

DRAFT MEMORANDUM

TRAFFIC IMPACT ASSESSMENT

**PROPOSED ENERGY CONVERSION PROJECT AT THE
EXISTING LION FERROCHROME SMELTER COMPLEX,
SITUATED NEAR STEELPOORT WITHIN THE
LIMPOPO PROVINCE**



MARCH 2022

Prepared for:

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Bendor, 0699**

Siyazi Reference: 21061



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 alternative	Section 2.5, Page 21
An identification of any areas to be avoided, including buffers	Section 2.5, Page 21
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 2.5, Page 21
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.1.1, Page 8
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
Any other information requested by the competent authority.	Not relevant

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 in a cursive style.

Date: 22 March 2022

VERIFICATION PAGE


PROJECT NAME:	PROPOSED ENERGY CONVERSION PROJECT AT THE EXISTING LION FERROCHROME SMELTER COMPLEX, SITUATED NEAR STEELPOORT WITHIN THE LIMPOPO PROVINCE	
<u>Project No:</u> 21061	<u>Date:</u> March 2022	<u>Report Status:</u> Draft V1-0
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The undersigned has been appointed as the registered professional for this Traffic Impact Assessment 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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ECSA Registration Number:	960547 (See Appendix G of report)	
Signature:		

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Section 1

INTRODUCTION

Siyazi Limpopo Consulting Services (Pty) Ltd. was appointed by nettZero to conduct a Traffic Impact Assessment (TIA) for the proposed Energy Conversion Project to be situated at the existing Lion Ferrochrome Smelter Complex near Steelpoort within the Limpopo Province, hereafter referred to as the Proposed Project.

The Proposed Project involves the construction and commissioning of an energy conversion facility, converting thermal energy in the excess furnace gas produced by the Smelter complex into electrical energy in Swedish Stirling's propriety power generation technology (PWR BLOK 400-F units). The estimated heat capacity will be 37,5 MW and the total contracted output electrical capacity will be 10 MW. The power conversion units in the PWR BLOKs are considered reciprocating engines with the supply of electrical energy back to the Smelter Complex to the energy conversion facilities gas intake works.

The purpose of this study is to undertake an assessment of the implications of the vehicle traffic that could potentially be generated due to the Proposed Project and:

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

Figure 1.1 provides a graphical presentation of the locality of the Proposed Project while **Figure 1.2** provides a graphical presentation of the proposed conceptual site layout.

Table 1.1 provides a summary of information of the Proposed Project in terms of the planned operations 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 operations are planned for and does not depict the exact month and or year that operations are planned.

Table 1.2 provides information on the relevant intersections under investigation as part of the Proposed Project.



FIGURE 1.1: GRAPHICAL PRESENTATION OF THE LOCALITY OF THE PROPOSED PROJECT

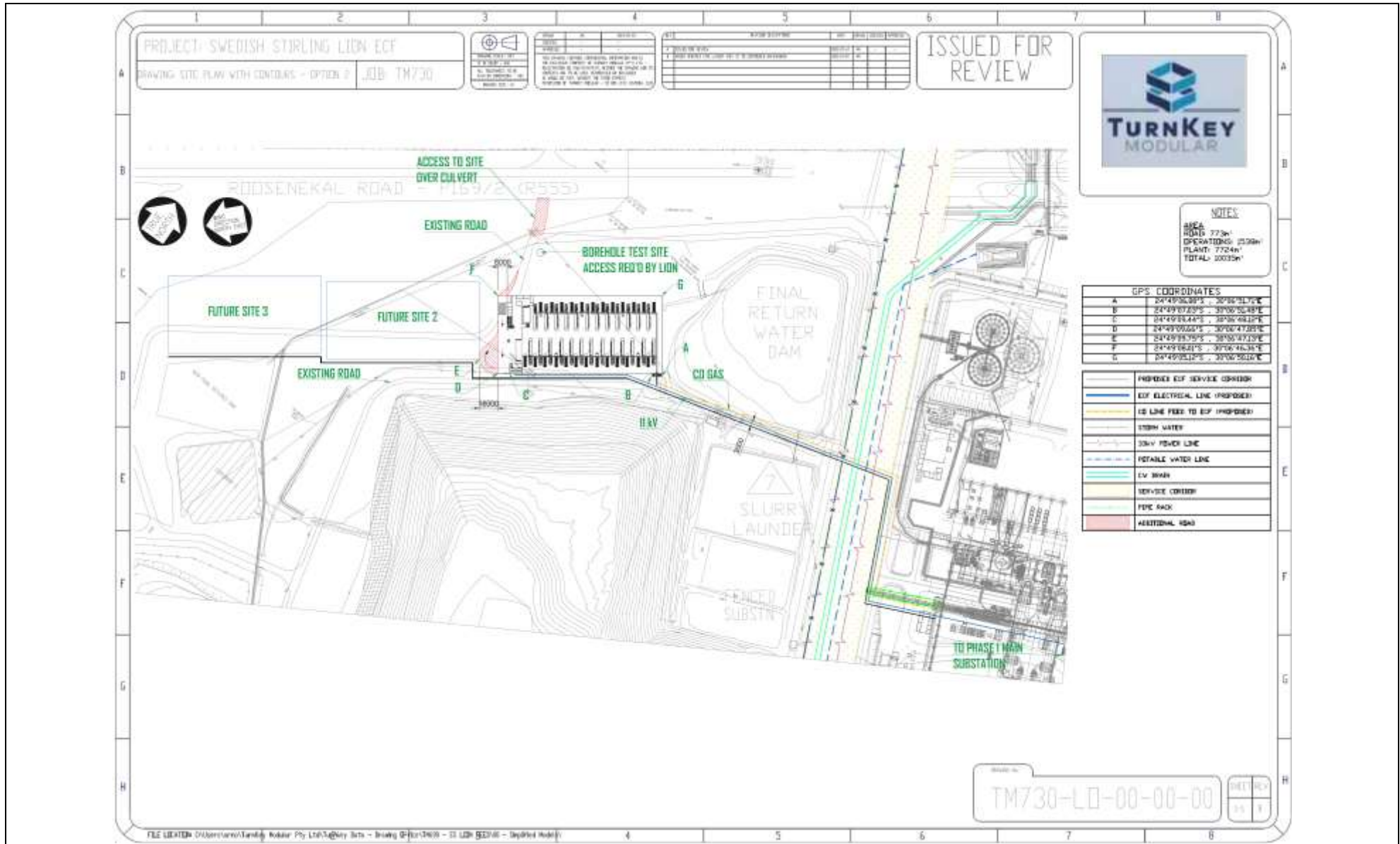



FIGURE 1.2: GRAPHICAL PRESENTATION OF THE PROPOSED CONCEPTUAL SITE LAYOUT

Source: TurnKey Modular

TABLE 1.1: SUMMARY OF THE EXTENT OF THE PROPOSED PROJECT FOR THE RESPECTIVE PHASES

ITEM	DESCRIPTION	PHASE	
		CONSTRUCTION	OPERATIONAL
a)	Duration of phase	21 months with a 8 month pause in construction between month 9 and 17. Actual month for construction activity = 13 months.	± 20 years.
b)	Expected number of heavy vehicles delivering consumables and plant materials per day	Maximum 40 per day.	Maximum 2 per day.
c)	Expected percentage of heavy vehicles delivering consumables or plant materials during traffic peak times	20%.	50%.
d)	Number of construction staff per day	Maximum 55 at peak of construction activities.	Not relevant.
e)	Number of shifts for construction staff per day	1 shift per day.	Not relevant.
f)	Number of workers per day	Not relevant.	i) 9 Technicians. ii) 2 Security staff (2 at day, 2 at night). iii) 1 Admin clerk iv) 1 Cleaning staff.
g)	Where staff are anticipated to reside	Within the Greater Tubatse and Makhuduthamaga Local Municipalities.	
h)	Abnormal vehicles delivering large components	Once-off events.	Once-off events.
i)	Access road to proposed project	From Road R555 via existing Smelter Access Road (Point A).	Same as for Construction Phase.
j)	Calculated number of vehicle trips to be generated by the proposed project during AM or PM peak hours	i) AM Peak: 26 (In: 15, Out: 11). ii) PM Peak: 26 (In: 11, Out: 15).	i) AM Peak: 8 (In: 6, Out: 2). ii) PM Peak: 8 (In: 2, Out: 6).

TABLE 1.2: RELEVANT INTERSECTIONS UNDER INVESTIGATION

POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES		INTERSECTION PHOTO
			LATITUDE	LONGITUDE	
A	Existing	Road R555 / Existing Smelter Access Road.	S24°49'15.81"	E30° 6'31.07"	

SCOPE OF WORK DETERMINED FROM ANTICIPATED NUMBER OF VEHICLE TRIPS TO BE GENERATED BY THE PROPOSED PROJECT

The number of additional vehicle trips to be generated by the proposed Project was calculated at 26 vehicles per hour during the AM and PM peaks for the construction phase (short term), and 8 vehicles per hour during the AM and PM peaks for the operational phase (long term). Based on the “COTO, TMH 16 Volume 1 South African Traffic Impact and Site Traffic Assessment Manual Version 1.0 August 2012”:

Traffic Impact Assessments (TIAs) must be undertaken when:

- a) An application is submitted for a change in land use.
- b) The highest total additional hourly vehicular trip generation (including pass-by and diverted trips) as a result of the application, exceeds 50 trips per hour.

Site Traffic Assessments (STAs) must, however, be undertaken when:

- a) An application is submitted for the erection of a building or other structure (roads and other) on a site for which a Site Development Plan (SDP) is required.
- b) Proposals are made for transportation facilities (roads and other) in a township during Township Establishment.

Since the calculated number of vehicle trips to be generated by the Proposed Project during the construction and operational phases is less than 50 vehicles per hour during the AM and PM Peaks (Refer to Section 2 of the report for detailed calculations), and that technically no change in land use is relevant as part of the Proposed Project since the land is already zoned for mining purposes and the Proposed Project will form part of the existing mining activities, it is only required to conduct a Site Traffic Assessment (STA). Investigations from a traffic engineering perspective for the Proposed Project was therefore limited to the existing intersection of Road R555 and Existing Smelter Access Road (Point A) from where access is proposed to be gained to the Proposed Project.

The following scenarios were investigated as part of the TIA:

- a) **Scenario 1:** 2022 peak hour traffic (Status quo) **without** the Proposed Project.
- b) **Scenario 2:** 2022 peak hour traffic **with** the Proposed Project (Construction Phase).
- c) **Scenario 3:** 2027 peak hour traffic **without** the Proposed Project.
- d) **Scenario 4:** 2027 peak hour traffic **with** the Proposed Project (Operational Phase).

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 the 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 Project which consists of the following information:
 - i. Existing land use information.
 - ii. Existing road characteristics and modal distribution.
 - iii. Traffic counts as basis for making traffic-engineering calculations.
- b) The future land use and road network characteristics relevant to the Proposed 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 Project.
 - ii. Determination of vehicle trips expected to be generated due to the Proposed Project
- c) Access to and from the Proposed Project.
- d) The current and future levels of service at the relevant intersections under investigation.
- e) Other traffic-related matters.

The following subsection elaborates on the above mentioned.

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.
- c) Traffic counts conducted as a basis for making traffic calculations.

2.1.1 EXISTING LAND USE INFORMATION

The relevant portion of the property where the Proposed Project is proposed to be located is currently vacant and borders the existing Lion Ferrochrome Smelter Complex on the eastern side.


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

- a) The vehicle traffic absorption rate (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 Project (background traffic) between the 2022 to 2027 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) **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*” Urban areas.

TABLE 2.1: SUMMARY OF INTERSECTION CONTROL AT EXISTING INTERSECTION UNDER INVESTIGATION				
POINT	DESCRIPTION	INTERSECTION CONTROL	PEDESTRIAN ACTIVITIES	INTERSECTION PHOTO
A	Road R555 / Existing Smelter Access Road	Free flow along Road R555.	No Pedestrian activity observed during surveys.	

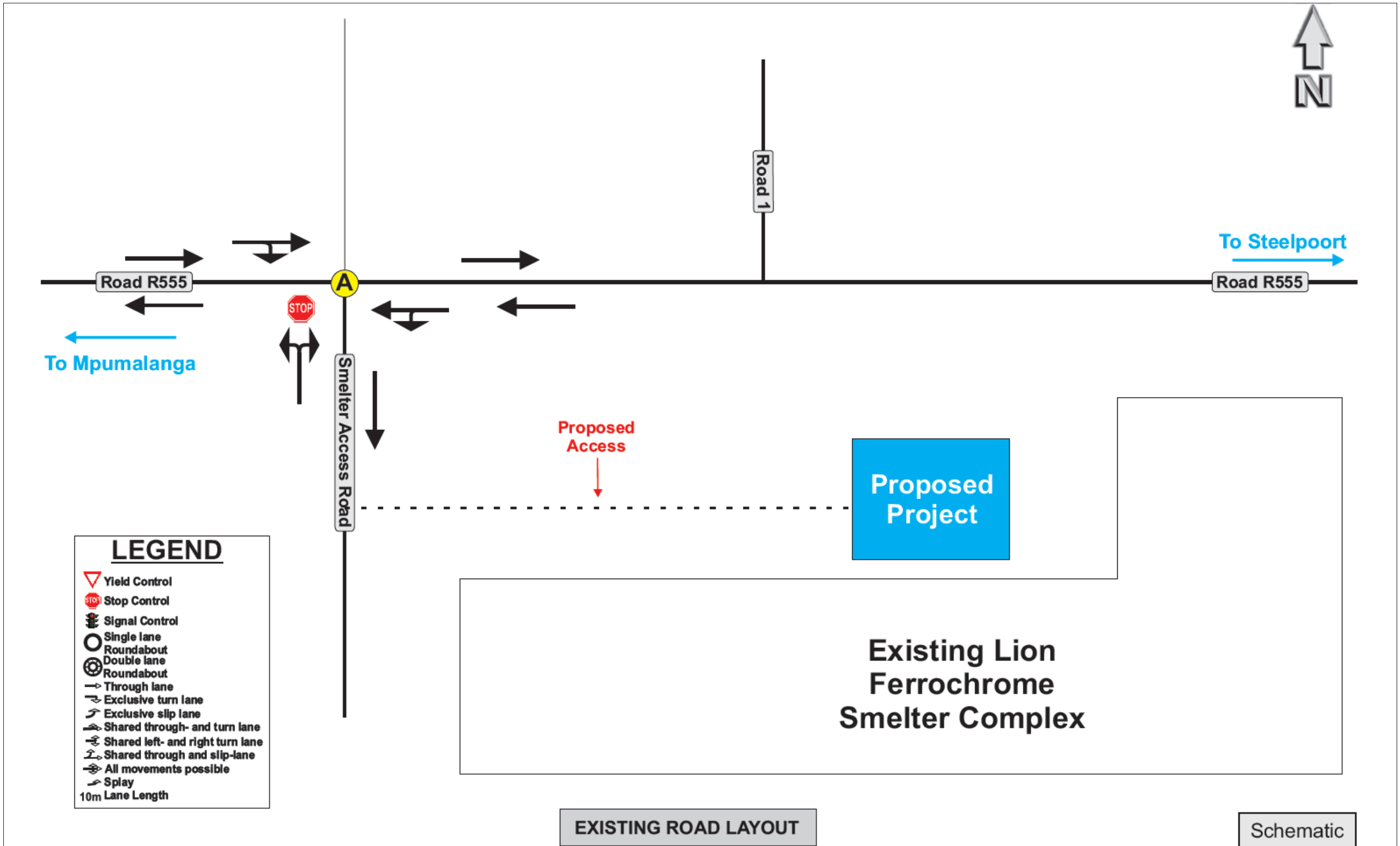




FIGURE 2.1: EXISTING ROAD NETWORK LAYOUT

TABLE 2.2: SUMMARY OF ROAD CHARACTERISTICS

RELEVANT ROAD SECTION	PICTURE OF ROAD SECTION	ASSUMED EXISTING FUNCTIONAL 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 5 Years	Speed Limit																								
Road Section 1 Road R555 National Road linking Mpumalanga to Steelpoort and ultimately to Road R37 at Burgersfort, and Makhuduthamag a Local Municipality through Steel Bridge		Assumed Primary Function: Mobility	Assumed Proposed Function: Mobility	SANRAL	±40m	One lane per direction	3.5m wide	Asphalt	None.	3%	60km/h																								
		<table border="1"> <thead> <tr> <th>Class</th> <th>Class No.</th> <th>Route No.</th> <th>Class</th> <th>Class No.</th> <th>Route No.</th> </tr> </thead> <tbody> <tr> <td>Major Arterial</td> <td>U2</td> <td>R</td> <td>Major Arterial</td> <td>U2</td> <td>R</td> </tr> </tbody> </table>	Class									Class No.	Route No.	Class	Class No.	Route No.	Major Arterial	U2	R	Major Arterial	U2	R	<table border="1"> <thead> <tr> <th>Class</th> <th>Class No.</th> <th>Route No.</th> <th>Class</th> <th>Class No.</th> <th>Route No.</th> </tr> </thead> <tbody> <tr> <td>Major Arterial</td> <td>U2</td> <td>R</td> <td>Major Arterial</td> <td>U2</td> <td>R</td> </tr> </tbody> </table>	Class	Class No.	Route No.	Class	Class No.	Route No.	Major Arterial	U2	R	Major Arterial	U2	R
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		Major Arterial	U2									R	Major Arterial	U2	R																				
		Class	Class No.									Route No.	Class	Class No.	Route No.																				
Major Arterial	U2	R	Major Arterial	U2	R																														
Description: Highway	Description: Highway																																		
Spacing between Intersections: 800m ±20%	Spacing between Intersections: 800m ±20%																																		
Road Section 3 Existing Smelter Access Road		Assumed Primary Function: Mobility	Assumed Proposed Function: Mobility	Private Access Road	±20m	One lane per direction	3.5m wide	Asphalt	None.	N/a	40km/h																								
		<table border="1"> <thead> <tr> <th>Class</th> <th>Class No.</th> <th>Route No.</th> <th>Class</th> <th>Class No.</th> <th>Route No.</th> </tr> </thead> <tbody> <tr> <td>Local Road</td> <td>U5a</td> <td>N/a</td> <td>Local Road</td> <td>U5a</td> <td>N/a</td> </tr> </tbody> </table>	Class									Class No.	Route No.	Class	Class No.	Route No.	Local Road	U5a	N/a	Local Road	U5a	N/a	<table border="1"> <thead> <tr> <th>Class</th> <th>Class No.</th> <th>Route No.</th> <th>Class</th> <th>Class No.</th> <th>Route No.</th> </tr> </thead> <tbody> <tr> <td>Local Road</td> <td>U5a</td> <td>N/a</td> <td>Local Road</td> <td>U5a</td> <td>N/a</td> </tr> </tbody> </table>	Class	Class No.	Route No.	Class	Class No.	Route No.	Local Road	U5a	N/a	Local Road	U5a	N/a
		Class	Class No.									Route No.	Class	Class No.	Route No.																				
		Local Road	U5a									N/a	Local Road	U5a	N/a																				
		Class	Class No.									Route No.	Class	Class No.	Route No.																				
Local Road	U5a	N/a	Local Road	U5a	N/a																														
Description: Commercial Access Street	Description: Commercial Access Street																																		
Spacing between Intersections: N/a	Spacing between Intersections: N/a																																		

Note: Road R555 adjacent to the Proposed Project is functioning as an urban area up to Steelpoort to the eastern direction.

**TABLE 2.3: URBAN FUNCTIONAL ROAD CLASIFICATION
(COTO TRH26 - SOUTH AFRICAN ROAD CLASIFICATION AND ACCESS MANAGEMENT MANUAL VERISON 1.0 AUGUST 2012)**

FUNCTION			DESCRIPTION		MOBILITY				TRAFFIC	
BASIC FUNCTION	ALTERNATE FUNCTIONAL DESCRIPTION	DETERMINING FUNCTION	CLASS NO (U_)	CLASS NAME	THROUGH TRAFFIC COMPONENT	DISTANCE BETWEEN PARALLEL ROADS (km)	% OF BUILT KM	REACH OF CONNECTIVITY	EXPECTED RANGE OF ADT (AVERAGE DAILY TRAFFIC)	% OF TRAVEL VEH-KM
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.	U1	Principal arterial (freeway)	Exclusively	5 - 10km	5 - 10% Classes U1 and U2	> 20km	40 000 - 120 000+	40 - 65% Classes U1 and U2
			U2	Major arterial	Predominant	1.5 - 5.0km			20 000 - 60 000	
			U3	Minor arterial	Major	0.8 - 2.0km	15 - 25% Classes U1, U2 and U3	> 10km	10 000 - 40 000	65 - 80% Classes U1, U2 and U3
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.	U4a	Collector street, commercial	Discourage	-	5 - 10%	> 2km	< 25 000	5 - 10%
			U4b	Collector street, residential	Discourage	-		< 2 to 3km	< 10 000	
			U5a	Local street, commercial	Prevent	-	65 - 80%	< 1km	< 5 000	10 - 30%
			U5b	Local street, residential	Prevent	-		< 0.5km (1km Max)	< 1 000	
			U6a	Walkway, pedestrian priority	Ban	-	-	-	-	-
			U6b	Walkway, pedestrian only	Ban	-	-	-	-	-

TABLE 2.4: URBAN 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 (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 lane 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 lane 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 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-motorized priority	Pedestrian priority	No	500m maximum	Yes	Yes, if parking lot on woonerf	15	None, pedestrians have right of way	Surfaced	-	-	If applicable, anywhere	Yes, or use roadway	Rare	Yes
	U6b	Walkway, non-motorized 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 can be considered if access spacing requirements met and there is no future need for public road.

** Partial and marginal access at reduced spacing allowed to relieve congestion, reduce excessive travel distance or remove the need for full intersections.

2.1.3 TRAFFIC COUNTS AS BASIS FOR MAKING TRAFFIC-ENGINEERING CALCULATIONS

In order to gain a better understanding of the existing vehicle traffic patterns and movements adjacent to the Proposed Project, 12-hour manual traffic counts were conducted at the existing intersections that would potentially be affected by the Proposed 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 26 November 2021 at the Intersection of Road R555 and Existing Smelter Access Road.

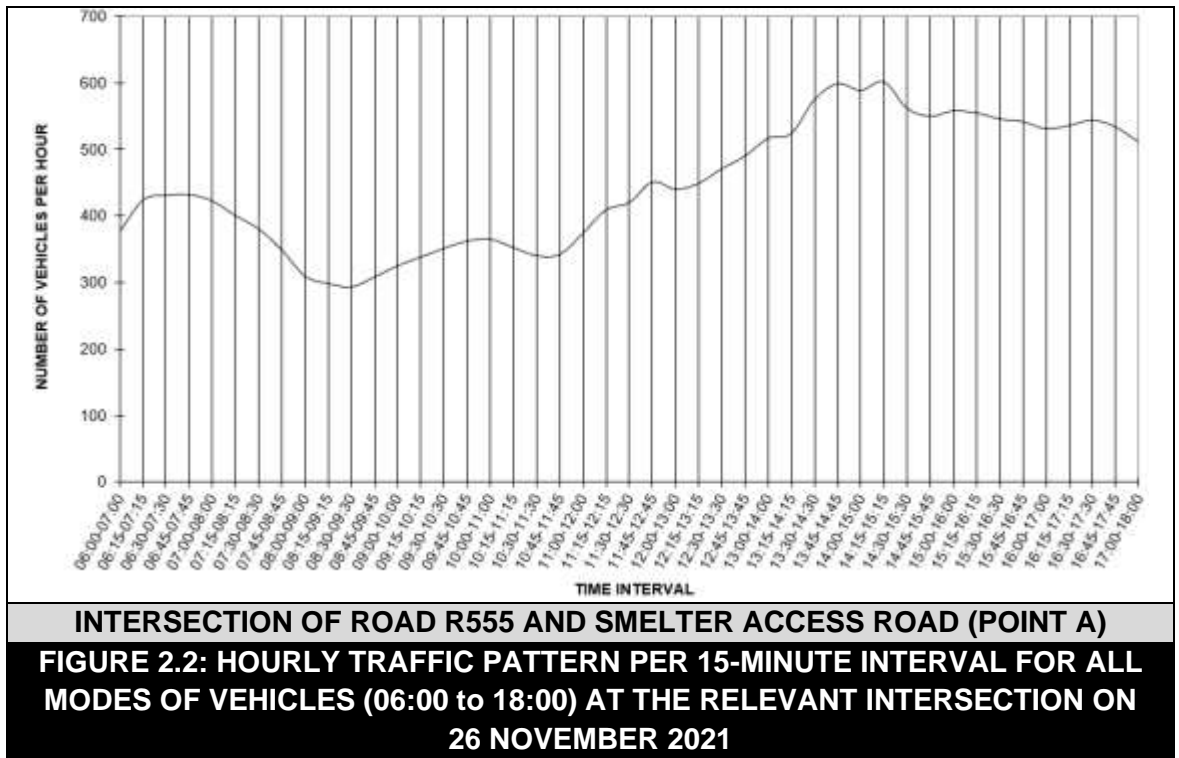
The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 26 November 2021 between 06:00 and 18:00 are indicated in **Table A-1 of Appendix A** of this report. The description of the relevant vehicle movements at the relevant intersection appears in **Figure A-1 of Appendix A**. **Figure B-1** provides a graphical presentation of the peak-hour traffic volumes as derived from the relevant manual traffic 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 Project (see **Table 1.1**) would fall within the existing vehicle traffic peak times for the purpose of the TIA.

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 R555 and Existing Smelter Access Road	06:45 to 07:45	432	14:15 to 15:15	602

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 26 November 2021. 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:

- 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 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

No information of any latent rights (planned or other known developments within the study area) is readily available at the time of conducting this study, and it was therefore assumed that there were no known approved latent rights within the vicinity of the Proposed Project.

2.2.2 INFORMATION ABOUT THE EXPECTED FUTURE MODAL DISTRIBUTION

Figure B-2 of **Appendix B** indicates, 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 2.6 indicate the trip generation rates and the number of vehicle trips which are expected to be generated due to the proposed activities of the Proposed Project for the construction phase, while **Table 2.7** provide 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.

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

The detailed traffic-related investigation was conducted for the operational phase of the proposed mining development expansion. The following figures are relevant:

- a) **Figure B-1:** 2022 peak hour traffic (background traffic) without the Proposed Project (**Scenario 1**).
- b) **Figure B-2:** Projected vehicle trip distribution for the Proposed Project (All Modes).
- c) **Figure B-3:** Projected vehicle trips to be generated by the Proposed Project (2022 Construction Phase).
- d) **Figure B-4:** Projected 2022 peak hour traffic with the Proposed Project (**Scenario 2 (Construction Phase)**).
- e) **Figure B-5:** Projected 2027 peak hour traffic without the Proposed Project (**Scenario 3**).
- f) **Figure B-6:** Projected vehicle trips to be generated by the Proposed Project (2027 Operational Phase).
- g) **Figure B-7:** Projected 2027 peak hour traffic with the Proposed Project (**Scenario 4 (Operational Phase)**).

TABLE 2.6: TRIP GENERATION RATES AND EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED DUE TO THE PROPOSED PROJECT AND THE DISTRIBUTION OF VEHICLE TRIPS (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	In	Out	In	Out		
AM Peak Hour																			
1.	Construction workers (using private transport = 20%)	17	100%	17				4,0	Trips per Worker (4 Persons per Vehicle)	1	4	0	0	4	0,25	100%	0%	4	0
2.	Construction workers (Transported via hired transport = 70%)	39	100%	39				15,0	15 persons per vehicle (Vehicle deliver workers and leave site empty)	1	3	1	3	6	0,13	50%	50%	3	3
3.	Heavy vehicles delivering consumables and plant materials per day (Worst Case Scenario)				40	20%	8	1,0	Delivery vehicles expected during peak periods as worst-case	1	8	1	8	16	2,00	50%	50%	8	8
TOTAL														26				15	11
PM Peak Hour																			
1.	Construction workers (using private transport = 20%)	17	100%	17				4,0	Trips per Worker (4 Persons per Vehicle)	0	0	1	4	4	0,25	0%	100%	0	4
2.	Construction workers (Transported via hired transport = 70%)	39	100%	39				15,0	15 persons per vehicle (Vehicle collect workers and leave site full)	1	3	1	3	6	0,13	50%	50%	3	3
3.	Heavy vehicles delivering consumables and plant materials per day (Worst Case Scenario)				40	20%	8	1,0	Delivery vehicles expected during peak periods as worst-case	1	8	1	8	16	2,00	50%	50%	8	8
TOTAL														26				11	15



TABLE 2.7: TRIP GENERATION RATES AND EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED DUE TO THE PROPOSED PROJECT AND THE DISTRIBUTION OF VEHICLE TRIPS (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	Calc Column	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.	Technicians	6	100%	6				6	4,0	Trips per Worker (4 Persons per Vehicle).	1	2	0	0	2	0,25	100%	0%	2	0		
2.	Security Staff	2	100%	2				2	4,0	Trips per Worker (4 Persons per Vehicle). Day shift in, night shift out)	1	1	1	1	2	1,00	50%	50%	1	1		
3.	Admin Clerk	1	100%	1				1	4,0	Trips per Worker (4 Persons per Vehicle).	1	1	0	0	1	1,00	100%	0%	1	0		
4.	Cleaning Staff	1	100%	1				1	4,0	Trips per Worker (4 Persons per Vehicle).	1	1	0	0	1	1,00	100%	0%	1	0		
5.	Heavy vehicles delivering consumables				2	50%	1	1	1,0	Delivery vehicles expected during peak periods as worst-case scenario	1	1	1	1	2	2,00	50%	50%	1	1		
TOTAL																8					6	2
PM Peak Hour																						
1.	Technicians	6	100%	6				6	4,0	Trips per Worker (4 Persons per Vehicle).	0	0	1	2	2	0,25	0%	100%	0	2		
2.	Security Staff	2	100%	2				2	4,0	Trips per Worker (4 Persons per Vehicle). Day shift in, night shift out)	1	1	1	1	2	1,00	50%	50%	1	1		
3.	Admin Clerk	1	100%	1				1	4,0	Trips per Worker (4 Persons per Vehicle).	0	0	1	1	1	1,00	0%	100%	0	1		
4.	Cleaning Staff	1	100%	1				1	4,0	Trips per Worker (4 Persons per Vehicle).	0	0	1	1	1	1,00	0%	100%	0	1		
5.	Heavy vehicles delivering consumables				2	50%	1	1	1,0	Delivery vehicles expected during peak periods as worst-case scenario	1	1	1	1	2	2,00	50%	50%	1	1		
TOTAL																8					2	6

2.3 ACCESS TO AND FROM THE PROPOSED PROJECT

Access to and from the Proposed Project is proposed to be gained via the existing Smelter Access Road which currently intersects with Road R555 at the intersection of Road R555 and Existing Smelter Access Road (Point A).

The existing intersection (Point A) is deemed suitable for access to and from the Proposed Project from Road R555 based on intersection stopping and decision sight distance requirements guided by the “*Committee of Transport Official TMH 16 Volume 2 South African Traffic Impact and Site Traffic Assessment Standards and Requirements Guideline version 1.01 February 2014*” and from a road geometry perspective. **Table 2.8** respectively provides sight distance information as determined by a visual inspection.

TABLE 2.8: AVAILABLE INTERSECTION STOPPING AND DECISION SIGHT DISTANCE AT THE EXISTING INTERSECTION OF ROAD R555 AND SMELTER ACCESS ROAD (POINT A)		
Relevant Picture		
	Eastbound	Westbound
Coordinates	S 24°49'16.05"	E 30° 6'30.98"
Required Stopping Sight Distance at recommended 60 km/h	85m	85m
Available Stopping Sight Distance	500m	500m
Required Decision Sight Distance at 60 km/h	170m	170m
Available Decision Sight Distance	500m	500m

2.4 DETERMINATION OF THE LEVELS OF SERVICE AT THE RELEVANT INTERSECTION

The “*SIDRA Intersection*” software was used as an aid for the design and evaluation of the relevant intersections. The following intersection was evaluated for levels of service:

- a) **Point A:** Intersection of Road R555 and Existing Smelter Access Road.

In **Appendix C Tables C-1 to C-4** indicates 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 2022 (background traffic) **without** the Proposed Project (**Scenario 1**).
- b) **Table C-2:** Levels of service for various approaches for the year 2022 (background traffic) **with** the Proposed Project (**Scenario 2 (Construction Phase)**).
- c) **Table C-3:** Levels of service for various approaches for the year 2027 (background traffic) **without** the Proposed Project (**Scenario 3**).
- d) **Table C-4:** Levels of service for various approaches for the year 2027 (background traffic) **with** the Proposed Project (**Scenario 4 (Operational Phase)**).

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

- a) The existing intersection evaluated as part of this study is currently operating at acceptable levels of service.
- b) The acceptable levels of service would remain relevant for at least the next five years should the background vehicle traffic (non-proposed projected related traffic) grow at 3% per annum.
- c) Levels of service would remain acceptable with the additional of the vehicle trips anticipated to be generated by the Proposed Project for the construction and operational phases, relevant to the 2022 and 2027 evaluated scenarios.
- d) No additional road infrastructure is required from a vehicle capacity point of view.
- e) Reserve vehicle capacity is available at the relevant intersections evaluated on the existing road network.

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 Project.

TABLE 29: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTION WITH THE PROPOSED PROJECT

Point	Intersection	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles		Reserve Capacity Available		Actual Number of Vehicles		Reserve Capacity Available	
						2022 Existing		2022 Existing		Projected 2027 with proposed project		Projected 2027 with proposed project	
						AM	PM	AM	PM	AM	PM	AM	PM
A	Intersection of Road R555 and Existing Smelter Access Road	East (Road R555)	1100	1	1100	235	383	865	817	268	440	832	660
		South (Smelter Access)	Not applicable. Access Road.										
		West (Road R555)	1100	1	1100	185	325	915	775	210	372	890	728

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

Sensitive road sections and Intersections related to existing conditions **without** and **with** the Proposed 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** and **with** the Proposed Project:

- a) **Figures 2.3:** Sensitive Road sections and Intersections indicating existing sensitive areas and Intersections **WITHOUT** the Proposed Project.
- b) **Figures 2.4:** Sensitive Road sections and Intersections indicating predicted sensitive areas and Intersections, **WITH** the Proposed Project, **WITHOUT** mitigating measures.
- c) **Figures 2.5:** Sensitive Road sections and Intersections indicating predicted sensitive areas and Intersections, **WITH** the Proposed Project, **WITH** mitigating measures.

It can be concluded from **Figures 2.3 to 2.6** that:

- a) In general, the existing road network and intersections under investigation is predicted to have a low sensitivity from a road capacity and intersection safety perspective.
- b) With the implementation of the Proposed Project, the sensitivity of the intersection under investigation (Point A) would increase to a medium sensitivity from an intersection safety perspective, due to the lack a dedicated right-turn lane on the western approach of Road R555.
- c) Implementing recommended mitigating measures as discussed in section 3 of this report, would improve the sensitivity at the intersection under investigation (Point A) from medium to low sensitivity.

Refer to **Section 3** of this report for more information regarding required and/or recommended road network improvements.





FIGURE 2.4: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING PREDICTED SENSITIVE AREAS AND INTERSECTIONS, WITH THE PROPOSED PROJECT, WITHOUT MITIGATING MEASURES



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 authorities 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

Item	Description of Element	General Comments	Specific Issues	Actions Required
3. ROADS SAFETY MATTERS				
3.1	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 on a continuous basis:</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. 	a) Point A does not have any dedicated right-turn or left-turn deceleration lanes and is a road safety concern.	a) As part of existing road conditions at Point A with the Proposed Project, provision of dedicated right-turn and left-turn deceleration lanes are recommended from a road safety perspective due to the Proposed Project.
4. NONMOTORISED TRANSPORT				
4.1	Non-motorised transport	a) No pedestrian activity was observed during a site visit at the relevant intersections under investigation.	a) None.	a) None.
5. PUBLIC TRANSPORT				
5.1	Public transport	<p>a) Two types of public transport commuters are relevant to the area under investigation:</p> <ul style="list-style-type: none"> i) Firstly, workers who travel to and from the area. ii) Secondly, visitors to the area. <p>In general, public transport loading and off-loading within the area under investigation is established with dedicated areas for loading and off-loading passengers further west around the Lion Ferrochrome Smelter.</p> <p>Providing loading and off-loading laybys along Road R555 near Point A would be possible if required.</p>	a) Workers will be loaded and off-loaded on site, and therefore no issues.	a) None.

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 AND RECOMMENDATIONS

The following are discussed in terms of the findings and recommendations:

- a) Traffic impact during the respective phases.
- b) Site accessibility.
- c) Summary of required improvements as part of the Proposed Project.
- d) Other traffic related recommendations.
- e) Environmental impact ratings related to Traffic Engineering.
- f) Institutional arrangements.
- g) Reasoned opinion for authorisation.

3.1.1 TRAFFIC IMPACT DURING THE RESPECTIVE PHASES

The capacity calculations for the TIA were conducted for the years 2022 and 2027 respectively. The last-mentioned time frame is in line with Traffic Engineering guidelines and practice and determined by the expected number of vehicle trips that could potentially be generated during any specific peak hour by a specific development.

Owing to the type and nature of the proposed activities as part of the Proposed Project, it is expected that the Proposed Project will have a manageable impact on vehicle traffic during all phases, provided that road infrastructure improvements are implemented as indicated in **Tables 3.1** and **3.2** and **Figure 3.1** in order to mitigate the impact of the Proposed Project.

3.1.2 SITE ACCESSIBILITY

Proper, safe, and reliable access could be provided to the Proposed Project from and to Road R555 via the existing intersection of Road R555 and Existing Smelter Access Road (Point A), provided that the required alterations are made to the road network as indicated as part of **Section 3.1.3**.

3.1.3 SUMMARY OF REQUIRED IMPROVEMENTS AS PART OF THE PROPOSED PROJECT

Table 3.1 provides a short summary of the improvements required as part of the Proposed Project, and whether the improvements are required from an Intersection performance point of view (Technical / Capacity) or a road safety point of view.

The intersection of Road R555 and Existing Smelter Access Road is an existing intersection which was constructed many years ago and is currently provides access to maintenance activities at the Lion Ferrochrome Smelter only. The smelter mainly gains access from Road D212 and therefore improvements to the intersection of Road R555 and Existing Smelter Access Road (Point A) without the Proposed Project is not justified, and due to the latest regulations and traffic engineering practice, improvements from a road safety perspective is required.

Figure 3.1 provides a graphical presentation of the required intersection and road network improvements as part of the Proposed Project while **Table 3.2** provides detailed information on Intersection improvements recommended as part of the Proposed 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 REQUIRED IN TERMS OF ROAD / EARTH WORKS AS PART OF THE PROPOSED PROJECT			
Point	Intersection Description	Intersection Performance Perspective	Road Safety Perspective
A	Intersection of Road R555 and Existing Smelter Access Road	No	Yes

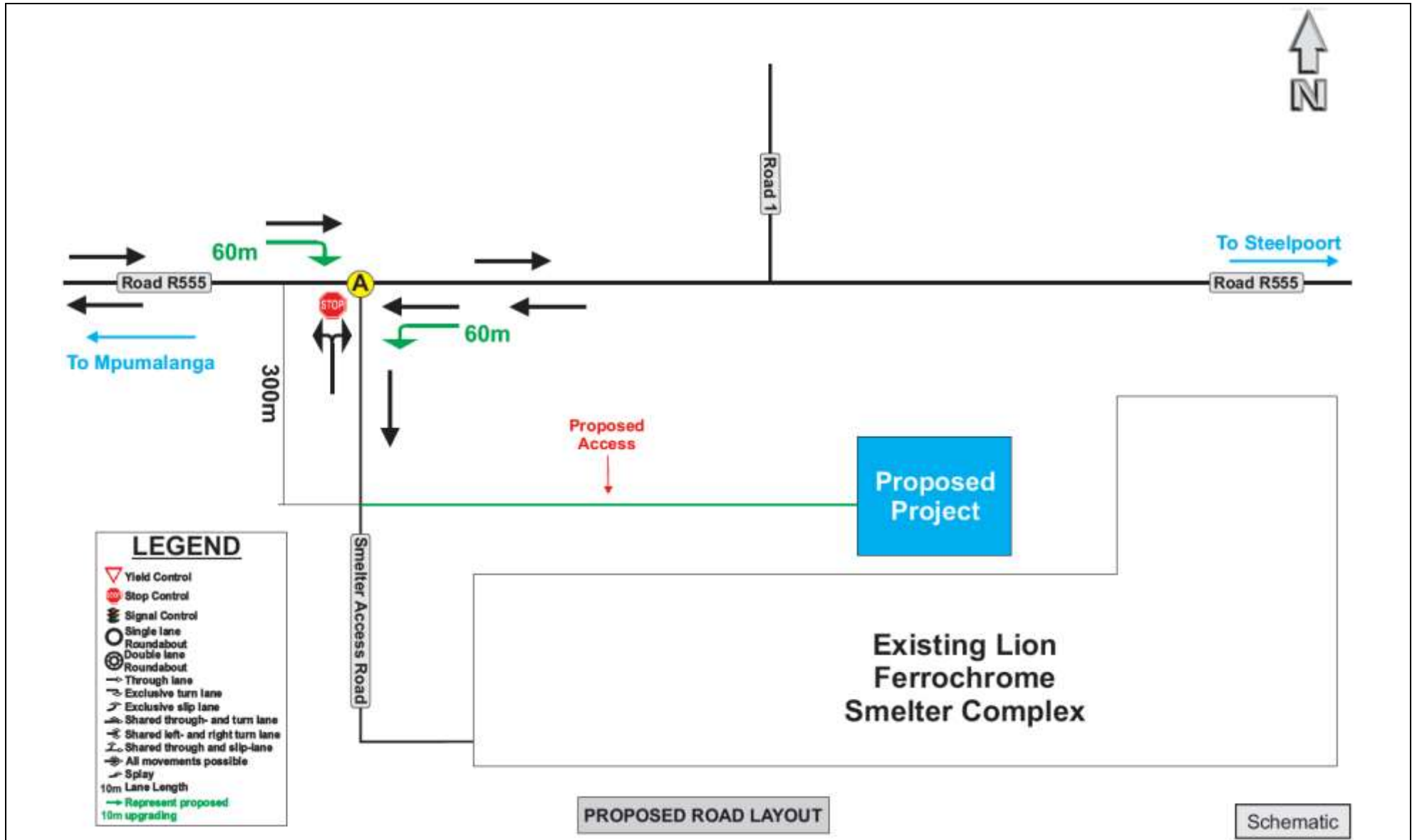
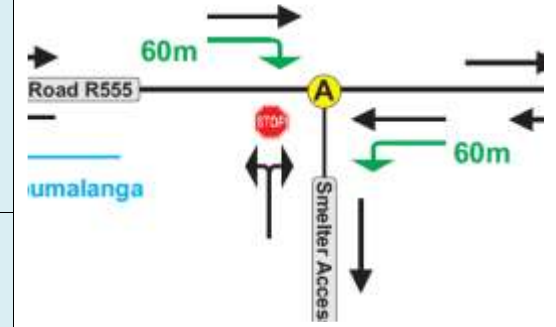


FIGURE 3.1: GRAPHICAL PRESENTATION OF THE REQUIRED INTERSECTION AND ROAD NETWORK IMPROVEMENTS AS PART OF THE PROPOSED PROJECT

TABLE 3.2: REQUIRED ROAD NETWORK IMPROVEMENTS AS PART OF THE PROPOSED PROJECT

POINT	INTERSECTION	APPROACH	IMPROVEMENTS REQUIRED										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 Deceleration Lane	Acceleration Lane	Acceleration Lane in Middle of Road	Dedicated Right-Turn Lane	Number of Extra Through Lanes											
A	Intersection of Road R555 and Smelter Access Road	East (Road R555)	Yes	-	-	-	-	Yes, 60 meters	-	-	-	-	Road Safety	Yes	Yes	Yes	-	-					
		South (Smelter Acc)	-	Yes	-	-	-	-	-	-	-	-	N/a		Yes	Yes	Yes	-	-				
		West (Road R555)	Yes	-	-	-	-	-	-	-	Yes, 60 meters	-	Road Safety		Yes	Yes	-	-					



3.1.4 OTHER TRAFFIC ENGINEERING RELATED RECOMMENDATIONS

The following recommendations are made in terms of other traffic engineering related matters with regards to the existing roads network, due to the Proposed Project:

- a) Provide reflective road studs at strategic points (LED if possible) to ensure the safe operation of the relevant intersections under investigation at night-time and during power outages.
- b) Provide required road traffic signs for the relevant intersection.
- c) Provide relevant road markings at relevant intersection under investigation (highway paint recommended).
- a) Provide workers with training on road safety.
- b) Road safety and awareness campaigns should be run at the Proposed Project.

3.1.5 ENVIRONMENTAL IMPACT RATINGS RELATED TO TRAFFIC ENGINEERING

Table E-1 of **Appendix E** provides a summary of the impact ratings for all phase respectively of the Proposed Project before and after mitigating measures implemented. **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 in terms of the anticipated vehicle traffic to be generated by the Proposed Project:

- a) That due to the Proposed Project the road related impact from a road safety perspective would have a high consequence and that road safety related mitigating measures would be required at **Point A** as recommended in **section 3.1.3**.

It is furthermore possible to conclude that owing to the type and nature of the Proposed Project, it is expected that the Proposed Project will have a manageable impact on vehicle traffic during all phases, provided that road infrastructure improvements are implemented as indicated in **Section 3.1.3**.

3.1.6 INSTITUTIONAL ARRANGEMENTS

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

- a) A formal application for intersection upgrading should be submitted to the South African National Roads Agency SOC Ltd (SANRAL) for approval purposes before any work is conducted within the road reserve of Road R555.

3.1.7 REASONED OPINION FOR AUTHORISATION

In conclusion of the findings as part of the investigations, Siyazi Limpopo Consulting (Pty) Ltd. is of the opinion that the Proposed Project would have a manageable impact on the relevant roads network as long as the mitigating measures are implemented as recommended as part of **Section 3** of this report and is therefore recommended to be granted authorisation.