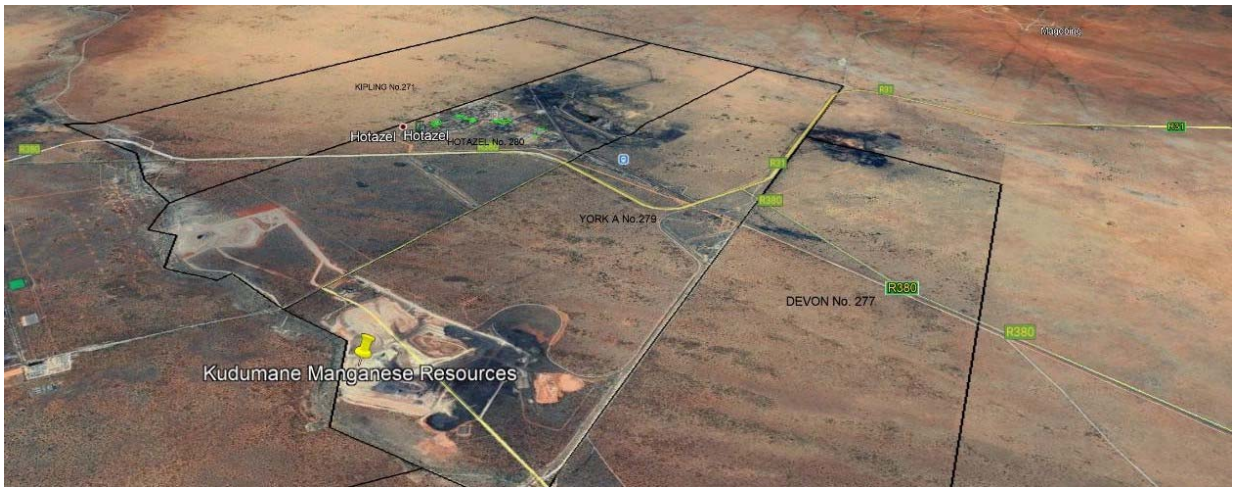
MEMORANDUM

TRAFFIC IMPACT ASSESSMENT

Proposed expansion of the existing Kudumane Manganese Resources Mine located near the town of Hotazel within the Northern Cape Province



SEPTEMBER 2021

Prepared for:
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Prepared by:
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Siyazi Reference: 21038

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 V 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 IV
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 specifically 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;	Page 15, Section 2.1.1 Page 27, Section 2.2.1
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	To be conducted
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 desk top analysis, using satellite imagery.	Refer to section 2.4 of the report.
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 the 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: 

Date: 28 September 2021

VERIFICATION PAGE

PROJECT NAME:	Traffic Impact Assessment for the Proposed Expansion of the existing Kudumane Manganese Resources Mine located near the town of Hotazel within the Northern Cape province.	
Project No: 21038	**Date:** September 2021	**Report Status:** F1-0 ed
Prepared by: SIYAZI LIMPOPO CONSULTING SERVICES (PTY) LTD P O BOX 11182 BENDOR LIMPOPO PROVINCE		Commissioned by: SRK CONSULTING (SOUTH AFRICA) (PTY) LTD P O BOX 55291 NORTHLANDS 2116 SOUTH AFRICA
Author: Paul van der Westhuizen **Contact information:** Cell: +27 79 690 8069 Email: paul@siyazi.co.za		**Report reviewed by and compiled under the supervision of:** Leon Roets (Pr Eng) Professional Number: 960547 **Contact information:** Cell: +27 82 371 0253 Email: leon@siyazi.co.za

Declaration by registered professional:

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 TIA is free of technical errors and takes full responsibility for its contents.

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Qualifications:	B Eng (Civil Eng.)
ECSA Registration Number:	960547 (Attached to report)
Signature:	

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Section 1

INTRODUCTION

Siyazi Limpopo Consulting Services (Pty) Ltd was appointed by SRK Consulting (South Africa) (Pty) Ltd to conduct a Traffic Impact Assessment (TIA) for the proposed expansion of the existing Kudumane Manganese Resources Mine (KMR), hereafter referred to as the proposed KMR Expansion Project, which is situated near the town Hotazel within the Northern Cape Province.

It is the intention of KMR to expand its existing operations and construct additional infrastructure in order to improve production capacity and increase the life of mine. The infrastructure and activities associated with the proposed KMR Expansion Project require a new Environmental Authorisation, the amendment of the mine's existing EMPrs, a Waste Management Licence (WML) and a Water Use Licence Application (WULA) to authorise the following key infrastructure:

a) A new opencast pit mine on Kipling.
b) Expansion of the Hotazel and York opencast pits to allow for the mining of KMR's boundary pillar associated with each pit.
c) Two attenuation dams on the Ga-Mogara River, to allow for the expansion of the York and Hotazel pits.

The above key infrastructure will have secondary infrastructure and activities associated with them, which include:

a) Establishment of an additional water storage tank near the proposed Kipling opencast pit operation, including a pipeline for the transfer of water between the proposed Kipling water storage tank and the existing Hotazel and York water storage tanks.
b) Development and expansion of waste rock dumps at the proposed Kipling operation and the existing Hotazel operation.
c) Establishment and expansion of ore stockpiles dumps at the proposed Kipling operation and the existing Hotazel and York operations.
d) New haul road between the proposed Kipling operation and the existing Hotazel operation and upgrading of the existing haul roads between the Hotazel and York operations.
e) Development and expansion of sewerage treatment plants at Kipling (new), Hotazel and York (Expansion).
f) Supporting infrastructure such as admin offices ancillary infrastructure on the farm Kipling.
g) Waste and fuel storage areas.
h) Relocation and development of new pollution control dams at York and Kipling operations.
i) Upgrading the intersection of Road R380 and Kudumane Haul access Road (Point E) – intersection used by KMR as haul truck transport entrance.
j) Establishment of a contractor's camp.
k) Extension of existing mine powerlines.

The purpose of this study is to undertake an assessment of the implications of the vehicle traffic that could potentially be generated due to an increase in traffic volumes because of the proposed KMR Expansion Project, 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 KMR Expansion Project within acceptable norms from a traffic engineering point of view.
c) The mitigating measures required to accommodate the proposed KMR Expansion Project within acceptable traffic engineering norms.

Figure 1.1 provides a graphical presentation of the broader locality of the existing development where the proposed KMR Expansion Project is proposed, and the relevant intersections investigated as part of this investigation, while **Figures 1.2** to **1.6** provide a more detailed graphical presentation of the relevant proposed expansion proposed.

Tables 1.1.1 and **1.1.2** provide a summary of information of the proposed project activities. It is important to take note that the anticipated timeline, as depicted by the last-mentioned tables, provides an estimated timeline in terms of months and/or years that is planned for and do not depict the exact month and/or year that implementing and operations of the proposed KMR Expansion Project will take place, while **Table 1.2** provides information on the relevant intersections under investigation as part of the proposed activities anticipated as part of the proposed KMR Expansion Project.

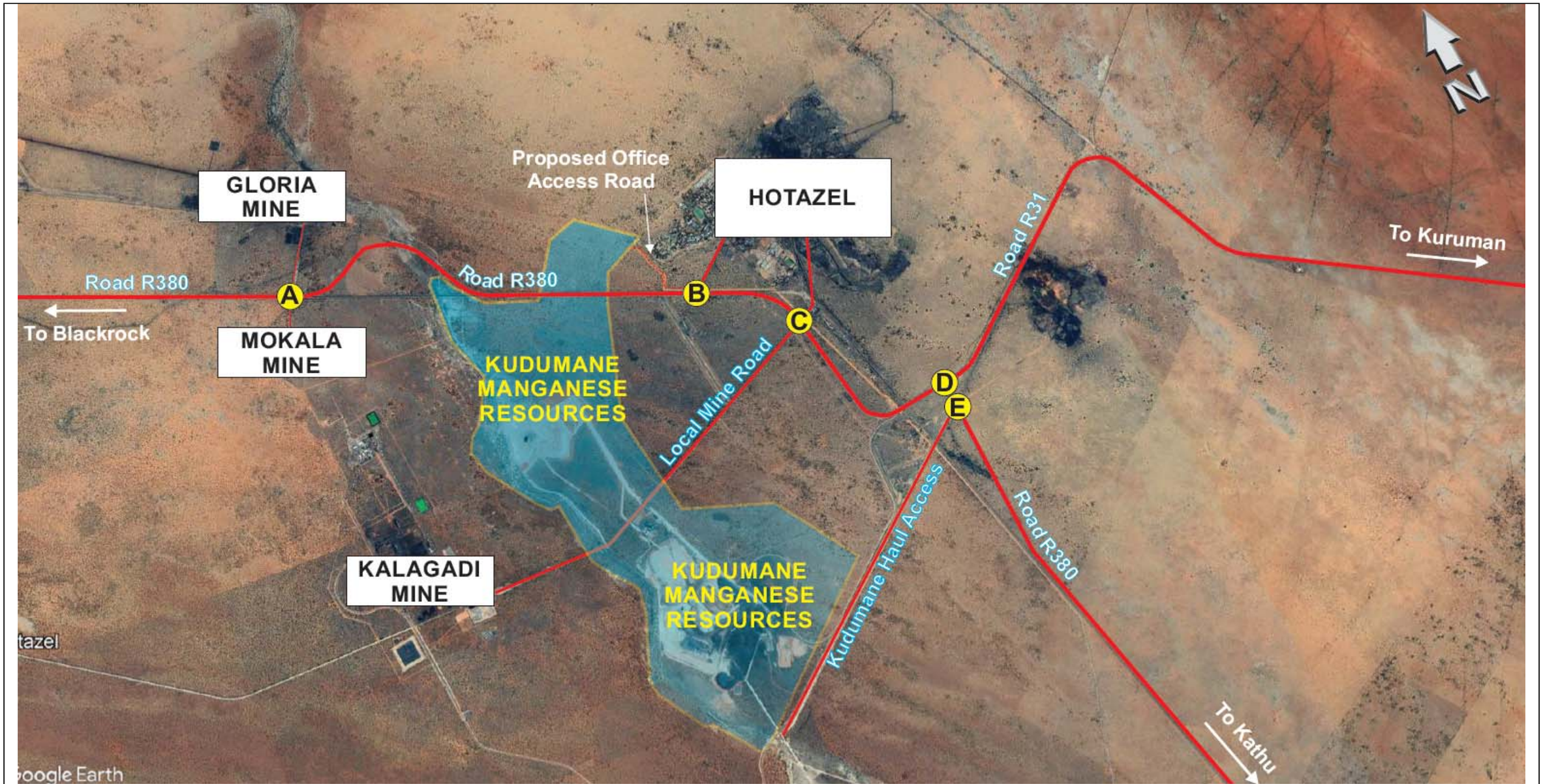

FIGURE 1.1: GRAPHICAL PRESENTATION OF THE BROADER LOCALITY OF THE EXISTING DEVELOPMENT WHERE THE PROPOSED KMR EXPANSION PROJECT IS PROPOSED AND THE RELEVANT INTERSECTIONS UNDER INVESTIGATION

Proposed activities and infrastructure on Kipling

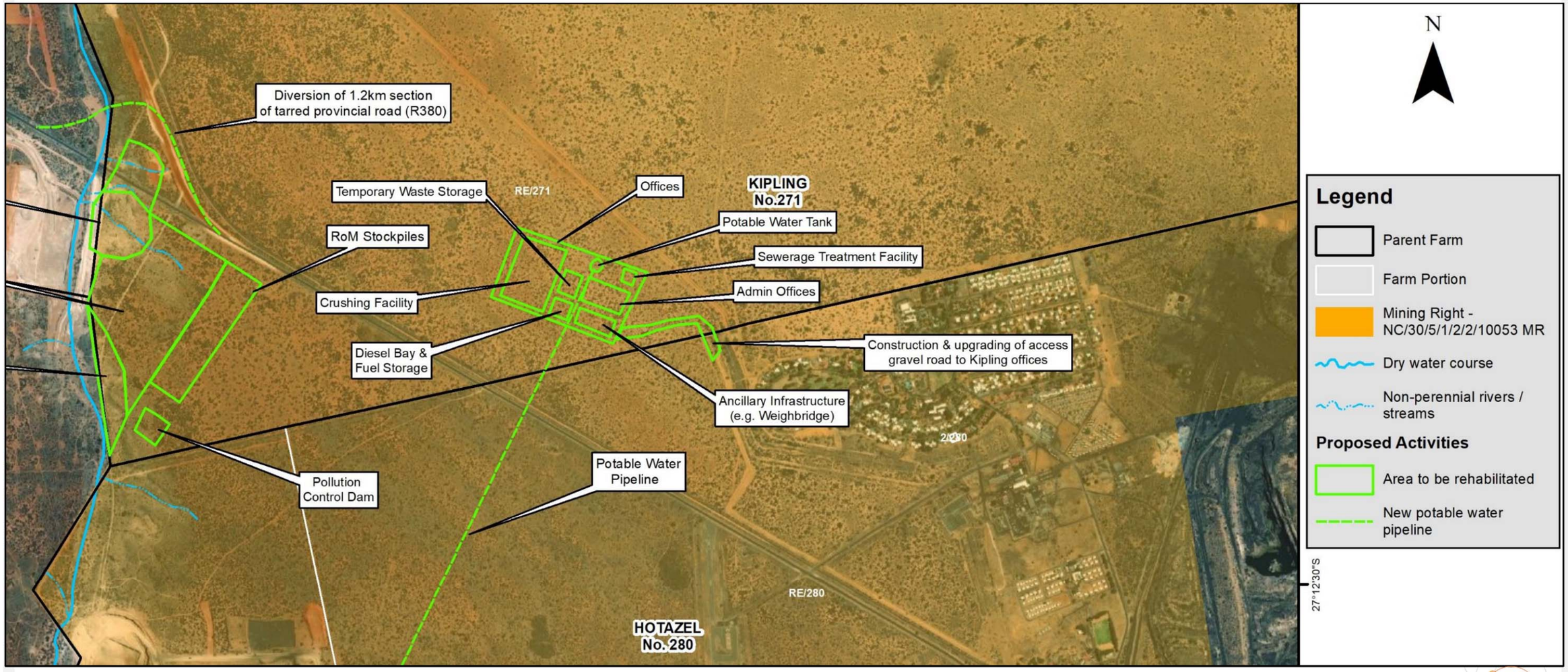

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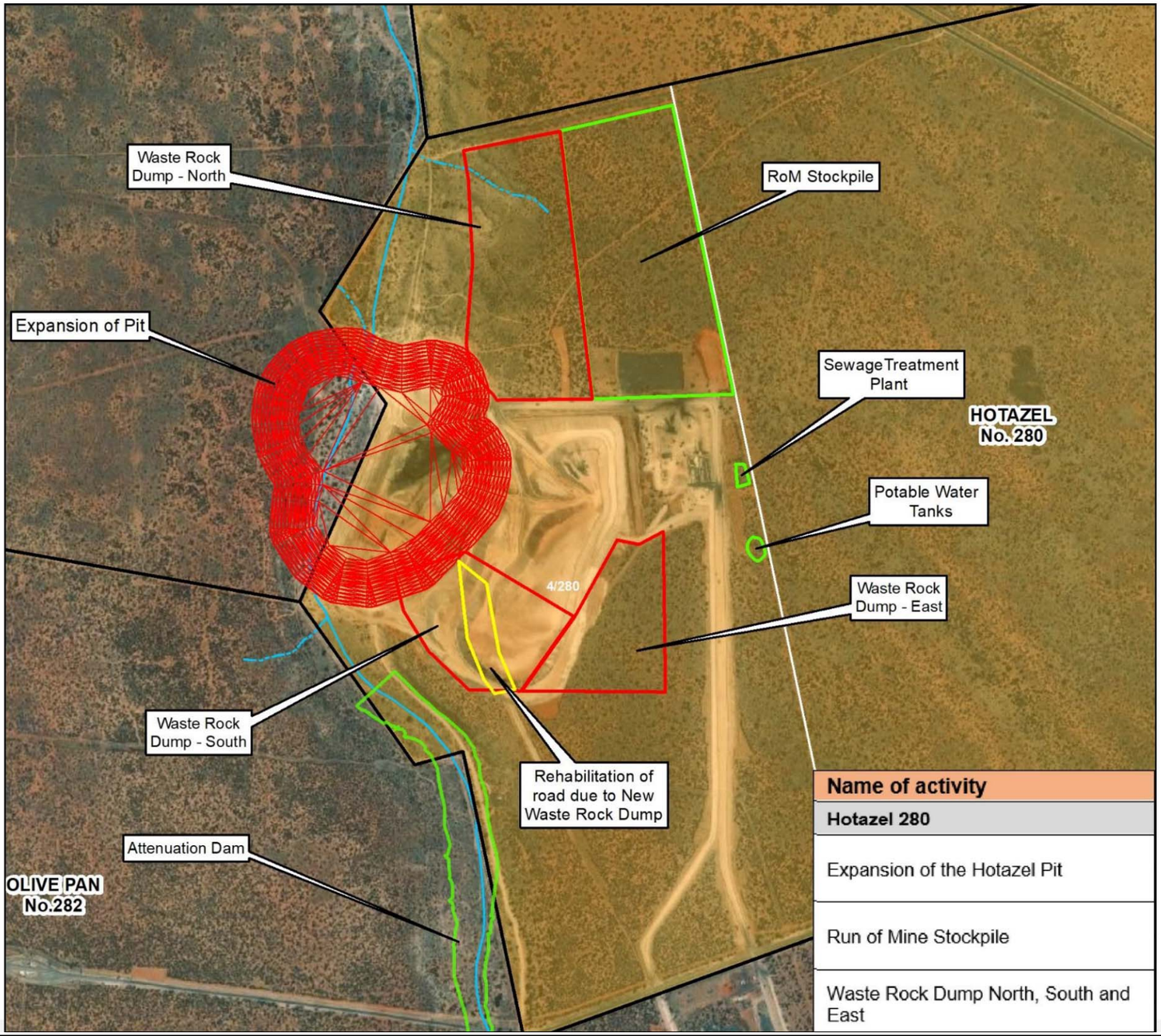
FIGURE 1.2: PROPOSED ACTIVITIES AND INFRASTRUCTURE ON KIPLING
FIGURE TO BE REPLACED WITH UPDATED (NO CRUSHER)

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



Proposed activities and infrastructure on Hotazel

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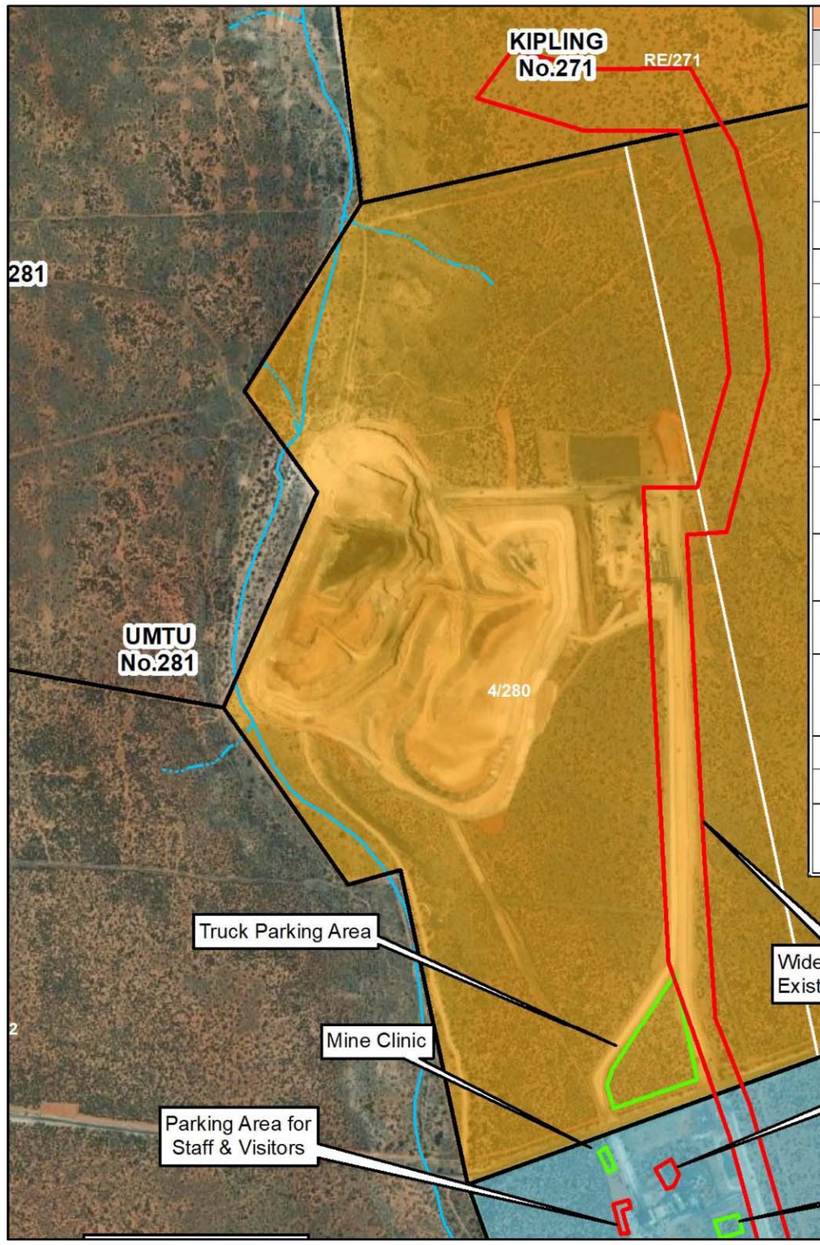
FIGURE 1.3: PROPOSED ACTIVITIES AND INFRASTRUCTURE ON HOTAZEL

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



Name of activity	Applicable listing notice	
York A 279		
Expansion of the York Pit	GNR 983: Activity 12, 19 and 34	
	GNR 984: Activity15	
Expansion of the rail loop (approx. 2.5 km)	GNR 983: Activity 64	
	GNR984: Activity 15	
Expansion of waste rock area	GNR984: Activity 15	NEM:W Categ
Widening of the existing haul road	GNR983: Activity 27 and 56	
Establishment of Truck Parking Area	GNR984: Activity 15	
Relocation of access control building	No Listed activity, however, this is an EMPr amendment	
Mine clinic	GNR 983: Activity 27	
Expand the parking area for staff and visitors	GNR 983: Activity 27	
Office Block (relocated)	No Listed activity, however, this is an EMPr amendment	
General and hazardous waste storage area		NEM:WA: Category A
Salvage yard	No Listed activity, however, this is an EMPr amendment	
Upgrade of sewage treatment plant	GNR 983: Activity 10, 25, 34, 46 and 57	
	GNR 984: Activity 6	
Relocation of PCD	GNR 984: Activity 6	
Manganese stockpile	GNR 983: Activity 27	
Attenuation dam	GNR 983: Activity 13, 16 and 19	
	GNR 984: Activity 15	

Proposed activities and infrastructure on Kipling, Hotazel & York

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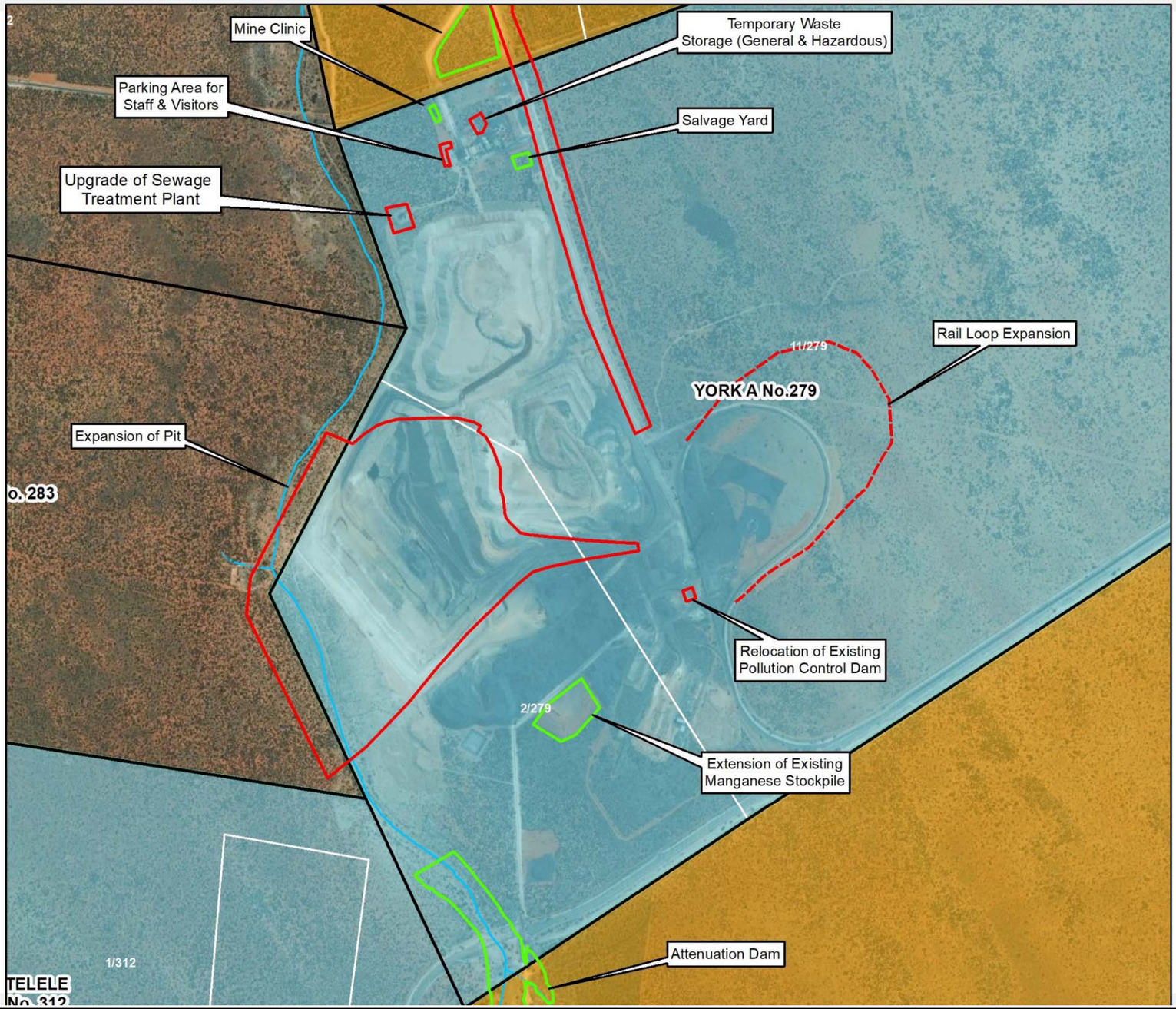
FIGURE 1.4: PROPOSED ACTIVITIES AND INFRASTRUCTURE ON KIPLING, HOTAZEL AND YORK

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



Proposed activities and infrastructure on York

FIGURE 1.5: PROPOSED ACTIVITIES AND INFRASTRUCTURE ON YORK

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

Proposed activities and infrastructure on Telele and Devon

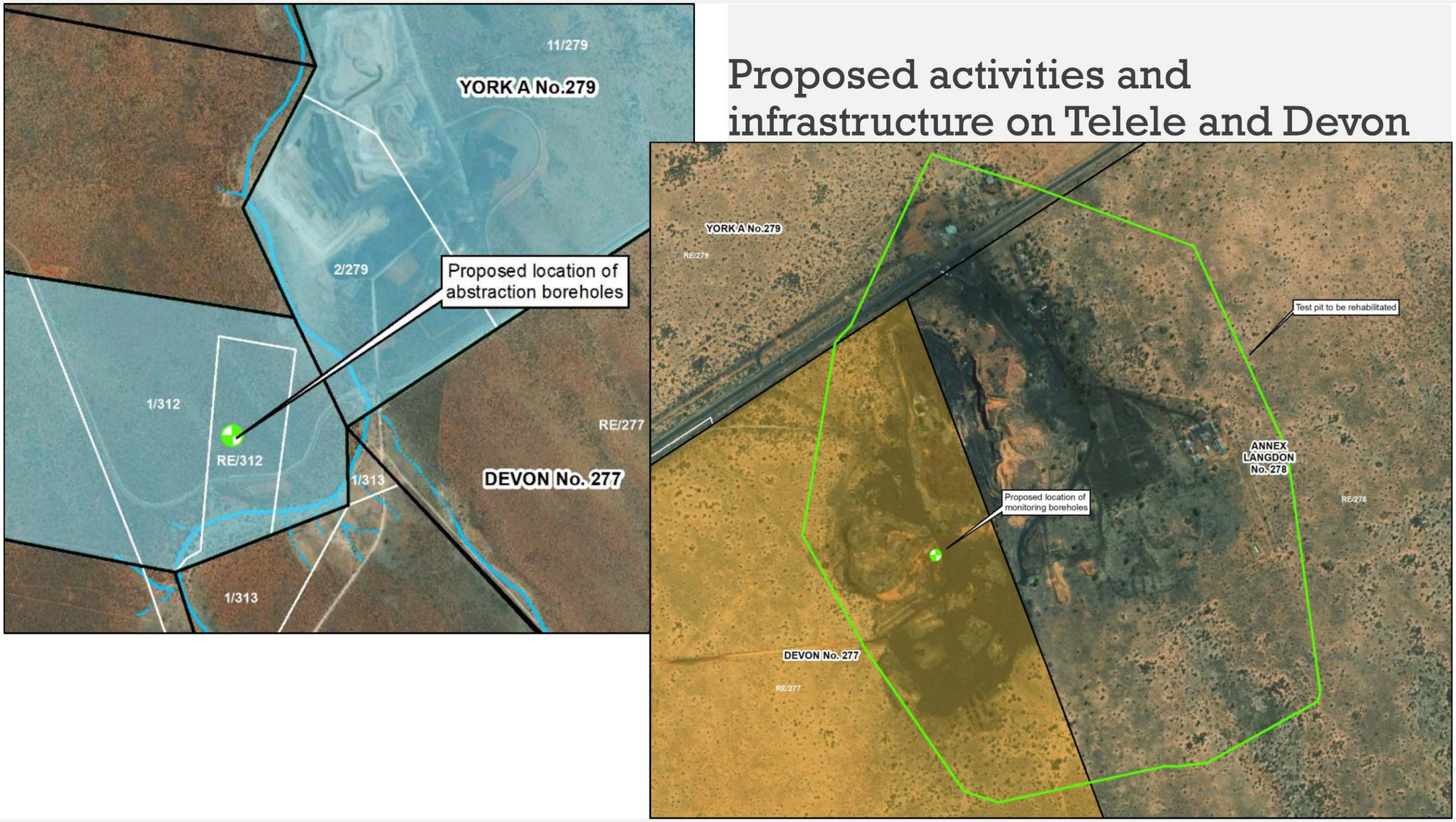


FIGURE 1.6: PROPOSED ACTIVITIES AND INFRASTRUCTURE ON TELELE AND DEVON

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

TABLE 1.1.1: SUMMARY OF THE EXTENT OF THE PROPOSED ACTIVITIES AS PART OF THE PROPOSED KMR EXPANSION PROJECT (CONSTRUCTION PHASE)			
DESCRIPTION	**KIPLING NO. 271**	**HOTAZEL NO. 280**	**YORK A NO. 279**
Main activities	Establishment of opencast pit mine and new administrative office.	Expansion of existing opencast pit mine.	Expansion of existing opencast pit mine.
Duration of construction	±6 months.	No construction as part of opencast pit expansion.	No construction as part of opencast pit expansion.
Relevant time frame	2021 to 2022.	Not relevant.	Not relevant.
Number of workers per shift	50 construction staff per day.	Not relevant.	Not relevant.
Anticipated location of workers	Surrounding areas.	Not relevant.	Not relevant.
Mode of transport for workers	Own transport to be provided by contractors. Worst-case 10-seater taxis and private vehicles for supervisors.	Not relevant.	Not relevant.
Anticipated number of heavy vehicles delivering construction materials per day	At peak, 1 per day delivering construction materials.	Not relevant.	Not relevant.
Total number of vehicle trips anticipated to be generated per day	AM Peak: 11 PM Peak: 11	Not relevant.	Not relevant.

TABLE 1.1.2: SUMMARY OF THE EXTENT OF THE PROPOSED ACTIVITIES AS PART OF THE PROPOSED KMR EXPANSION PROJECT (OPERATIONAL PHASE)			
DESCRIPTION	**KIPLING NO. 271**	**HOTAZEL NO. 280**	**YORK A NO. 279**
Main activities	Mining of opencast pit mine and exporting processed product by rail.	Mining of opencast pit mine and exporting processed product by rial.	Mining of opencast pit mine and exporting processed product by rial.
Duration (life of mine)	±3 years.	±6 years.	±6 years.
Relevant time frame	2022 to 2025.	2022 to 2028.	2022 to 2028.
Number of additional mining workers per day	100 workers per day.	No additional workers as part of expansion.	No additional workers as part of expansion.
Number of additional administration workers per day	50 existing admin workers to be relocated from Hotazel to Kipling.	50 existing admin workers to be relocated from Hotazel to Kipling.	No additional workers as part of expansion.
Mode of transport for workers	Private vehicles for supervisors and admin workers, and public transport (taxis) for mining workers.	Not relevant as part of expansion.	Not relevant as part of expansion.
Anticipated number of heavy vehicles delivering consumables per day	4 per day.	Not relevant as part of expansion.	Not relevant as part of expansion.
Additional heavy vehicles exporting product from mine	Mining of Kipling would not result in an increase in production, it would rather extend the life of the existing KMR mine.	Mining of Hotazel would not result in an increase in production, it would rather extend the life of the existing KMR mine.	Some production increase is expected at the York pit. All processed products will be transported by rail.
Total number of additional vehicle trips anticipated to be generated per day	AM Peak: 23 PM Peak: 23	Not relevant.	Not relevant.

TABLE 1.2: RELEVANT INTERSECTIONS UNDER INVESTIGATION					
POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES		INTERSECTION PHOTO
			LATITUDE	LONGITUDE	
A	Existing	Road R380, Gloria Mine Access Road and Mokala Mine Access Road	S 27°10'57.56"	E 22°54'10.25"	
B	Existing	Road R380, Hotazel Airfield and Hotazel West Access Road	S 27°12'28.55"	E 22°57'5.78"	
C	Existing	Road R380, Hotazel East Access Road and Local Mine Access Road	S 27°13'1.82"	E 22°57'42.52"	

TABLE 1.2: RELEVANT INTERSECTIONS UNDER INVESTIGATION (Continued)					
POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES		INTERSECTION PHOTO
			LATITUDE	LONGITUDE	
D	Existing	Road R380 and Road R31	S 27°13'56.17"	E 22°58'28.16"	
E	Existing	Road R380 and Kudumane Haul Access Road	S 27°14'5.81"	E 22°58'27.64"	

The following scenarios were investigated as part of the TIA:

a) **Scenario 1:** 2021 peak-hour traffic **with** latent developments **without** the proposed KMR Expansion Project.
b) **Scenario 2:** 2021 peak-hour traffic **with** latent developments **with** the proposed KMR Expansion Project (**Operational Phase**).
c) **Scenario 3:** 2026 peak-hour traffic **with** latent developments **without** the proposed KMR Expansion Project.
d) **Scenario 4:** 2026 peak-hour traffic **with** latent developments **with** the proposed KMR Expansion Project (**Operational Phase**).

Although the proposed KMR Expansion Project is anticipated to be operational past the year 2026, the following were taken into consideration in determining the investigation timeframe:

a) The proposed Kipling opencast pit is anticipated to take approximately six months to be constructed and is proposed to operate for approximately three years.
b) The production due to the proposed Kipling opencast pit will not increase the overall production output of the existing KMR mine.
c) The expansion of the existing Hotazel opencast pit will not increase the overall production output of the existing KMR mine.
d) The potential increase in production due to the proposed York opencast pit expansion would not result in an increase in existing employment by KMR and all processed products would be transported by rail.
e) The proposed KMR Expansion Project extends the overall life of mine (LOM) by six years.

The following sections of the report elaborate on the:

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

Section 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 KMR Expansion Project which consists of the following information:

   i. Existing land use information.
   ii. Existing road characteristics and modal distribution.
   iii. Traffic counts as a basis for making traffic-engineering calculations.

b) The future land use and road network characteristics relevant to the proposed KMR Expansion Project which consists of the following information:

   i. Land use information, including existing and proposed approved future developments in the area other than the proposed KMR Expansion Project.
   ii. Determination of vehicle trips expected to be generated due to the proposed KMR Expansion Project.

c) The current and future levels of service at the relevant intersections under investigation.
d) Other traffic-related matters.

The following subsection elaborates on the above-mentioned.

2.1 STATUS QUO OF LAND USE AND 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.
c) Traffic counts conducted as a basis for making traffic calculations.

2.1.1 EXISTING LAND USE INFORMATION

The relevant properties, where the existing KMR mine and the proposed KMR Expansion Project are proposed, are currently mostly utilised for mining activities apart from a portion of the Farm Kipling No. 271 north of Road R380 that is currently vacant.

For the purpose of this traffic impact assessment, it is assumed that:

a) The vehicle traffic absorption rate (the rate at which existing developments attract vehicular traffic) by all other types of completed developments will maintain the same status for the next five years.
b) That the average rate of growth of vehicle traffic in the area under investigation that is not relevant to the proposed KMR Expansion Project (background traffic) between the 2021 to 2026 scenarios was anticipated at 3% per annum.

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 intersections 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.
    vii) Median widths.

d) **Table 2.3** provides a copy of the guidelines (COTO TRH26 *South African Road Classification and Access Management Manual, Version 1.0, August 2012* Urban areas) of typical road characteristics and access management requirements.
e) **Table 2.4** provide a copy of the guidelines (COTO TRH26 *South African Road Classification and Access Management Manual, Version 1.0, August 2012* Rural areas) of typical road characteristics and access management requirements.

TABLE 2.1: SUMMARY OF INTERSECTION CONTROL AT EXISTING INTERSECTIONS UNDER INVESTIGATION				
POINT	**DESCRIPTION**	**INTERSECTION CONTROL**	**PEDESTRIAN ACTIVITIES**	**INTERSECTION PHOTO**
A	Road R380, Gloria Mine Access Road and Mokala Mine Access Road	Free flow along Road R380	Pedestrian activity observed during surveys	
B	Road R380, Hotazel Airfield, and Hotazel West Access Road	Free flow along Road R380	Pedestrian activity observed during surveys	
C	Road R380, Hotazel East Access Road and Local Mine Access Road	Free flow along Road R380	Pedestrian activity observed during surveys	
D	Road R380 and Road R31	Free flow along Road R380	No pedestrian activity observed during surveys	
E	Road R380 and Kudumane Haul Access Road	Free flow along Road R380	No pedestrian activity observed during surveys	

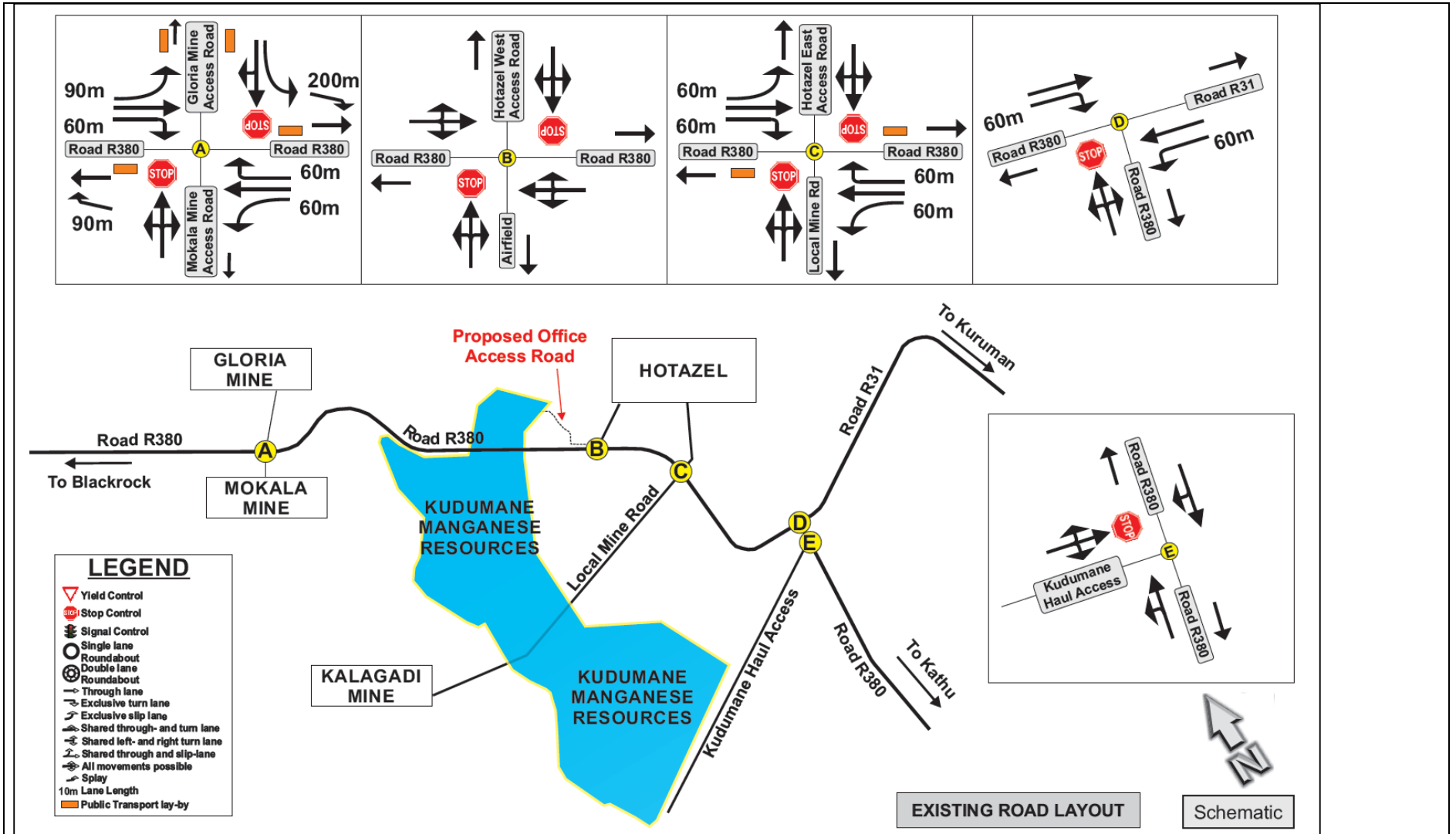


FIGURE 2.1: EXISTING ROAD NETWORK LAYOUT

TABLE 2.2: SUMMARY OF ROAD CHARACTERISTICS											
RELEVANT ROAD SECTION	**PICTURE OF ROAD SECTION**	**EXISTING CLASS OF ROAD**	**FUNCTIONAL 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**
Road Section 1 Relevant section of Road R31		**Primary Function:** Mobility **Class**: Minor Arterial; **Class No.**: R3; **Route No.**: R **Description:** Main Road **Spacing between Intersections:** 1.6km	**Operational Function:** Mobility **Class**: Minor Arterial; **Class No.**: R3; **Route No.**: R **Description:** Main Road **Spacing between Intersections:** 1.6km		±30m	One lane per direction	3.6m wide	Asphalt	None	3%	100 km/h
Road Section 2 Relevant section of Road R380 (Points A to D)		**Primary Function:** Mobility **Class**: Minor Arterial; **Class No.**: U3; **Route No.**: R **Description:** Main Road **Spacing between Intersections:** 600m (±20%)	**Operational Function:** Mobility **Class**: Minor Arterial; **Class No.**: U3; **Route No.**: R **Description:** Main Road **Spacing between Intersections:** 600m (±20%)	Northern Cape Department of Roads and Public Works	±30m	One lane per direction	3.6m wide	Asphalt	None	3%	80 km/h

TABLE 2.2: SUMMARY OF ROAD CHARACTERISTICS (Continued)

RELEVANT ROAD SECTION	PICTURE OF ROAD SECTION	EXISTING CLASS OF ROAD	FUNCTIONAL CLASS OF ROAD	Road Authority	Road Reserve (M)	Number of Lanes	Lane Width	Type of Surface	Median	Anticipated Traffic Growth per Annum over 5 Years	Speed Limit
Road Section 3 Relevant section of Road R380 (Point D southbound)		**Primary Function:** Mobility **Class:** Minor Arterial; **Class No.:** R3; **Route No.:** R **Description:** Main Road **Spacing between Intersections:** 1.6km	**Operational Function:** Mobility **Class:** Minor Arterial; **Class No.:** R3; **Route No.:** R **Description:** Main Road **Spacing between Intersections:** 1.6km		±30m	One lane per direction	3.6m wide	Asphalt	None	3%	100 km/h
Road Section 4 Local Mine Road		**Primary Function:** Access / Activity **Class:** Collector Road; **Class No.:** R4; **Route No.:** N/A **Description:** Collector **Spacing between Intersections:** 600 - 800m	**Operational Function:** Access / Activity **Class:** Collector Road; **Class No.:** R4; **Route No.:** N/A **Description:** Collector **Spacing between Intersections:** 600 - 800m	Northern Cape Department of Roads and Public Works	±50m	One lane per direction	3.7m wide	Asphalt	None.	3%	80 km/h

TABLE 2.2: SUMMARY OF ROAD CHARACTERISTICS (Continue...)

RELEVANT ROAD SECTION	PICTURE OF ROAD SECTION	EXISTING CLASS OF ROAD	FUNCTIONAL CLASS OF ROAD	Road Authority	Road Reserve (M)	Number of Lanes	Lane Width	Type of Surface	Median	Anticipated Traffic Growth per Annum over 5 Years	Speed Limit
Road Section 5 Hotazel Eastern Access Road		**Primary Function:** Access / Activity **Class:** Collector Street; **Class No.:** U4a; **Route No.:** N/A **Description:** Major Collector **Spacing between Intersections:** > 150m	**Operational Function:** Access / Activity **Class:** Collector Street; **Class No.:** U4a; **Route No.:** N/A **Description:** Major Collector **Spacing between Intersections:** > 150m		±20m	One lane per direction	3.7m wide	Asphalt	None.	3%	60 km/h
Road Section 6 Hotazel Western Access Road		**Primary Function:** Access / Activity **Class:** Collector Street; **Class No.:** U4a; **Route No.:** N/A **Description:** Major Collector **Spacing between Intersections:** > 150m	**Operational Function:** Access / Activity **Class:** Collector Street; **Class No.:** U4a; **Route No.:** N/A **Description:** Major Collector **Spacing between Intersections:** > 150m	Northern Cape Department of Roads and Public Works	±20m	One lane per direction	3.7m wide	Asphalt	None.	3%	60 km/h

TABLE 2.3: URBAN ACCESS MANAGEMENT REQUIREMENTS AND FEATURES
(EXTRACT FROM *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. (U_)	CLASS NAME	DESIGN TOPOLOGY	ROUTE NO.	INTERSECTION SPACING	ACCESS TO PROPERTY	PARKING	SPEED km/h	INTERSECTION CONTROL	TYPICAL CROSS SECTION	ROADWAY / LANE WIDTH	ROAD RESERVE WIDTH	PUBLIC TRANSPORT AND PEDESTRIAN CROSSINGS	PEDESTRIAN FOOTWAYS (CONSTRUCTED)	CYCLE LANES	TRAFFIC CALMING
Mobility	U1	Principal arterial	Expressway	Yes (M/R/N)	2,4km (1.6km - 3.6km)	Not allowed *. **	No	100 - 120	Interchange	4/6/8 lane freeway	3.3 - 3.7m lanes	60 - 120m (60m)	No	No	No	No
	U2	Major arterial	Highway	Yes (M/R)	800m (±15%)	Not allowed *. **	No	80	Co-ordinated traffic signal, interchange	4/6 lanes divided, kerbed	3.3 - 3.6m lanes	38 - 62m (40m)	Yes, at intersections	Off road	Yes, widen roadway	No
	U3	Minor arterial	Main road	Yes (M)	600m (±20%)	Not allowed *. **	No	70	Co-ordinated traffic signal, roundabout	4 lanes divided or undivided, kerbed	3.3 - 3.5m lanes	25 - 40m (30m)	Yes, at intersections	Yes	Yes, widen roadway	No
Access / Activity	U4a	Collector Street, commercial	Commercial major collector	No (A for temp. Routing)	> 150m	Yes (larger properties)	Yes, if conditional allow	60	Traffic signal, roundabout or priority	4 lanes, median at pedestrian crossings, boulevard, CBD one-way		20 - 40m (25m)	Yes, at intersections or midblock	Yes	Yes, widen roadway or on verge	Median for pedestrians, curved roadway
	U4b	Collector street, residential	Residential minor collector	No	> 150m	Yes	Yes, if appropriate	50	Roundabout, mini-circle or priority	2/3 lanes undivided	6-9m roadway, < 3.3m lanes	16 - 30m (20m)	Yes, anywhere	Yes	Yes, on road or verge	Raised pedestrian, median, narrow lanes
	U5a	Local street, commercial	Commercial access street	No		Yes	Yes, if conditions allow	40	Priority	2 lanes plus parking		15 - 25m (22m)	If applicable, anywhere	Normally yes	Use roadway	Raised pedestrian crossing
	U5b	Local street, residential	Local residential street	No		Yes	Yes, on verge	40	Mini-circle, priority or none	1/2 lane/s mountable kerb	3.0 - 5.5m roadway (two way)	10 - 16m (14m)	If applicable, anywhere	Not normally, pedestrians can use roadway	Use roadway	Yes, but should not be necessary
	U6a	Walkway, non-motorised priority	Pedestrian priority	No	500m maximum	Yes	Yes, if parking lot on woon erf	15	None, pedestrians have right of way	Surfaced			If applicable, anywhere	Yes, or use roadway	Rare	Yes
	U6b	Walkway, non-motorised priority	Pedestrian only	No	500m maximum	Yes	No vehicles	peds. 80m / minute	None, pedestrian signal	Block paving		6m		Yes	Yes	

* 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.

** Partial and marginal access at reduced spacing allowed relieving congestion, reducing excessive travel distance or removing the need for full intersections.

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

In order to gain a better understanding of the existing traffic patterns and movements adjacent to the existing development, 12-hour manual traffic counts were conducted at the existing intersections that would potentially be affected by the proposed KMR Expansion Project.

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 counts were conducted on Friday 30 July 2021 at the following intersection under investigation:

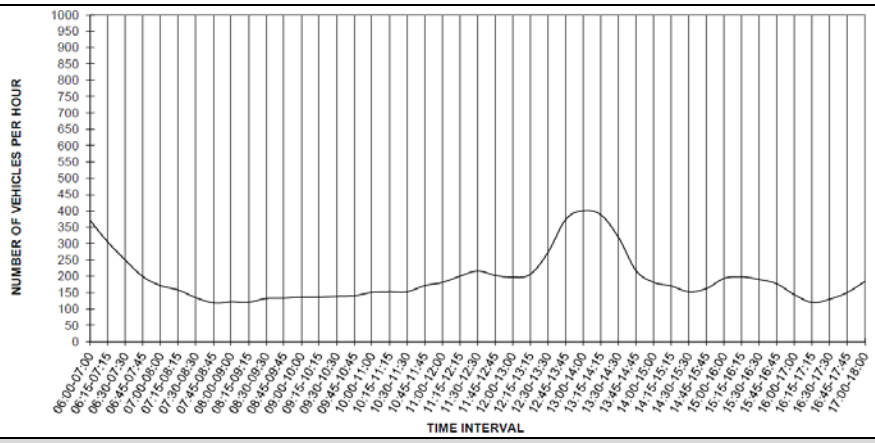
a) **Point A**: Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road.
b) **Point B**: Intersection of Road R380, Hotazel Airfield Access and Hotazel West Access Road.
c) **Point C**: Intersection of Road R380, Hotazel East Access Road and Local Mine Road.
d) **Point D**: Intersection of Road R380 and Road R31.
e) **Point E**: Intersection of Road R31 and Kudumane Haul Access Road.

The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 30 July 2021 between 06:00 and 18:00 are indicated in **Tables A-1** to **A-5** of **Appendix A** of this report. The description of the relevant vehicle movements at the relevant intersections appears in **Figure 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 counts.

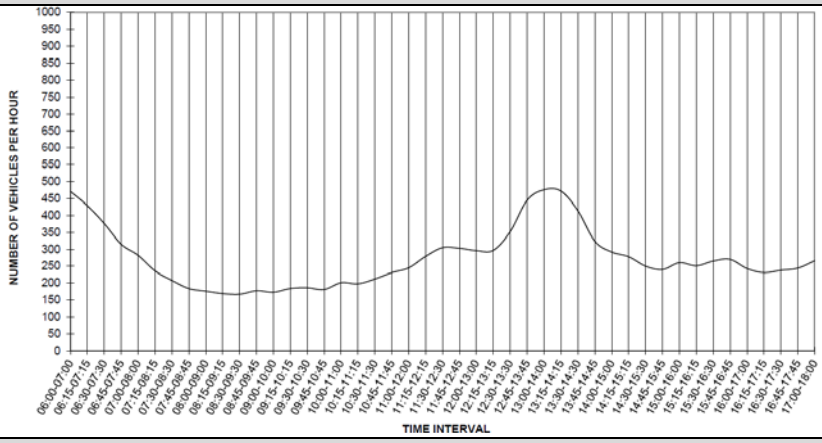
The respective peak-hour flows for the traffic count at the relevant intersections were identified as indicated in **Table 2.5** below.

TABLE 2.5: PEAK HOUR PERIODS AT THE RELEVANT INTERSECTIONS					
POINT	INTERSECTION	AM PEAK HOUR		PM PEAK HOUR	
		TIME INTERVAL	NUMBER OF VEHICLES	TIME INTERVAL	NUMBER OF VEHICLES
A	Road R380, Gloria Mine Access Road and Mokala Mine Access Road	06:00 – 07:00	371	13:15 to 14:15	389
B	Road R380, Hotazel Airfield Access and Hotazel West Access Road	06:00 – 07:00	471	13:15 to 14:15	472
C	Road R380, Hotazel East Access Road and Local Mine Road	06:00 – 07:00	557	13:15 to 14:15	520
D	Road R380 and Road R31	06:00 – 07:00	859	13:15 to 14:15	579
E	Road R31 and Kudumane Haul Access Road	06:00 – 07:00	444	13:15 to 14:15	191

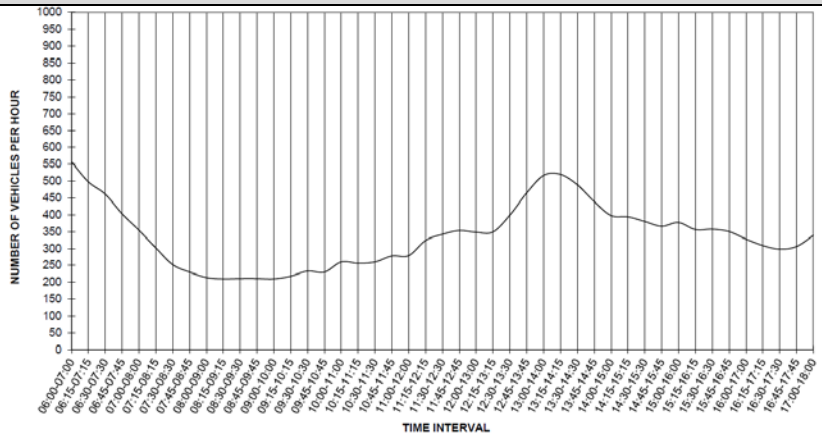
Figure 2.2 indicates the hourly traffic pattern, per 15-minute interval, for all modes of vehicles at the relevant intersections between 06:00 and 18:00 on Friday 30 July 2021. A graphical presentation of the peak-hour vehicle flows is indicated with **Figure B-1** of **Appendix B**.



INTERSECTION OF ROAD R380, GLORIA MINE ACCESS ROAD AND MOKALA MINE ACCESS ROAD (POINT A)

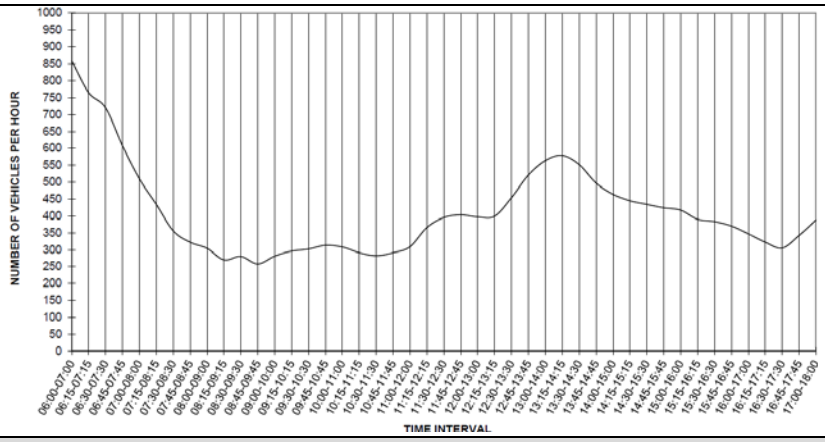


INTERSECTION OF ROAD R380, HOTAZEL AIRFIELD ACCESS AND HOTAZEL WEST ACCESS ROAD (POINT B)

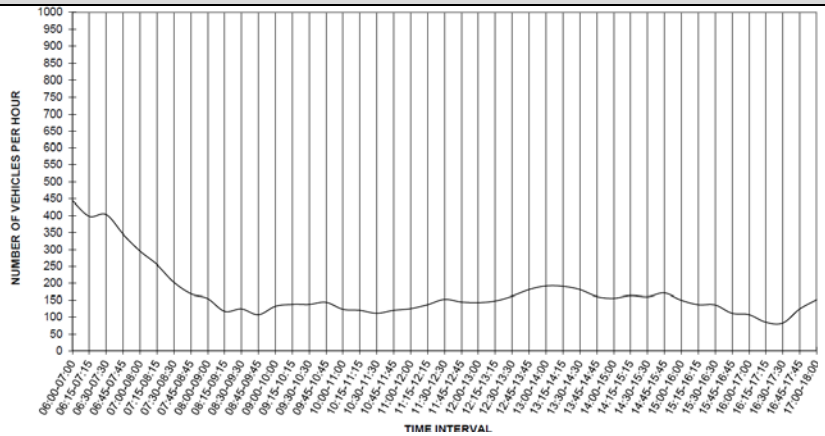


INTERSECTION OF ROAD R380, HOTAZEL EAST ACCESS ROAD AND LOCAL MINE ROAD (POINT C)

FIGURE 2.2: HOURLY TRAFFIC PATTERN PER 15-MINUTE INTERVAL FOR ALL MODES OF VEHICLES (06:00 to 18:00) AT THE RELEVANT INTERSECTIONS



INTERSECTION OF ROAD R380 AND ROAD R31 (POINT D)



INTERSECTION OF ROAD R31 AND KUDUMANE HAUL ACCESS ROAD (POINT E)

FIGURE 2.2: HOURLY TRAFFIC PATTERN PER 15-MINUTE INTERVAL FOR ALL MODES OF VEHICLES (06:00 to 18:00) AT THE RELEVANT INTERSECTIONS

2.2 FUTURE LAND USE AND ROAD CHARACTERISTICS

The following are relevant:

a) Land use information, including existing and proposed future approved developments in the area.
b) Determination of the vehicle trips anticipated to be generated by the proposed KMR Expansion Project.

The subsections below elaborate on the above-mentioned future land use and road characteristics.

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

A mining development to be known as Mokala Mine, for which environmental authorisation has been granted and construction has been started, is proposed to the west of the existing KMR Mine. The proposed mining development would also make use of Road R380 and gain access from and to Road R380 at the existing intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road (**Point A**).

The proposed mining development would entail the mining and selling of manganese and as per information obtained from the traffic impact assessment conducted by Siyazi in 2015, **Table 2.6** provides information on the number of vehicle trips which are anticipated to be generated during the same peaks as determined as part of this study.

TABLE 2.6: NUMBER OF VEHICLE TRIPS WHICH ARE ANTICIPATED TO BE GENERATED BY THE PROPOSED MOKALA MINE

Phase	Construction Phase		Operational Phase	
Trips	**IN**	**OUT**	**IN**	**OUT**
AM Peak	30	15	64	49
PM Peak	15	30	49	64

The above-mentioned vehicle trips were included as part of this investigation as latent approved vehicle trips. More detail regarding the proposed Mokala mining development is available upon request and authorisation from the proposed mining development company.

2.2.2 INFORMATION ABOUT THE EXPECTED FUTURE MODAL DISTRIBUTION

Figures B-3 and **B-5** of **Appendix B** indicate, in percentages, the expected vehicle trips distribution, respectively, of light vehicles and heavy vehicles for the AM and PM peak periods for the relevant scenarios.

2.2.3 DETERMINATION OF VEHICLE TRIPS EXPECTED TO BE GENERATED DUE TO THE PROPOSED PROJECT

Table 2.7 provides information on the projected number of existing administrative staff vehicle trips to be diverted due to being relocated from Hotazel to Kipling.

Table 2.8 indicate the trip generation rates, the additional number of vehicle trips which are expected to be generated due to the proposed KMR Expansion Project for the construction phase while **Table 2.9** provides the same for the operational phase.

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.

It is important to take note that the relocation of the administrative offices from Hotazel to Kipling would not result in additional vehicle trips to be generated but would rather result in the diversion of the existing vehicle trips from Hotazel to Kipling.

TABLE 2.7: PROJECTED NUMBER OF EXISTING ADMINISTRATIVE STAFF VEHICLE TRIPS TO BE DIVERTED DUE TO BEING RELOCATED FROM HOTAZEL TO KIPLING

Item	Component	Number Workers per Day	% Workers Active during Peak Hour	Number Workers Active per Peak Hour	Assumed Ave. Number Persons per Vehicle	Comments	Total Number of Trips to be Diverted	Final Trip Information for Traffic Engineering Calculations			
								Trip Dist. %		Trip Generation	
								In	Out	In	Out
AM Peak Hour											
1.1	Hotazel admin staff relocated to Kipling	50	100%	50	4,0	Trips per worker (4 persons per vehicle). Vehicles enter site and park until shift is over.	13	100 %	0%	13	0
						TOTAL				**13**	**0**
PM Peak Hour											
1.2	Hotazel admin staff relocated to Kipling	50	100%	50	4,0	Trips per worker (4 persons per vehicle). Vehicles enter site and park until shift is over.	13	0%	100 %	0	13
						TOTAL				**0**	**13**

TABLE 2.8: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED DUE TO THE PROPOSED KMR EXPANSION PROJECT (CONSTRUCTION PHASE)

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																				
KIPLING OPENCAST PIT AND ADMINISTRATIVE COMPONENT																				
1.	Kipling construction workers (using own transport) **(1 shift per day)**	10	100%	10	-	-	-	4,0	Trips per worker (4 persons per vehicle) vehicles enter site and park until shift is over	1	3	0	0	3	**0,25**		100%	0%	3	0
2.	Kipling construction workers (using taxi transport) **(1 shift per day)**	40	100%	40	-	-	-	10,0	10 persons per taxi (taxi deliver workers to site and leave empty)	1	4	1	4	8	**0,20**		50%	50%	4	4
3.	Heavy vehicles delivering consumables	-	-	-	1	20%	0	1,0	Worst-case scenario, at least one truck during peak hour	1	0	1	0	0	**2,00**		50%	50%	0	0
HOTAZEL PIT EXPANSION																				
4.	No construction as part of the opencast pit expansion.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**		0%	0%	0	0
YORK PIT EXPANSION																				
5.	No construction as part of the opencast pit expansion.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**	0	0%	0%	0	0
TOTAL														11					7	4
PM Peak Hour																				
KIPLING OPENCAST PIT AND ADMINISTRATIVE COMPONANT																				
1.	Kipling construction workers (using own transport) **(1 shift per day)**	10	100%	10	-	-	-	4,0	Trips per worker (4 persons per vehicle) vehicles enter site and park until shift is over	0	0	1	3	3	**0,25**		0%	100%	0	3
2.	Kipling construction workers (using taxi transport) **(1 shift per day)**	40	100%	40	-	-	-	10,0	10 persons per taxi (Taxi deliver workers to site and leave empty)	1	4	1	4	8	**0,20**		50%	50%	4	4
3.	Heavy vehicles delivering consumables	-	-	-	4	20%	1	1,0	Worst-case scenario, at least one truck during peak hour	1	1	1	1	2	**2,00**		50%	50%	1	1
HOTAZEL PIT EXPANSION																				
4.	No construction as part of the opencast pit expansion.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**		0%	0%	0	0
YORK PIT EXPANSION																				
5.	No construction as part of the opencast pit expansion.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**	0	0%	0%	0	0
TOTAL														13					5	8

TABLE 2.9: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED DUE TO THE PROPOSED KMR EXPANSION PROJECT (OPERATIONAL PHASE)

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																			
KIPLING OPENCAST PIT																			
1.	Kipling open-pit mining workers (Using own transport) **(1 shift per day)**	20	100%	20	-	-	-	4,0	Trips per worker (4 persons per vehicle) vehicles enter site and park until shift is over	1	5	0	0	5	**0,25**	100%	0%	5	0
2.	Kipling open-pit mining workers (Using taxi transport) **(1 shift per day)**	80	100%	80	-	-	-	10,0	10 persons per taxi (taxi deliver workers to site and leave empty)	1	8	1	8	16	**0,20**	50%	50%	8	8
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
KIPLING ADMINISTRATIVE COMPONANT																			
4.	Administration staff from the existing Hotazel section will be relocated to Kipling, therefore the projected existing trips would only be diverted.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**	0%	0%	0	0
HOTAZEL PIT EXPANSION																			
5.	No change in Hotazel component due to expansion.				-	-	-	0,0	N/a	0	0	0	0	0	**0,00**	0%	0%	0	0
YORK PIT EXPANSION																			
6.	No additional York pit and administrative staff or deliveries due to York expansion. Some increase production is possible due to the opencast pit expansion, and all processed products will be transported by rail.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**	0	0%	0%	0	0
									TOTAL					**23**				**14**	**9**
PM Peak Hour																			
KIPLING OPENCAST PIT																			
1.	Kipling open-pit mining workers (Using own transport) **(1 shifts per day)**	20	100%	20	-	-	-	4,0	Trips per worker (4 persons per vehicle) vehicles parked on-site during shift, leave the site	0	0	1	5	5	**0,25**	0%	100%	0	5
2.	Kipling open-pit mining workers (Using taxi transport) **(1 shift per day)**	80	100%	80	-	-	-	10,0	10 persons per taxi (Taxi enter site empty and collect workers)	1	8	1	8	16	**0,20**	50%	50%	8	8
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
KIPLING ADMINISTRATIVE COMPONANT																			
4.	Administration staff from the existing Hotazel section will be relocated to Kipling, therefore the projected existing trips would only be diverted.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**	0%	0%	0	0
HOTAZEL PIT EXPANSION																			
5.	No change in Hotazel component due to expansion.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**	0%	0%	0	0
YORK PIT EXPANSION																			
6.	No additional York pit and administrative staff or deliveries due to York expansion. Some increase production is possible due to the opencast pit expansion, and all processed products will be transported by rail.				-	-	-	0,0	N/A	0	0	0	0	0	**0,00**	0	0%	0%	0	0
									TOTAL					**23**				**9**	**14**

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

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

a) **Figure B-1:** 2021 peak-hour traffic (background traffic) without latent developments without the proposed KMR Expansion Project.
b) **Figure B-2:** 2021 peak-hour traffic (background traffic) with latent developments without the proposed KMR Expansion Project **(Scenario 1)**.
c) **Figure B-3:** Projected vehicle trip re-distribution for the proposed KMR Expansion Project (**administrative staff relocation)**.
d) **Figure B-4:** Projected vehicle trip distribution for the proposed KMR Expansion Project (**light vehicles)**.
e) **Figure B-5:** Projected vehicle trip distribution for the proposed KMR Expansion Project (**heavy vehicles)**.
f) **Figure B-6:** Projected vehicle trips to be generated by the proposed KMR Expansion Project (**operational phase**).
g) **Figure B-7:** Projected 2021 peak-hour traffic with latent developments with the proposed KMR Expansion Project **(Scenario 2)**.
h) **Figure B-8:** Projected 2026 peak-hour traffic with latent developments without the proposed KMR Expansion Project **(Scenario 3)**.
i) **Figure B-9:** Projected 2026 peak-hour traffic with latent developments with the proposed KMR Expansion Project **(Scenario 4)**.

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 intersections. The following intersections were evaluated for levels of service:

a) **Point A**: Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road.
b) **Point B**: Intersection of Road R380, Hotazel Airfield Access and Hotazel West Access Road.
c) **Point C**: Intersection of Road R380, Local Mine Road and Hotazel East Access Road.
d) **Point D**: Intersection of Road R380 and Road R31.
e) **Point E**: Intersection of Road R380 and Kudumane Haul 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 2021 (background traffic) **with** latent developments, **without** the proposed KMR Expansion Project **(Scenario 1)**.
b) **Table C-2:** Levels of service for various approaches for the year 2026 (background traffic) **with** latent developments, **without** the proposed KMR Expansion Project **(Scenario 3)**.
c) **Table C-3:** Levels of service for various approaches for the year 2021 (background traffic) **with** latent developments, **with** the proposed KMR Expansion Project **(Scenario 2)**.
d) **Table C-4:** Levels of service for various approaches for the year 2026 (background traffic) **with** latent developments, **with** the proposed KMR Expansion Project **(Scenario 4)**.

From **Tables C-1** to **C-4** it is possible to note that:

a) Geometric upgrading (mitigating measures) is recommended as part of the status quo without the Proposed KMR Expansion Project.
b) No further geometric upgrading (mitigating measures), apart from the construction of the Kipling administrative offices access intersection, is recommended due to the proposed KMR Expansion Project, as long as geometric improvements (mitigating measures) are implemented as recommended for the existing circumstances.
c) Refer to **Section 3** of this report for more information regarding required and recommended improvements (mitigating measures).

Refer to **Tables D-1** and **D-2** of **Appendix D** for level of service criteria description respectively for unsignalised and signalised intersections.

Table 2.9 provides a summary of the predicted available reserve capacity on the various sections of roads that had been investigated with the proposed KMR Expansion Project.

TABLE 2.9: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTIONS														
Point	Intersection	Direction of Road Section	Capacity per Lane	2021 Number of Lanes	2021 Total Capacity	2026 Number of Lanes	2026 Total Capacity	2021 Actual Number of Vehicles		2021 Reserve Capacity Available		2026 Actual Number of Vehicles		2026 Reserve Capacity Available	
								AM	PM	AM	PM	AM	PM	AM	PM
A	Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road	North (Road R380)	1100	1	1100	1	1100	209	65	891	1035	243	75	209	1025
		East (Gloria Mine)	Not relevant. Access road.												
		South (Road R380)	1100	1	1100	1	1100	129	370	971	730	141	419	129	681
		West (Mokala Mine)	Not relevant. Access road.												
B	Intersection of Road R380, Hotazel Airfield Access and Hotazel West Access Road	North (Road R380)	1100	1	1100	1	1100	328	127	772	973	370	140	328	960
		East (Hotazel West)	700	1	700	1	700	76	110	624	590	85	126	76	574
		South (Road R380)	1100	1	1100	1	1100	198	366	902	734	221	413	198	687
		West (Hotazel Airfield)	Not relevant. Access road.												
C	Intersection of Road R380, Local Mine Road and Hotazel East Access Road	North (Road R380)	1100	1	1100	1	1100	298	131	802	969	333	144	298	956
		East (Hotazel East)	700	1	700	1	700	42	45	658	655	48	50	42	650
		South (Road R380)	1100	1	1100	1	1100	238	430	862	670	269	489	238	611
		West (Local Mine Rd)	Not relevant. Access road.												
D	Intersection of Road R380 and Road R31	East (Road R31)	1100	1	1100	1	1100	209	394	891	706	235	447	209	653
		South (Road R380)	1100	1	1100	1	1100	362	122	738	978	419	141	362	959
		West (Rod R380)	1100	1	1100	1	1100	396	171	704	929	449	191	396	909
E	Intersection of Road R380 and Kudumane Haul Access Road	North (Road R380)	1100	1	1100	1	1100	87	73	1013	1027	101	84	87	1016
		South (Road R380)	1100	1	1100	1	1100	353	113	747	987	409	131	353	969
		West (Kudumane Haul Access)	Not relevant. Access road.												

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

It is important to determine the sensitivity of existing roads in order to assist in an understanding of the current baseline conditions. Sensitive road sections and intersections related to existing conditions **without** and **with** the proposed KMR Expansion Project 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.
d) Speeding.

The following figures are presented as part of the sensitive road sections **without** the proposed KMR Expansion Project (status quo):

a) **Figures 2.3:** Sensitive road sections and intersections indicating existing sensitive areas and intersections **WITHOUT** the proposed KMR Expansion Project **WITHOUT** recommended mitigating measures.
b) **Figures 2.4:** Sensitive road sections and intersections indicating existing sensitive areas and intersections **WITHOUT** the proposed KMR Expansion Project **WITH** recommended mitigating measures.
c) **Figures 2.5:** Sensitive road sections and intersections indicating existing sensitive areas and intersections **WITH** the proposed KMR Expansion Project **WITH** recommended mitigating measures.

With reference to **Figure 2.3**, without recommended mitigation, intersections B and E are considered to have a moderate significance due to the following reasons:

a) The intersection of Road R380, Hotazel Airfield Access and Hotazel West Access Road (Point B) lacks a dedicated right-turn lane on the southern approach of Road R380, which results in vehicles waiting to turn right from Road R380 having to do so within the through lane. Without a passing lane for other vehicles travelling straight through the intersection along Road R380, the lack of a dedicated right-turn lane creates the possibility of rear-ending collisions, therefore creating a road safety risk.
b) The intersection of Road R380 and Kudumane Haul Access Road (Point E) lacks a dedicated right-turn lane on the northern approach of Road R380, which results in vehicles waiting to turn right from Road R380 having to do so within the through lane. Without a passing lane for other vehicles travelling straight through the intersection along Road R380, the lack of a dedicated right-turn lane creates the possibility of rear-end collisions, therefore creating a road safety risk.

Tables 3.1 and **3.2** and **Figure 3.1** of **Section 3** outline the recommended mitigation measures that are required at Points B and E, without the proposed KMR Expansion Project. These recommendations are required to assist in improving current third-party road safety. With reference to **Figure 2.4**, with the implementation of the recommended mitigation measures as outlined in **Tables 3.1** and **3.2** and **Figure 3.1**, the significance of this impact is considered to improve to a low significance and would improve road safety at these intersections

It is important to take into consideration that the anticipated vehicle traffic to be generated due to the Proposed KMR Expansion Project as determined as part of **Section 2.2.3** is an insignificant volume of vehicle traffic during peak traffic times for the construction and operational phases. It follows, as depicted by **Figure 2.5**, that the proposed KMR Expansion Project would have a negligible impact on the sensitivity of roads.

2.5 ACCESS TO AND FROM THE EXISTING KMR MINE AND THE PROPOSED KMR EXPANSION PROJECT

Access to and from the existing KMR Mine is currently gained from the intersection of Road R380, Local Mine Road and Hotazel East Access Road (Point C) which is the main access intersection, and the intersection of Road R380 and Kudumane Haul Access Road (Point E) which is mainly used by haul vehicles. Both these access intersections are existing approved intersections.

As part of the proposed KMR Expansion Project, a new access intersection is proposed from Hotazel West Access Road (Point F) which would provide access to the proposed Kipling Administrative Office. **Figure 2.6** provides a graphical presentation of the recommended locality of the last-mentioned access point. All other proposed activities as part of the proposed KMR Expansion Project is proposed to gain access from the existing access intersections.

The following is important to take into consideration for the proposed access point from Hotazel West Access Road:

a) Due to the locality of the proposed access intersection, which is near a railway crossing, low vehicle speeds were observed.
b) The proposed access would be used by administrative staff only, which was determined as part of this report to be a low number of vehicles.
c) Sight distance at the proposed intersection would be adequate.
d) The life of mine for the KMR Mine due to the proposed KMR Expansion Project is six years.
e) Relevant road traffic warning signs at the railway line need to be provided where not done already.

prop

The access is therefore regarded as acceptable from a traffic engineering point of view. Final requirements and approval should be obtained as part of the detailed design phase of the osed KMR Expansion Project.

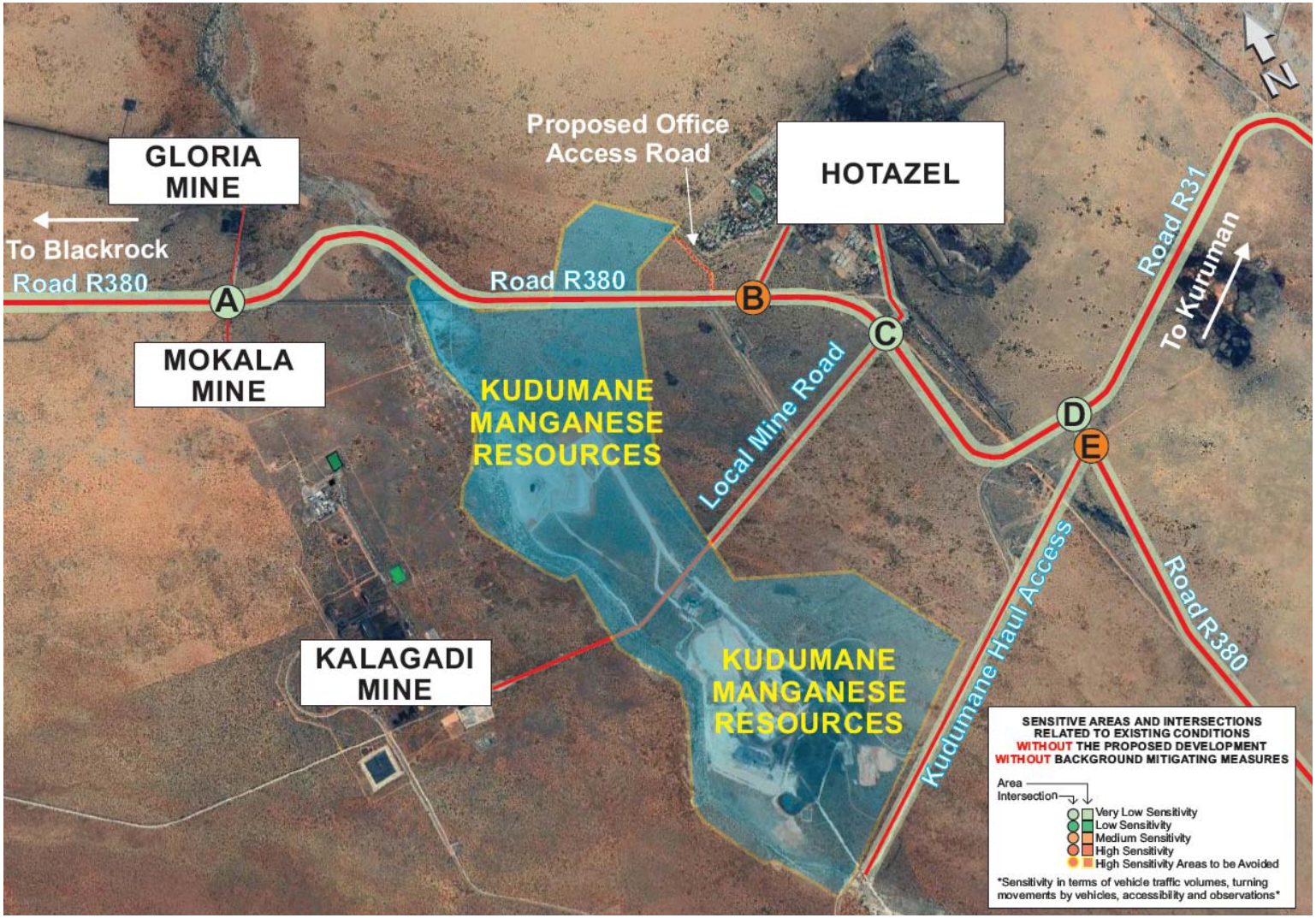


FIGURE 2.3: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING EXISTING SENSITIVE AREAS AND INTERSECTIONS WITHOUT THE PROPOSED KMR EXPANSION PROJECT WITHOUT RECOMMENDED MITIGATING MEASURES

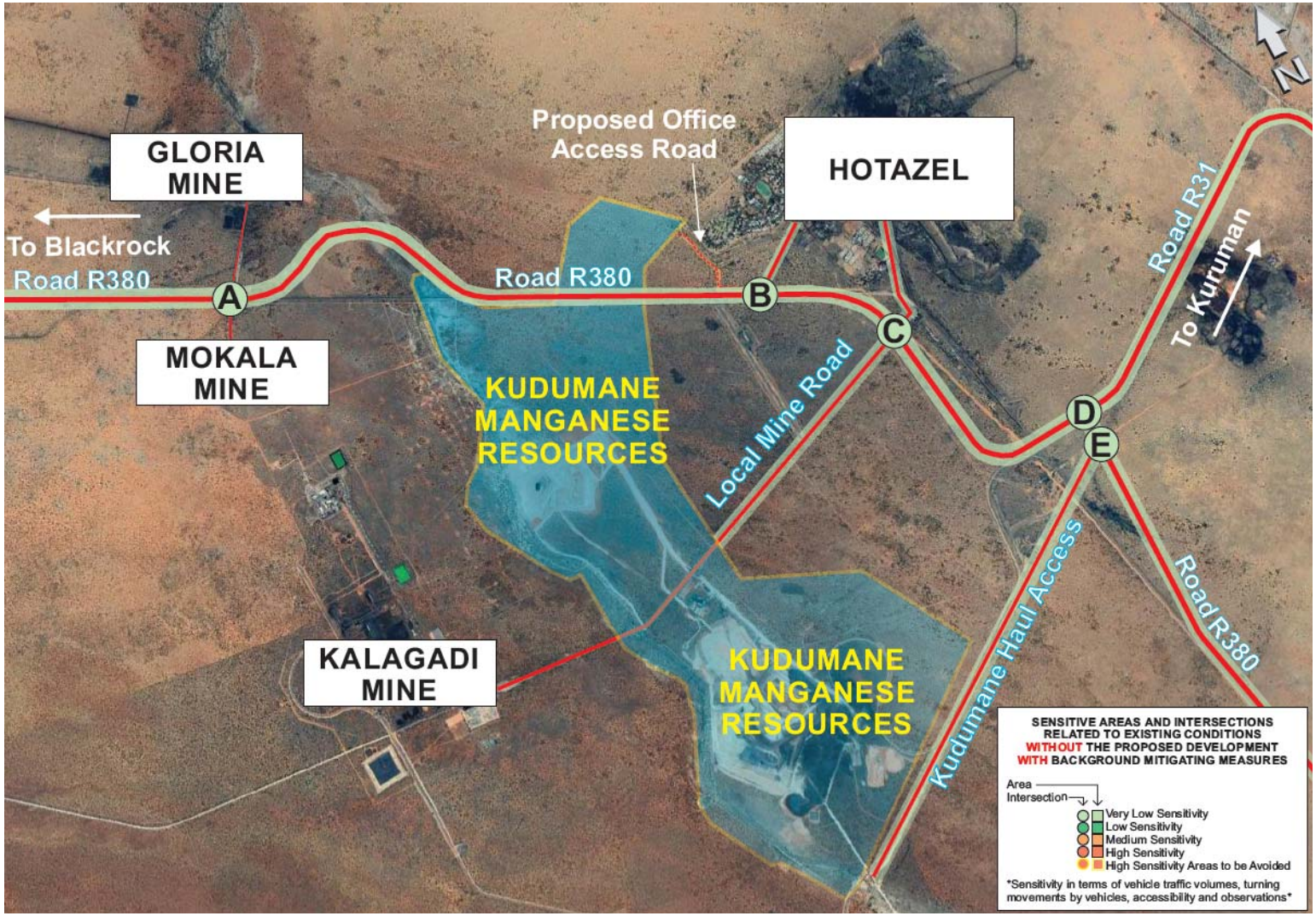


FIGURE 2.4: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING EXISTING SENSITIVE AREAS AND INTERSECTIONS WITHOUT THE PROPOSED KMR EXPANSION PROJECT WITH RECOMMENDED MITIGATING MEASURES

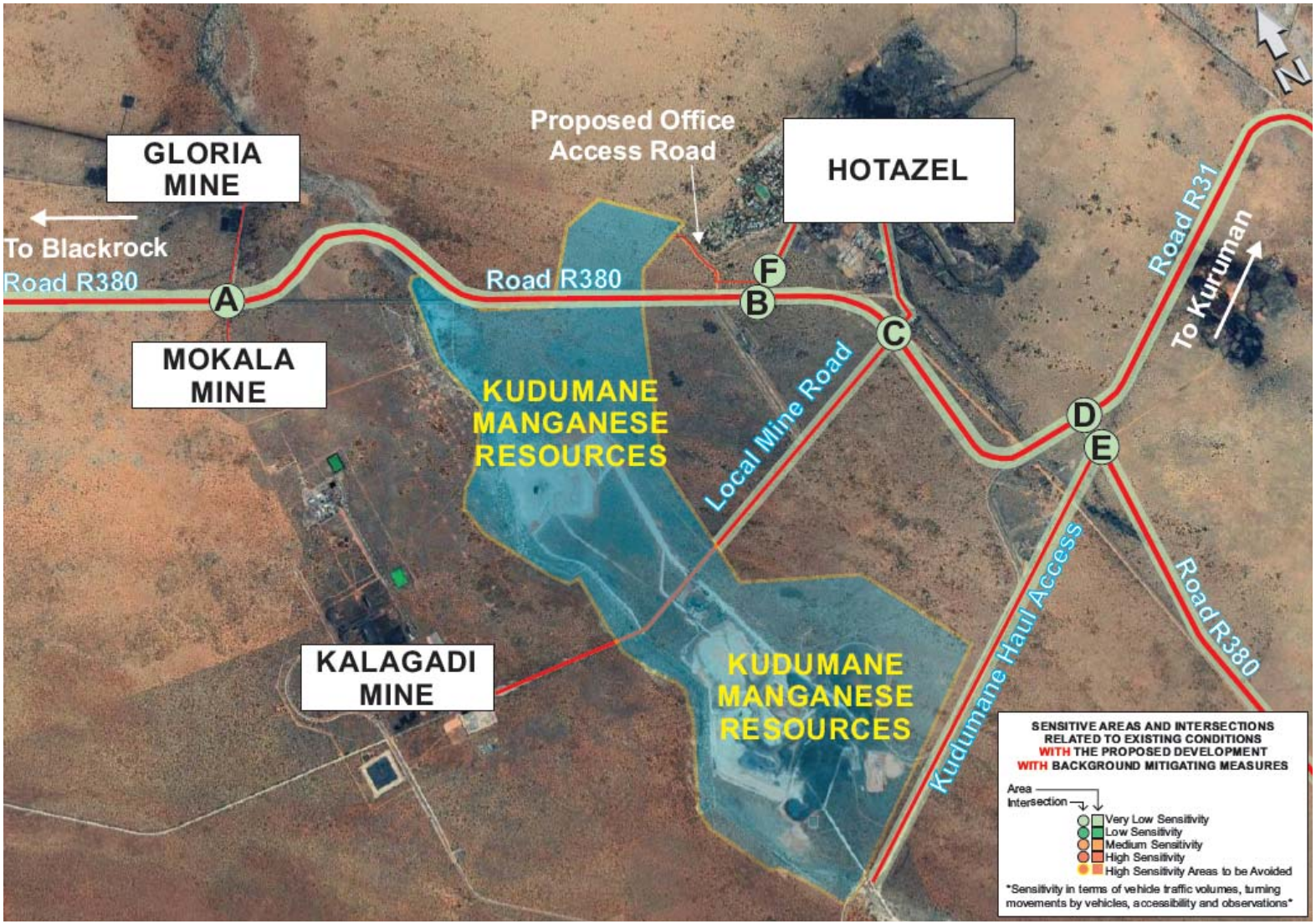


FIGURE 2.5: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING EXISTING SENSITIVE AREAS AND INTERSECTIONS WITH THE PROPOSED KMR EXPANSION PROJECT WITH RECOMMENDED MITIGATING MEASURES

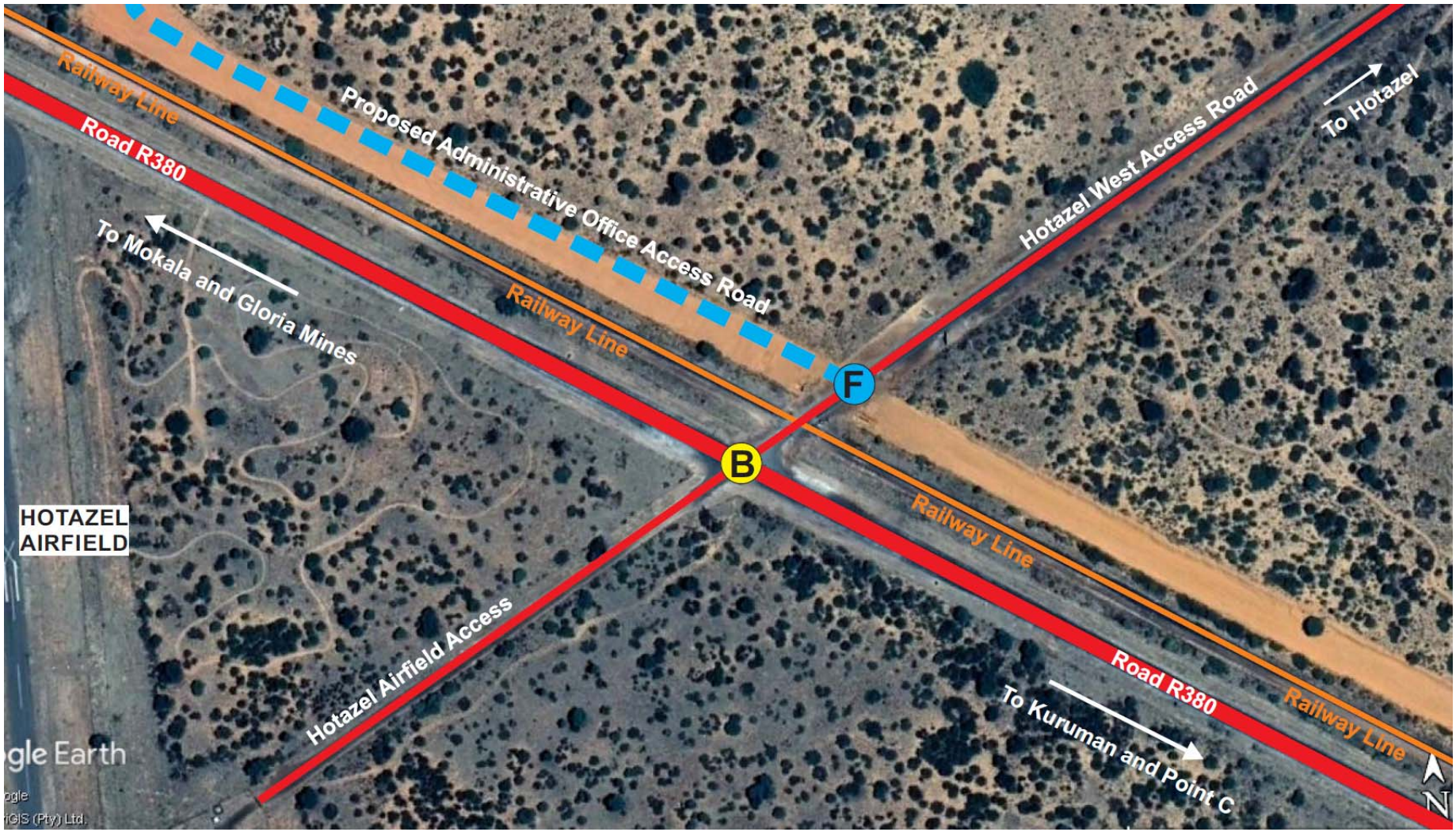


FIGURE 2.6: PROPOSED KIPLING ADMINISTRATIVE OFFICE ACCESS FROM AND TO HOTAZEL WEST ACCESS ROAD

2.6 INFORMATION REQUESTED BY RELEVANT ROAD AUTHORITY

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

2.7 OTHER TRAFFIC-RELATED MATTERS

Table 2.10 provides a summary of the following:

a) Road safety.
b) Non-motorised transport.
c) Public transport.

TABLE 2.10: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS RELEVANT TO ALL PHASES OF THE PROPOSED KMR EXPANSION PROJECT				
Item	**Description of Element**	**General Comments**	**Specific Issues**	**Actions Required**
1.	**ROAD SAFETY MATTERS**			
1.1	**General road safety**	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 on a continuous basis: 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. k) Improper road safety training for workers as well as adjacent communities.	Road safety assessment on roads adjacent to the KMR Mine is recommended to determine the need for: a) Reflective road studs at strategic points. b) Overhead lighting at intersections. c) Road markings which are fading. d) Need for relevant road traffic signs.	In general, the report was compiled so as to address the road safety issues as far as practically possible. Refer to **Section 3.2** for the required and recommended intersection improvements. <u>KMR in conjunction with other mining developments should:</u> a) Collaborate with the relevant road authority and municipality to conduct detailed investigations and to ensure that the road maintenance plan to maintain the relevant road network adjacent to the KMR Mine on which heavy vehicle movement is anticipated incorporates the necessary measures to support road safety conditions. b) Provide mine and contractor workers with training on road safety. c) Run road safety and awareness campaigns at the mine. d) Provide reflective road studs at strategic points (LED if possible) to ensure the safe operation of the relevant intersections under investigation at night-time. e) Provide required road traffic signs (including road markings) for the relevant intersections under investigation.
2.	**NON-MOTORISED TRANSPORT**			
2.1	**Non-motorised transport**	a) Non-mine and mine-related pedestrian activity around the relevant intersections under investigation, with specific reference to Points A, B, and C were observed during the site visit.	a) No pedestrian walkways are provided at Point B in order to split motorised and non-motorised traffic. b) No pedestrian crossings are provided at Point B.	<u>KMR in conjunction with other mining developments, relevant road authority and municipality should provide:</u> a) Paved pedestrian walkways at Point B to create a safe environment for pedestrians to move around within the relevant intersection. b) Provide pedestrian crossings at Point B.
3.	**PUBLIC TRANSPORT**			
3.1	**Public transport**	a) Three types of public transport commuters are relevant: i) Firstly, workers who are travel to and from the existing mining development during all phases. ii) Secondly, visitors to the mining development during all phases. iii) Thirdly, residents of Hotazel. b) On-site loading- and off-loading areas are currently provided where workers are loaded and off-loaded safely.	a) No public transport loading and off-loading lay-bys are provided along Road R380 at Point B.	<u>KMR in conjunction with other mining developments, relevant road authority and municipality should provide:</u> a) Public transport loading and off-loading lay-bys along Road R380 at Point B as close as possible to the intersection.

Section 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 2021 and 2026 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.

The following are discussed in terms of the findings:

a) Traffic impact during the respective phases.
b) Site accessibility.
c) Other traffic-related matters.

3.1.1 TRAFFIC IMPACT WITHOUT THE PROPOSED KMR EXPANSION PROJECT

Table E-1, presented as part of **Appendix E,** provides a summary of the impact ratings respectively without the proposed KMR Expansion Project. **Table E-1** of **Appendix E** was derived from **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 conditions on the existing road network:

a) Without the proposed KMR Expansion Project currently from a road capacity perspective have a low to moderate significance and that no mitigating measures would be required.
b) Without the proposed KMR Expansion Project currently from a road safety perspective overall have a low significance, with the exclusion of the need for dedicated right-turn lanes at intersections B and E, which has a moderate significance. Implementation of the recommended mitigating measures as described in section 3.2 would be positive and improve the significance to low.

3.1.2 TRAFFIC IMPACT DURING THE CONSTRUCTION AND OPERATIONAL PHASES WITH THE PROPOSED KMR EXPANSION PROJECT

Table E-2, presented as part of **Appendix E,** provides a summary of the impact ratings respectively with the proposed KMR Expansion Project. **Table E-2** of **Appendix E** was derived from **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 proposed KMR Expansion Project:

a) That the existing road network with the proposed KMR Expansion Project would from a road capacity perspective remain at a low to moderate significance and that no mitigating measures would be required. The impact of the low number of vehicle trips anticipated to be generated due to the proposed KMR Expansion Project as determined as part of this study is therefore anticipated to have a negligible impact on the significance from a road safety perspective.
b) That the existing road network with the proposed KMR Expansion Project from a road safety perspective would remain at a low significance, as long as mitigating measures as recommended in section 3.2 of this report have been implemented. The impact of the low number of vehicle trips anticipated to be generated due to the proposed KMR Expansion Project as determined as part of this study is therefore anticipated to have a negligible impact on the significance from a road safety perspective.

It is furthermore possible to conclude that owing to the type and nature of the proposed KMR Expansion Project, it is expected that the proposed KMR Expansion Project 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 CLOSURE PHASE WITH THE PROPOSED KMR EXPANSION PROJECT

Table E-3 presented as part of **Appendix E** provides a summary of the impact ratings respectively with the proposed KMR Expansion Project. **Table E-3** of **Appendix E** was derived from **Appendix F** of the report that provides the criteria used in terms of the assessments process.

The closure phase entails the KMR Mining Development closure, where all mining activities cease, the mining company leaves the site and rehabilitation of the site is done. From a road capacity and safety perspective, taking into consideration that the mining company has ceased all operations and vacated the site, an insignificant volume of vehicle trips would still be active on the relevant road network due to the mining development, and is therefore anticipated to have a negligible impact on all road-related elements, and therefore have an insignificant impact.

3.1.4 SITE ACCESSIBILITY

Access to and from the existing KMR Mine is currently gained from the intersection of Road R380, Local Mine Road and Hotazel East Access Road (Point C) which is the main access intersection, and the intersection of Road R380 and Kudumane Haul Access Road (Point E) which is mainly used by haul vehicles. Both these access intersections are existing approved intersections.

As part of the proposed KMR Expansion Project, a new access intersection is proposed from Hotazel West Access Road (Point F) which would provide access to the proposed Kipling Administrative Office. All other proposed activities as part of the proposed KMR Expansion Project is proposed to gain access from the existing access intersections.

The following is important to take into consideration for the proposed access point from Hotazel West Access Road:

a) Due to the locality of the proposed access intersection, which is near a railway crossing, low vehicle speeds were observed.
b) The proposed access would be used by administrative staff only, which was determined as part of this report to be a low number of vehicles.
c) Sight distance at the proposed intersection would be adequate.
d) The life of mine for the KMR Mine due to the proposed KMR Expansion Project is six years.

The access is therefore regarded as acceptable from a traffic engineering point of view. Final requirements and approval should be obtained as part of the detailed design phase of the proposed KMR Expansion Project. **Section 3.2** provides more information on the recommendations for geometric improvements.

3.2 RECOMMENDATIONS

The following are discussed in terms of the recommendations:

a) Detailed summary of recommended improvements without the proposed KMR Expansion Project.
b) Summary of recommended improvements with the proposed KMR Expansion Project.
c) Detailed summary of recommended improvements with the proposed KMR Expansion Project.
d) Institutional arrangements.
e) Reasoned opinion for authorisation.

3.2.1 DETAILED SUMMARY OF RECOMMENDED IMPROVEMENTS WITHOUT THE PROPOSED KMR EXPANSION PROJECT

Table 3.1 provides a short summary of the intersection improvements recommended without the proposed KMR Expansion Project, and whether the improvements are required from an Intersection performance point of view (technical/capacity) or a road safety point of view.

Figure 3.1 provides a graphical presentation of the recommended intersection and road network improvements **WITHOUT** the proposed KMR Expansion Project while **Table 3.2** provides detailed information on intersection improvements recommended **WITHOUT** the proposed KMR Expansion Project.

The TIA does not comment on pavement layer attributes in terms of the relevant road sections. The last-mentioned need to be based on recommendations to be made by a Pavement Design Specialist input.

TABLE 3.1: SUMMARY OF INTERSECTION IMPROVEMENTS RECOMMENDED IN TERMS OF ROAD/EARTHWORKS WITHOUT THE PROPOSED KMR EXPANSION PROJECT			
Point	Intersection Description	**WITHOUT** Proposed KMR Expansion Project	
		Intersection Performance Perspective	Road Safety Perspective
A	Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road	No improvements required.	
B	Intersection of Road R380, Hotazel Airfield Access Road and Hotazel West Access Road	None.	• Provide 60-metre dedicated right-turn lane on southern approach of Road R380.
C	Intersection of Road R380, Hotazel East Access Road and Local Mine Road	• Provide 60 metres dedicated right-turn lane on western approach of Local Mine Access Road.	None.
D	Intersection of Road R380 and Road R31	No improvements required.	
E	Intersection of Road R380 and Kudumane Haul Access Road	None.	• 60-metre dedicated right-turn lane on northern approach of Road R380.
F	Intersection of Hotazel West Access Road and Proposed Administrative Office Access Road	Intersection not relevant to scenarios without the proposed KMR Expansion Project.	

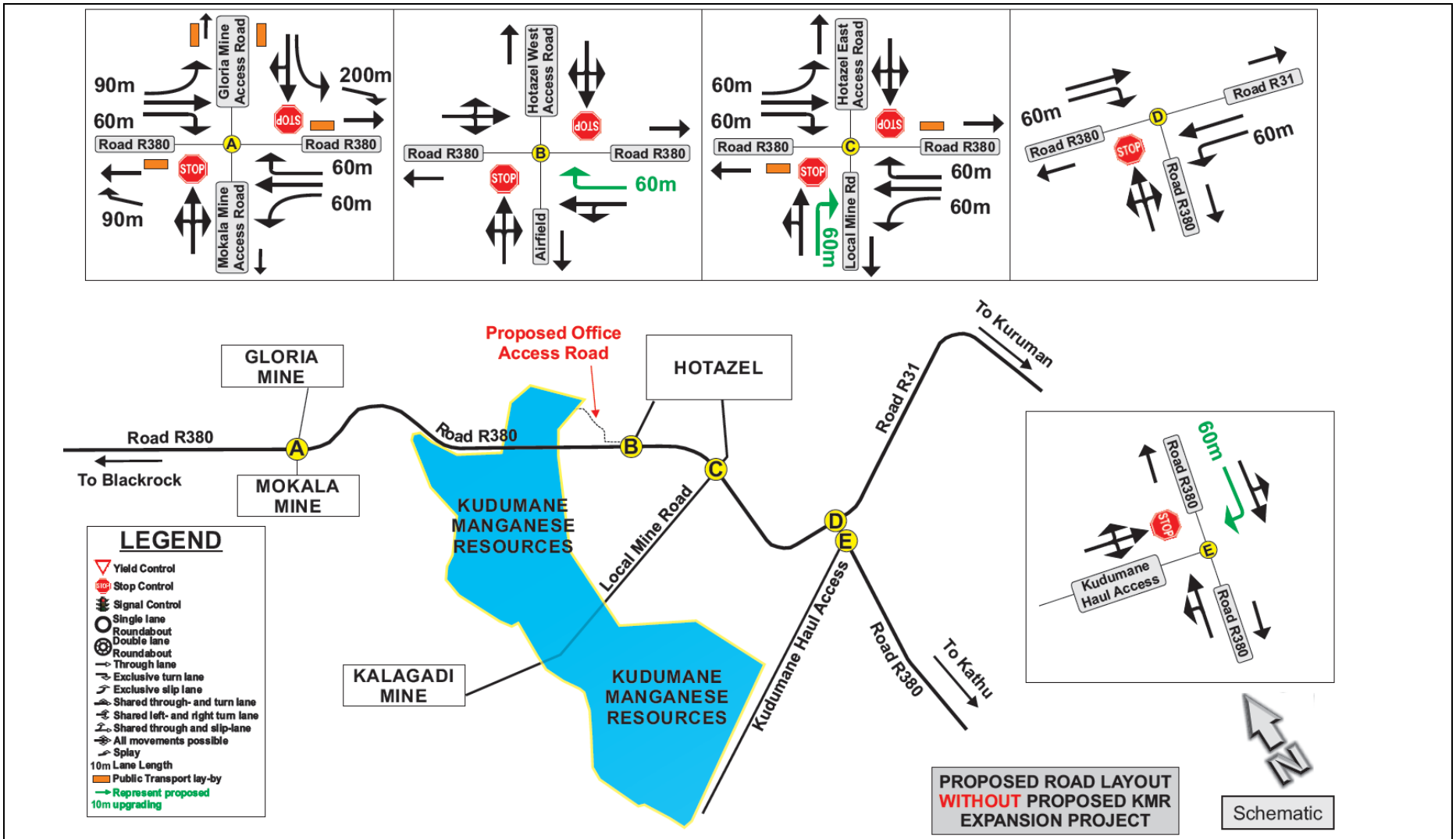


FIGURE 3.1: GRAPHICAL PRESENTATION OF THE RECOMMENDED INTERSECTION AND ROAD NETWORK IMPROVEMENTS WITHOUT THE PROPOSED KMR EXPANSION PROJECT

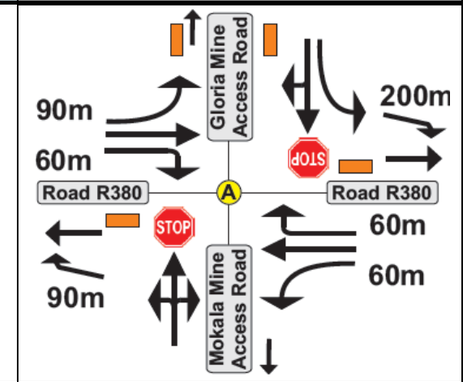
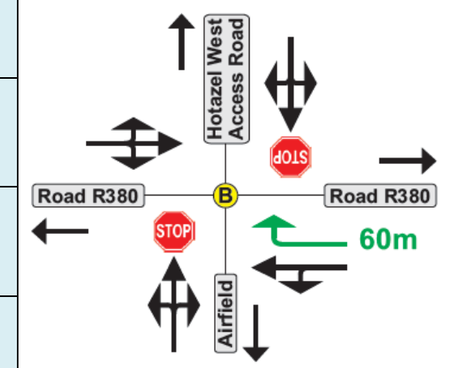
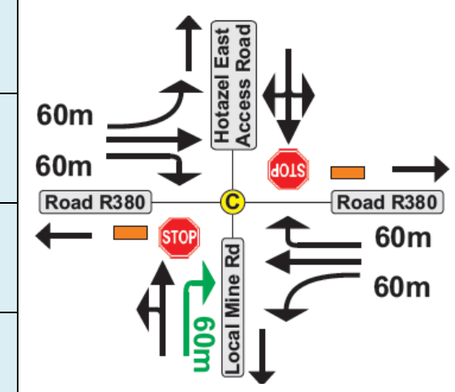
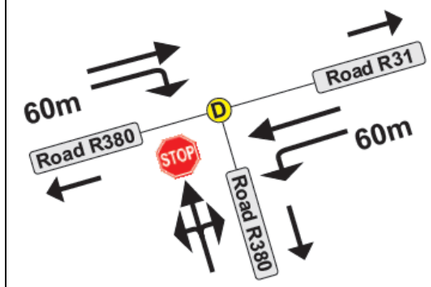
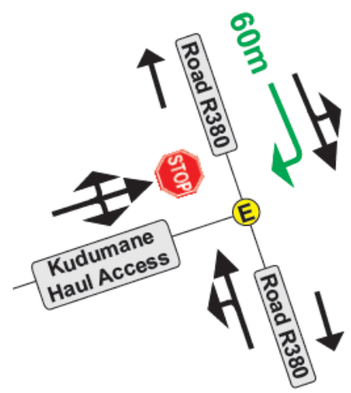
TABLE 3.2: RECOMMENDED ROAD NETWORK IMPROVEMENTS WITHOUT THE KMR EXPANSION PROJECT																				
POINT	INTERSECTION	APPROACH	IMPROVEMENTS RECOMMENDED																	GEOMETRY DETERMINED BY MEANS OF SIDRA
			Approach Traffic Control				Extra Lanes Required (m)													
			Free Flow	Stop	60m Radius Roundabout	Traffic Light System	Left-turn Taper	Left-turn Lane	Acceleration Lane	Acceleration Lane in Middle of Road	Dedicated Right-turn Lane	Number of Extra Through Lanes	Improvements Required from a Road Safety or Intersection Performance Perspective	Improvements Required from a Road Safety or Intersection Performance Perspective	Reflective Road Studs required at Intersection	Road Markings Required	Road Signs Required	Public Transport Loading and Off-Loading	Pedestrian Walkways	
A	Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road	*North (Road R380)*	Yes	-	-	-	No improvements required.													
		East (Gloria Mine Acc)	-	Yes	-	-														
		South (Road R380)	Yes	-	-	-														
		West (Mokala Mine Acc)	-	Yes	-	-														
B	Intersection of Road R380, Hotazel Airfield Access Road and Hotazel West Access Road	*North (Road R380)*	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		East (Hotazel West Acc)	-	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		South (Road R380)	Yes	-	-	-	-	-	-	-	Yes, 60m	-	Road Safety		-	-	-	-	-	
		West (Hotazel Airfield Acc)	-	Yes	-	-	-	-	-	-	-	-	-		-	-	-	-	-	
C	Intersection of Road R380, Hotazel East Access Road and Local Mine Road	*North (Road R380)*	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		East (Hotazel East Acc)	-	Yes	-	-	-	-	-	-	-	-	-		-	-	-	-	-	
		South (Road R380)	Yes	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	
		West (Local Mine Rd)	-	Yes	-	-	-	-	-	-	Yes, 60m	-	Performance		-	-	-	-	-	

TABLE 3.2: RECOMMENDED ROAD NETWORK IMPROVEMENTS WITHOUT THE KMR EXPANSION PROJECT (Continue...)

POINT	INTERSECTION	APPROACH	IMPROVEMENTS RECOMMENDED																GEOMETRY DETERMINED BY MEANS OF SIDRA
			Approach Traffic Control				Extra Lanes Required (m)												
			Free Flow	Stop	60m Radius Roundabout	Traffic Light System	Left-turn Taper	Left-turn Lane	Acceleration Lane	Acceleration Lane in Middle of Road	Dedicated Right-turn Lane	Number of Extra Through Lanes	Improvements Required from a Road Safety or Intersection Performance Perspective	Improvements Required from a Road Safety or Intersection Performance Perspective	Reflective Road Studs required at Intersection	Road Markings Required	Road Signs Required	Public Transport Loading and Off-Loading	Pedestrian Walkways	
D	Intersection of Road R380 and Road R31	*East (Road R31)*	Yes	-	-	-	No improvements required.												
		South (Road R380)	-	Yes	-	-													
		West (Road R380)	Yes	-	-	-													
E	Intersection of Road R380 and Kudumane Haul Access Road	*North (Road R380)*	Yes	-	-	-	-	-	-	-	Yes, 60m	-	Road Safety	Yes	Yes	Yes	Yes	-	-	
		South (Road R380)	Yes	-	-	-	-	-	-	-	-	-	-		Yes	Yes	Yes	-	-	
		West (Kudumane Haul Acc	-	Yes	-	-	-	-	-	-	-	-	-		Yes	Yes	Yes	-	-	
F	Intersection of Hotazel West Access Road and Proposed Administrative Office Access Road	Intersection not relevant to scenarios without the proposed KMR Expansion Project.																	

3.2.2 DETAILED SUMMARY OF RECOMMENDED IMPROVEMENTS WITH THE PROPOSED KMR EXPANSION PROJECT

Table 3.3 provides a short summary of the intersection improvements recommended with the proposed KMR Expansion Project, and whether the improvements are required from an Intersection performance point of view (technical/capacity) or a road safety point of view.

Figure 3.2 provides a graphical presentation of the recommended intersection and road network improvements **WITH** the proposed KMR Expansion Project while **Table 3.4** provides detailed information on intersection improvements recommended **WITH** the proposed KMR Expansion Project.

TABLE 3.3: SUMMARY OF INTERSECTION IMPROVEMENTS RECOMMENDED IN TERMS OF ROAD/EARTHWORKS WITH THE PROPOSED KMR EXPANSION PROJECT			
Point	Intersection Description	**WITHOUT** Proposed KMR Expansion Project	
		Intersection Performance Perspective	Road Safety Perspective
A	Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road	No improvements required.	
B	Intersection of Road R380, Hotazel Airfield Access Road and Hotazel West Access Road	No improvements required.	
C	Intersection of Road R380, Hotazel East Access Road and Local Mine Road	No improvements required.	
D	Intersection of Road R380 and Road R31	No improvements required.	
E	Intersection of Road R380 and Kudumane Haul Access Road	No improvements required.	
F	Intersection of Hotazel West Access Road and Proposed Administrative Office Access Road	• Construct an access road to gain access from and to the proposed administrative office.	None.

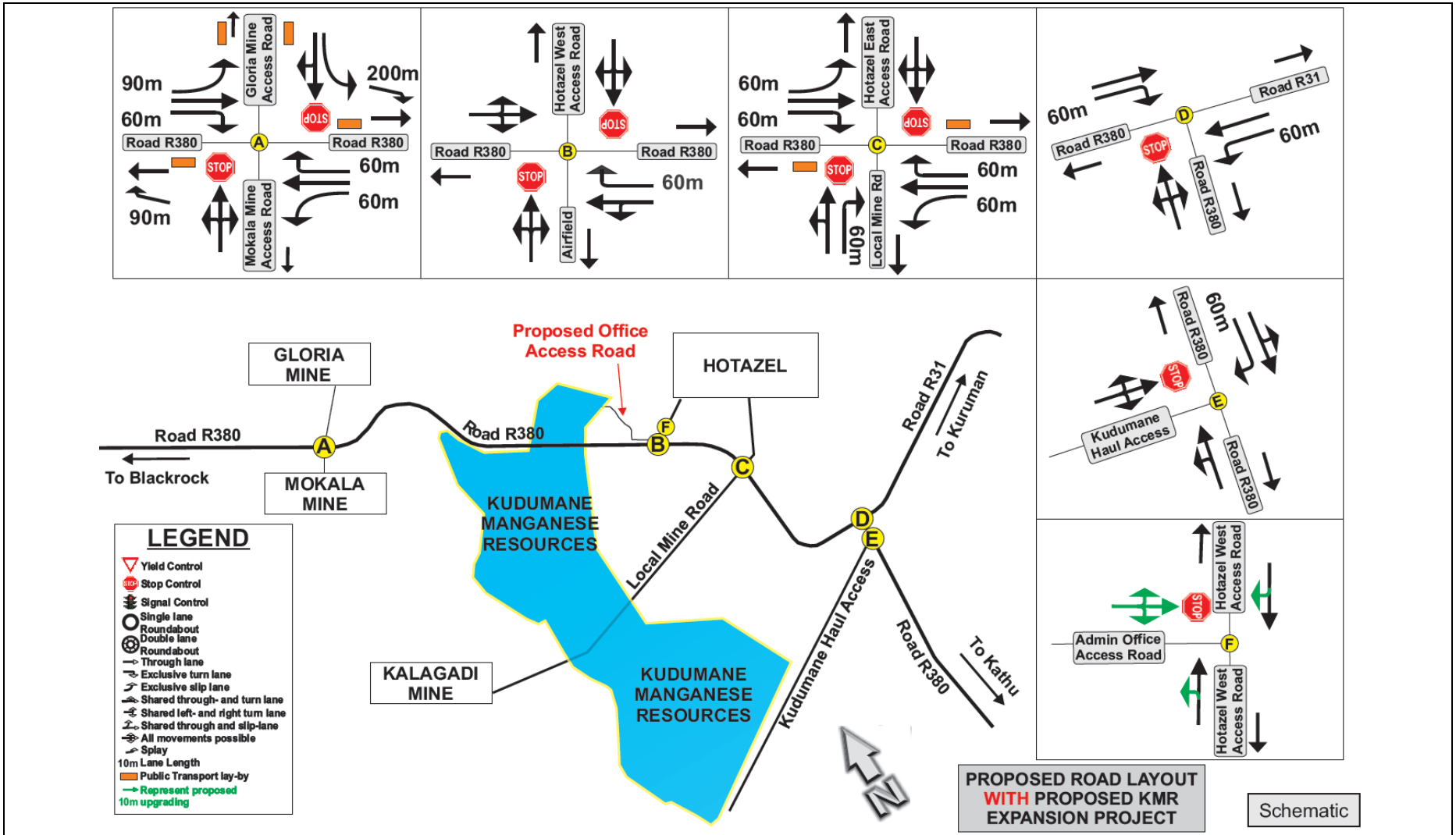


FIGURE 3.2: GRAPHICAL PRESENTATION OF THE RECOMMENDED INTERSECTION AND ROAD NETWORK IMPROVEMENTS WITH THE PROPOSED KMR EXPANSION PROJECT

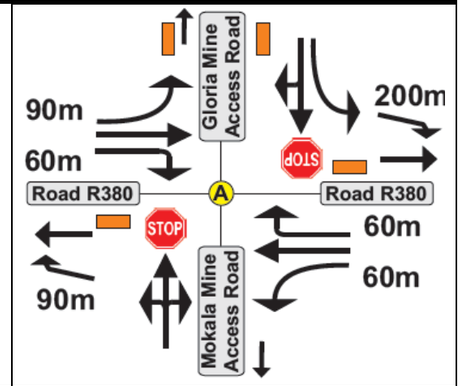
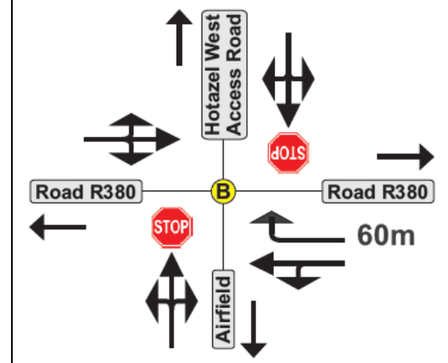
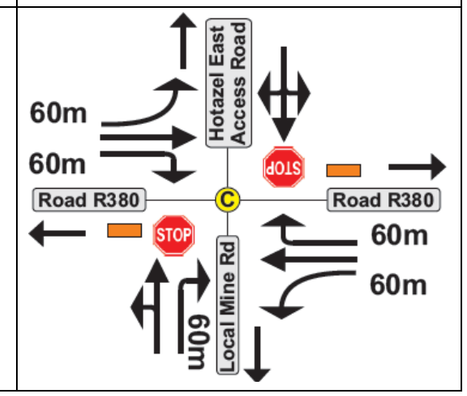
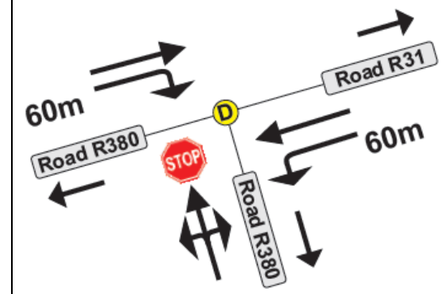
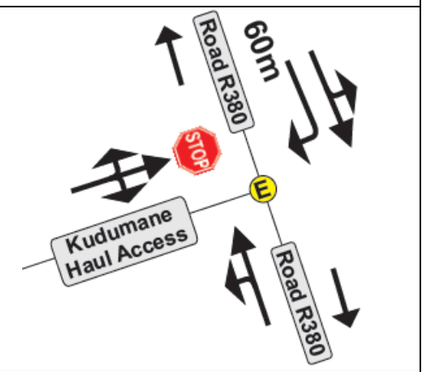
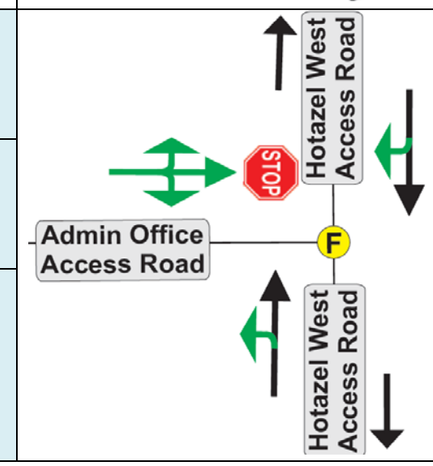
TABLE 3.4: RECOMMENDED ROAD NETWORK IMPROVEMENTS WITHOUT THE KMR EXPANSION PROJECT																			
POINT	INTERSECTION	APPROACH	IMPROVEMENTS RECOMMENDED																GEOMETRY DETERMINED BY MEANS OF SIDRA
			Approach Traffic Control				Extra Lanes Required (m)						Improvements Required from a Road Safety or Intersection PErformance Perspective	Reflective Road Studs required at Intersection	Road Markings Required	Road Signs Required	Public Transport Loading and Off-Loading	Pedestrian Walkways	
			Free Flow	Stop	60m Radius Roundabout	Traffic Light System	Left-turn Taper	Left-turn Lane	Acceleration Lane	Acceleration Lane in Middle of Road	Dedicated Right-turn Lane	Number of Extra Through Lanes							
A	Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road	*North (Road R380)*	Yes	-	-	-	No improvements required.												
		East (Gloria Mine Acc)	-	Yes	-	-													
		South (Road R380)	Yes	-	-	-													
		West (Mokala Mine Acc)	-	Yes	-	-													
B	Intersection of Road R380, Hotazel Airfield Access Road and Hotazel West Access Road	*North (Road R380)*	Yes	-	-	-	No improvements required.												
		East (Hotazel West Acc)	-	Yes	-	-													
		South (Road R380)	Yes	-	-	-													
		West (Hotazel Airfield Acc)	-	Yes	-	-													
C	Intersection of Road R380, Hotazel East Access Road and Local Mine Road	*North (Road R380)*	Yes	-	-	-	No improvements required.												
		East (Hotazel East Acc)	-	Yes	-	-													
		South (Road R380)	Yes	-	-	-													
		West (Local Mine Rd)	-	Yes	-	-													

TABLE 3.4: RECOMMENDED ROAD NETWORK IMPROVEMENTS WITHOUT THE KMR EXPANSION PROJECT (Continue...)																				
POINT	INTERSECTION	APPROACH	IMPROVEMENTS RECOMMENDED																	GEOMETRY DETERMINED BY MEANS OF SIDRA
			Approach Traffic Control				Extra Lanes Required (m)													
			Free Flow	Stop	60m Radius Roundabout	Traffic Light System	Left-turn Taper	Left-turn Lane	Acceleration Lane	Acceleration Lane in Middle of Road	Dedicated Right-turn Lane	Number of Extra Through Lanes	Improvements Required from a Road Safety or Intersection Performance Perspective	Improvements Required from a Road Safety or Intersection Performance Perspective	Reflective Road Studs required at Intersection	Road Markings Required	Road Signs Required	Public Transport Loading and Off-Loading	Pedestrian Walkways	
D	Intersection of Road R380 and Road R31	*East (Road R31)*	Yes	-	-	-	No improvements required.													
		South (Road R380)	-	Yes	-	-														
		West (Road R380)	Yes	-	-	-														
E	Intersection of Road R380 and Kudumane Haul Access Road	*North (Road R380)*	Yes	-	-	-	No improvements required.													
		South (Road R380)	Yes	-	-	-														
		West (Kudumane Haul Acc	-	Yes	-	-														
F	Intersection of Hotazel West Access Road and Proposed Administrative Office Access Road	*North (Hotazel West Acc)*	Yes	-	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-		
		South (Hotazel West Acc	Yes	-	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-		
		West (Proposed Access)	-	Yes	-	-	-	-	-	-	-	1	Access	-	Yes	Yes	-	-		

3.2.3 INSTITUTIONAL ARRANGEMENTS

The following recommendations are made in terms of the detailed design phase of roads as part of the existing KMR Mine and the proposed KMR Expansion 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 of the roads where consumables, ROM 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, ROM 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 KMR Expansion Project would have a minimal impact during all phases on the relevant roads network as long as the mitigating measures are implemented as recommended as part of **Section 3** of this report, ROM ore is transported within mine site boundaries (not making use of public roads) and the processed product is exported by rail. The proposed KMR Expansion is therefore recommended to be granted authorisation.