annum;
- b) That the anticipated average rate of growth will be included as background traffic for the respective road sections; and
- c) That the absorption rate by all other types of completed developments will maintain the same status for the next ten years.

2.1.2 EXISTING ROAD CHARACTERISTICS AND MODAL DISTRIBUTION

The following are relevant as part of this section:

- a) **Table 2.1** contains information related to the existing intersection under investigation.
- b) **Figure 2.1** provides the existing road network layout for the area under investigation.
- c) **Table 2.2** provides information concerning the relevant road sections under investigation and includes the following:
 - i) Relevant road section;
 - ii) Picture of road section;
 - iii) Existing class of road;
 - iv) Proposed class of road;
 - v) Road reserve widths;
 - vi) Lane widths; and
 - vii) Median widths.
- d) **Tables 2.3** and **2.4** provide information on typical road characteristics and access management requirements as per the guideline COTO TRH26 “*South African Road Classification and Access Management Manual, Version 1.0, August 2012*” Rural areas.

TABLE 2.1: SUMMARY OF INTERSECTION CONTROL AT INTERSECTION UNDER INVESTIGATION				
POINT	DESCRIPTION	INTERSECTION CONTROL	PEDESTRIAN ACTIVITIES	INTERSECTION PHOTO
A	Road R380 and Proposed Mine Access Road	Free-flow on Road R380	No pedestrian activity observed during surveys	

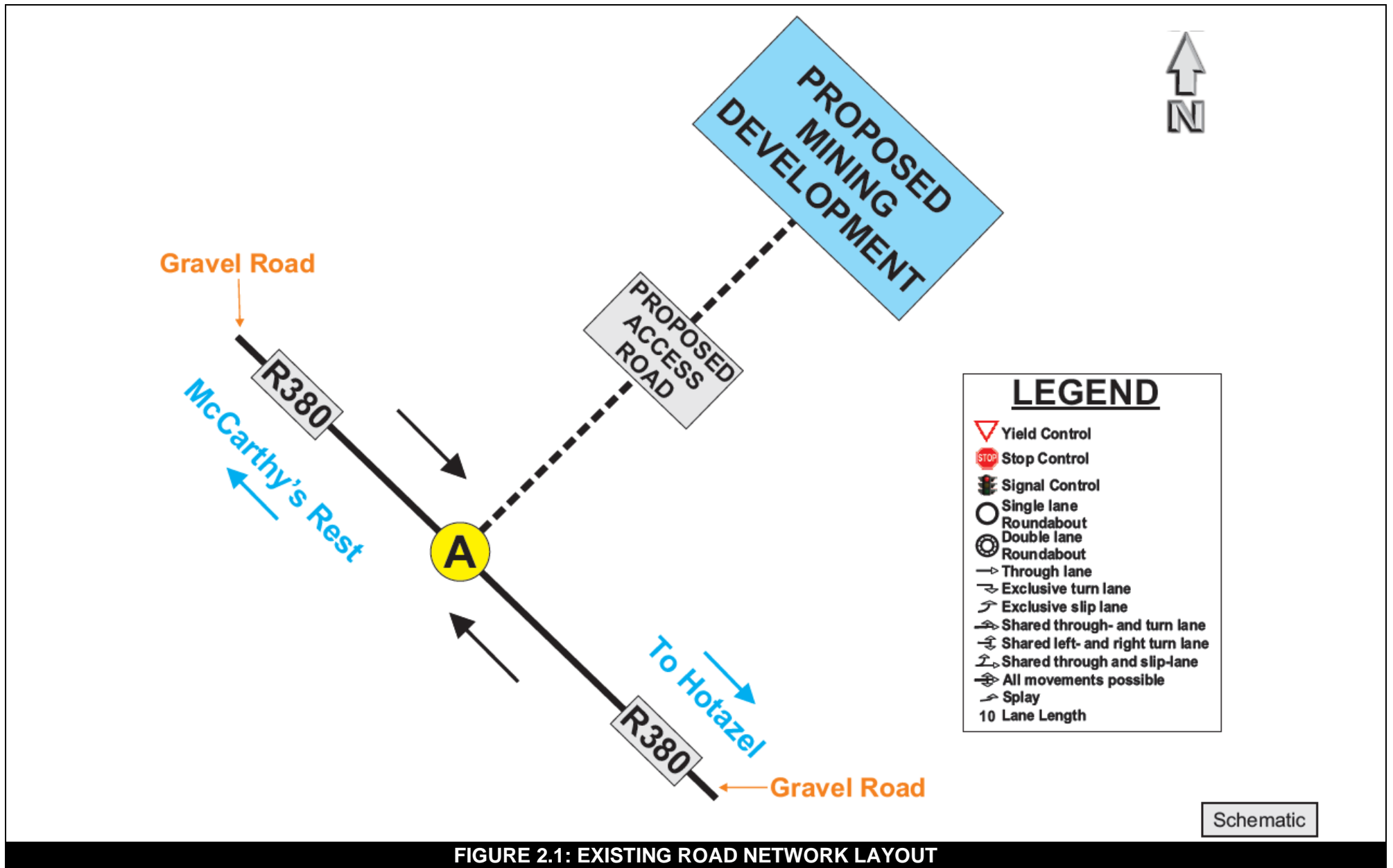


TABLE 2.2: SUMMARY OF ROAD CHARACTERISTICS


RELEVANT ROAD SECTION	PICTURE OF ROAD SECTION	ASSUMED EXISTING CLASS OF ROAD			POSSIBLE FUTURE CLASS OF ROAD			Road Authority	Road Reserve (M)	Number of Lanes	Lane Width	Type of Surface	Median	Anticipated Traffic Growth per Annum over 10 Years	Speed Limit
<u>Road Section 1</u> Road R380 Road link between Kuruman, Hotazel, Black Rock and McCarthy's Rest		<u>Primary Function:</u> Mobility (Vehicle priority, through route)			<u>Proposed Function:</u> Mobility (Vehicle priority, through route)			Northern Cape Department of Transport, Roads and Public Works	30m	One lane per direction	3.5m wide	Gravel	None	2%	90 km/h
		Class	Class No.	Route No.	Class	Class No.	Route No.								
		Minor arterial	3	R	Minor arterial	3	R								
		<u>Description:</u> Minor provincial road (Rural)			<u>Description:</u> Minor provincial road (Rural)										
		Access spacing: > 800m			Access spacing: > 800m										

TABLE 2.3: RURAL FUNCTIONAL ROAD CLASSIFICATION
(COTO TRH26 - SOUTH AFRICAN ROAD CLASSIFICATION AND ACCESS MANAGEMENT MANUAL VERSION 1.0 AUGUST 2012)

FUNCTION			DESCRIPTION		MOBILITY				
BASIC FUNCTION	ALTERNATE FUNCTIONAL DESCRIPTION	DETERMINING FUNCTION	CLASS NO. (R_)	CLASS NAME	ORIGIN / DESTINATION	THROUGH TRAFFIC COMPONENT	REACH OF CONNECTIVITY	% OF BUILT KM	AADT (AVERAGE ANNUAL DAILY TRAFFIC)
Mobility	Vehicle priority, vehicle only, long distance, through, high order, high speed, numbered, commercial, economic, strategic; route, arterial road or highway	Movement is dominant, through traffic is dominant, the majority of traffic does not originate or terminate in the immediate vicinity; the function of the road is to carry high volumes of traffic between urban areas.	R 1	Principal arterial*	Metro areas, large cities, large border posts, join national routes.	Exclusively	> 50km	2 - 4% Classes 1 and 2	1 000 - 100 000+
			R 2	Major arterial*	Cities and large towns, transport nodes (harbour and international airports), smaller border posts, join major routes.	Exclusively	> 25km		500 - 25 000+
			R 3	Minor arterial*	Towns, villages and rural settlements, tourist destinations, transport nodes (railway sidings, seaports, and landing strips), small border posts, and other routes.	Predominant	> 10km	6 - 12% Classes 1, 2 and 3	100 - 2 000+
Access / Activity	Access, mixed pedestrian and vehicle traffic, short distance, low order, lower speed, community/farm, road or street.	Access, turning and crossing movements are allowed, the majority of traffic has an origin or destination in the district, the function of the road is to provide a safe environment for vehicles and pedestrians using access points.	R 4	Collector road	Connect farming districts, rural settlements, tourist areas, national and private parks and mines to mobility routes.	Minimal	< 10km	20 - 25%	< 1 000
			R 5	Local road	Farm or property access, connection to other routes.	Nil Discontinued	< 5km	65 - 75%	< 500
			R 6	Walkway (path or track)	Settlements, farms, transport nodes, water points.	N/A	N/A	N/A	N/A

* In rural areas, the term distributor may be preferred to arterial.

TABLE 2.4: RURAL ACCESS MANAGEMENT REQUIREMENTS AND FEATURES
(COTO TRH26 - SOUTH AFRICAN ROAD CLASSIFICATION AND ACCESS MANAGEMENT MANUAL VERSION 1.0 AUGUST 2012)

BASIC FUNCTION	DESCRIPTION		REQUIREMENTS				TYPICAL FEATURES (Use appropriate context sensitive standards for design)									
	CLASS NO. (R_)	CLASS NAME	DESIGN TOPOLOGY	ROUTE NO.	ACCESS TO PROPERTY	PARKING	SPEED km/h	INTERSECTION CONTROL	INTERSECTION SPACING	TYPICAL CROSS SECTION	ROADWAY / LANE WIDTH	ROAD RESERVE WIDTH	PUBLIC TRANSPORT AND PEDESTRIAN CROSSINGS	PEDESTRIAN FOOTWAYS (CONSTRUCTED)	CYCLE LANES	ANIMAL DRAWN VEHICLES
Mobility	R 1	Principal arterial	Expressway	Yes (N)	Not allowed*	No (off-road rest stops allowed)	120	Grade separated or priority to through	8.0km	2/3/4 lanes, surfaced shoulders, climbing lanes	3.5 - 3.7m	60 - 80m (62m)	No	No	No	No
	R 2	Major arterial	Highway	Yes (R: 2 or 3-digit; or N)	Not allowed */**	No (off-road rest stops allowed)	120	Priority or grade separated	5.0km	2/3 lanes, surfaced shoulders, climbing lanes	3.5 - 3.7m	40-70m (48m)	As required	Isolated	Recreational on shoulder	No
	R 3	Minor arterial	Main road	Yes (R: 3 or 2-digit)	Not allowed */**	No (off-road rest stops allowed)	100 - 120	Priority, roundabout	1.6km	2 lanes surfaced, gravel shoulders	4.0m	30-50m (30m)	As required	Isolated	Recreational widen roadway both sides	Widen shoulder
Access / Activity	R 4	Collector road	Collector	Allowed, T (tourist) or D (district)	Yes	No (off road edge or in lay byes / viewpoints)	80 - 100	Priority	600 - 800m	2 lanes surfaced or gravel, gravel shoulders	3.5m	25m	As required	Rare, isolated	Widen roadway	Widen shoulder
	R 5	Local road	Farm road	Allowed, T (tourist) or L (local)	Yes	No (on verge or shoulder)	60 - 80	Priority	450 - 600m	1/2 lane/s gravel, 600mm concrete strips in environmental areas		20m	As required	Rare	Use roadway	Use roadway
	R 6	Walkway	Track or pathway	No	Yes	N/A			N/A					Not constructed, formed by use		

* Access to properties sufficiently large to warrant a private intersection/interchange which can be considered if access spacing requirements are met and there is no future need for a public road.

** Low volume farm gate and tourist access (less than 10 vehicles per day) can be considered if no alternative exists.

2.1.3 TRAFFIC COUNTS AS BASIS FOR MAKING TRAFFIC-ENGINEERING CALCULATIONS

To gain a better understanding of the existing traffic patterns and movements adjacent to the proposed MN48 mining development and the relevant intersection under investigation, 12-hour manual traffic counts were conducted along Road R380 near the point where access is proposed to the proposed MN48 mining development.

It is standard traffic engineering practice to conduct at least 12-hour manual traffic counts, as close as possible to a month-end Friday when traffic movement is expected to be at its highest.

The relevant 12-hour manual traffic count was conducted on Friday 3 July 2020 at the proposed mine access intersection along Road R380, Point A.

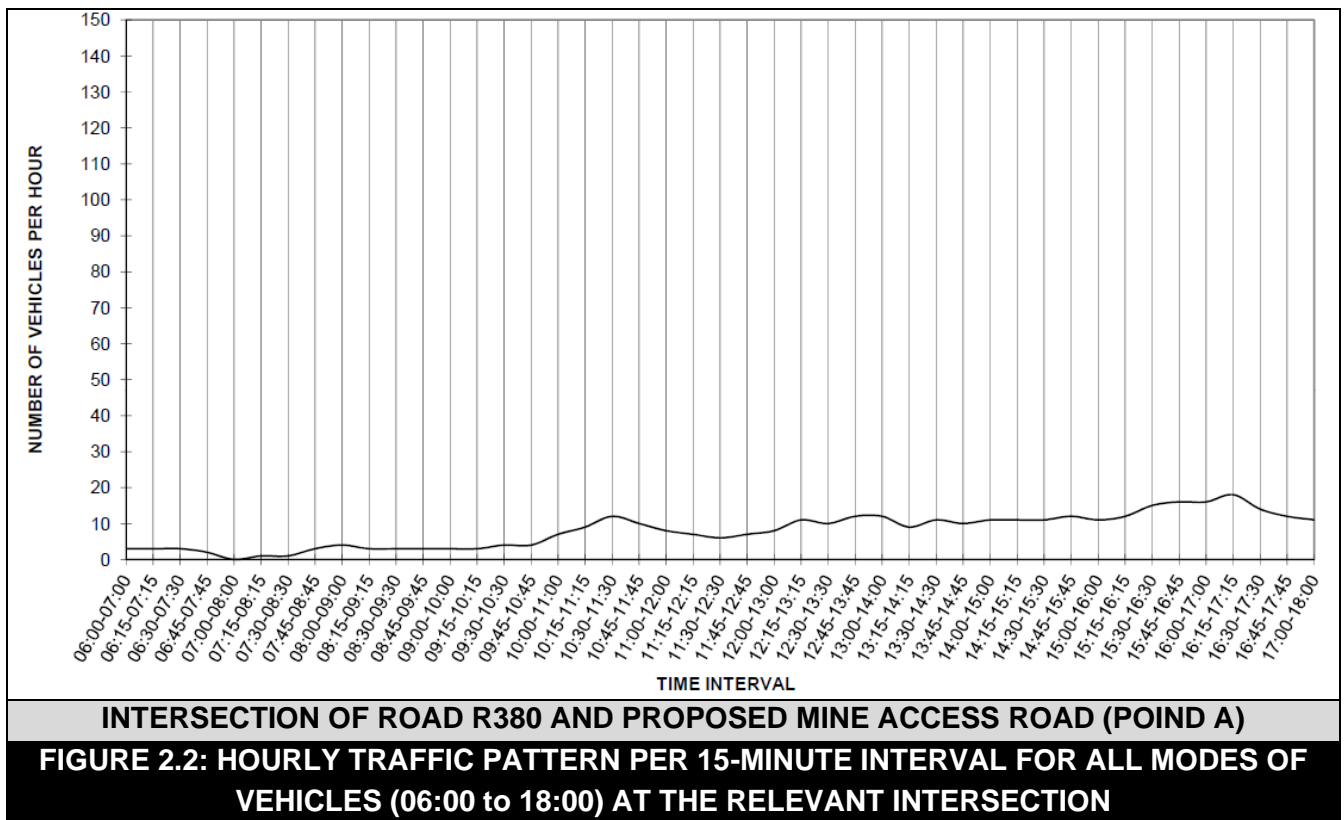
The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 3 July 2020 between 06:00 and 18:00 are indicated in **Table A-1 of Appendix A** of this report. The description of the relevant vehicle movements at the relevant intersection appears in **Figures A-1 of Appendix A**. **Figure B-1** provides a graphical presentation of the peak-hour traffic volumes as derived from the relevant manual traffic count.

The respective peak-hour flows for the traffic count at the relevant intersection was identified as indicated in **Table 2.5** below.

It is assumed, as a worst-case scenario, that shift starting and ending times of the proposed MN48 mining development (see **Table 1.1 of Section 1**) would fall within the existing vehicle traffic peak times for the purpose of the traffic impact assessment.

TABLE 2.5: PEAK HOUR PERIODS AT THE RELEVANT INTERSECTION					
POINT	INTERSECTION	AM PEAK		PM PEAK	
		TIME INTERVAL	NUMBER OF VEHICLES	TIME INTERVAL	NUMBER OF VEHICLES
A	Road R380 and Proposed Mine Access Road	06:00 to 07:00	3	16:15 to 17:15	18

Figure 2.2 indicates the hourly traffic pattern, per 15-minute interval, for all modes of vehicles at the relevant intersection between 06:00 and 18:00 on 3 July 2020. A graphical presentation of the peak-hour vehicle flows is indicated with **Figure B-1 of Appendix B**.



2.2 FUTURE LAND USE AND ROAD CHARACTERISTICS

The following are relevant:

- Future land use information, including existing and proposed approved future developments in the area;
- Determination of the vehicle trips anticipated to be generated by the proposed MN48 mining development;
- Information about the expected future modal distribution; and
- Determination of the total traffic expected to be generated at the relevant intersection.

The sections below elaborate on future land use and road characteristics.

2.2.1 FUTURE LAND USE INFORMATION, INCLUDING EXISTING AND PROPOSED APPROVED FUTURE DEVELOPMENTS IN THE AREA

At the time of conducting this study, there were no known approved latent developments within the area under investigation that would have a significant impact on the relevant road network adjacent to the proposed MN48 mining development.

2.2.2 DETERMINATION OF VEHICLE TRIPS EXPECTED TO BE GENERATED DUE TO THE PROPOSED MN48 MINING DEVELOPMENT

A detailed Ore and Logistics Model was prepared by Process Design & Automation to evaluate the logistics of the proposed MN48 mining development for transporting processed product from the proposed MN48 mining development to the relevant ports.

Transportation of the processed product is proposed to be done by means of transporting the processed product in the following manner:

- a) By means of trucks to a railway siding near Black Rock approximately seven kilometres from the proposed mining development from where the processed product will be loaded onto trains; and
- b) By means of trucks to the relevant sea ports by road (From the proposed mining development, all transport make use of Road R380 to and from the south).

Two options were investigated as part of the logistics model which entailed loading one or two trains per week at the railway siding, and the rest of the processed product would be trucked to the relevant ports. It was found from the investigation that:

- a) Should only one train be loaded per week, a fleet of 5 trucks would be required to transport the processed product to the railway siding and 90 trucks for transporting to the relevant ports.
- b) Should two trains be loaded per week, a fleet of 10 trucks would be required to transport the processed product to the railway siding and 33 trucks for transporting to the relevant ports.

In order to conduct the relevant traffic engineering-related assessment, the worst-case scenario approach was adopted in order to assess the potential traffic engineering-related impact on the existing road network due to the proposed MN48 mining development, and therefore the scenario of loading only one train per week at the railway siding and transporting the rest of the processed product by means of road transport to the relevant ports was used as part of this assessment.

The following tables indicate the anticipated number of vehicle trips to be generated by the proposed MN48 mining development for the relevant phases:

- a) **Table 2.6:** Trip generation rates, expected number of vehicle trips to be generated and the distribution of vehicle trips during the **construction phase** due to the proposed MN48 mining development.
- b) **Table 2.7:** Trip generation rates, expected number of vehicle trips to be generated and the distribution of vehicle trips during the **operational phase** due to production by the proposed **Lehating** mining development (Am peak).
- c) **Table 2.8:** Trip generation rates, expected number of vehicle trips to be generated and the distribution of vehicle trips during the **operational phase** due to production by the proposed **Lehating** mining development (Pm peak).

- d) **Table 2.9:** Trip generation rates, expected number of vehicle trips to be generated and the distribution of vehicle trips during the **operational phase** due to production by the proposed **Khwara** mining development (AM Peak).
- e) **Table 2.10:** Trip generation rates, expected number of vehicle trips to be generated and the distribution of vehicle trips during the **operational phase** due to production by the proposed **Khwara** mining development (PM Peak).

It is important to take note of the following:

- a) That during the construction phase, it is expected that the construction of both mining components at the same time would not result in an increase in construction vehicle traffic due to:
 - i. Both proposed mining components will make use of the same processing plant, and
 - ii. Both mining components will gain access to underground operations from the same shaft.
- b) The proposed processing plant would be utilised for the processing of ore from Lehating and Khwara and the work force would for the processing plant would remain the same whether processing is only done for either Lehating or Khwara, or for both Lehating and Khwara.

The trip generation rates are based on the “*COTO TMH17, South African Trip Data Manual Version 1.01, September 2013*” information provided by the project team and assumptions made based on professional experience where information was not available.

TABLE 2.6: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE CONSTRUCTION PHASE DUE TO THE PROPOSED MN48 MINING DEVELOPMENT																				
Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour		Num Trucks Per Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations			
											If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																	In	Out	In	Out
AM Peak Hour																				
1.	Construction workers (using own transport)	50	100%	50					1,2	Trips per worker (1.2 persons per vehicle)	1	42	0	0	42	0,83	100%	0%	42	0
2.	Construction workers (Transported via 50 seater buses)	950	100%	950					50,0	50 persons per bus (bus delivers workers and leaves site empty)	1	19	1	19	38	0,04	50%	50%	19	19
3.	Heavy vehicles delivering consumables					4	20%	1	1,0	20% of delivery vehicles expected during peak periods	1	1	1	1	2	2,00	50%	50%	1	1
TOTAL															81				61	20
PM Peak Hour																				
1.	Construction workers (using own transport)	50	100%	50					1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	42	42	0,83	0%	100%	0	42
2.	Construction workers (Transported via 50 seater buses)	950	100%	950					50,0	50 persons per bus (bus delivers workers and leaves site empty)	1	19	1	19	38	0,04	50%	50%	19	19
3.	Heavy vehicles delivering consumables					4	20%	1	1,0	20% of delivery vehicles expected during peak periods	1	1	1	1	2	2,00	50%	50%	1	1
TOTAL															81				20	61

TABLE 2.7: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED LEHATING MINING DEVELOPMENT (AM PEAK)

Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour		Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations			
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																		In	Out	In	Out
AM Peak Hour (Operational Phase)																					
MINING																					
1	Surface mining staff (using own transport) DAY SHIFT	1	100%	0,9						1,2	Trips per worker (1.2 persons per vehicle)	1	1	0	0	1	0,83	100%	0%	1	0
2	Surface mining staff (using contracted transport) DAY SHIFT	8	100%	8						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,23	50%	50%	1	1
3	Surface mining staff (using own transport) TWO SHIFTS PER DAY	3	33%	1						1,2	Trips per worker (1.2 persons per vehicle) day shift in, night shift out	1	1	1	1	2	2,11	50%	50%	1	1
4	Surface mining staff (using contracted transport) TWO SHIFTS PER DAY	24	33%	8						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,23	50%	50%	1	1
5	Underground mining staff (using own transport) DAY SHIFT	1	100%	1						1,2	Trips per worker (1.2 persons per vehicle)	1	1	0	0	1	0,83	100%	0%	1	0
6	Underground mining staff (using contracted transport) DAY SHIFT	5	100%	5						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,36	50%	50%	1	1
7	Underground mining staff (using own transport) TWO SHIFTS PER DAY	15	33%	5						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	4	1	4	8	1,67	50%	50%	4	4
8	Underground mining staff (using contracted transport) TWO SHIFTS PER DAY	138	33%	46						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	3	1	3	6	0,13	50%	50%	3	3

TABLE 2.7: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED LEHATING MINING DEVELOPMENT (AM PEAK) Continued...

Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour		Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations				
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation		
																		In	Out	In	Out	
AM Peak Hour (Operational Phase)																						
PROCESS PLANT																						
9	Process plant workers (using own transport DAY SHIFT	1	100%	1						1,2	Trips per Worker (1.2 Persons per Vehicle)	1	1	0	0	1	0,83	100%	0%	1	0	
10	Process plant workers (using contracted transport DAY SHIFT	13	100%	13						15,0	Trips per Worker (15 Persons per Vehicle) Transport off-load workers and leave site empty	1	1	1	1	2	0,13	50%	50%	1	1	
11	Process plant workers (using own transport TWO SHIFT PER DAY	4	25%	1						1,2	Trips per Worker (1.2 Persons per Vehicle) Night shift in, Day shift out	1	1	1	1	2	1,67	50%	50%	1	1	
12	Process plant workers (using contracted transport TWO SHIFT PER DAY	32	25%	8						15,0	Trips per Worker (15 Persons per Vehicle) Day shift in, Night shift out	1	1	1	1	2	0,26	50%	50%	1	1	
OPERATIONAL STAFF (MANAGEMENT, ADMIN, HR, HSEC, ENGINEERING, etc.)																						
13	Operational staff (using own transport) DAY SHIFT	27	100%	27						1,2	Trips per Worker (1.2 Persons per Vehicle)	1	22	0	0	22	0,83	100%	0%	22	0	
14	Operational staff (using contracted transport) DAY SHIFT	11	100%	11						15,0	Trips per Worker (15 Persons per Vehicle) Transport off-load workers and leave site empty	1	1	1	1	2	0,13	50%	50%	1	1	
15	Operational staff (using own transport) TWO SHIFTS PER DAY	25	33%	8						1,2	Trips per Worker (1.2 Persons per Vehicle) Night shift in, Day shift out	1	7	1	7	14	1,67	50%	50%	7	7	
16	Operational staff (using contracted transport) TWO SHIFTS PER DAY	11	33%	3						15,0	Trips per Worker (15 Persons per Vehicle) Day shift in, Night shift out	1	1	1	1	2	0,48	50%	50%	1	1	
HEAVY VEHICLES																						
17	Heavy vehicles exporting processed product to railway siding					3	13	100%	3	1,0	100% of export vehicles expected during peak periods	1	3	1	3	6	2,00	50%	50%	3	3	
18	Heavy vehicles exporting processed product to port					45	25	10%	5	1,0	10% of export vehicles expected during peak periods	1	5	1	5	10	2,11	50%	50%	5	5	
19	Heavy vehicles delivering consumables					N/A	9	10%	1	1,0	10% of delivery vehicles expected during peak periods	1	1	1	1	2	2,00	50%	50%	1	1	
TOTAL																86					57	32

TABLE 2.8: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED LEHATING MINING DEVELOPMENT (PM PEAK)

Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour		Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations			
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																		In	Out	In	Out
PM Peak Hour (Operational Phase)																					
MINING																					
1	Surface mining staff (using own transport) DAY SHIFT	1	100%	0,9						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	1	1	0,83	0%	100%	0	1
2	Surface mining staff (using contracted transport) DAY SHIFT	8	100%	8						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,23	50%	50%	1	1
3	Surface mining staff (using own transport) TWO SHIFTS PER DAY	3	33%	1						1,2	Trips per worker (1.2 persons per vehicle) day shift in, night shift out	1	1	1	1	2	2,11	50%	50%	1	1
4	Surface mining staff (using contracted transport) TWO SHIFTS PER DAY	24	33%	8						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,23	50%	50%	1	1
5	Underground mining staff (using own transport) DAY SHIFT	1	100%	1						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	1	1	0,83	0%	100%	0	1
6	Underground mining staff (using contracted transport) DAY SHIFT	5	100%	5						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,36	50%	50%	1	1
7	Underground mining staff (using own transport) TWO SHIFTS PER DAY	15	33%	5						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	4	1	4	8	1,67	50%	50%	4	4
8	Underground mining staff (using contracted transport) TWO SHIFTS PER DAY	138	33%	46						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	3	1	3	6	0,13	50%	50%	3	3

TABLE 2.8: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED LEHATING MINING DEVELOPMENT (PM PEAK) Continued...																						
Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour		Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations				
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation		
																		In	Out	In	Out	
PM Peak Hour (Operational Phase)																						
PROCESS PLANT																						
9	Process plant workers (using own transport DAY SHIFT	1	100%	1						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	1	1	0,83	0%	100%	0	1	
10	Process plant workers (using contracted transport DAY SHIFT	13	100%	13						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,13	50%	50%	1	1	
11	Process plant workers (using own transport TWO SHIFTS PER DAY	4	25%	1						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	1	1	1	2	1,67	50%	50%	1	1	
12	Process plant workers (using contracted transport TWO SHIFTS PER DAY	32	25%	8						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,26	50%	50%	1	1	
OPERATIONAL STAFF (MANAGEMENT, ADMIN, HR, HSEC, ENGINEERING, etc.)																						
13	Operational staff (using own transport) DAY SHIFT	27	100%	27						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	22	22	0,83	0%	100%	0	22	
14	Operational staff (using contracted transport) DAY SHIFT	11	100%	11						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,13	50%	50%	1	1	
15	Operational staff (using own transport) TWO SHIFTS PER DAY	25	33%	8						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	7	1	7	14	1,67	50%	50%	7	7	
16	Operational staff (using contracted transport) TWO SHIFTS PER DAY	11	33%	3						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,48	50%	50%	1	1	
HEAVY VEHICLES																						
17	Heavy vehicles exporting processed product to railway siding					3	13	100%	3	1,0	100% of export vehicles expected during peak periods	1	3	1	3	6	2,00	50%	50%	3	3	
18	Heavy vehicles exporting processed product to port					45	25	10%	5	1,0	10% of export vehicles expected during peak periods	1	5	1	5	10	2,22	50%	50%	5	5	
19	Heavy vehicles delivering consumables					N/A	9	10%	1	1,0	10% of delivery vehicles expected during peak periods	1	1	1	1	2	2,00	50%	50%	1	1	
TOTAL																87					32	57

TABLE 2.9: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED KHWARA MINING DEVELOPMENT (AM PEAK)

Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour	Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour		Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations			
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																		In	Out	In	Out
AM Peak Hour (Operational Phase)																					
MINING																					
1	Surface mining staff (using own transport) DAY SHIFT	2	100%	1,8						1,2	Trips per worker (1.2 persons per Vehicle)	1	2	0	0	2	0,83	100%	0%	2	0
2	Surface mining staff (using contracted transport) DAY SHIFT	16	100%	16						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	3	0,18	50%	50%	1	1
3	Surface mining staff (using own transport) TWO SHIFTS PER DAY	5	33%	2						1,2	Trips per worker (1.2 persons per vehicle) day shift in, night shift out	1	2	1	2	3	1,89	50%	50%	2	2
4	Surface mining staff (using contracted transport) TWO SHIFTS PER DAY	49	33%	16						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	3	0,18	50%	50%	1	1
5	Underground mining staff (using own transport) DAY SHIFT	1	100%	1						1,2	Trips per worker (1.2 persons per vehicle)	1	1	0	0	1	0,83	100%	0%	1	0
6	Underground Mining Staff (using contracted transport) DAY SHIFT	11	100%	11						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	3	0,24	50%	50%	1	1
7	Underground mining staff (using own transport) TWO SHIFTS PER DAY	31	33%	10						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	8	1	8	17	1,67	50%	50%	8	8
8	Underground mining staff (using contracted transport) TWO SHIFTS PER DAY	275	33%	92						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	6	1	6	12	0,13	50%	50%	6	6

TABLE 2.9: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED KHWARA MINING DEVELOPMENT (AM PEAK) Continue...

Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour	Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour		Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations			
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																		In	Out	In	Out
AM Peak Hour (Operational Phase)																					
PROCESS PLANT																					
9	Process plant workers (using own transport DAY SHIFT	1	100%	1						1,2	Trips per worker (1.2 persons per vehicle)	1	1	0	0	1	0,83	100%	0%	1	0
10	Process plant workers (using contracted transport DAY SHIFT	13	100%	13						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,13	50%	50%	1	1
11	Process plant workers (using own transport TWO SHIFT PER DAY	4	25%	1						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	1	1	1	2	1,67	50%	50%	1	1
12	Process plant workers (using contracted transport TWO SHIFT PER DAY	32	25%	8						15,0	trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,26	50%	50%	1	1
OPERATIONAL STAFF (MANAGEMENT, ADMIN, HR, HSEC, ENGINEERING, etc.)																					
13	Operational staff (using own transport) DAY SHIFT	27	100%	27						1,2	Trips per worker (1.2 persons per vehicle)	1	22	0	0	22	0,83	100%	0%	22	0
14	Operational staff (using contracted transport) DAY SHIFT	11	100%	11						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,13	50%	50%	1	1
15	Operational staff (using own transport) TWO SHIFTS PER DAY	25	33%	8						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	7	1	7	14	1,67	50%	50%	7	7
16	Operational staff (using contracted transport) TWO SHIFTS PER DAY	11	33%	3						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,48	50%	50%	1	1
HEAVY VEHICLES																					
17	Heavy vehicles exporting processed product to railway siding				5	26	100%	5		1,0	100% of export vehicles expected during peak periods	1	5	1	5	10	2,00	50%	50%	5	5
18	Heavy vehicles exporting processed product to port				90	51	10%	9		1,0	10% of export vehicles expected during peak periods	1	9	1	9	18	2,00	50%	50%	9	9
19	Heavy vehicles delivering consumables				N/A	9	10%	1		1,0	10% of delivery vehicles expected during peak periods	1	1	1	1	2	2,00	50%	50%	1	1
TOTAL																119				74	48

TABLE 2.10: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED KHWARA MINING DEVELOPMENT (PM PEAK)

Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour	Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour		Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations			
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																		In	Out	In	Out
PM Peak Hour (Operational Phase)																					
MINING																					
1	Surface mining staff (using own transport) DAY SHIFT	2	100%	1,8						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	2	2	0,83	0%	100%	0	2
2	Surface mining staff (using contracted transport) DAY SHIFT	16	100%	16						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	3	0,18	50%	50%	1	1
3	Surface mining staff (using own transport) TWO SHIFTS PER DAY	5	33%	2						1,2	Trips per worker (1.2 persons per vehicle) day shift in, night shift out	1	2	1	2	3	1,89	50%	50%	2	2
4	Surface mining staff (using contracted transport) TWO SHIFTS PER DAY	49	33%	16						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	3	0,18	50%	50%	1	1
5	Underground mining staff (using own transport) DAY SHIFT	1	100%	1						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	1	1	0,83	0%	100%	0	1
6	Underground mining staff (using contracted transport) DAY SHIFT	11	100%	11						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	3	0,24	50%	50%	1	1
7	Underground mining staff (using own transport) TWO SHIFTS PER DAY	31	33%	10						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	8	1	8	17	1,67	50%	50%	8	8
8	Underground mining staff (using contracted transport) TWO SHIFTS PER DAY	275	33%	92						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	6	1	6	12	0,13	50%	50%	6	6

TABLE 2.10: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO PRODUCTION BY THE PROPOSED KHWARA MINING DEVELOPMENT (PM PEAK) Continue...																					
Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour	Num Trucks in Fleet	Max Trucks Loaded on Peak Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour		Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic Engineering Calculations			
												If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In & Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																		In	Out	In	Out
PM Peak Hour (Operational Phase)																					
PROCESS PLANT																					
9	Process plant workers (using own transport DAY SHIFT	1	100%	1						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	1	1	0,83	0%	100%	0	1
10	Process plant workers (using contracted transport DAY SHIFT	13	100%	13						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,13	50%	50%	1	1
11	Process plant workers (using own transport TWO SHIFT PER DAY	4	25%	1						1,2	Trips per Worker (1.2 Persons per Vehicle) Night shift in, Day shift out	1	1	1	1	2	1,67	50%	50%	1	1
12	Process plant workers (using contracted transport TWO SHIFT PER DAY	32	25%	8						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,26	50%	50%	1	1
OPERATIONAL STAFF (MANAGEMENT, ADMIN, HR, HSEC, ENGINEERING, etc.)																					
13	Operational staff (using own transport) DAY SHIFT	27	100%	27						1,2	Trips per worker (1.2 persons per vehicle)	0	0	1	22	22	0,83	0%	100%	0	22
14	Operational staff (using contracted transport) DAY SHIFT	11	100%	11						15,0	Trips per worker (15 persons per vehicle) transport off-loads workers and leaves site empty	1	1	1	1	2	0,13	50%	50%	1	1
15	Operational staff (using own transport) TWO SHIFTS PER DAY	25	33%	8						1,2	Trips per worker (1.2 persons per vehicle) night shift in, day shift out	1	7	1	7	14	1,67	50%	50%	7	7
16	Operational staff (using contracted transport) TWO SHIFTS PER DAY	11	33%	3						15,0	Trips per worker (15 persons per vehicle) day shift in, night shift out	1	1	1	1	2	0,48	50%	50%	1	1
HEAVY VEHICLES																					
17	Heavy vehicles exporting processed product to railway siding				5	26	100%	5		1,0	100% of export vehicles expected during peak periods	1	5	1	5	10	2,00	50%	50%	5	5
18	Heavy vehicles exporting processed product to port				90	51	10%	9		1,0	10% of export vehicles expected during peak periods	1	9	1	9	18	2,00	50%	50%	9	9
19	Heavy vehicles delivering consumables				N/A	9	10%	1		1,0	10% of delivery vehicles expected during peak periods	1	1	1	1	2	2,00	50%	50%	1	1
TOTAL																119				48	73

2.2.3 INFORMATION ABOUT THE EXPECTED FUTURE MODAL DISTRIBUTION

Figure B-2 of **Appendix B** indicates, in percentages, the expected vehicle trips distribution, respectively, of light and heavy vehicles for the AM and PM peak periods for the relevant scenarios and is relevant for the proposed Lehating and Khwara mining developments.

2.2.4 DETERMINATION OF THE TOTAL TRAFFIC EXPECTED TO BE GENERATED AT THE RELEVANT INTERSECTIONS

The detailed traffic-related investigation was conducted for the operational phase of the proposed Gamsberg Smelter Project. The following figures are relevant:

- a) **Figure B-1:** 2020 peak hour traffic (background traffic) without the proposed MN48 mining development (**Scenario 1**);
- b) **Figure B-2:** Projected vehicle trip distribution for the proposed mining development (**light and heavy vehicles**);
- c) **Figure B-3:** Projected vehicle trips to be generated by the production for the proposed Lehating mining development;
- d) **Figure B-4:** Projected vehicle trips to be generated by the production for the proposed Khwara mining development;
- e) **Figure B-5:** Projected 2020 peak hour traffic **with** the production for the proposed Lehating mining development **without** the production for the proposed Khwara mining development (**Scenario 2**);
- f) **Figure B-6:** Projected 2020 peak hour traffic **with** the production for the proposed Khwara mining development **without** the production for the proposed Lehating mining development (**Scenario 3**);
- g) **Figure B-7:** Projected 2020 peak hour traffic **with** production for **both** proposed mining developments (MN48 mining development) (**Scenario 4**);
- h) **Figure B-8:** Projected 2030 peak hour traffic without the proposed MN48 mining development (**Scenario 5**);
- i) **Figure B-9:** Projected 2030 peak hour traffic **with** the production for the proposed Lehating mining development **without** the production for the proposed Khwara mining development (**Scenario 6**);
- j) **Figure B-10:** Projected 2030 peak hour traffic **with** the production for the proposed Khwara mining development **without** the production for the proposed Lehating mining development (**Scenario 7**); and
- k) **Figure B-11:** Projected 2030 peak hour traffic **with** production for **both** proposed mining developments (MN48 mining development) (**Scenario 8**).

2.3 DETERMINATION OF THE LEVELS OF SERVICE AT THE RELEVANT INTERSECTIONS

The “**SIDRA Intersection**” software was used as an aid for the design and evaluation of the relevant intersection. The evaluations determine the intersection levels of service (LOS) which qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, manoeuvrability, delay, and safety. The following intersection was evaluated for levels of service:

- a) **Point A:** Intersection of Road R380 and proposed mine access road.

In **Appendix C Tables C-1 to C-4** indicate the levels of service and the degree of saturation calculated for the relevant intersections for the respective scenarios:

- a) **Table C-1:** Levels of service for various approaches for the year 2020 (background traffic) **with** the production for the proposed Lehating mining development **without** the production for the proposed Khwara mining development (**Scenario 2**);
- b) **Table C-2:** Levels of service for various approaches for the year 2020 (background traffic) **with** the production for the proposed Khwara mining development **without** the production for the proposed Lehating mining development (**Scenario 3**);
- c) **Table C-3:** Levels of service for various approaches for the year 2020 (background traffic) **with** production for **both** proposed mining developments (MN48 mining development) (**Scenario 4**);
- d) **Table C-4:** Levels of service for various approaches for the year 2030 (background traffic) **with** the production for the proposed Lehating mining development **without** the production for the proposed Khwara mining development (**Scenario 6**);
- e) **Table C-5:** Levels of service for various approaches for the year 2030 (background traffic) **with** the production for the proposed Khwara mining development **without** the production for the proposed Lehating mining development (**Scenario 7**); and
- f) **Table C-6:** Levels of service for various approaches for the year 2030 (background traffic) **with** production for **both** proposed mining developments (MN48 mining development) (**Scenario 8**).

From **Tables C-1 to C-8** it is possible to note from the relevant evaluations as part of the proposed MN48 mining development, regardless of whether only the Lehating or Khwara mining component are implemented or both mining components (MN48) that:

- a) No additional infrastructure is required other than constructing the proposed access intersection from a traffic capacity point of view.
- b) That the relevant proposed intersection will operate at acceptable levels of services for the relevant time frame that this report was prepared.
- c) Reserve capacity is available at the relevant proposed intersection on the existing road network.

Refer to **Section 3** of this report for more information regarding required and/or recommended improvements and **Tables D-1 and D-2** of **Appendix D** for the level of service criteria description respectively for unsignalised and signalised intersections.

Tables 2.11 to 2.13 provide a summary of the available reserve capacity on the various sections of roads that were investigated. The assumed free-flow capacity of individual lanes is relevant provided that the relevant intersections have reserve capacity available for the relevant lanes of the intersection.

TABLE 2.11: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTIONS WITH PRODUCTION FOR THE PROPOSED LEHATING MINING DEVELOPMENT WITHOUT THE PRODUCTION FOR THE PROPOSED KHWARA MINING DEVELOPMENT

Point	Intersection	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles with Proposed Mining Development		Reserve Capacity Available with Proposed Mining Development		Actual Number of Vehicles with Proposed Mining Development		Reserve Capacity Available with Proposed Mining Development	
						2020		2020		2030		2030	
						AM	PM	AM	PM	AM	PM	AM	PM
A	Road R380 and Proposed Mine Access Road	North (R380)	700	1	700	0	16	700	684	0	22	700	678
		East (proposed mine access road)	400	1	400	55	31	345	369	55	31	645	369
		South (R380)	700	1	700	34	58	666	642	35	59	665	641

TABLE 2.12: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTIONS WITH PRODUCTION FOR THE PROPOSED KHWARA MINING DEVELOPMENT WITHOUT THE PRODUCTION FOR THE PROPOSED LEHATING MINING DEVELOPMENT													
Point	Intersection	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles with Proposed Mining Development		Reserve Capacity Available with Proposed Mining Development		Actual Number of Vehicles with Proposed Mining Development		Reserve Capacity Available with Proposed Mining Development	
						2020		2020		2030		2030	
						AM	PM	AM	PM	AM	PM	AM	PM
A	Road R380 and Proposed Mine Access Road	North (R380)	700	1	700	0	16	700	684	0	22	700	678
		East (proposed mine access road)	400	1	400	55	31	345	369	55	31	645	369
		South (R380)	700	1	700	34	58	666	642	35	59	665	641

TABLE 2.13: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTIONS WITH PRODUCTION FOR BOTH THE PROPOSED MINING DEVELOPMENTS (MN48 MINING DEVELOPMENT)													
Point	Intersection	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles With Proposed Mining Development		Reserve Capacity Available With Proposed Mining Development		Actual Number of Vehicles With Proposed Mining Development		Reserve Capacity Available With Proposed Mining Development	
						2020		2020		2030		2030	
						AM	PM	AM	PM	AM	PM	AM	PM
A	Road R380 and Proposed Mine Access Road	North (R380)	700	1	700	0	16	700	684	0	22	700	678
		East (proposed mine access road)	400	1	400	72	47	328	353	72	47	328	353
		South (R380)	700	1	700	50	74	650	626	51	75	649	625

2.4 SENSITIVE ROAD SECTIONS AND INTERSECTIONS RELATED TO EXISTING AND FUTURE CONDITIONS

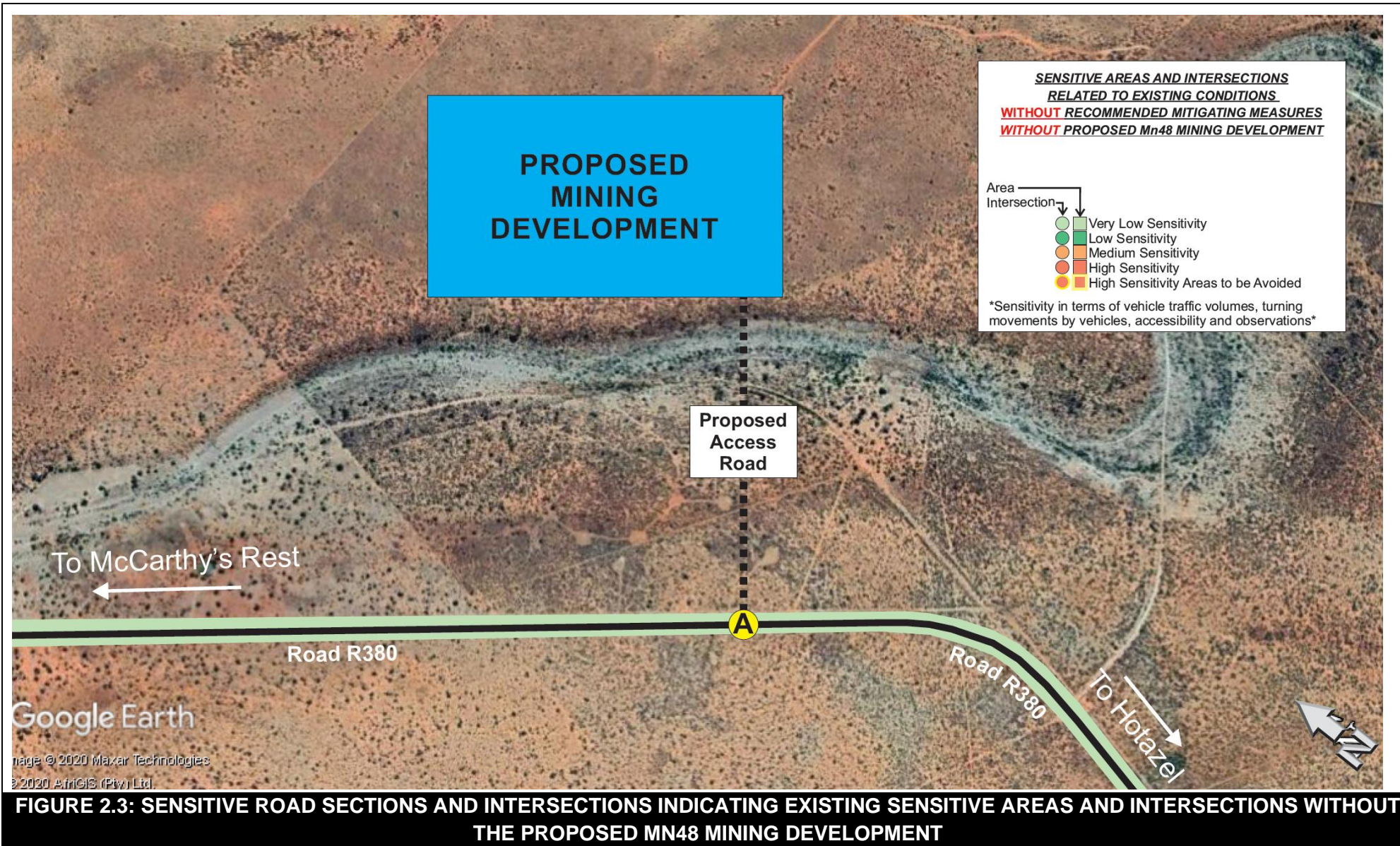
Sensitive road sections and intersections related to existing and future conditions **without** and **with** the proposed MN48 mining development in terms of vehicular traffic include the following:

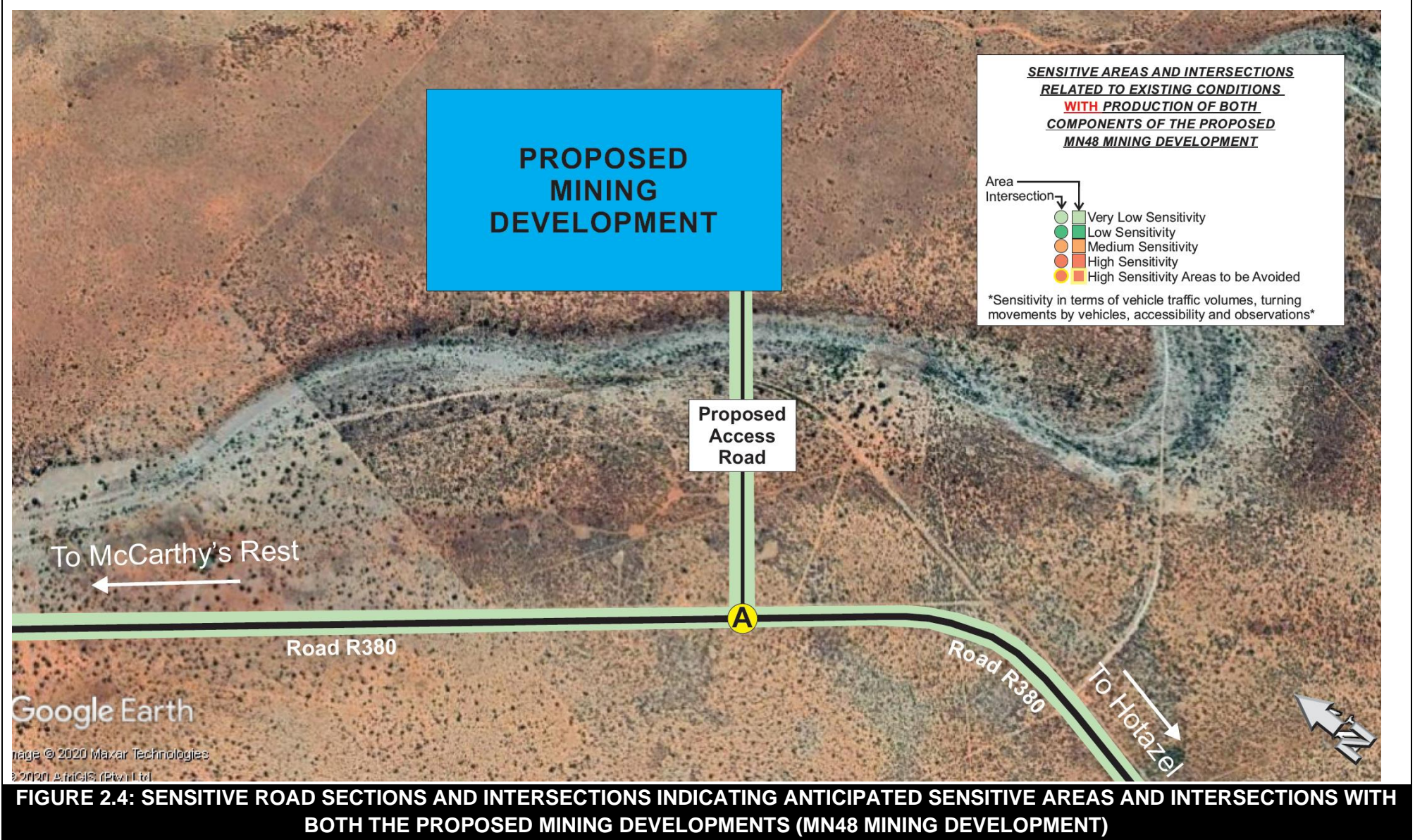
- a) Where residents and schools are located (vehicle/pedestrian conflict);
- b) Free-flow legs of intersections where right-turning movements take place and where no dedicated right-turn lanes are provided;
- c) Intersections with high volumes of vehicular traffic conflicts; and
- d) Speeding.

The following figures are presented as part of the sensitive road sections **without** and **with** the proposed MN48 mining development:

- a) **Figure 2.3:** Sensitive road sections and intersections indicating existing sensitive areas and intersections **without** the proposed MN48 mining development.
- b) **Figure 2.4:** Sensitive road sections and intersections indicating anticipated sensitive areas and intersections **with** both the proposed mining developments (MN48 mining development).

It can be concluded from **Figures 2.3** and **2.4** that the proposed MN48 mining development would have an insignificant impact on the sensitivity of the roads network in terms of the previously mentioned vehicular traffic factors. Refer to **Section 3** for more detail regarding recommended road network improvements.





2.5 INFORMATION REQUESTED BY RELEVANT ROAD AUTHORITY

Input will be provided as part of the Detail Design Phase of the proposed MN48 mining development. All comments/approval from the relevant road authorities will be included as part of the applications for approval and detail design process as a separate document.

2.6 OTHER TRAFFIC-RELATED MATTERS

Table 2.14 provides a summary of the following:



- a) Access-related matters in terms of access to and from the proposed MN48 mining development to and from Road R380 and include:
 - i) Point of access-related matters;
 - ii) Sight distances;
 - iii) Intersection spacing; and
 - iv) Speed limits along the Road N14 at relevant intersections;
- b) Road safety;
- c) Non-motorised transport; and
- d) Public transport.

TABLE 2.14: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS

Item	Description of Element	General Comments	Specific Issues	Actions Required
1.	ACCESS - RELATED MATTERS			
1.1	Access to the proposed MN48 mining development from Road R380 (Point A)			
1.1.1	Point of access-related matters	<p>a) Safe and reliable access will be provided via an access corridor over Portion 2 of the Farm Wessels 227 which is part of the proposed mining development. Refer to Figure 1.1 for a graphical presentation of the locality of the proposed access road and access corridor.</p> <p>b) Currently, Road R380 is a gravel road that is in good condition. At this point, no standards are available for the design of an access on a gravel road. The following guidelines should provide a safe and proper access intersection:</p> <p>i) The wide gravel road surface will allow for vehicles passing the proposed access to pass stationary vehicles waiting to turn right into the proposed MN48 mining development safely.</p>	a) None	a) None
1.1.2	Sight distances	<p>a) During the site visit, it was determined visually that the available sight distances at the proposed access intersection could be achieved.</p> <p>b) The required sight distance for a single unit and trailer type of vehicle is 225 metres for a speed of 60 km/h. (Recommended speed limit reduction from 90 km/h.)</p> <p>c) Table 3.11 provides a summary of the sight distance calculations.</p>	a) None	a) None
1.1.3	Intersection spacing	a) There are no other accesses located near the proposed location of the proposed access intersection	a) None	a) None
1.3	Vehicle speed limit along Road R380 at proposed access intersection			
1.3.1	Speed limits along Road R380	b) The current stated speed limit along Road R380 at Point A is 90km/h.	a) The high vehicle speed limit at Point A where light and heavy vehicles will make turning movements to join in with the through traffic flow along Road R380 could contribute to a possible road safety risk and could lead to fatal accidents due to high speeds.	<p>a) It is recommended that the vehicle speed limit at Point A be reduced to 60km/h which is recommended from a road safety perspective.</p> <p>b) Provide required road traffic signs as part of the recommended vehicle speed limit reduction at Point A.</p>

TABLE 2.14: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS (Continue...)

Item	Description of Element	General Comments	Specific Issues	Actions Required
2.	ROAD SAFETY ISSUES			
2.1	General road safety	<p>The following are typical elements related to the road network, which cause road safety problems in rural and urban areas and which need to be addressed continuously:</p> <ul style="list-style-type: none"> a) Intersection layout, with specific reference to dedicated right-turn lanes, where there is heavy vehicle movement; b) Pedestrian movements (road crossings); c) Intersection alignment, such as staggered intersections; d) Insufficient public transport facilities; e) Access control for vehicle movement; f) Fencing to control animal movement; g) Lack of or deterioration of reflective road studs for visibility during the night at strategic points; h) Lack of pedestrian walkways to separate pedestrian and vehicle movements at strategic points; i) Lack of provision and quality of road markings; j) Lack of provision and quality of road signs; and k) Improper road safety training for workers as well as adjacent communities. 	<p>a) None.</p>	<p>In general, the report was compiled to address road safety issues as far as practically possible; furthermore:</p> <ul style="list-style-type: none"> a) Refer to Section 3 for the required and recommended intersection improvements. b) It is important to collaborate with the relevant road authority to ensure that the road maintenance plan is in place in the light of the heavy vehicle movement that is anticipated; c) It is important to provide mine and contract workers with training on road safety; and d) Road safety and awareness campaigns should be run at the mine.
3.	NON-MOTORISED TRANSPORT			
3.1	Non-motorised transport	<ul style="list-style-type: none"> a) There is currently a low volume of non-motorised transport movements in the vicinity of the section of Road R380 and the proposed access road. b) Pedestrian movement was observed in the vicinity of the proposed MN48 mining development. 	<p>a) Locals make use of donkey carts and pedestrians walk on Road R380.</p>	<p>a) Mining workers and contractors should be made aware of the possibility of encountering donkey carts and pedestrians and be provided with road safety training.</p>
4.	PUBLIC TRANSPORT			
4.1	Public transport	<p>a) Currently, there is limited public transport available in the vicinity of the proposed MN48 mining development, and it is thus anticipated that workers will make use of contracted taxis or private transport.</p>	<p>a) Workers will preferably make use of minibus taxis to get to the proposed MN48 mining development.</p>	<p>a) It is recommended that a dedicated loading and off-loading area should be provided for public transport close to the operational area of the mine where workers can be loaded and off-loaded in a safe environment as part of the construction and operational phases.</p>

TABLE 2.15: SUMMARY OF SIGHT DISTANCE CALCULATIONS (60 km/h)							
Date	03 July 2020						
Type of Development	Mining						
Recommended vehicle	Single unit & trailer						
DESCRIPTION	NORTHERN SIDE OF INTERSECTION			SOUTHERN SIDE OF INTERSECTION			COMMENTS
Available sight distance horizontal	+500m			500m			None.
Available sight distance vertical	+500m			500m			None.
Gradient of road section	N/A			N/A			None.
Design speed	60 km/h			60 km/h			None.
Picture of relevant approach							None.
Type of vehicle	Passenger car	Single unit	Single unit & trailer	Passenger car	Single unit	Single unit & trailer	
1) Required, intersection sight distance (m). Based on SANRAL Geometric Design Guidelines. Road Access Management in South Africa. (Table 7.4) (Same as the minimum required Gap Acceptance Distance.)	120m	180m	225m	120m	180m	225m	None.
	Pass	Pass	Pass	Pass	Pass	Pass	
2) Required, stopping sight distances (m) (Depend on Gradient) (Based on SANRAL Geometric Design Guidelines. (Table 3.5 and Figure 3.2))	90m	90m	90m	90m	90m	90m	None.
	Pass	Pass	Pass	Pass	Pass	Pass	
3) Minimum required gap acceptance sight distance (m) (Based on the National Guidelines for Road Access Management in South Africa. (Table 7.4))	120m	180m	225m	120m	180m	225m	None.
	Pass	Pass	Pass	Pass	Pass	Pass	

3. FINDINGS AND RECOMMENDATIONS

Based on a site inspection of the existing road network adjacent to the site under investigation, traffic surveys, calculations and reference to the relevant traffic engineering guideline documents, the following findings and recommendations were made:

3.1 FINDINGS

The capacity calculations for the traffic impact assessment were conducted for the years 2020 and 2030 respectively. This time frame is in line with traffic engineering guidelines and practice and is determined by the expected number of vehicle trips that could potentially be generated during any specific peak hour by a specific development.

Although the proposed mining development is anticipated to be operational past the year 2030, anticipated vehicle traffic predictions past a 10 year scenario becomes unpredictable due to factors that are not known at the time of preparing this report, which include future developments in the area and potential road network changes.

The following are discussed in terms of the findings:

- a) Traffic impact during the respective phases for mining activities as part of the Lehating component of the proposed MN48 mining development;
- b) Traffic impact during the respective phases for mining activities as part of the Khwara component of the proposed MN48 mining development;
- c) Cumulative traffic impact during the respective phases for mining activities as part of the Lehating and Khwara components of the proposed MN48 mining development;
- d) Site accessibility; and
- e) Sensitive road sections as part of the proposed mining development.

3.1.1 TRAFFIC IMPACT WITHOUT THE PROPOSED MN48 MINING DEVELOPMENT

Table E-1 presented as part of **Appendix E** provides a summary of the impact ratings respectively without the proposed MN48 mining development. **Table E-1** of **Appendix E** was derived from **Tables F-1** to **F-3** of **Appendix F** of the report that provides the criteria used in terms of the assessments process.

It is possible to conclude from **Table E-1** that the existing road network has no mitigating measures required and that from a road capacity and road safety perspective has a low significance and consequence.

3.1.2 TRAFFIC IMPACT DURING THE RESPECTIVE PHASES FOR MINING ACTIVITIES AS PART OF THE LEHATING COMPONENT OF THE PROPOSED MN48 MINING DEVELOPMENT

The Lehating component of the proposed MN48 mining development would comprise of mining activities which include underground mining and the processing of excavated ore, after which the processed ore will be transported by means of road transport to a railway siding near Black Rock for loading onto trains and also to seaports for loading onto ships. The processing of the ore is proposed to be done on-site at the proposed processing plant to be constructed as part of the Lehating component of the proposed MN48 mining development.

Table E-2 presented as part of **Appendix E** provides a summary of the impact ratings respectively with the proposed Lehating component of the proposed MN48 mining development. **Table E-2** of **Appendix E** was derived from **Tables F-1 to F-3** of **Appendix F** of the report that provides the criteria used in terms of the assessments process.

It is possible to conclude from **Table E-2** that in terms of the anticipated vehicle traffic to be generated by the Lehating component of the proposed MN48 mining development:

- a) That the road related impact from a road capacity perspective would have a medium consequence and significance and that no road capacity related mitigating measures would be required;
- b) That the road related impact from a road safety perspective would have a medium to high consequence without recommended road safety mitigating measures implemented, and that the implementation of the recommended mitigating measures would result in an improvement to a medium consequence; and
- c) That the road related impact from a road safety perspective would have a low to medium significance without recommended road safety mitigating measures implemented, and that the implementation of the recommended mitigating measures would result in an improvement to a low significance.

It is furthermore possible to conclude that owing to the type and nature of the proposed mining activities as part of the Lehating component of the proposed MN48 mining development, it is expected that the proposed mining development will have a manageable impact on vehicle traffic during all phases, provided that road infrastructure improvements are implemented as indicated in **Section 3.2**.

3.1.3 TRAFFIC IMPACT DURING THE RESPECTIVE PHASES FOR MINING ACTIVITIES AS PART OF THE KHWARA COMPONENT OF THE PROPOSED MN48 MINING DEVELOPMENT

The Khwara component of the proposed MN48 mining development would comprise of mining activities which include underground mining. The processing of excavated ore is proposed to be done on-site at the proposed processing plant to be constructed as part of the Lehating component of the proposed MN48 mining development, after which the processed ore will be transported by means of road transport to a railway siding near Black Rock for loading onto trains and also to seaports for loading onto ships.

Table E-3 presented as part of **Appendix E** provides a summary of the impact ratings respectively with the proposed Khwara component of the proposed MN48 mining development. **Table E-3** of **Appendix E** was derived from **Tables F-1 to F-3** of **Appendix F** of the report that provides the criteria used in terms of the assessments process.

It is possible to conclude from **Table E-3** that in terms of the anticipated vehicle traffic to be generated by the Khwara component of the proposed MN48 mining development:

- a) That the road related impact from a road capacity perspective would have a medium consequence and significance and that no road capacity related mitigating measures would be required;
- b) That the road related impact from a road safety perspective would have a medium to high consequence without recommended road safety mitigating measures implemented, and that the implementation of the recommended mitigating measures would result in an improvement to a medium consequence; and
- c) That the road related impact from a road safety perspective would have a low to medium significance without recommended road safety mitigating measures implemented, and that the implementation of the recommended mitigating measures would result in an improvement to a low significance.

It is furthermore possible to conclude that owing to the type and nature of the proposed mining activities as part of the Khwara component of the proposed MN48 mining development, it is expected that the proposed mining development will have a manageable impact on vehicle traffic during all phases, provided that road infrastructure improvements are implemented as indicated in **Section 3.2**.

3.1.4 CUMULATIVE TRAFFIC IMPACT DURING THE RESPECTIVE PHASES FOR MINING ACTIVITIES AS PART OF THE LEHATING AND KHWARA COMPONENTS OF THE PROPOSED MN48 MINING DEVELOPMENT

Owing to the type and nature of the proposed mining activities as part of the Lehating and Khwara components of the proposed MN48 mining development, it is expected that the proposed MN48 mining development will have a manageable impact on vehicle traffic during all phases, provided that road infrastructure improvements are implemented as indicated in **Section 3.2**.

Table E-4 presented as part of **Appendix E** provides a summary of the impact ratings respectively with the proposed Lehating and Khwara components of the proposed MN48 mining development. **Table E-4** of **Appendix E** was derived from **Tables F-1** to **F-3** of **Appendix F** of the report that provides the criteria used in terms of the assessments process.

It is possible to conclude from **Table E-4** that in terms of the anticipated vehicle traffic to be generated by the Lehating and Khwara components of the proposed MN48 mining development:

- a) That the road related impact from a road capacity perspective would have a medium consequence and significance and that no road capacity related mitigating measures would be required;
- b) That the road related impact from a road safety perspective would have a medium to high consequence without recommended road safety mitigating measures implemented, and that the implementation of the recommended mitigating measures would result in an improvement to a medium consequence; and
- c) That the road related impact from a road safety perspective would have a low to medium significance without recommended road safety mitigating measures implemented, and that the implementation of the recommended mitigating measures would result in an improvement to a low significance.

It is furthermore possible to conclude that owing to the type and nature of the proposed mining activities as part of the Lehating and Khwara components of the proposed MN48 mining development, it is expected that the proposed mining development will have a manageable impact on vehicle traffic during all phases, provided that road infrastructure improvements are implemented as indicated in **Section 3.2**.

3.1.5 SITE ACCESSIBILITY

Access from and to the proposed MN48 mining development would be gained via a proposed intersection on Road R380 (**Point A**). Based on the calculated anticipated vehicle trips to be generated by the proposed MN48 mining development and the detailed intersection performance evaluations, it is possible to conclude that the proposed access intersection (**Point A**) would perform at acceptable levels of service for the proposed MN48 mining development.

Section 3.2 provides more information on the recommendations for road and traffic-related improvements as part of the proposed MN48 mining development.

3.1.6 SENSITIVE ROAD SECTIONS AS PART OF THE PROPOSED MINING DEVELOPMENT

It was possible to conclude, as part of investigations, that the proposed MN48 mining development would have an insignificant impact on the sensitivity of the roads network in terms of the vehicular traffic factors as mentioned in **Section 2.4** as long as road network alterations are implemented as recommended. Refer to **Figures 2.3 to 2.6** of **Section 2.4** for a graphical presentation of the sensitivity of relevant road sections under investigation.

3.2 RECOMMENDATIONS

The following are discussed in terms of the recommendations:

- a) Summary of recommended improvements without the proposed MN48 mining development;
- b) Summary of recommended improvements as part of the Lehating and Khwara components of the proposed MN48 mining development (Mitigating measures);
- c) Institutional arrangements; and
- d) Reasoned opinion for authorisation.

3.2.1 SUMMARY OF RECOMMENDED IMPROVEMENTS WITHOUT THE PROPOSED MN48 MINING DEVELOPMENT (MITIGATING MEASURES)

No improvements would be required on the relevant existing roads network in terms of geometric upgrading or road safety improvements without the proposed MN48 mining development.

3.2.2 SUMMARY OF RECOMMENDED IMPROVEMENTS AS PART OF THE LEHATING AND KHWARA COMPONENTS OF THE PROPOSED MN48 MINING DEVELOPMENT (MITIGATING MEASURES)

Recommendations for improvements made are regardless of whether either the Lehating or Khwara components of the proposed MN48 mining development are implemented individually or together due to the following:

- a) Both mining components would share the same access intersection along Road R380, and no additional upgrading would be required on the access intersection owing to one of the mining components not being operational or both mining components being operational; and
- b) The traffic engineering-related impacts that additional vehicle trips of both mining components would have on the relevant road network would be insignificant and would not result in any additional road network-related upgrading or improvements.

As part of implementing either both the mining components (proposed MN48 mining development) or only one of the proposed mining components, at this stage, no improvements would be required on the relevant existing road network in terms of geometric upgrading. It is recommended that the following road safety mitigation measures should be implemented for the current situation, regardless of whether both or only one of the proposed mining components as part of the proposed MN48 mining development is implemented:

- a) In terms of workers and visitors, a dedicated loading and off-loading area should be provided on the property of the proposed mining development;
- b) Proper lighting and road signs should be provided at the proposed access intersection to ensure visibility during night time and sufficient information to road users; and
- c) It is recommended that the speed limit of 90 km/h should be reduced to at least 60 km/h at the proposed access intersection (**Point A**) recommended from a road safety perspective, which would result in a safer intersection.

Table 3.1 provides a summary of recommended mitigation measures as part of the proposed MN48 mining development.

**TABLE 3.1: SUMMARY OF INTERSECTION IMPROVEMENTS RECOMMENDED AS PART OF THE PROPOSED MN48 MINING DEVELOPMENT
(RELEVANT TO EITHER THE LEHATING COMPONENT OR KHWARA COMPONENT OF THE PROPOSED MN48 MINING DEVELOPMENT)**

Point	Intersection Description	<u>WITH</u> proposed mining development		
		Intersection Performance Perspective	Road Safety Perspective	Pedestrian Safety and Public Transport Perspective
A	Intersection of Road R380 and Proposed Mine Access Road	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> Reduce vehicle speed limit to 60km/h. 	<ul style="list-style-type: none"> Provide dedicated loading- and off-loading area on mining development property.

Should Road R380 be tarred in the future, the following additional improvements are recommended:

- a) The improvements as indicated by **Table 3.2** which provides a summary of the intersection improvements recommended and whether the improvements are required from an intersection performance (technical/capacity), road safety, pedestrian safety or public transport point of view.
- b) The layout as indicated by **Figure 3.1** which provides a geometrical presentation of the recommended intersection layout of **Point A** (proposed intersection of Road R380 and the proposed access road) should Road R380 be tarred in the future.

The traffic impact assessment does not comment on pavement layer attributes in terms of the relevant road sections. This would need to be based on recommendations from a Pavement Design Specialist.

TABLE 3.2: SUMMARY OF INTERSECTION IMPROVEMENTS RECOMMENDED SHOULD ROAD R380 BE TARRED IN THE FUTURE

Point	Intersection Description	<u>WITH</u> proposed mining development		
		Intersection Performance Perspective	Road Safety Perspective	Pedestrian Safety and Public Transport Perspective
A	Intersection of Road R380 and Proposed Mine Access Road	<ul style="list-style-type: none">• None.	<ul style="list-style-type: none">• Provide dedicated right-turn lane on southern approach of Road R380.• Provide sufficient road traffic signs.• Provide overhead lighting in order to ensure visibility at night time.• Provide reflective road studs.	<ul style="list-style-type: none">• Provide pedestrian walkways around intersection.• Provide public transport loading and off-loading lay-bys along Road R380 as close as possible to the access intersection.• Provide pedestrian crossing.

3.2.3 INSTITUTIONAL ARRANGEMENTS

The following recommendations are made in terms of the detailed design phase of roads for the proposed project:

- a) Detailed investigations should be conducted in conjunction with the relevant road authority in terms of the existing quality and potential life span of the existing road surface layers where consumables, processed ore and workers will be transported.
- b) A road maintenance plan should be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved to ensure that the consumables, processed ore and workers can be transported at all times.

3.2.4 REASONED OPINION FOR AUTHORISATION

In conclusion of the findings as part of the investigations, Siyazi Limpopo Consulting Services (Pty) Ltd is of the opinion that the proposed MN48 mining development would have a manageable impact on the relevant road network as long as the mitigation measures are implemented as recommended in **Section 3** of this report. In this case, it is therefore recommended that authorisation be granted.

APPENDIX A

INFORMATION RELATED TO STATUS QUO

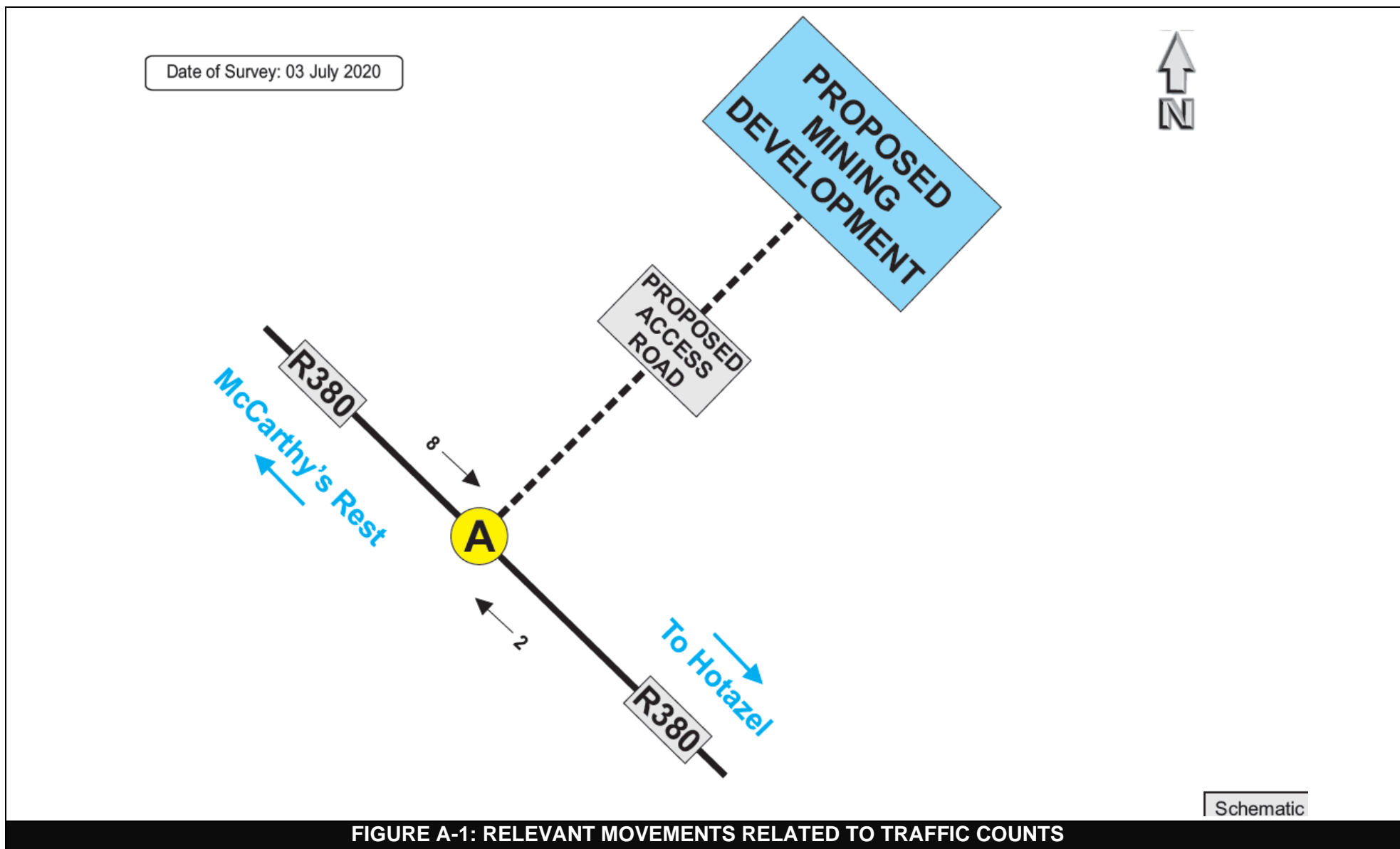
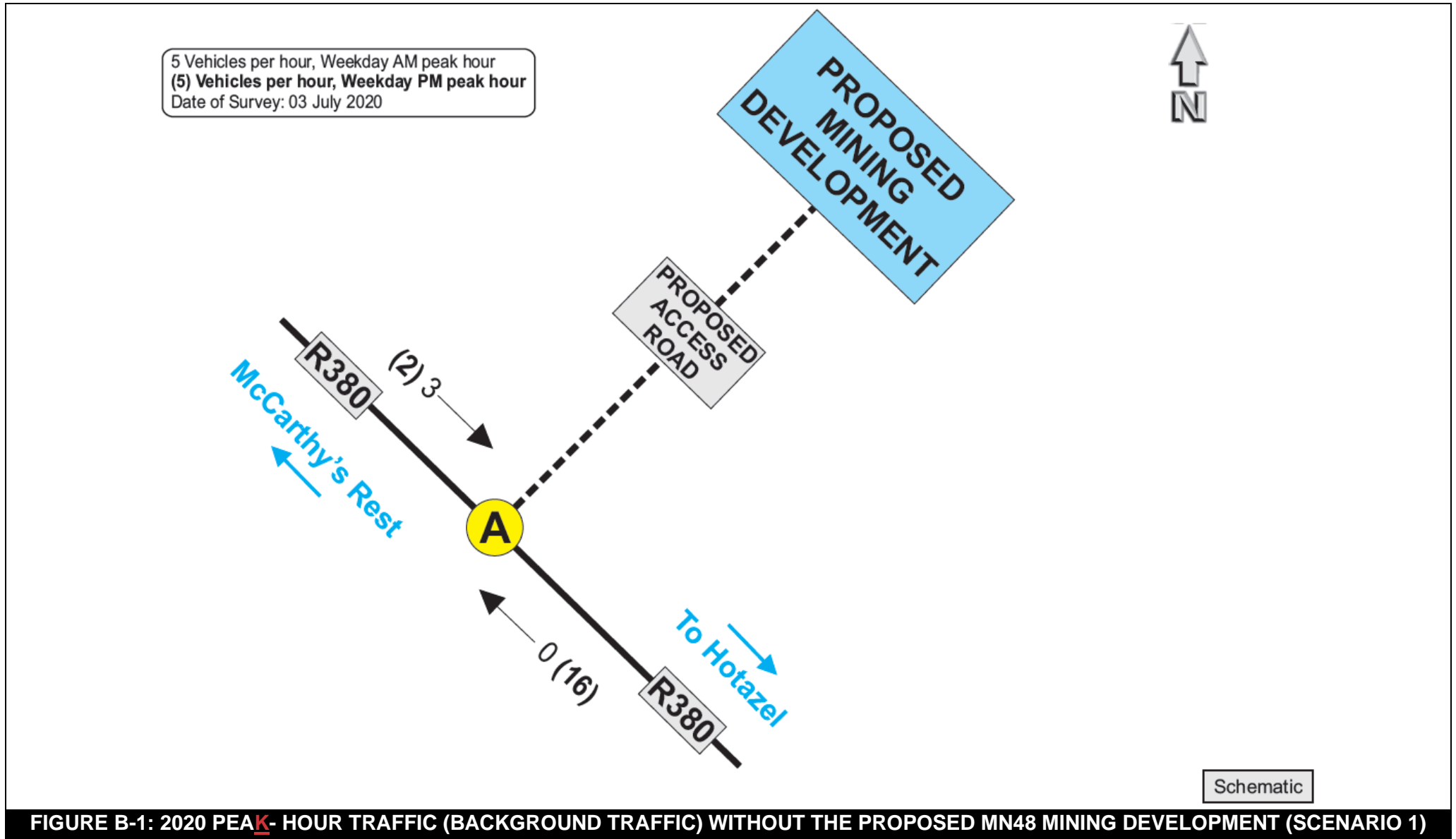


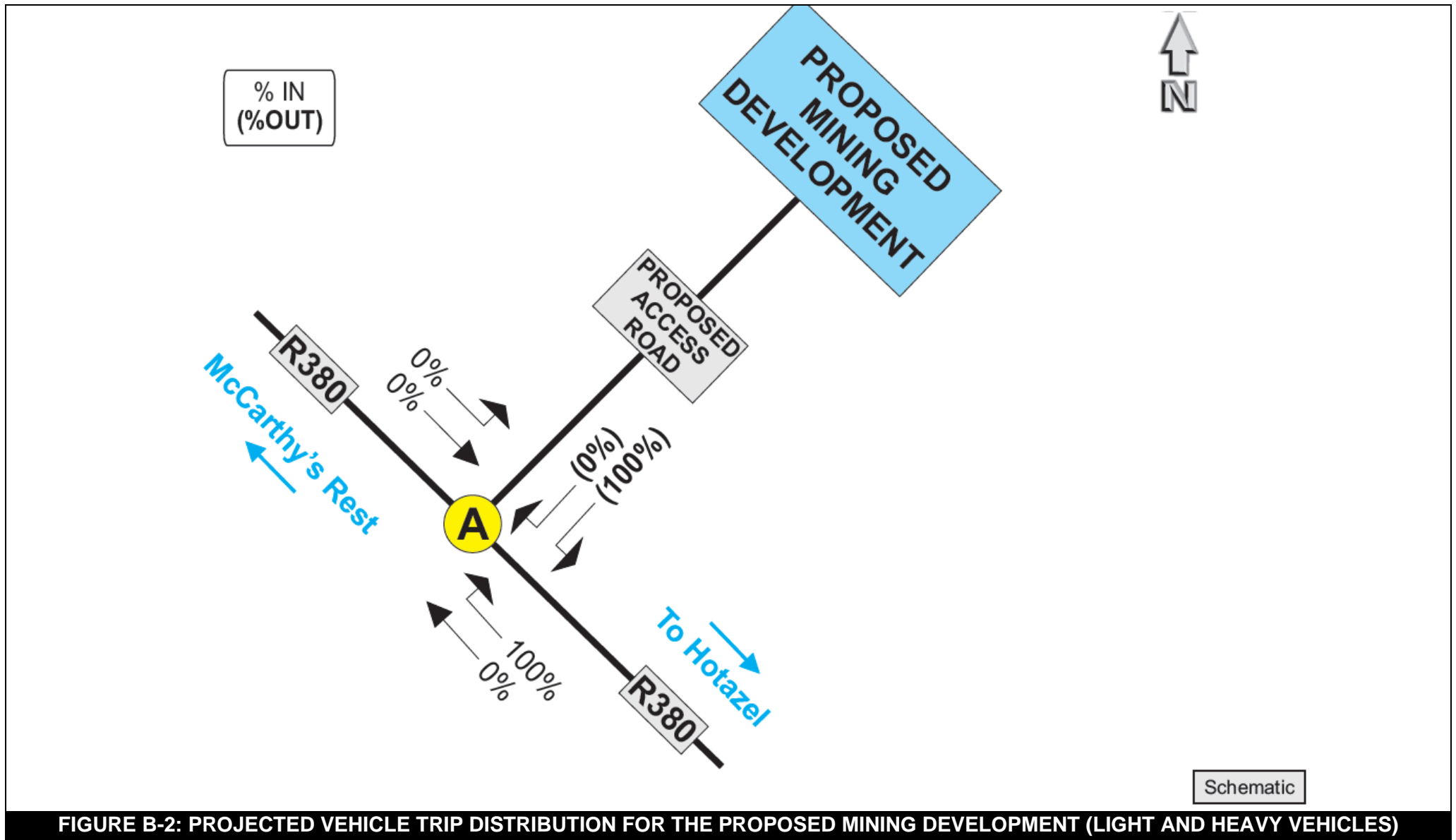
TABLE A-1: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD R380 AND THE PROPOSED MINE ACCESS ROAD (POINT A)

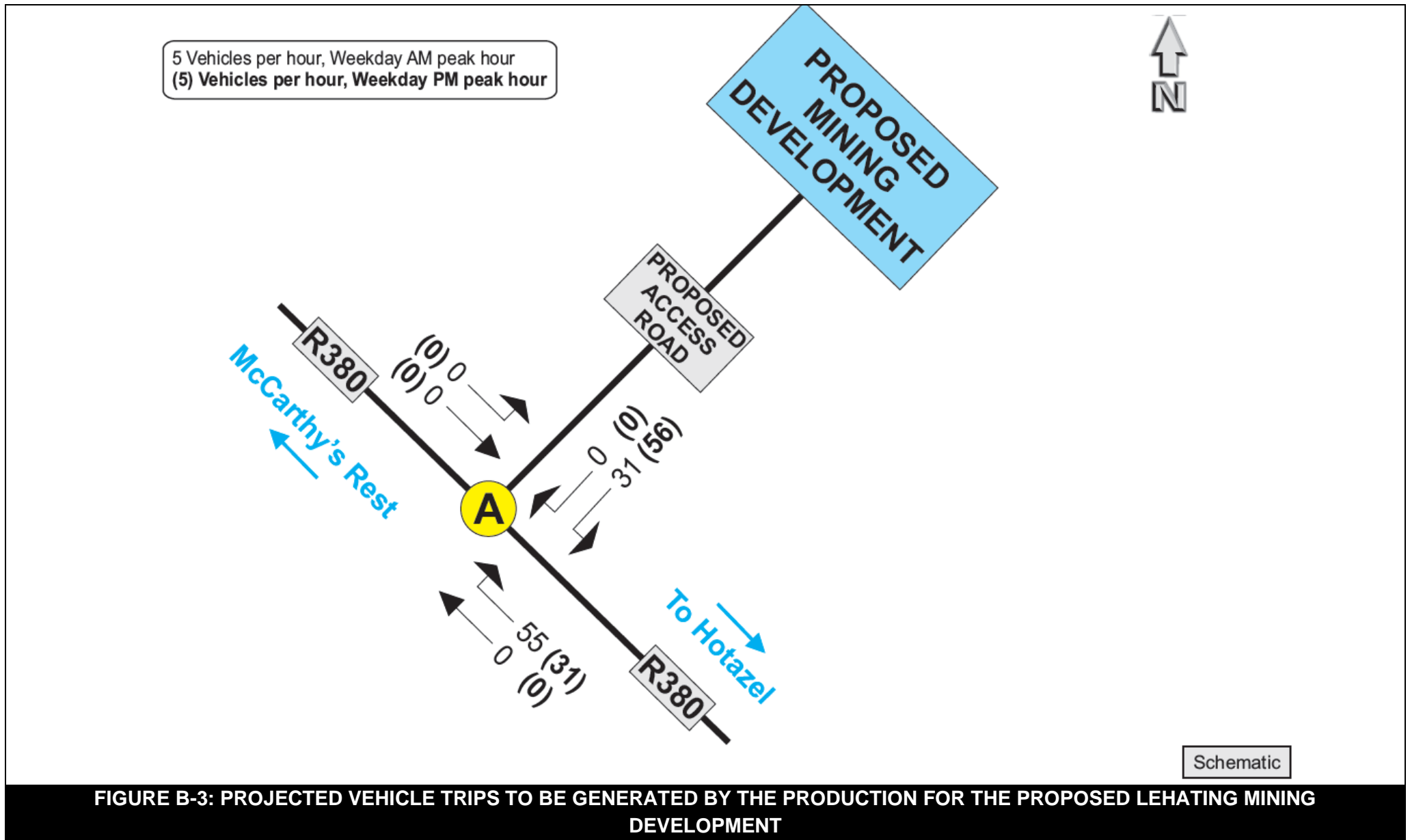
TIME INTERVALS	MOVEMENTS		
	2	8	TOTAL
06:00-07:00	0	3	3
06:15-07:15	0	3	3
06:30-07:30	0	3	3
06:45-07:45	0	2	2
07:00-08:00	0	0	0
07:15-08:15	0	1	1
07:30-08:30	0	1	1
07:45-08:45	1	2	3
08:00-09:00	1	3	4
08:15-09:15	1	2	3
08:30-09:30	1	2	3
08:45-09:45	2	1	3
09:00-10:00	2	1	3
09:15-10:15	2	1	3
09:30-10:30	3	1	4
09:45-10:45	2	2	4
10:00-11:00	3	4	7
10:15-11:15	4	5	9
10:30-11:30	4	8	12
10:45-11:45	3	7	10
11:00-12:00	3	5	8
11:15-12:15	2	5	7
11:30-12:30	4	2	6
11:45-12:45	5	2	7
12:00-13:00	5	3	8
12:15-13:15	8	3	11
12:30-13:30	6	4	10
12:45-13:45	7	5	12
13:00-14:00	8	4	12
13:15-14:15	6	3	9
13:30-14:30	6	5	11
13:45-14:45	5	5	10
14:00-15:00	4	7	11
14:15-15:15	4	7	11
14:30-15:30	5	6	11
14:45-15:45	6	6	12
15:00-16:00	5	6	11
15:15-16:15	6	6	12
15:30-16:30	9	6	15
15:45-16:45	11	5	16
16:00-17:00	14	2	16
16:15-17:15	16	2	18
16:30-17:30	14	0	14
16:45-17:45	12	0	12
17:00-18:00	11	0	11

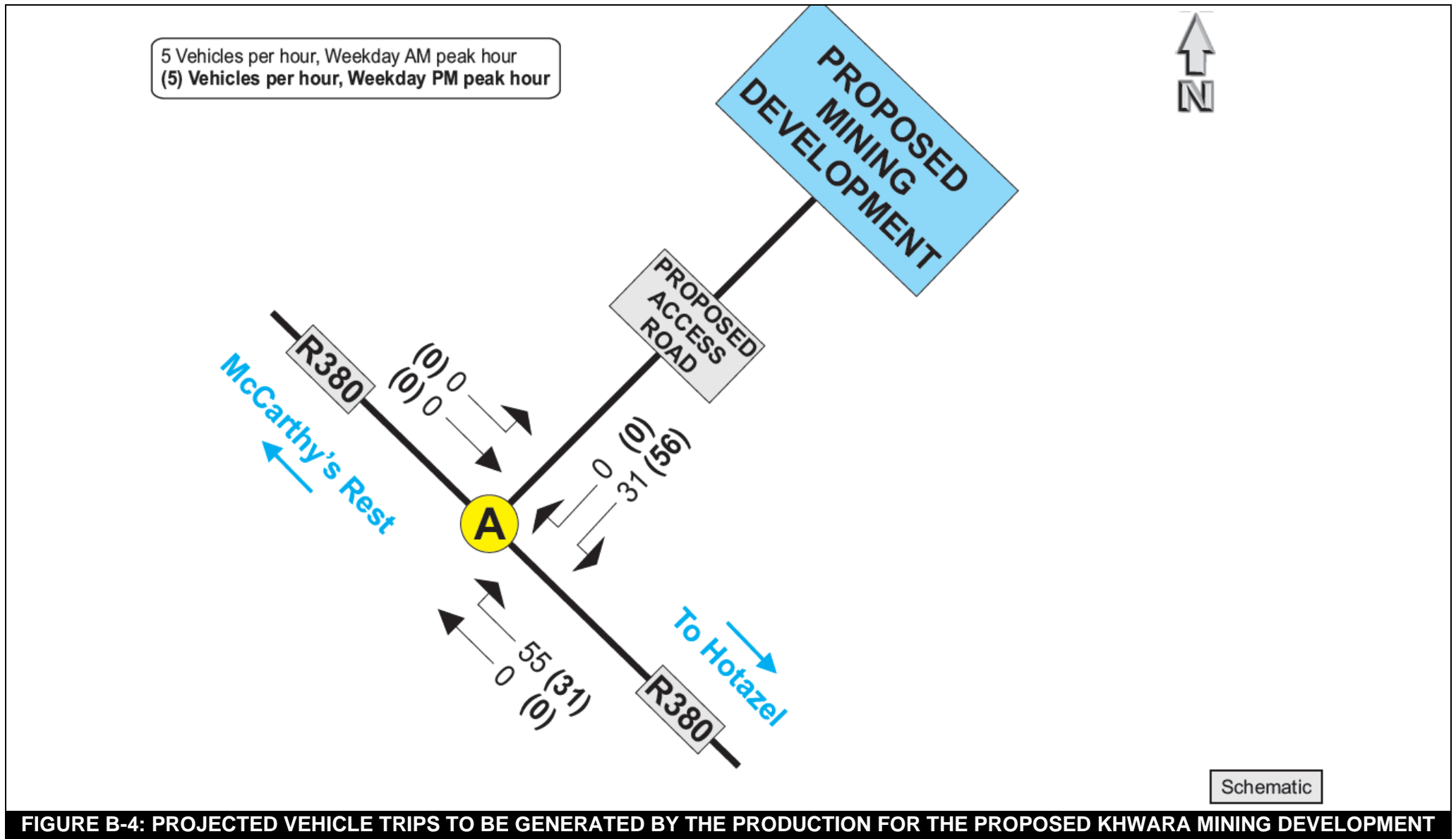
APPENDIX B

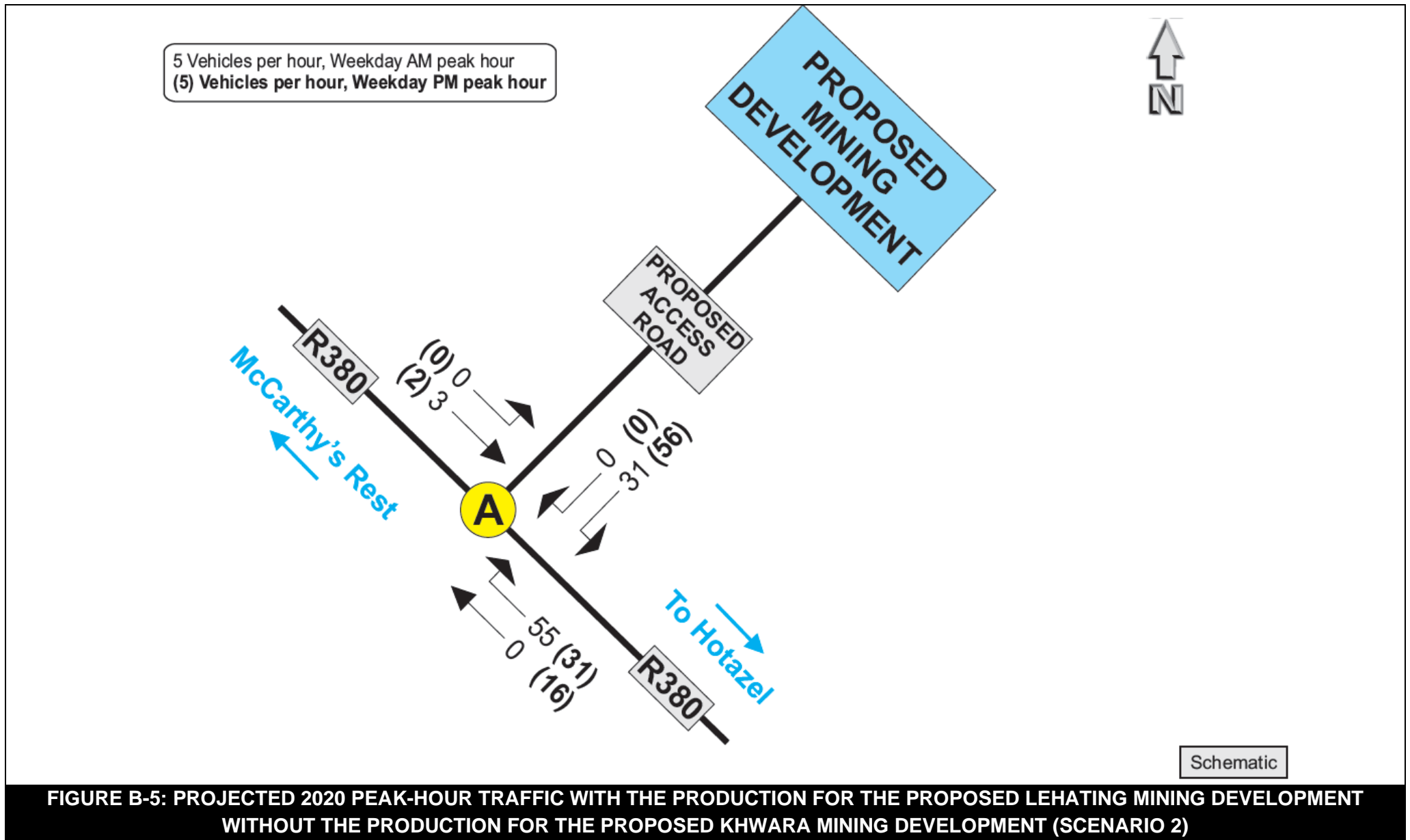
TRIP INFORMATION RELATED TO THE EXISTING TRAFFIC

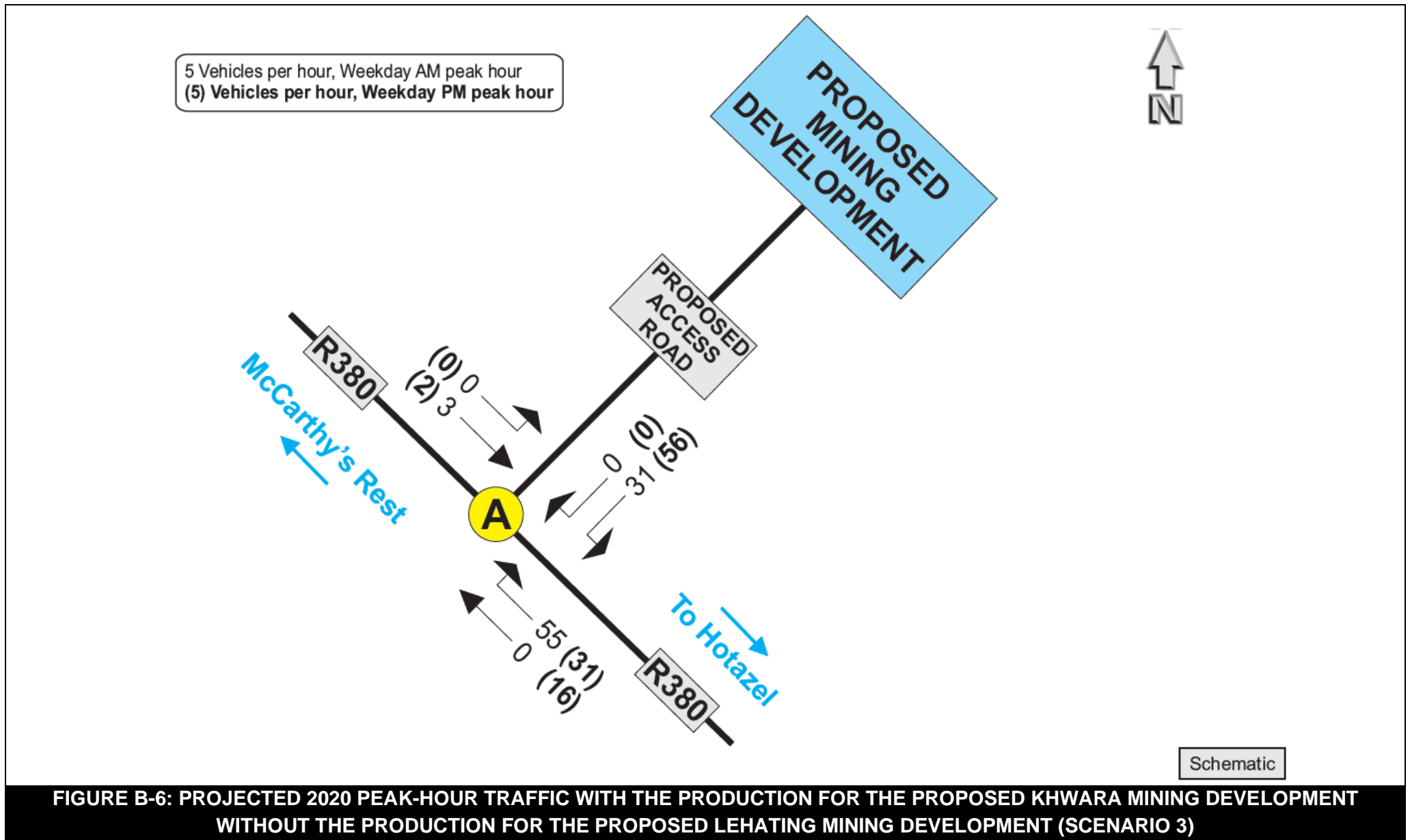


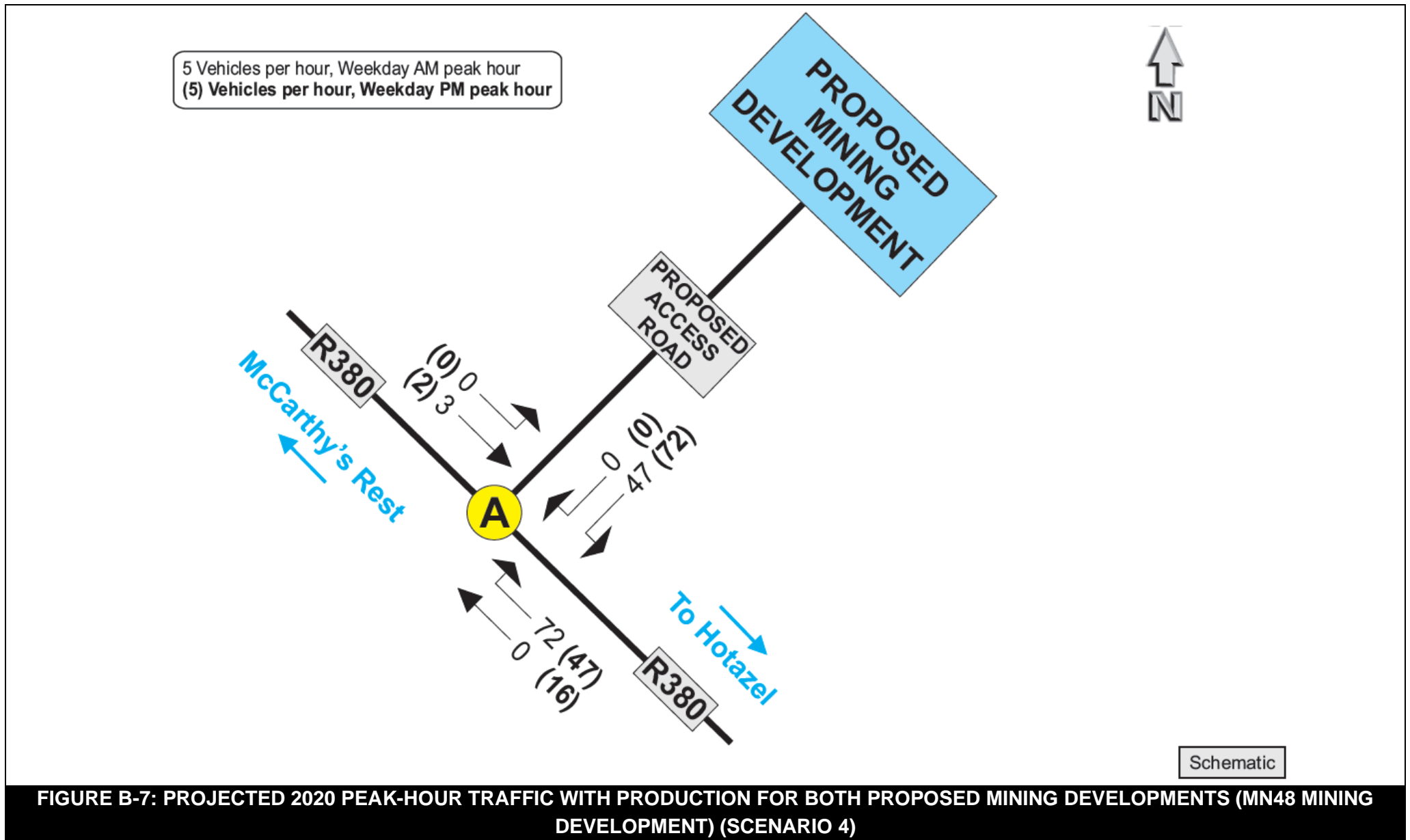


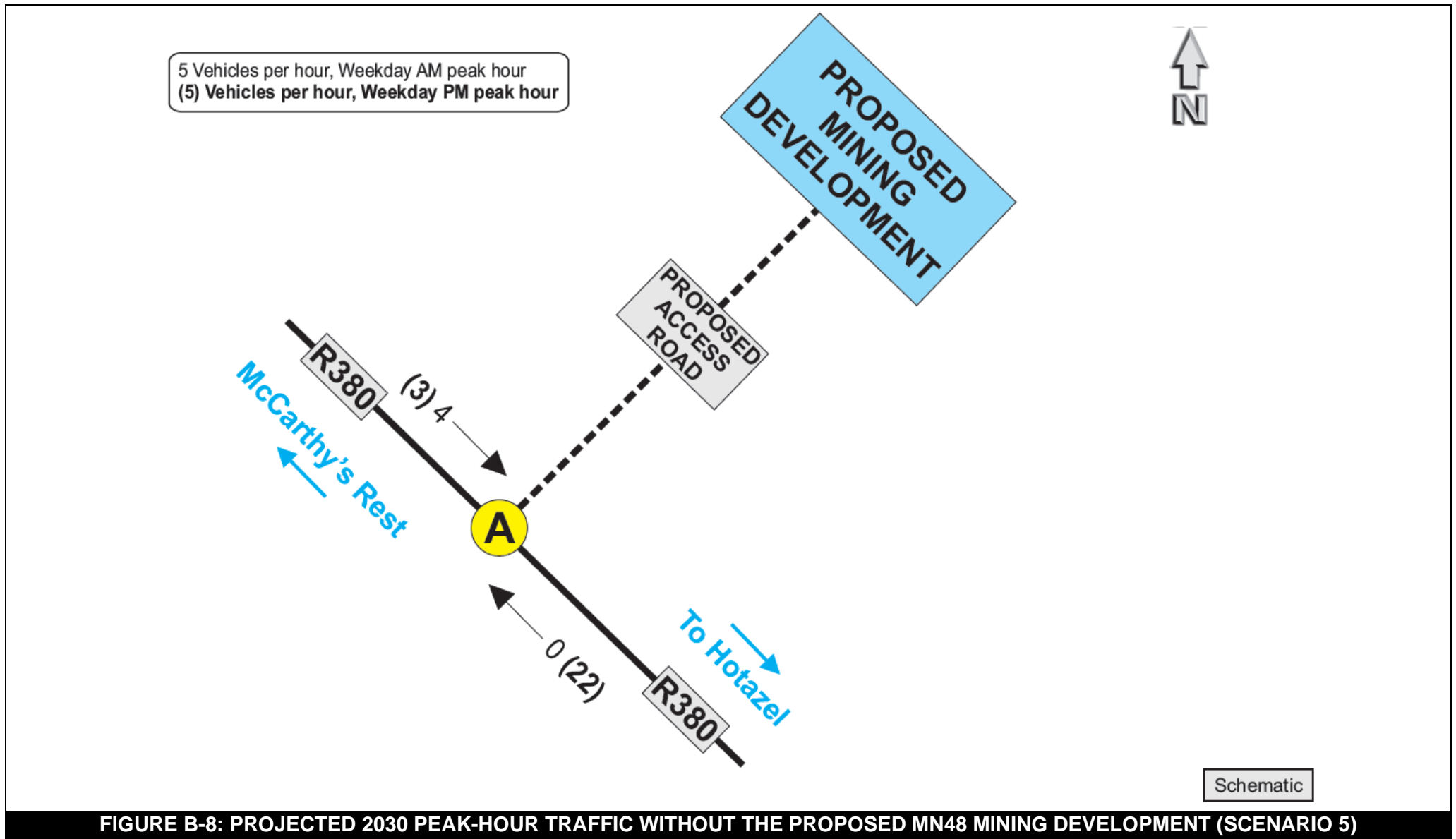


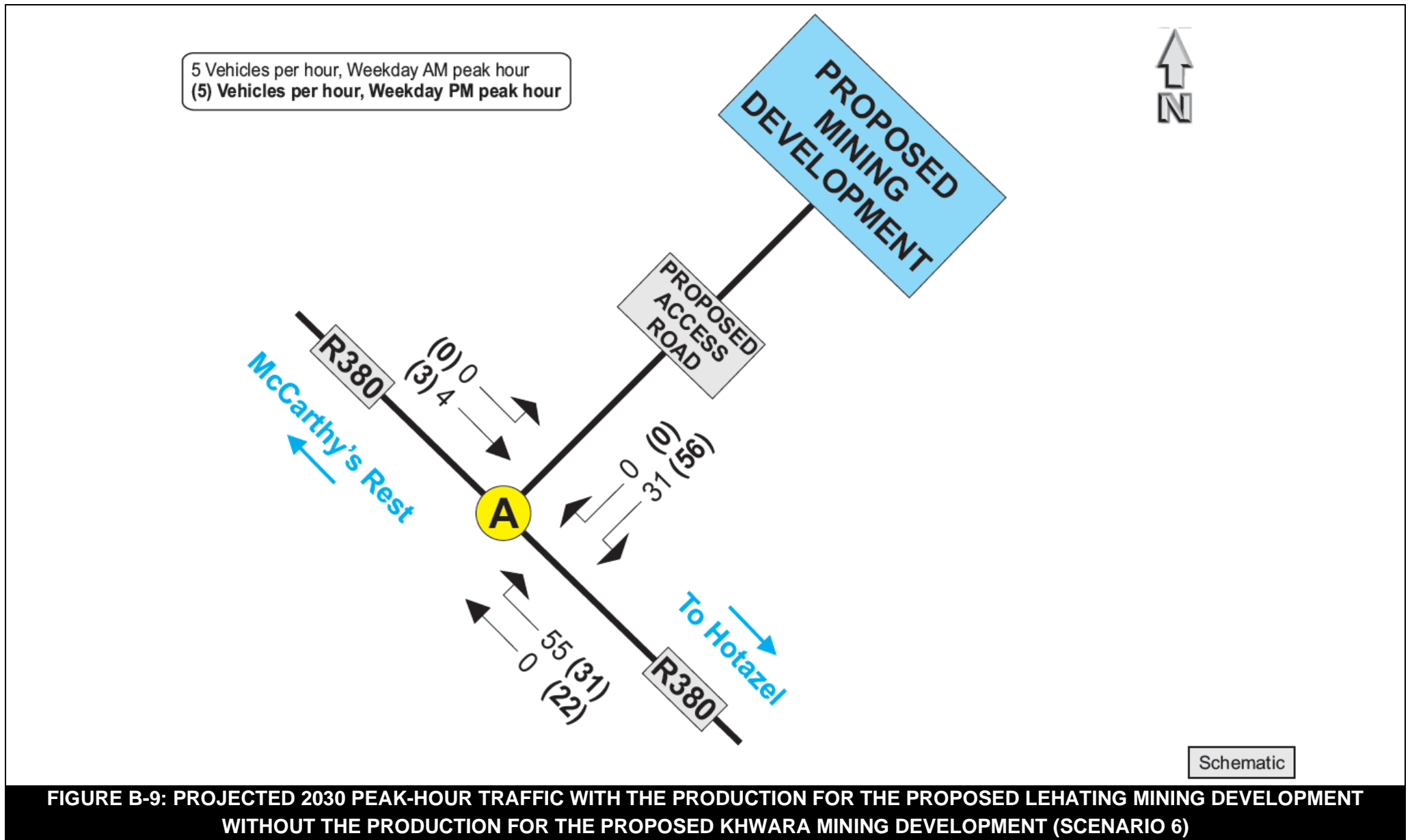


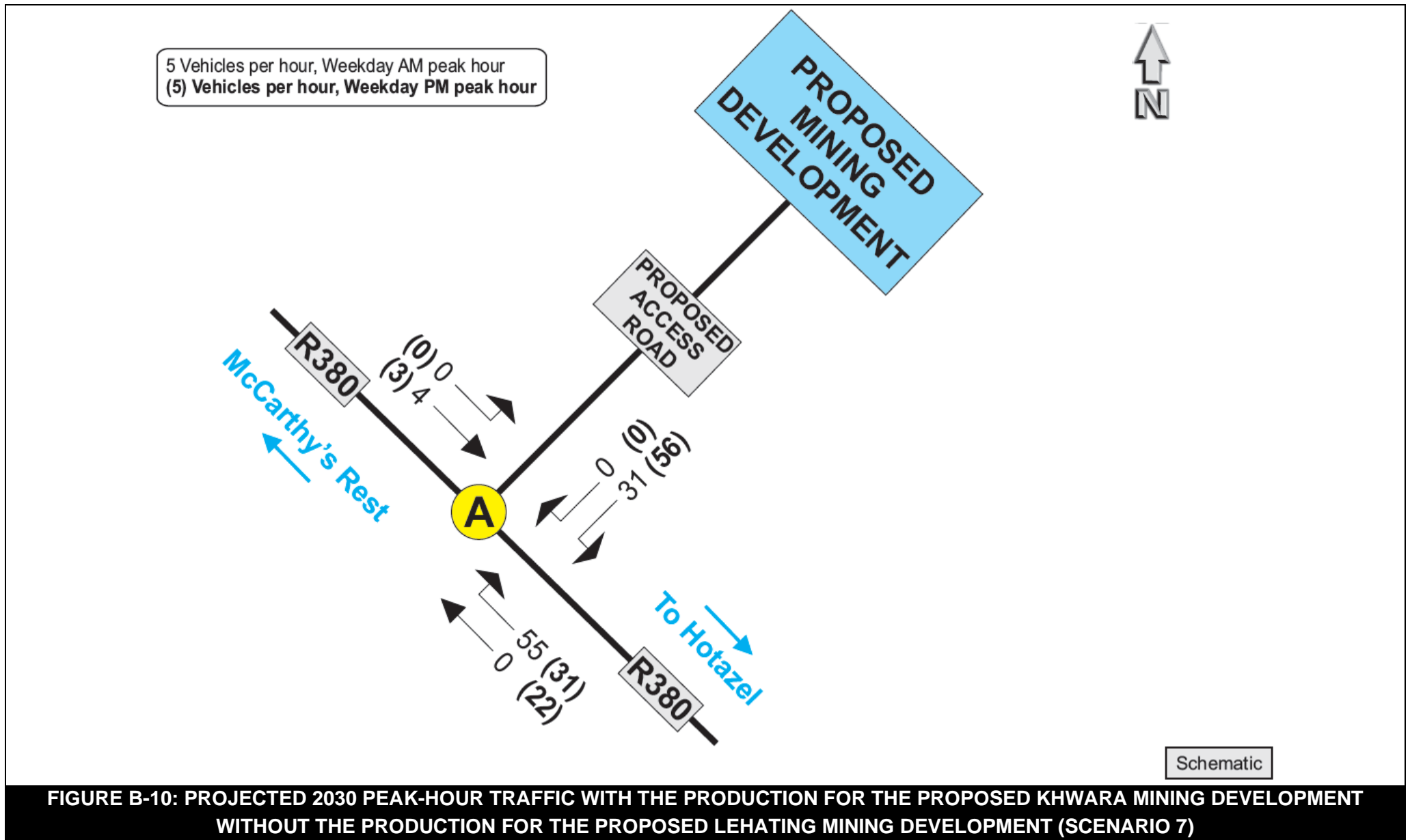


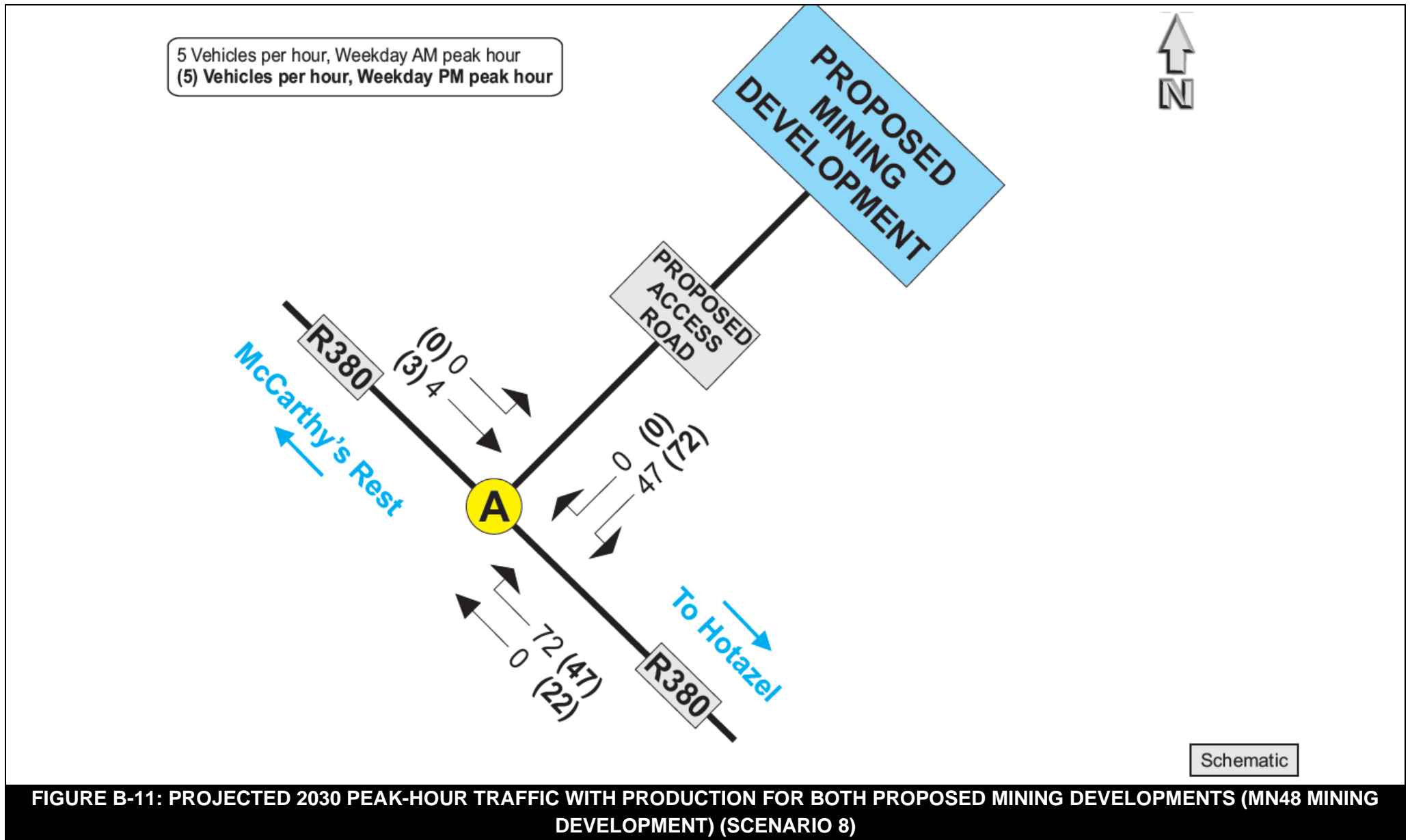












APPENDIX C

SIDRA CALCULATION RESULTS

TABLE C-1: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2020 (BACKGROUND TRAFFIC) WITH THE PRODUCTION FOR THE PROPOSED LEHATING MINING DEVELOPMENT WITHOUT THE PRODUCTION FOR THE PROPOSED KHWARA MINING DEVELOPMENT (SCENARIO 2)

<u>POINT A:</u> INTERSECTION OF ROAD R380 AND THE PROPOSED MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	1.4	A	0.002	1.8	A	0.002
East (Mine Access)	8.0	A	0.024	8.0	A	0.042
South (Road R380)	5.4	A	0.033	3.6	A	0.027
Intersection	6.1	A	0.033	5.9	A	0.042

TABLE C-2: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2020 (BACKGROUND TRAFFIC) WITH THE PRODUCTION FOR THE PROPOSED KHWARA MINING DEVELOPMENT WITHOUT THE PRODUCTION FOR THE PROPOSED LEHATING MINING DEVELOPMENT (SCENARIO 3)

<u>POINT A:</u> INTERSECTION OF ROAD R380 AND THE PROPOSED MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	1.4	A	0.002	1.8	A	0.002
East (Mine Access)	8.0	A	0.024	8.0	A	0.042
South (Road R380)	5.4	A	0.033	3.6	A	0.027
Intersection	6.1	A	0.033	5.9	A	0.042

Results for analyses done as presented as part of **Tables C-1** and **C-2** are the same due to the anticipated same vehicle trips being generated by the Lehating and Khwara mining components.

TABLE C-3: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2020 (BACKGROUND TRAFFIC) WITH PRODUCTION FOR BOTH PROPOSED MINING DEVELOPMENTS (MN48 MINING DEVELOPMENT) (SCENARIO 4)

<u>POINT A:</u> INTERSECTION OF ROAD R380 AND THE PROPOSED MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	1.4	A	0.002	1.8	A	0.002
East (Mine Access)	8.0	A	0.035	8.0	A	0.054
South (Road R380)	5.4	A	0.043	4.1	A	0.036
Intersection	6.3	A	0.043	6.1	A	0.054

TABLE C-4: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2030 (BACKGROUND TRAFFIC) WITH THE PRODUCTION FOR THE PROPOSED LEHATING MINING DEVELOPMENT WITHOUT THE PRODUCTION FOR THE PROPOSED KHWARA MINING DEVELOPMENT (SCENARIO 6)

<u>POINT A:</u> INTERSECTION OF ROAD R380 AND THE PROPOSED MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	1.1	A	0.003	1.4	A	0.002
East (Mine Access)	8.0	A	0.024	8.0	A	0.042
South (Road R380)	5.4	A	0.033	3.2	A	0.030
Intersection	6.1	A	0.033	5.6	A	0.042

TABLE C-5: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2030 (BACKGROUND TRAFFIC) WITH THE PRODUCTION FOR THE PROPOSED KHWARA MINING DEVELOPMENT WITHOUT THE PRODUCTION FOR THE PROPOSED LEHATING MINING DEVELOPMENT (SCENARIO 7)

<u>POINT A:</u> INTERSECTION OF ROAD R380 AND THE PROPOSED MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	1.1	A	0.003	1.4	A	0.002
East (Mine Access)	8.0	A	0.024	8.0	A	0.042
South (Road R380)	5.4	A	0.033	3.2	A	0.030
Intersection	6.1	A	0.033	5.6	A	0.042

Results for analyses done as presented as part of **Tables C-4** and **C-5** are the same due to the anticipated same vehicle trips being generated by the Lehating and Khwara mining components.

TABLE C-6: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2030 (BACKGROUND TRAFFIC) WITH PRODUCTION FOR BOTH PROPOSED MINING DEVELOPMENTS (MN48 MINING DEVELOPMENT) (SCENARIO 8)

<u>POINT A:</u> INTERSECTION OF ROAD R380 AND THE PROPOSED MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	1.1	A	0.003	1.4	A	0.002
East (Mine Access)	8.0	A	0.035	8.0	A	0.054
South (Road R380)	5.4	A	0.043	3.7	A	0.040
Intersection	6.2	A	0.043	5.8	A	0.054

APPENDIX D

LEVEL OF SERVICE CRITERIA DESCRIPTION

TABLE D-1: LEVEL OF SERVICE CRITERIA DESCRIPTION FOR UNSIGNALISED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE TOTAL DELAY (SEC/VEH)	PERFORMANCE EVALUATION
A	≤ 5	Excellent
B	> 5 and ≤ 10	Very Good
C	>10 and ≤ 20	Good
D	>20 and ≤ 30	Average
E	>30 and ≤ 45	Poor
F	>45	Fail

TABLE D-2: LEVEL OF SERVICE CRITERIA DESCRIPTION FOR SIGNALISED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE TOTAL DELAY (SEC/VEH)	PERFORMANCE EVALUATION
A	≤ 5	Excellent
B	> 5 and ≤ 15	Very Good
C	> 15 and ≤ 25	Good
D	> 25 and ≤ 40	Average
E	> 40 and ≤ 60	Poor
F	> 60	Fail

Level of Service criteria obtained from *The Highway Capacity Manual (Special Report 2009)*

APPENDIX E

SUMMARY OF IMPACT RATINGS

TABLE E-1: IMPACT RATING WITHOUT THE PROPOSED MN48 MINING DEVELOPMENT

RECEPTOR	ACTIVITY	IMPACT	BEFORE BACKGROUND MITIGATION					AFTER BACKGROUND MITIGATION					Comments and Mitigation Measures		
			Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	Intensity	Duration	Spatial Scale	Consequence		Probability	Significance
Road and Traffic	Road Capacity	1. Relevant road sections (reconstructing/repairing of roads)	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	Road vehicle capacity is no problem. No existing improvements without the proposed mining development required.
		2. Relevant intersections (need for additional lanes)	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	No existing improvements without the proposed mining development required.
	Road Safety Matters	3. Intersection (access) spacing	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	No existing improvements without the proposed mining development required.
		4. Vertical road alignment	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	Vertical road alignment acceptable.
		5. Available sight distance at existing intersections	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	Sight distances acceptable.
		6. Speed limit along Road R380	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	Acceptable without the proposed mining development.
		7. Relevant intersections (need for dedicated left- and right-turn lanes)	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	No existing improvements without the proposed mining development required.
		8. Pedestrian movements (with reference to access roads and intersections)	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	No existing improvements without the proposed mining development required.
		9. Public transport loading and off-loading	VL	H	M	Low	H	Low	VL	H	M	Low	H	Low	No existing improvements without the proposed mining development required.

TABLE E-2: IMPACT RATING WITH THE PRODUCTION OF THE LEHATING COMPONENT WITHOUT THE PRODUCTION OF THE KHWARA COMPONENT OF THE PROPOSED MN48 MINING DEVELOPMENT

RECEPTOR	ACTIVITY	IMPACT	BEFORE MITIGATION MEASURES AS PART OF LEHATING COMPONENT						AFTER MITIGATION MEASURES AS PART OF LEHATING COMPONENT						Comments and Mitigation Measures
			Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	
Road and Traffic	Road Capacity	1. Relevant road sections (reconstructing/repairing of roads)	VL	H	M	Med	H	Med	No mitigation measures required.						Road vehicle capacity is no problem. Refer to Tables 2.11 to 2.13 of Section 2.3 .
		2. Relevant intersections (need for additional lanes)	VL	H	M	Med	H	Med	No mitigation measures required.						See Section 2.3 of the report and Appendix C of the report. (No additional lanes required at relevant intersections from a road capacity point of view.)
	Road Safety Matters	3. Intersection (access) spacing	VL	H	M	Med	H	Med	No mitigation measures required.						See Section 2.6 of the report. (No mitigation measures required.)
		4. Vertical road alignment	VL	H	M	Med	H	Med	No mitigation measures required.						See Section 2.6 of the report. (No mitigation measures required.)
		5. Available sight distance at intersection (Points A)	VL	H	M	Med	H	Med	No mitigation measures required.						See Section 2.6 of the report. Sight distances acceptable.
		6. Speed limit along Road R380 (Points A)	H	H	M	High	M	Med	M+	H	M	Med	M	Low	See Section 2.6 of the report. Reduction of speed limit at Point A recommended.
		7. Relevant intersections (need for dedicated left- and right-turn lanes, Point A)	VL	H	M	Med	H	Med	No mitigation measures required.						Not required due to Road R380 being a gravel road. See Section 2.6 of the report should Road R380 be tarred in future.
		8. Pedestrian movements (with reference to access roads and intersections) (Point A)	M	H	M	Med	M	Low	M+	H	M	Med	M	Low	See Section 2.6 of the report. Loading and off-loading area should be provided on-site. Significant impact if workers are loaded and off-loaded within road reserve of Road R380.
		9. Public transport loading and off-loading	M	H	M	Med	M	Low	M+	H	M	Med	M	Low	See Section 2.6 of the report. Loading and off-loading area should be provided on-site. Significant impact if workers are loaded and off-loaded within road reserve of Road R380.

TABLE E-3: IMPACT RATING WITH THE PRODUCTION OF THE KHWARA COMPONENT WITHOUT THE PRODUCTION OF THE LEHATING COMPONENT OF THE PROPOSED MN48 MINING DEVELOPMENT

RECEPTOR	ACTIVITY	IMPACT	BEFORE MITIGATION MEASURES AS PART OF KHWARA COMPONENT					AFTER MITIGATION MEASURES AS PART OF KHWARA COMPONENT					Comments and Mitigation Measures		
			Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	Intensity	Duration	Spatial Scale	Consequence		Probability	Significance
Road and Traffic	Road Capacity	1. Relevant road sections (reconstructing/repairing of roads)	VL	H	M	Med	H	Med	No mitigation measures required.					Road vehicle capacity is no problem. Refer to Tables 2.11 to 2.13 of Section 2.3 .	
		2. Relevant intersections (need for additional lanes)	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.3 of the report and Appendix C of the report. (No additional lanes required at relevant intersections from a road capacity point of view.)	
	Road Safety Matters	3. Intersection (access) spacing	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.6 of the report. (No mitigation measures required.)	
		4. Vertical road alignment	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.6 of the report. (No mitigation measures required.)	
		5. Available sight distance at intersection (Points A)	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.6 of the report. Sight distances acceptable.	
		6. Speed limit along Road R380 (Points A)	H	H	M	High	M	Med	M+	H	M	Med	M	Low	See Section 2.6 of the report. Reduction of speed limit at Point A recommended.
		7. Relevant intersections (need for dedicated left- and right-turn lanes, Point A)	VL	H	M	Med	H	Med	No mitigation measures required.					Not required due to Road R380 being a gravel road. See Section 2.6 of the report should Road R380 be tarred in future.	
		8. Pedestrian movements (with reference to access roads and intersections) (Point A)	M	H	M	Med	M	Low	M+	H	M	Med	M	Low	See Section 2.6 of the report. Loading and off-loading area should be provided on-site. Significant impact if workers are loaded and off-loaded within road reserve of Road R380.
		9. Public transport loading and off-loading	M	H	M	Med	M	Low	M+	H	M	Med	M	Low	See Section 2.6 of the report. Loading and off-loading area should be provided on-site. Significant impact if workers are loaded and off-loaded within road reserve of Road R380.

TABLE E-4: IMPACT RATING WITH THE PRODUCTION OF BOTH MINING COMPONENTS OF THE PROPOSED MN48 MINING DEVELOPMENT

RECEPTOR	ACTIVITY	IMPACT	BEFORE MITIGATION MEASURES AS PART OF BOTH COMPONENTS					AFTER MITIGATION MEASURES AS PART OF BOTH COMPONENTS					Comments and Mitigation Measures		
			Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	Intensity	Duration	Spatial Scale	Consequence		Probability	Significance
Road and Traffic	Road Capacity	1. Relevant road sections (reconstructing/repairing of roads)	VL	H	M	Med	H	Med	No mitigation measures required.					Road vehicle capacity is no problem. Refer to Tables 2.11 to 2.13 of Section 2.3 .	
		2. Relevant intersections (need for additional lanes)	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.3 of the report and Appendix C of the report. (No additional lanes required at relevant intersections from a road capacity point of view.)	
	Road Safety Matters	3. Intersection (access) spacing	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.6 of the report. (No mitigation measures required.)	
		4. Vertical road alignment	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.6 of the report. (No mitigation measures required.)	
		5. Available sight distance at intersection (Points A)	VL	H	M	Med	H	Med	No mitigation measures required.					See Section 2.6 of the report. Sight distances acceptable.	
		6. Speed limit along Road R380 (Points A)	H	H	M	High	M	Med	M+	H	M	Med	M	Low	See Section 2.6 of the report. Reduction of speed limit at Point A recommended.
		7. Relevant intersections (need for dedicated left- and right-turn lanes, Point A)	VL	H	M	Med	H	Med	No mitigation measures required.					Not required due to Road R380 being a gravel road. See Section 2.6 of the report should Road R380 be tarred in future.	
		8. Pedestrian movements (with reference to access roads and intersections) (Point A)	M	H	M	Med	M	Low	M+	H	M	Med	M	Low	See Section 2.6 of the report. Loading and off-loading area should be provided on-site. Significant impact if workers are loaded and off-loaded within road reserve of Road R380.
		9. Public transport loading and off-loading	M	H	M	Med	M	Low	M+	H	M	Med	M	Low	See Section 2.6 of the report. Loading and off-loading area should be provided on-site. Significant impact if workers are loaded and off-loaded within road reserve of Road R380.

APPENDIX F

IMPACT RATING CRITERIA

TABLE F-1: CRITERIA USED IN THE ASSESSMENT OF IMPACTS – DEFINITIONS AND CRITERIA

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		Significance = consequence x probability
Definition of CONSEQUENCE		Consequence is a function of intensity, spatial extent and duration
Criteria for ranking of the INTENSITY of environmental impacts	VH	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	VL	Very short, always less than a year. Quickly reversible
	L	Short term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity.)
	VH	Very long, permanent, +20 years. (Irreversible. Beyond closure)
Criteria for ranking the EXTENT of impacts	VL	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours.
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

TABLE F-2: CRITERIA USED IN THE ASSESSMENT OF IMPACTS – DETERMINING CONSEQUENCE

PART B: DETERMINING CONSEQUENCE

INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High

VL	L	M	H	VH
A part of the site/ property	Whole site	Beyond the site, affecting neighbours	Extending far beyond site but localised	Regional/ National
EXTENT				

TABLE F-3: CRITERIA USED IN THE ASSESSMENT OF IMPACTS – DETERMINING SIGNIFICANCE

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VVH
CONSEQUENCE							

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	Decision guideline
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely to be required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.

APPENDIX G

PROFESSIONAL REGISTRATION AND CURRICULUM VITAE

Suid-Afrikaanse Raad vir Ingenieurswese



Hiermee word
gesertifiseer
dat

Leon Roets

geregistreer is as

Professionele Ingenieur

kragtens die Wet op die Ingenieurswese-professie van Suid-Afrika
1990 (Wet 114 van 1990)

Datum *14 November 1996*

Registrasienommer *960547*

A handwritten signature in black ink, appearing to read 'L. Roets', is written over a horizontal line.

President

A large, stylized handwritten signature in black ink is written over a horizontal line.

Registrateur





Die Suid-Afrikaanse Instituut van Siviele Ingenieurswese

Hiermee word gesertifiseer dat

Leon Roetz

behoorlik verkies is as

Lid

Lidnommer: 206744

van

Die Suid-Afrikaanse
Instituut van Siviele Ingenieurswese
op

29 September 2006

Uitgereik onder die seël van die Instituut
Onder resoluë van die Raad

President

Uitvoerende Direkteur





SOUTH AFRICAN ROAD FEDERATION

This is to certify that

Leon Roets

ID No: 6510145135085

Has successfully attended a 5 day course on

ROAD SAFETY AUDITS

CPD VALIDATION NUMBER: SARF 14/0003/17 (5 CREDITS)

SARF

better roads

Stefan Lotter
Presenter

Innocent Jumo
SARF President

13TH JULY – 17TH JULY 2015
GAUTENG – SANRAL – NORTHERN REGION

TRANSPORT & TRAFFIC ENGINEER CV

PERSONAL PARTICULARS

Name and Surname: Leon Roets
 Identity Number: 6510145135085
 Nationality: South African
 Prof. Registration: 960547 - Professional Engineer

ACADEMIC QUALIFICATIONS

B Eng. (Civil Eng.) University of Pretoria, 1988

PROFESSIONAL MEMBERSHIP

Engineering Council of South Africa (ECSA)



EMPLOYMENT RECORD

01/2002 – Current: Traffic Engineer Technical Director to SIYAZI Group of Companies
 01/2002 – Current: Office Manager for SIYAZI Limpopo (Pty) Ltd
 01/2002 – Current: Director and shareholder, SIYAZI Holdings (Pty) Ltd, SIYAZI Limpopo, SIYAZI-Thula, SIYAZI Gauteng and SIYAZI Free State
 07/1996 – 12/2003: Office Manager for all SIYAZI activities in the Limpopo Province
 07/1996 – 12/2003: Director and shareholder, SIYAZI Transportation & Services CC
 11/1994 – 06/1996: Representative of Africon Consulting Engineers Inc., Transportation Planning Division in the then Northern Province, based in Polokwane
 08/1992 - 10/1994: Africon Consulting Engineers Inc., Transport Planning Division in Pretoria
 06/1990 - 08/1992: Lexetran, Transport Planning Division of the then Van Wyk & Louw Group

Mr Roets has a total of 24 years experience. He is a Transport and Traffic Engineer with wide experience in transportation planning and modelling, data processing as well as Traffic Impact Studies.

MR ROETS COMPLETED A CONSIDERABLE NUMBER OF TRAFFIC IMPACT STUDIES FOR ALL TYPES OF DEVELOPMENTS, WHICH VARIES FROM BASIC RESIDENTIAL DEVELOPMENTS TO MAJOR SHOPPING CENTRE DEVELOPMENTS. THE FOLLOWING PROVIDES A SUMMARY OF SOME OF THE PROJECTS SPECIFICALLY RELATED TO MINE ACTIVITY:

Project	Client
Siyazi Transport & Technical and Liaison Assistance for Tripartite Forum (Twickenham)	Rustenburg Platinum Mine Limited-Mogalakwena Section
Mogalakwena Section Mine - Road Safety	Anglo American
Existing Aquarius Platinum Mine (Rustenburg) Transport Route Investigation (Proposed ROM Ore Transport by Road from K6 and Kwezi Shafts to AQPSA Kroondal Smelter)	SLR Consulting Engineers (Metago)
Twickenham Platinum Mines Integrated Transport Management Plan	WorleyParsons
7-day Electronic Counts for Two Rivers Platinum Mines	Two Rivers Platinum Mine
Proposed Scheiding Chrome Mine, Limpopo Province	Prime Resources (Pty) Ltd
Traffic Impact Assessment for Fumani Gold Mine	Ages (Pty) Ltd
Proposed CSP and PV Solar Power Plants near Jacobsdal, Free State	SLR Consulting Engineers
Proposed Siyanda Chrome Smelter, Northam, Limpopo	SLR Consulting Engineers
Traffic assessment for AQPSA, Rustenburg	SLR Consulting Engineers
Existing PPM mine near Pilanesberg, North West Province expansion	SLR Consulting Engineers
Proposed Musonoi Mine Situated near the Town of Kolwezi, Democratic Republic of Congo: Traffic Impact Assessment	Metago Environmental Engineers (PTY) Ltd
Botswana Traffic Impact Assessment	SLR Consulting Engineers (Metago)
Proposed division of Road P50-1 near Pilanesberg	SLR Consulting Engineers (Metago)
Development of The Eastern Limb Mining Land Transport Strategy (ELM-LTS)	Steelpoort Valley Producers Forum
Proposed Kotulo Tsatsi Solar Park near Kenhardt, Northern Cape	Savannah Environmental (Pty) Ltd
Proposed Leeuw Mining Coral Mine: Utrecht KZN	SLR Consulting Engineers (Metago)
Proposed Moonlight Iron Ore Mining Development situated in the Waterberg District of the Limpopo Province: Traffic Impact Assessment	SLR Consulting Engineers (Metago)

Project	Client
Proposed Upgrading Kinsenda Copper Mine, Situated near the town of Likasi, in the DRC	SLR Consulting Engineers (Metago)
Traffic Impact Assessment for Intersection between Windhoek and Swakopmund	Metago Environmental Engineers (Pty) Ltd
Traffic Impact Assessment: Proposed Hawerklip Railway Station Situated on the Farm Matjisgoedkuil 266-IR Near Delmas	Metago Environmental Engineers (Pty) Ltd
Road Safety Project for Road R555	Steelpoort Producers Forum
Road Safety Project for Road R37, between Olifantsrivier and Burgersfort	Steelpoort Producers Forum
Kameni Product Transport Feasibility Study	Kameni
Proposed New PGM Mine Situated on the Farms Kalkfontein and Buffelshoek in the Steelpoort Area	Metago Environmental Engineers (Pty) Ltd
Proposed New Manganese Mining Operation, NCMC: Traffic Impact Assessment, Kuruman	Metago Environmental Engineers (Pty) Ltd
Project Management Road N11, Road Safety Project	Economic Sector Forum
Twickenham Public Transport System	Twickenham Platinum Mine
Road Master Plan for Mines in the Sekhukhune District	Steelpoort Producers Forum
Traffic Related Input for Realignment of Road N11	Economic Sector Forum in conjunction with SANRAL
Access to the Polokwane Smelter (Road R37)	Economic Sector Forum
Greenfield Expansion Project, Traffic Impact Assessment for Lwala Smelter	Semancor
Road R37 upgrade in Burgersfort for SANRAL	Steelpoort Producers Forum
Road Master Plan for Burgersfort	Steelpoort Producers Forum
Application to upgrade the existing Access Road D4170 to Road R37 (Modikwa Platinum Mine)	Steelpoort Producers Forum
New concentrator and smelter complex at Hercul's Bokfontein Chrome Mine on the farm Bokfontein 448 JQ near Brits in North West Province	Metago Environmental Engineers (Pty) Ltd
Proposed Development of a Manganese Mining Operation	Metago Environmental Engineers (Pty) Ltd
R555/Tweefontein Road Safety Project (Xtrata)	Xstrata Alloys Lion Ferrochrome
Traffic Related Input for Road R555	Steelpoort Producers Forum
Proposed Manganese Mining Operation On Portion 1 Of The Farm Lehating 741 Near Hotazel, Northern Cape Province	SLR Consulting Engineers (Metago)
Proposed Mokala Manganese Mine Situated Near Hotazel, Northern Cape Province	SLR Consulting Engineers (Metago)
Background Information on the Environmental Assessment for the proposed expansion of Eland Platinum Mine	Metago Environmental Engineers (Pty) Ltd
Development of an opencast and underground coal mining operation – Keaton Mine	Metago Environmental Engineers (Pty) Ltd
Mogalakwena Economic Sector, Transport related input for Mogalakwena Economic Sector	Economic Sector Forum
Traffic Counts Road R37	Steelpoort Producers Forum
Planning of multi modal facility for Burgersfort	Steelpoort Producers Forum
Provide input into traffic safety along Road R37	Steelpoort Producers Forum
Input into the transport of workers (Dilokong corridor)	Steelpoort Producers Forum
Strategy for Travel Demand Management for the Greater Tubatse Municipality and modelling for the R37 road	Steelpoort Producers Forum
Strategy to transport workers at the Modikwa Shaft	Modikwa Mine

SOME OF THE TRANSPORT PLANNING PROJECTS THAT LEON ROETS HAD BEEN INVOLVED IN THE LIMPOPO PROVINCE INCLUDE:																
Authority / Project Description	Transport Forum	CPTA	OLS	RATPlan	PTP	ITP	LITP	DITP	Business Plans	Liaison	Public Transport Facilities	Public Transport Facilities	Colour Coding	Transport Framework	Corridor Planning	Year
Technical Advisor – Taxi Industry Polokwane Integrated Rapid Transit									Y	Y		Y			Y	2015-2011
Elim Mall, Tzaneng Mall, Tzaneen Crossing, Tzaneen Lifestyle Centre, Burgersfort Mall, Malamulele												Y				2012-1998
Greater Tubatse Municipality	Y															2013-2003
Road R37 between Polokwane and Burgersfort (Dilokong Corridor)										Y					Y	2013-2003
Polokwane Intermodal Facilities, as part of Prism Consortium (Planning)											Y					2013-2010
Thohoyandou Intermodal Facilities, as part of MCE Consortium											Y					2013-2010
Giyani intermodal Facility, Taxi Facilitation																2013-2010
Giyani, Makhado, Thohoyandou, Burgersfort, Special advisor for Intersite											Y					2013-2010
Vhembe District Municipality								Y								2010
Burgersfort, Road Master Network															Y	2009-2007
Mogalakwena Local Municipality	Y															2009-2006
Ba-Phalaborwa Local Municipality						Y										2008
Mogalakwena Local Municipality							Y									2008
Mogalakwena, Relocation and Road Safety of Road N11															Y	2008
Fetakgomo Local Municipality	Y															2007-2005
Polokwane, 2010 Priority Statement (PTIS)									Y							2007-2005
Polokwane Local Municipality					Y	Y										2007
Mogalakwena Local Municipality					Y											2007
Polokwane Local Municipality	Y															2006-1997
Sekukhune District Municipality		Y	Y	Y	Y	Y			Y							2006
Taxi Recapitalisation for Limpopo Department of Roads & Transport																2005-2004
Limpopo Department of Roads and Transport													Y			2004
Part of team for Limpopo in Motion														Y		2004
Greater Tubatse Municipality		Y	Y	Y	Y	Y										2003
Capricorn District Municipality		Y														2003
Vhembe District Municipality		Y	Y		Y	Y										2003
Mopani District Municipality		Y	Y		Y	Y										2003
Pietersburg-Polokwane Transport Strategy																2000
Polokwane, N1 Eastern bypass						Y									Y	2000
Pietersburg-Polokwane Public Transport Strategy					Y											1997