TRAFFIC SURVEYS
TRAFFIC SURVEY & ANALYSIS SPECIALISTS

TRAFFIC IMPACT STUDY

KHANYAZWE POWER PLANT

MALELANE, MPUMALANGA

JULY 2024

+27 71 689 4588
WWW.TRAFFICSURVEYS.CO.ZA
OFFICE@TRAFFICSURVEYS.CO.ZA

SA TRAFFIC SURVEYS PTY (LTD)
REG. NO. 2020/879170/07

REPORT INFORMATION SHEET

REPORT TYPE	Traffic Impact Study
TITLE	Khanyazwe Power Plant, Malelane, Mpumalanga
DATE	July 2024
VERSION	1

STUDY PROPERTY	Remainder and Portion 1 of the farm Malelane 389-JU
MUNICIPAL AREA	Nkomazi Local Municipality
PROVINCE	Mpumalanga

PROJECT NUMBER	518
AUTHOR	Pieter Jooste | *Traffic Engineer*

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1 INTRODUCTION AND STUDY SCOPE

SA Traffic Surveys (Pty) Ltd (Traffic Surveys) was appointed to undertake a traffic impact study for a proposed new gas power plant to be located just outside Malelane in the Mpumalanga province. The project site is known as the Khunyazwe Power Plant.

The scope of this traffic impact study includes:

- Conducting traffic surveys to determine current traffic conditions on the surrounding road network (within a defined study area);
- Quantify the impact the proposed project is expected to have on the surrounding road network;
- Determine whether it is necessary to mitigate the expected impact, and
- If required, recommend measures to mitigate the traffic impact of the proposed project.

This report will form part of the environmental authorisations associated with the proposed project.

2 PROPOSED PROJECT

2.1 Location

The location of the project site is shown in **Figure 1** (all figures are attached at the end of this report).

2.2 Property details

The proposed project will be situated on the following farm portion, located in the Mpumalanga province:

- The Remainder and Portion 1 of the farm Malelane 389-JU

The farm portion is located within the Nkomazi Local Municipality.

2.3 Project details

The project will include, among others, the following general activities:

- Removal and stockpiling of topsoil;
- Construction of on-site roads and infrastructure;
- Construction of gas pipelines to the site;
- Converting gas to electricity;
- Transfer electricity to the nearby substation, and
- General site supervision and maintenance during operations.

The proposed layout of the site is shown in **Figure 2**.

3 OVERVIEW OF THE METHOD USED FOR ASSESSMENT

3.1 General overview

The assessment method used can generally be defined by the following steps:

- Determining the traffic characteristics of the proposed project;
- Defining the affected area (study area);
- Collecting data to define the baseline operating conditions within the study area;
- Determining the impact the proposed project will have on the baseline operating conditions, and
- Based on the expected impact, propose possible mitigation measures if necessary.

These steps are further discussed in the remainder of this chapter.

3.2 Traffic characteristics

The type, volume and expected travel paths are determined for the traffic to be generated by the proposed project. This is done by analysing current traffic volumes and movement patterns in the study area, considering the type of activity and its location to other projects/points of interest and by consulting various guidelines. The traffic characteristics of the proposed activities are further discussed in **Section 5.4**.

3.3 Study area

The study area is defined based on the extent and type of activity and the characteristics of the traffic expected to be generated as a result of the proposed project. Although the traffic impact will most probably extend beyond a chosen study area, the area to be investigated should be large enough to ensure that the degree of impact outside its boundaries is insignificant and can be ignored. The study area is defined and described in the following subsections.

3.3.1 Site visit

As per the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*[1], it is a specific requirement to undertake a site visit when conducting a traffic study. During such a site visit all relevant aspects of the area can be recorded and a better understanding of the study area can be acquired.

A site visit to the study area was conducted in February 2024. All relevant developments, points of interest, transport facilities, roads and road intersections were visited and recorded.

3.3.2 Surrounding road network

Considering the expected number of vehicle trips to be generated as a result of the proposed project (discussed in **Section 5.4**) as well as the expected distribution of these trips on the surrounding road network the following existing roads were deemed relevant for this study:

- N4: This road can be classified as a class 2 road (major arterial) and falls under the jurisdiction of the South African National Roads Agency Limited (SANRAL).
- Unnamed Gravel Road: This gravel road can be classified as a class 5 road (access road) and is believed to be a shared private road providing access to a number of farms and properties south of the N4. Access to the study site is gained via this road.

The classification of the above roads is based on the *TRH 26, South African Road Classification and Access Management Manual*[2]. The location of these roads in relation to the subject site is also shown in **Figure 1**.

The planned realignment of the N4 is underway. The route will be realigned to the south and serve as a ring road around Malelane. The current N4 route passing through the town will be declassified to a class 3 minor arterial road, and the traffic volumes on this route are expected to decrease. The realignment of the N4 is not expected happen within the next 10 years.

As shown in **Figure 3**, the new alignment of the N4 will run between the subject site and the existing N4. As also shown in this figure, a new "Link Road East" will be constructed. The existing gravel road will be closed at its intersection with the N4, and the subject site and all the surrounding properties will gain access from this new link road in the future.

3.3.3 Intersections investigated

As per the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*[1] the study area should include all routes and intersections within a maximum distance of 1.5 km from the access to the site measured along the shortest routes to the access. At least one intersection with an arterial route (in this case the N4) should also form part of the study area.

By considering these guidelines as well as the expected number of vehicle trips to be generated as a result of the proposed project (discussed in **Section 5.4**) the following intersection was deemed relevant for investigation:

- N4/Unnamed Gravel Access Road

The boundaries of the study area are therefore limited to the location of this intersection.

3.3.4 Vulnerabilities/Sensitivities

From a traffic engineering and transportation planning perspective, no vulnerabilities or sensitivities have been identified in the study area.

3.4 Data collection

Historical traffic surveys were used to determine the existing traffic demand on the nearby road network. A more detailed discussion follows in **Section 4.2**.

3.5 Impact and mitigation

By using the data collected, traffic operating conditions were determined by means of traffic engineering software, namely SIDRA INTERSECTION 8. Operating conditions at the study intersection identified in **Section 3.3.3** were determined and compared for the following three scenarios:

- Existing conditions (baseline)
- During the implementation of the proposed project (construction phase)
- After implementation of the proposed project (operational phase)

Based on the results obtained, the need for mitigation measures is discussed.

4 EXISTING TRAFFIC STATE (ENVIRONMENTAL BASELINE)

4.1 Site access

Access to the study site is provided via an unnamed gravel road, as shown in **Figure 1**. The position of the access will remain unchanged. It can be confirmed that the access position from this gravel road is in line with the *TRH 26, South African Road Classification and Access Management Manual*[2] and is, therefore, supported from a traffic engineering and transport planning viewpoint.

It is important to note the queuing of vehicles entering the site is not allowed on public roads or in a public road reserve. These vehicle queues must be accommodated on-site so that the traffic flow and safety of public roads are not affected.

The intersection of the unnamed gravel road with the N4 is located more than 1 km from the next intersections along the N4. A farm access is located opposite the N4 access point approximately 30 m to the east, but as part of the current upgrading of the N4 this farm access will be moved approximately 500 m to the west to the location of the future "Link Road East" intersection shown in **Figure 3**.

As discussed in **Section 3.3.2**, the realignment of the N4 is planned where the unnamed gravel road will then be closed at its intersection with the N4, and the subject site and all the surrounding properties will gain access from the future "Link Road East" road. The proposed project is expected to generate an insignificant volume of peak hour traffic once operational (refer to **Table 5.6**), and it is not deemed necessary that the unnamed gravel road be closed at the N4 and moved to the future "Link Road East" position only for the subject project.

4.2 Existing traffic flows

Traffic surveys were conducted on Wednesday 14 April 2021 at the key study intersection previously discussed. From this survey it was determined that the critical peak traffic hours occurred between 06h45-07h45 (AM peak hour) and 15h30-16h30 (PM peak hour). Light and heavy vehicles constitute 79.5 % and 20.5 % of the total traffic volume, respectively.

Although it is recommended that traffic data not older than 2 years be used for traffic studies, it was deemed acceptable that this data be used to determine existing traffic volumes based on the following:

- Since the previous traffic counts, no new developments were constructed to the south of the N4 which could have resulted in an increase in traffic along the unnamed gravel road. Traffic volumes along the unnamed gravel road are therefore expected to have remained unchanged, and
- The increase in traffic along the N4 since the previous traffic counts can be accurately determined by using recent SANRAL traffic data.

Considering the above, an annual growth rate of 2.0% was applied to the traffic volumes of the 2021 traffic survey to get an indication of the existing 2024 traffic volumes at the study intersection. These existing 2024 peak hour traffic volumes are shown in **Figure 4**.

4.3 Baseline operating conditions

The baseline operating conditions for the key intersections are summarised in **Table 4.1** below with the detailed SIDRA outputs attached as **Appendix A**. These operating conditions are based on the existing 2024 peak hour traffic volumes (as per **Figure 4**) and consider the existing intersection layout and traffic control as shown in **Drawing D001**.

The Level of Service (LOS) parameter is determined by the V/C ratio (ratio between the traffic volume and traffic capacity per movement, both measured in vehicles per hour) and delay (time delay experienced, measured in seconds) values. LOS values can vary between "A" and "F", with "F" being the worst operating condition. A LOS of "D" or better is deemed acceptable, with a LOS of "E" acceptable for right-turn traffic movements if adequate lengths of storage lanes are provided.

The baseline operating conditions indicate that good traffic operating conditions are experienced at the key study intersection. This was also confirmed during the site visit.

The existing baseline conditions would be influenced by the following variables:

- Traffic volumes
- Intersection geometry
- Intersection traffic control

Table 4.1 – Baseline operating conditions

Intersection & approach definitions	Peak hour	Analysis parameter	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
N4/Unnamed Gravel Road Approach 1: Gravel Rd S Approach 2: N4 E Approach 4: N4 W	**Week AM**	**V/C**	0.01	-	0.01	0.45	0.45	-	-	-	-	-	0.30	0.30
		Delay (s)	15	-	12	6	0	-	-	-	-	-	0	11
		LOS	B	-	B	A	A	-	-	-	-	-	A	B
	Week PM	**V/C**	0.01	-	0.01	0.40	0.40	-	-	-	-	-	0.41	0.41
		Delay (s)	13	-	13	6	0	-	-	-	-	-	0	11
		LOS	B	-	B	A	A	-	-	-	-	-	A	B

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

4.4 Non-motorised and public transport

A public transportation and non-motorised transport assessment were carried out as part of this study.

Public transport in the study area is mainly provided by minibus taxis and busses observed operating along the N4, approximately 1.6 km from the site. The site is, therefore, not easily accessible to public transport users.

The proposed project is not expected to generate a notable demand for non-motorised and public transport and no new facilities are recommended. However, due to the remote location of the site it is proposed that transport for staff be provided during both the construction and operational phases of the project.

5 PROJECT TRAFFIC IMPACT

The impact of the project activities (discussed in **Section 2.3**) is investigated for the following project phases:

- Construction phase
- Operational phase

Each project phase will have the following traffic characteristics:

- Construction phase:
  - Construction workers will commute to and from the site daily by either making use of transport provided by the Contractor or private vehicles, and
  - Construction and delivery vehicles will travel to and from the site daily as required.
- Operational phase:
  - Employees will commute to and from the site daily by either making use of transport provided by the Employer or private vehicles, and
  - General delivery and maintenance vehicles will travel to and from the site daily.

5.1 Probability of impact occurring

Considering **Table 5.1** below, a rating of 4 can be allocated to the probability of the traffic impact during both the construction and operational phases.

Table 5.1 – Listing of the descriptors for the probability of the impact

Probability descriptors	Definitions	Rating
Improbable:	The possibility of the impact occurring is very low, due to the circumstances, design or experience.	1
Probable:	There is a probability that the impact will occur to the extent that provision must be made.	2
Highly Probable:	It is most likely that the impact will occur at some stage of the project.	4
Definite:	The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.	5

5.2 Duration of impact

Considering **Table 5.2** below, a rating of 3 can be allocated to the duration of the traffic impact during both the construction and operational phases.

Table 5.2 – Listing of the descriptors for the duration of the impact

Duration descriptors	Definitions	Rating
Short term:	The impact will either disappear with mitigation or will be mitigated through natural processes in a period shorter than any of the phases.	1
Medium term:	The impact will last up to the end of the phases, where after it will be negated.	3
Long term:	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.	4
Permanent:	Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a period that the impact can be considered transient.	5

5.3 Scale of impact

Although some of the traffic generated during the construction or operational phases will be destined regionally or even nationally, the impact (as determined by the defined study area) will be concentrated locally. The traffic influence outside the boundaries of the study area is expected to be insignificant. As per **Table 5.3** below, the scale of the impact can be described as "regional" for both the project phases and a rating of 3 can be adopted.

Table 5.3 – Listing of the descriptors for the scale of the impact

Extent descriptors	Definitions	Rating
Local:	The impacted area extends only as far as the activity, e.g., footprint	1
Site:	The impact could affect the whole, or a measurable portion of the above-mentioned properties.	2
Regional:	The impact could affect the area including the neighbouring residential areas.	3

5.4 Magnitude of impact

5.4.1 Impact during construction phase

To determine the traffic impact during construction the following construction activity assumptions are made:

- A maximum of 1000 construction workers will be working on the site;
- 80% of the construction workers will make use of transport provided by the Contractor;
- The remaining 20% will make use of private transport which is assumed to have a vehicle occupancy of 1.5 occupants per vehicle during peak traffic hours, and
- An in: out traffic split of 80%:20% and 20%:80% is assumed for the AM and PM peak traffic hours, respectively.

Based on the assumptions above, the site is expected to generate peak hour traffic volumes as per **Table 5.4** below during the project's construction phase.

Table 5.4 – Expected traffic to be generated during the construction phase

Peak hour	Vehicle trips generated (veh/h)		
	In	Out	Total
AM	192	48	240
PM	48	192	240

Figure 5 presents the expected peak-hour traffic volumes at the key study intersection during construction. These volumes also include an expected 2% annual growth in background traffic (i.e., existing traffic) over a period of 3 years.

The operating conditions for the key intersection during the construction phase are summarised in **Table 5.5** overleaf, with the detailed SIDRA outputs attached as **Appendix A**. These operating conditions are based on the expected peak hour traffic volumes during construction (as per **Figure 5**) and consider the completed upgrade of the N4 to two lanes per direction, which is currently underway.

Table 5.5 – Construction phase operating conditions

Intersection & approach definitions	Peak hour	Analysis parameter	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
N4/Unnamed Gravel Road Approach 1: Gravel Rd S Approach 2: N4 E Approach 4: N4 W	**Week AM**	**V/C**	0.15	-	0.15	0.25	0.25	-	-	-	-	-	0.29	0.29
		Delay (s)	11	-	27	6	0	-	-	-	-	-	1	12
		LOS	B	-	D	A	A	-	-	-	-	-	A	B
	Week PM	**V/C**	0.59	-	0.59	0.22	0.22	-	-	-	-	-	0.25	0.25
		Delay (s)	16	-	**36**	6	0	-	-	-	-	-	1	11
		LOS	C	-	**E**	A	A	-	-	-	-	-	A	B

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

Good traffic operating conditions are expected at the study intersection during the AM peak traffic hour for the construction phase of the proposed project. However, the right-turn movement for vehicles exiting the unnamed gravel road during the PM peak traffic hour is expected to become problematic.

To mitigate the traffic impact during the construction phase, it is recommended that pointsmen be assigned at the N4/Unnamed Gravel Road intersection during peak traffic hours.

5.4.2 Impact during operational phase

The expected number of trips to be generated by a development is typically determined by considering the guidelines set out in the *South African Trip Data Manual (TMH17)* [3]. However, this manual does not provide any trip generation data for the construction and operation of power stations.

To determine the expected number of vehicle trips to be generated by the proposed project, information regarding the operational characteristics of the facility was obtained, and the following assumptions were made:

- A maximum of 125 employees will be employed on-site during the operational phase;
- A workday will be divided into a minimum of two shifts;
- 70% of the employees will make use of transport provided by the Employer (shuttles, taxis or busses);
- The remaining 30% will make use of private transport which is assumed to have a vehicle occupancy of 1.5 occupants per vehicle during peak traffic hours;
- 90% of the workers will commute to and from the site during the AM and PM peak traffic hours;
- A peak hour factor of 0.7 applies to the critical 15-minute traffic peak, and
- An in:out traffic split of 80%:20% and 20%:80% is assumed for the AM and PM peak traffic hours, respectively

Based on the assumptions above, the site is expected to generate peak hour traffic volumes as per **Table 5.6** below during the project's operational phase.

Table 5.6 – Expected traffic to be generated during the operational phase

Peak hour	Vehicle trips generated (veh/h)		
	In	Out	Total
AM	16	4	20
PM	4	16	20

Figure 6 presents the expected peak hour traffic volumes at the key study intersection during the future operational phase. These volumes also include an expected 2% annual growth in background traffic (i.e., existing traffic) over a period of 5 years. Although the operational phase of the power plant is expected to be much longer than 5 years, national guidelines require a 5-year future traffic horizon to be investigated based on the extent of the subject project.

The operating conditions for the key intersection during the future operational phase are summarised in **Table 5.7** below, with the detailed SIDRA outputs attached as **Appendix A**. These operating conditions are based on the expected peak hour traffic volumes during construction (as per **Figure 6**) and consider the completed upgrade of the N4 to two lanes per direction, which is currently underway.

The SIDRA analysis results indicate that good traffic operating conditions are expected at the study intersection during the operational phase of the proposed project.

Table 5.7 – Operational phase operating conditions

Intersection & approach definitions	Peak hour	Analysis parameter	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
N4/Unnamed Gravel Road Approach 1: Gravel Rd S Approach 2: N4 E Approach 4: N4 W	**Week AM**	**V/C**	0.02	-	0.02	0.25	0.25	-	-	-	-	-	0.18	0.18
		Delay (s)	11	-	23	6	0	-	-	-	-	-	0	11
		LOS	B	-	C	A	A	-	-	-	-	-	A	B
	Week PM	**V/C**	0.07	-	0.07	0.22	0.22	-	-	-	-	-	0.23	0.23
		Delay (s)	11	-	27	6	0	-	-	-	-	-	0	11
		LOS	B	-	D	A	A	-	-	-	-	-	A	B

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

5.4.3 Comparing operating conditions with the baseline

By comparing the expected operating conditions during the project's construction and operational phases with the baseline, it can be stated that the proposed project's traffic impact on the external road network is expected to be minimal for the operational phase. A notable impact is, however, expected during the PM peak hour of the construction phase.

Based on the above and considering **Table 5.8** below, the magnitude of the traffic impact can be described as "medium" and "low" for the construction and operational phases, respectively.

Table 5.8 – Listing of the descriptors for the magnitude of the impact

Magnitude descriptors	Definitions	Rating
Low:	The impact alters the affected environment in such a way that natural processes are not affected.	2
Medium:	The affected environment is altered, but functions and processes continue in a modified way.	6
High:	The function or process of the affected environment is disturbed to the extent that it temporarily or permanently ceases.	8

6 MITIGATION MEASURES

A significance rating can be allocated to the expected traffic impact, based on the following equation and the descriptors provided in **Table 6.1** below:

Significance = (Duration + Scale + Magnitude) x Probability

Table 6.1 – Listing of the descriptors for the significance score of the impact

Significance descriptors	Definitions	Rating
Negligible:	The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.	< 20
Low:	The impact is limited in extent and has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.	< 40
Moderate:	The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.	< 60
High:	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.	> 60

The significance ratings (without any mitigation) for the project phases are presented in **Table 6.2** below.

Table 6.2 – Significance ratings for the project phases considered (without mitigation)

Project phase	Impact rating criteria				Significance
	Probability	Duration	Scale	Magnitude	
Construction	4	3	3	6	48 (Moderate)
Operational	4	3	3	2	32 (Low)

Based on the significance scores in **Table 6.2** above, no impact mitigation measures are required for the operational phase of the project. However, for the construction phase, it is recommended that pointsmen be assigned at the N4/Gravel Access Road intersection during peak traffic hours.

7 LEGAL REQUIREMENTS AND OTHER CONSIDERATIONS

The following comments can be made concerning legal requirements and other considerations during the project phases:

- All legal authorisations and permits must be obtained for the transportation of abnormal loads and hazardous materials on public roads;
- Measures should be taken to ensure that all health and safety requirements regarding transportation activities are complied with. This may include dust covers for hauling vehicles and dust control on all gravel roads;
- It is proposed that flagmen and temporary warning signs be placed at all access points where heavy vehicles will access public roads during construction;
- Controls should be in place to ensure that vehicles exiting the site are not overloaded, and
- Where feasible, heavy vehicles should not operate on public roads during peak traffic hours.

8 SUMMARY AND CONCLUSIONS

In summary and based on the contents of this document the following key conclusions are made regarding the proposed Khunyazwe Power Plant:

- This report will form part of the environmental authorisations associated with the proposed project;
- The purpose of this report is to investigate the traffic impact that the project will have on the surrounding road network and, if necessary, propose possible measures to mitigate such impact;
- Access to the study site is provided via an unnamed gravel road, as shown in **Figure 1**. No changes to the access are proposed;
- The study area (receiving environment) was defined based on the extent and type of the project activities and the characteristics of the traffic expected to be generated as a result. Based on this the boundaries of the study area are limited to the location of the following key intersection:
  - Road N4/Unnamed Gravel Road
- No vulnerabilities or sensitivities currently exist in the defined study area;
- Historical traffic surveys were used to determine the existing traffic demand on the nearby road network;
- By using the data collected and observations made during the site visit traffic operating conditions were determined by means of traffic engineer software, namely SIDRA INERSECTION 8. Operating conditions were determined and compared for the following three scenarios:
  - Baseline
  - Project construction phase
  - Project operational phase
- By comparing the operating conditions for the different scenarios, it is concluded that the project will have a "low" traffic impact on the surrounding road network for the operational phase, with a significance rating of 32. Based on this no impact mitigation measures are required. However, the construction phase will have a "medium" traffic impact and it is recommended that pointsmen be assigned at the N4/Gravel Access Road intersection during peak traffic hours.

9 REFERENCES

1. Committee of Transport Officials. TMH 16 Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual. Version 1.0, August 2012.
2. Committee of Transport Officials. TRH 26, South African Road Classification and Access Management Manual. Version 1.0, August 2012.
3. Committee of Transport Officials. TMH 17 Volume 1, South African Trip Data Manual. Version 1.0, September 2012.

FIGURES

TRAFFIC SURVEYS
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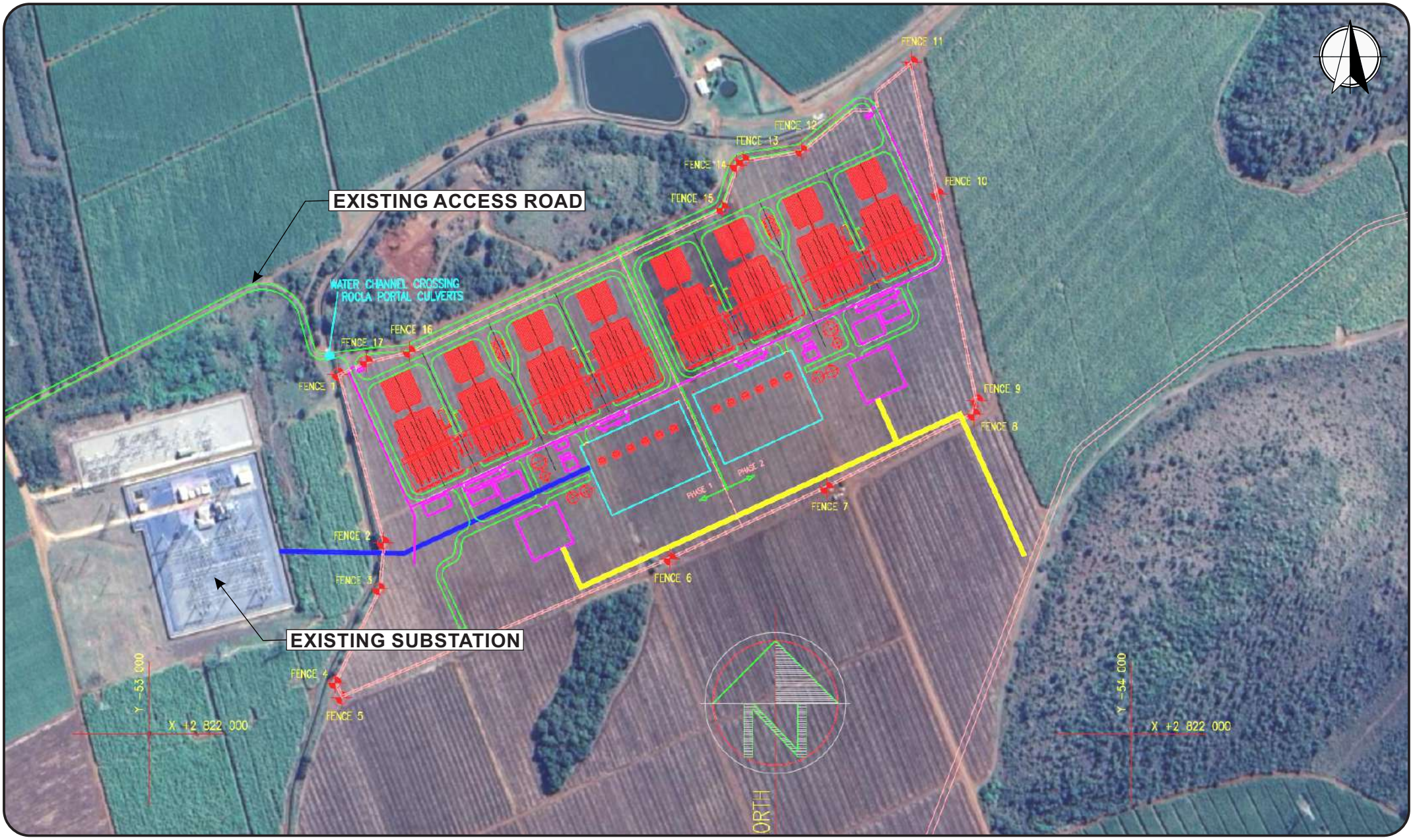
PROJECT:
Traffic Impact Study:
Khanyazwe Power Plant

FIGURE NAME:
Locality Map

PROJECT NO.
518

FIGURE NO.
1



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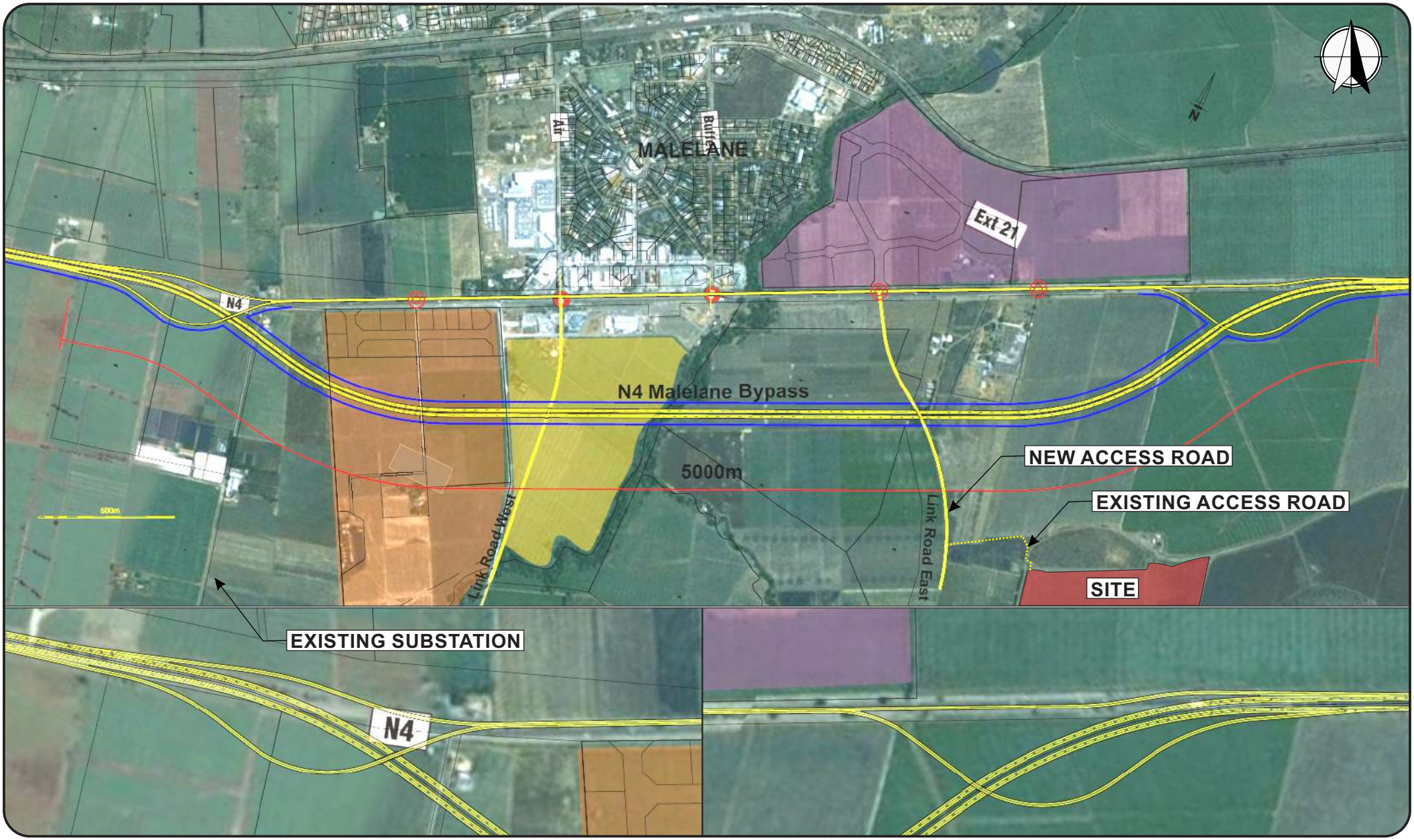
PROJECT:
Traffic Impact Study:
Khanyazwe Power Plant

FIGURE NAME:
Proposed Site Layout

PROJECT NO.
518

FIGURE NO.
2



TRAFFIC SURVEYS
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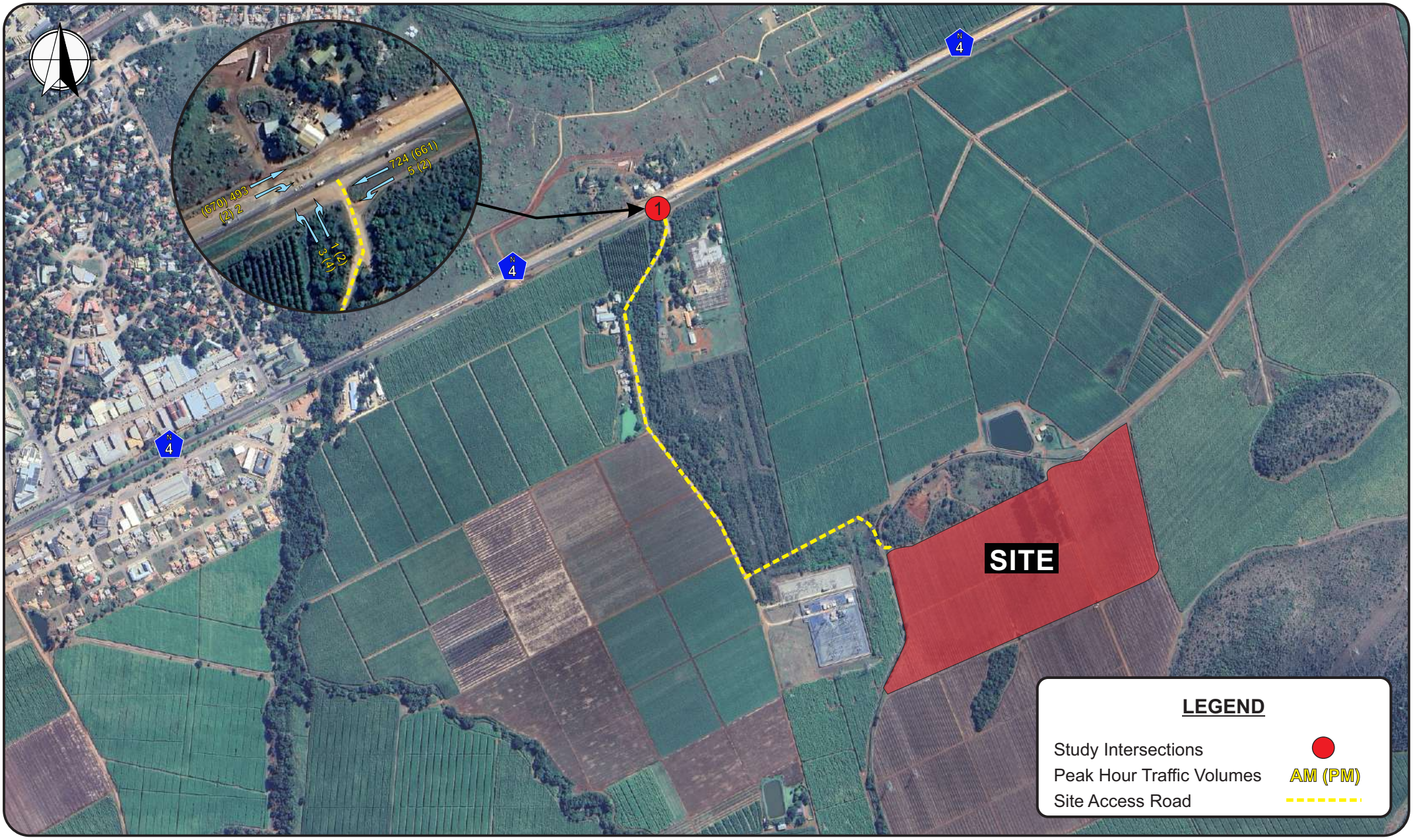
PROJECT:
Traffic Impact Study:
Khanyazwe Power Plant

FIGURE NAME:
Planned Realignment of the N4

PROJECT NO.
518

FIGURE NO.
3



TRAFFIC SURVEYS
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PROJECT:
Traffic Impact Study:
Khanyazwe Power Plant

FIGURE NAME:
Existing 2024 Peak Hour Traffic Volumes

PROJECT NO.
518

FIGURE NO.
4

DEVELOPMENT TRIP GENERATION

Peak Hour	IN	OUT	TOTAL
AM	192	48	240
PM	48	192	240

LEGEND

Study Intersections

Peak Hour Traffic Volumes AM (PM)

Site Access Road

TRAFFIC SURVEYS
Traffic survey & Analysis Specialists

PROJECT:
Traffic Impact Study:
Khanyazwe Power Plant

FIGURE NAME:
Expected Peak Hour Traffic Volumes During Construction

PROJECT NO.
518

FIGURE NO.
5

DEVELOPMENT TRIP GENERATION

Peak Hour	IN	OUT	TOTAL
AM	16	4	20
PM	4	16	20

LEGEND

Study Intersections

Peak Hour Traffic Volumes AM (PM)

Site Access Road

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PROJECT:
Traffic Impact Study:
Khanyazwe Power Plant

FIGURE NAME:
Expected Peak Hour Traffic Volumes During Operations

PROJECT NO.
518

FIGURE NO.
6

DRAWINGS

Drawing D001 Existing Intersection Layout: N4/Unnamed Gravel Road

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PROJECT: TRAFFIC IMPACT STUDY: KHANYAZWE POWER PLANT	SCALE @ A3: N.T.S	CHECKED: PJ	DRAWING TYPE: CONCEPTUAL
	DESIGN: PJ	DRAWN: PJ	DATE: 08/07/2024
TITLE: EXISTING INTERSECTION LAYOUT: N4/UNNAMED GRAVEL ROAD	PROJECT NO: 518	DRAWING NO: D001	REV: A

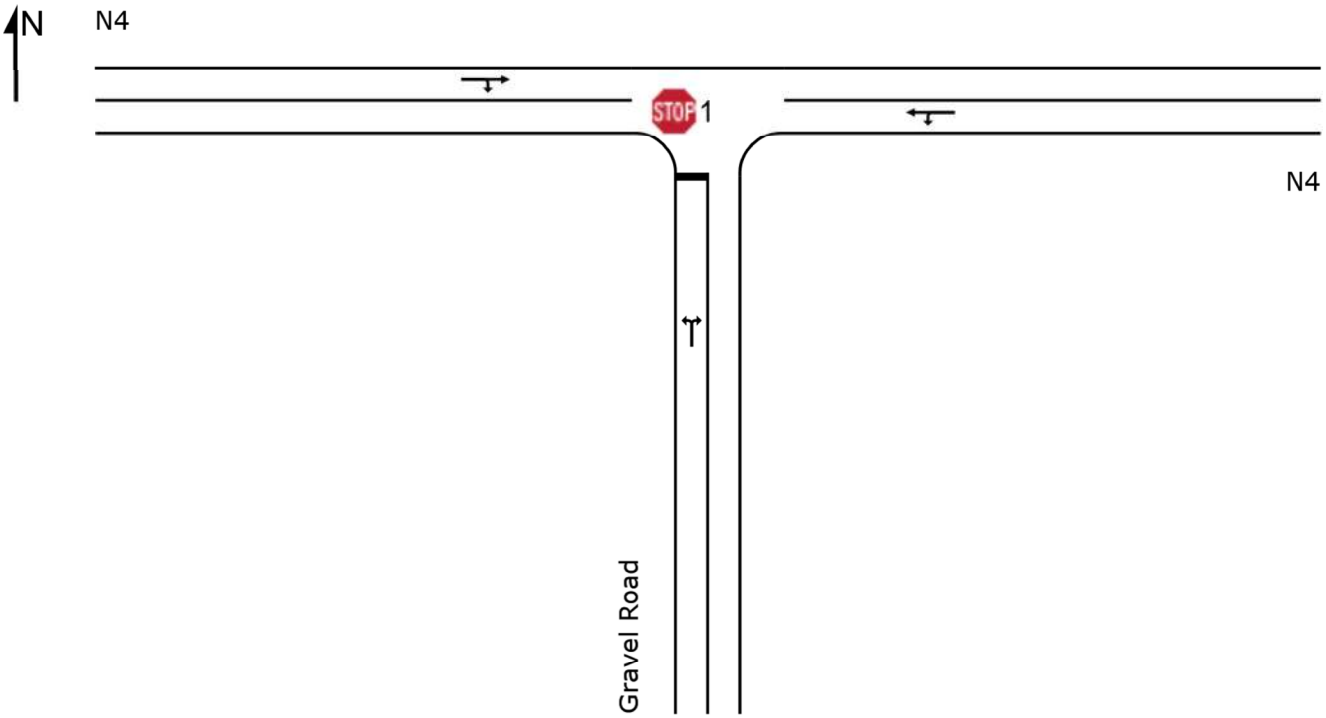
APPENDIX A

Output of SIDRA intersection capacity analyses

SITE LAYOUT

Site: 1 [01_2024 AM]

N4/Gravel Road
Site Category: -
Stop (Two-Way)



Organisation: INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING | Created: Monday, 08 July 2024 15:15:22
Project: C:\Users\chamo\Dropbox\2_Projects\518_Malelane Gas Power Plant, Mpumalanga EIA TIA\01_Report\Sidra\N4_Site Access Rd.sip8

MOVEMENT SUMMARY

Site: 1 [01_2024 AM]

N4/Gravel Road
Site Category: -
Stop (Two-Way)

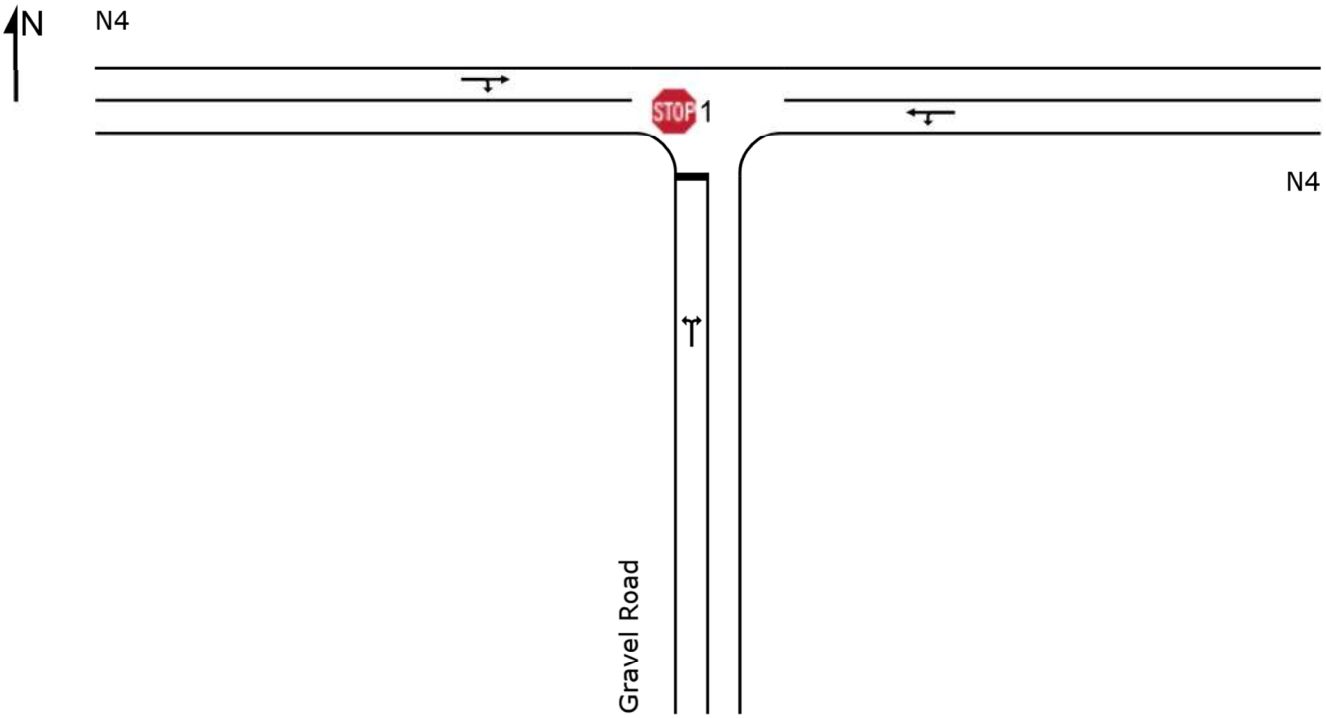
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	3	3,0	0,009	14,5	LOS B	0,0	0,2	0,67	0,93	0,67	48,7
3	R2	1	3,0	0,009	11,8	LOS B	0,0	0,2	0,67	0,93	0,67	48,2
Approach		4	3,0	0,009	13,8	LOS B	0,0	0,2	0,67	0,93	0,67	48,5
East: N4												
4	L2	5	3,0	0,445	5,6	LOS A	0,0	0,0	0,00	0,00	0,00	58,0
5	T1	762	20,0	0,445	0,1	LOS A	0,0	0,0	0,00	0,00	0,00	59,8
Approach		767	19,9	0,445	0,1	NA	0,0	0,0	0,00	0,00	0,00	59,8
West: N4												
11	T1	519	20,0	0,303	0,0	LOS A	0,0	0,3	0,01	0,00	0,01	59,9
12	R2	2	3,0	0,303	10,7	LOS B	0,0	0,3	0,01	0,00	0,01	57,5
Approach		521	19,9	0,303	0,1	NA	0,0	0,3	0,01	0,00	0,01	59,9
All Vehicles		1293	19,8	0,445	0,1	NA	0,0	0,3	0,01	0,01	0,01	59,8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [02_2024 PM]

N4/Gravel Road
Site Category: -
Stop (Two-Way)



Organisation: INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING | Created: Monday, 08 July 2024 15:15:38
Project: C:\Users\chamo\Dropbox\2_Projects\518_Malelane Gas Power Plant, Mpumalanga EIA TIA\01_Report\Sidra\N4_Site Access Rd.sip8

MOVEMENT SUMMARY

Site: 1 [02_2024 PM]

N4/Gravel Road
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles

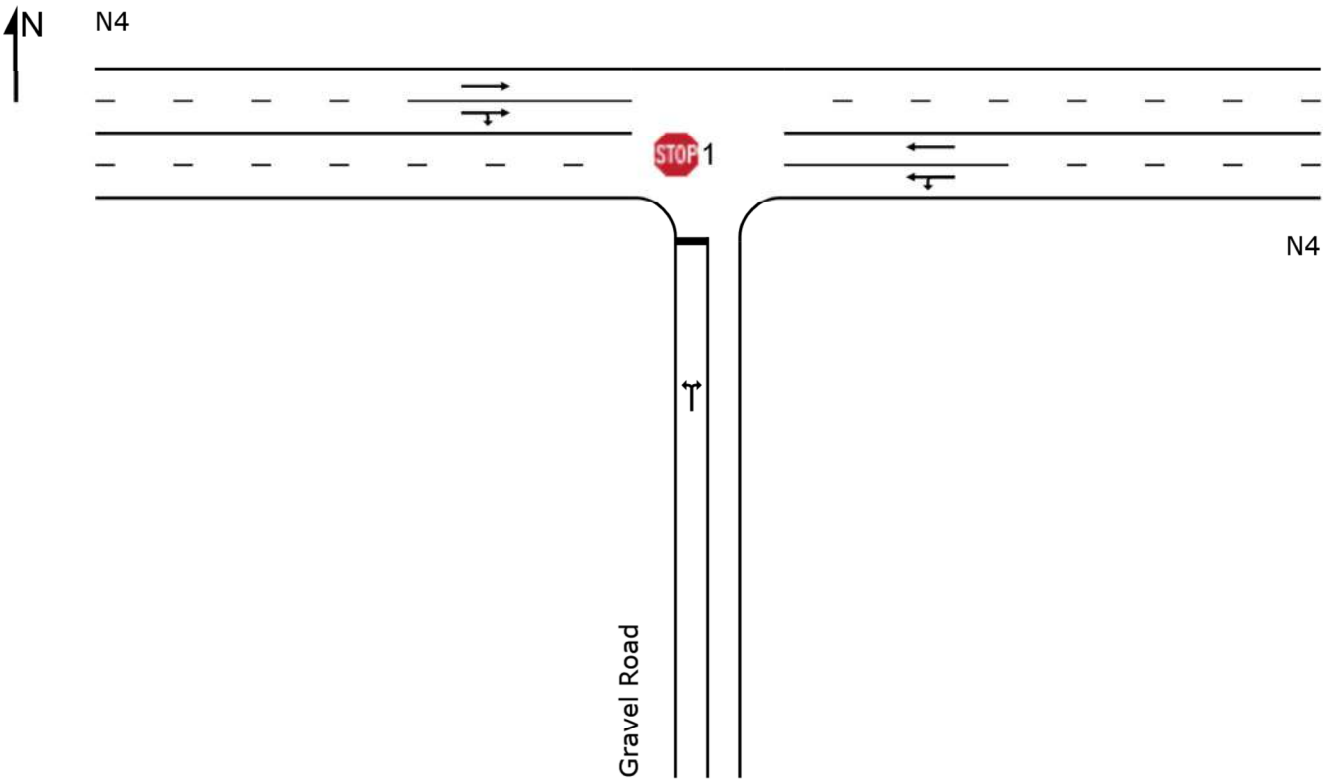
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	4	3,0	0,013	13,4	LOS B	0,0	0,3	0,64	0,94	0,64	49,1
3	R2	2	3,0	0,013	12,5	LOS B	0,0	0,3	0,64	0,94	0,64	48,6
Approach		6	3,0	0,013	13,1	LOS B	0,0	0,3	0,64	0,94	0,64	48,9
East: N4												
4	L2	2	3,0	0,404	5,6	LOS A	0,0	0,0	0,00	0,00	0,00	58,1
5	T1	696	20,0	0,404	0,1	LOS A	0,0	0,0	0,00	0,00	0,00	59,9
Approach		698	19,9	0,404	0,1	NA	0,0	0,0	0,00	0,00	0,00	59,9
West: N4												
11	T1	705	20,0	0,411	0,0	LOS A	0,0	0,3	0,01	0,00	0,01	59,9
12	R2	2	3,0	0,411	10,7	LOS B	0,0	0,3	0,01	0,00	0,01	57,5
Approach		707	19,9	0,411	0,1	NA	0,0	0,3	0,01	0,00	0,01	59,9
All Vehicles		1412	19,9	0,411	0,1	NA	0,0	0,3	0,01	0,01	0,01	59,8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [03_2027 AM + Construction]

N4/Gravel Road
Site Category: -
Stop (Two-Way)



Organisation: INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING | Created: Monday, 08 July 2024 15:15:55
Project: C:\Users\chamo\Dropbox\2_Projects\518_Malelane Gas Power Plant, Mpumalanga EIA TIA\01_Report\Sidra\N4_Site Access Rd.sip8

MOVEMENT SUMMARY

Site: 1 [03_2027 AM + Construction]

N4/Gravel Road
Site Category: -
Stop (Two-Way)

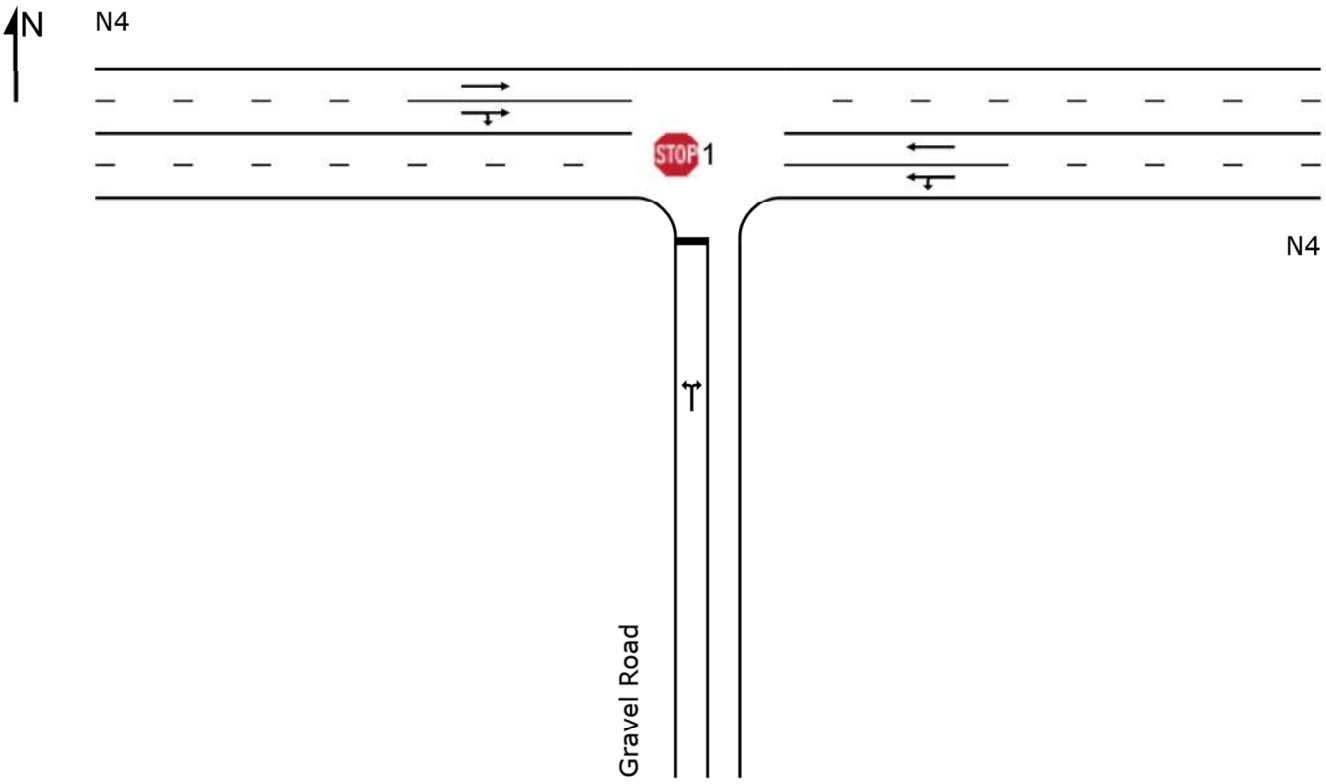
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	39	3,0	0,152	10,7	LOS B	0,4	3,1	0,58	0,95	0,58	47,5
3	R2	16	3,0	0,152	27,1	LOS D	0,4	3,1	0,58	0,95	0,58	47,3
Approach		55	3,0	0,152	15,4	LOS C	0,4	3,1	0,58	0,95	0,58	47,5
East: N4												
4	L2	67	3,0	0,253	5,6	LOS A	0,0	0,0	0,00	0,09	0,00	57,2
5	T1	808	20,0	0,253	0,0	LOS A	0,0	0,0	0,00	0,04	0,00	59,5
Approach		876	18,7	0,253	0,5	NA	0,0	0,0	0,00	0,05	0,00	59,3
West: N4												
11	T1	552	20,0	0,286	0,7	LOS A	1,4	10,8	0,07	0,07	0,09	58,9
12	R2	143	3,0	0,286	11,9	LOS B	1,4	10,8	0,71	0,68	0,83	49,7
Approach		695	16,5	0,286	3,0	NA	1,4	10,8	0,20	0,20	0,24	56,7
All Vehicles		1625	17,2	0,286	2,0	NA	1,4	10,8	0,11	0,14	0,12	57,7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [04_2027 PM + Construction]

N4/Gravel Road
Site Category: -
Stop (Two-Way)



Organisation: INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING | Created: Monday, 08 July 2024 15:16:08
Project: C:\Users\chamo\Dropbox\2_Projects\518_Malelane Gas Power Plant, Mpumalanga EIA TIA\01_Report\Sidra\N4_Site Access Rd.sip8

MOVEMENT SUMMARY

Site: 1 [04_2027 PM + Construction]

N4/Gravel Road
Site Category: -
Stop (Two-Way)

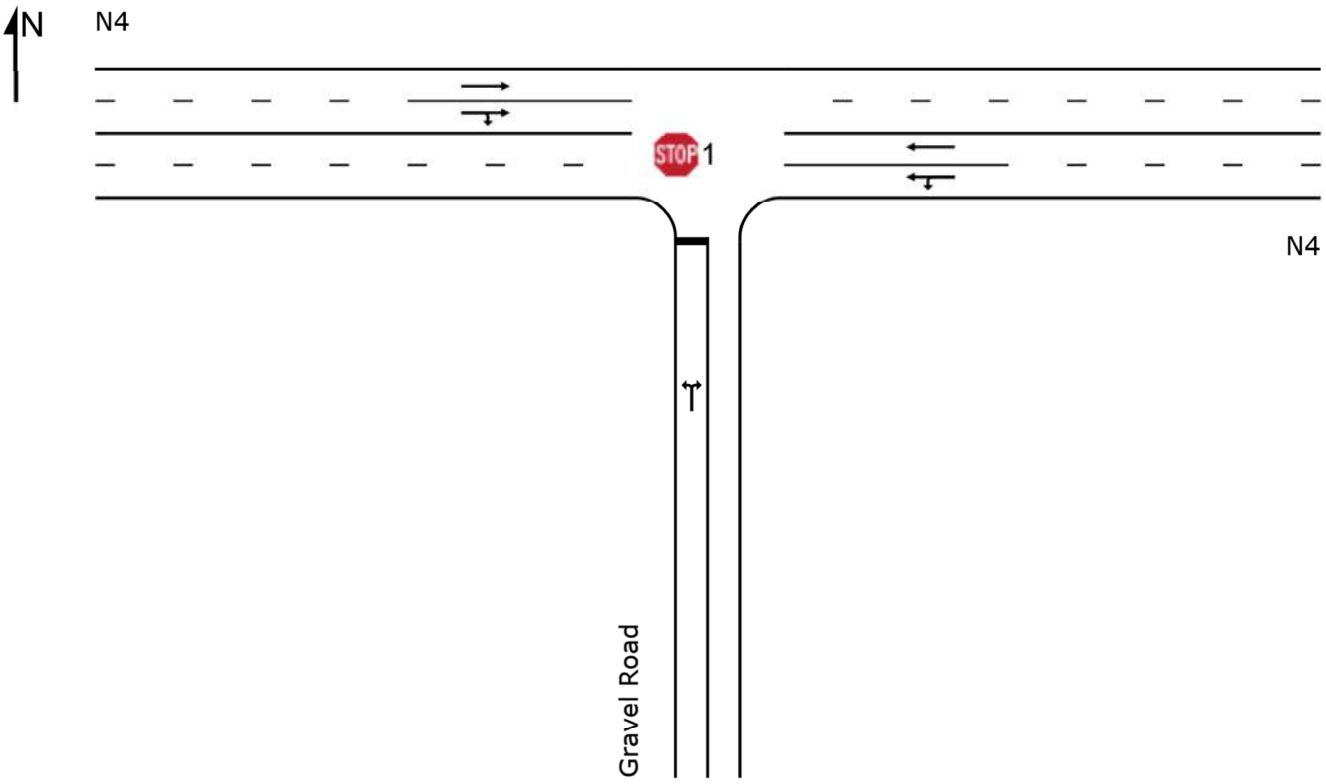
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	146	3,0	0,588	15,6	LOS C	2,9	20,6	0,68	1,18	1,21	44,1
3	R2	63	3,0	0,588	35,8	LOS E	2,9	20,6	0,68	1,18	1,21	43,9
Approach		209	3,0	0,588	21,7	LOS C	2,9	20,6	0,68	1,18	1,21	44,0
East: N4												
4	L2	17	3,0	0,219	5,6	LOS A	0,0	0,0	0,00	0,03	0,00	57,9
5	T1	739	20,0	0,219	0,0	LOS A	0,0	0,0	0,00	0,01	0,00	59,8
Approach		756	19,6	0,219	0,2	NA	0,0	0,0	0,00	0,01	0,00	59,8
West: N4												
11	T1	748	20,0	0,245	0,5	LOS A	0,7	5,5	0,09	0,03	0,10	59,1
12	R2	38	3,0	0,245	10,7	LOS B	0,7	5,5	0,20	0,08	0,22	56,0
Approach		786	19,2	0,245	1,0	NA	0,7	5,5	0,09	0,04	0,10	58,9
All Vehicles		1752	17,4	0,588	3,1	NA	2,9	20,6	0,12	0,16	0,19	56,9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [05_2029 AM + Operations]

N4/Gravel Road
Site Category: -
Stop (Two-Way)



Organisation: INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING | Created: Monday, 08 July 2024 15:16:22
Project: C:\Users\chamo\Dropbox\2_Projects\518_Malelane Gas Power Plant, Mpumalanga EIA TIA\01_Report\Sidra\N4_Site Access Rd.sip8

MOVEMENT SUMMARY

Site: 1 [05_2029 AM + Operations]

N4/Gravel Road
Site Category: -
Stop (Two-Way)

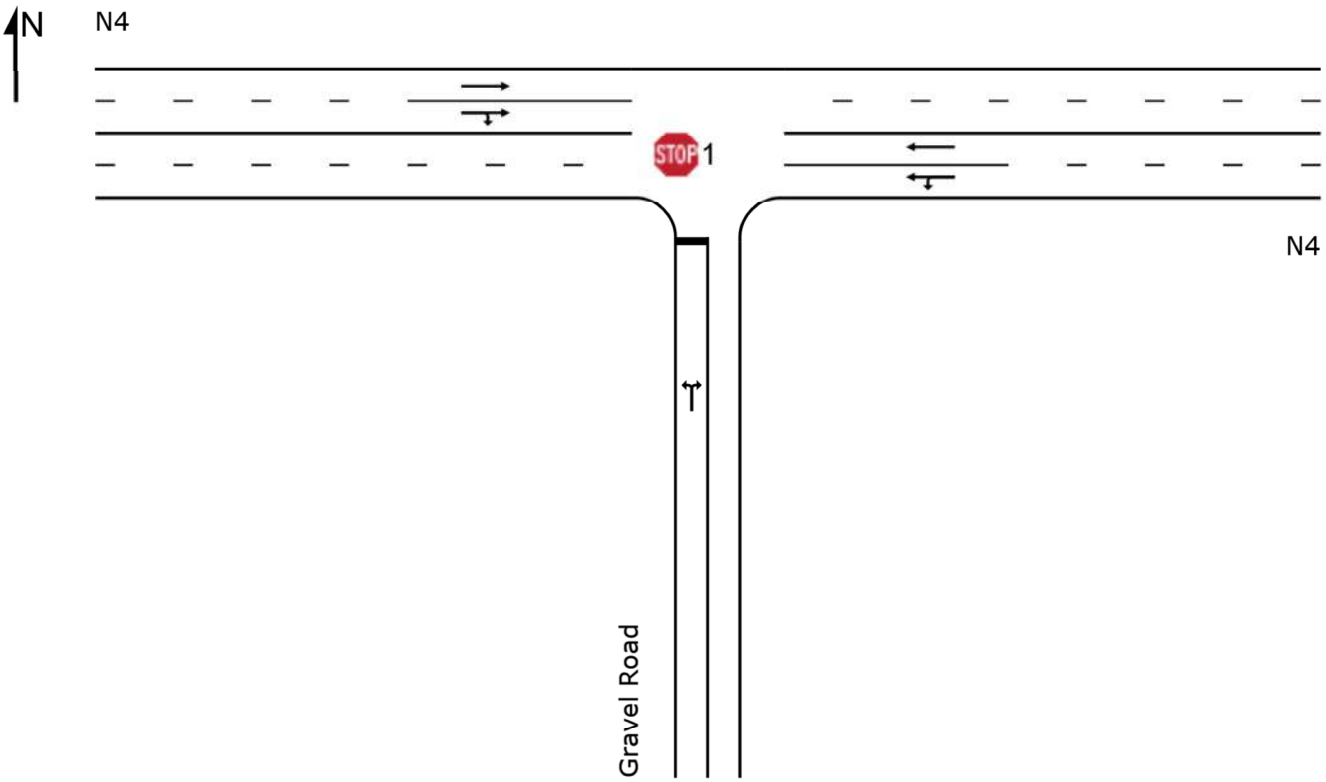
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	7	3,0	0,022	10,9	LOS B	0,1	0,5	0,54	0,90	0,54	48,6
3	R2	2	3,0	0,022	23,0	LOS C	0,1	0,5	0,54	0,90	0,54	48,4
Approach		9	3,0	0,022	13,6	LOS B	0,1	0,5	0,54	0,90	0,54	48,6
East: N4												
4	L2	11	3,0	0,247	5,6	LOS A	0,0	0,0	0,00	0,01	0,00	58,0
5	T1	841	20,0	0,247	0,0	LOS A	0,0	0,0	0,00	0,01	0,00	59,9
Approach		852	19,8	0,247	0,1	NA	0,0	0,0	0,00	0,01	0,00	59,8
West: N4												
11	T1	574	20,0	0,179	0,3	LOS A	0,3	2,4	0,05	0,02	0,05	59,4
12	R2	15	3,0	0,179	11,4	LOS B	0,3	2,4	0,12	0,04	0,12	56,8
Approach		588	19,6	0,179	0,6	NA	0,3	2,4	0,05	0,02	0,05	59,3
All Vehicles		1449	19,6	0,247	0,4	NA	0,3	2,4	0,03	0,02	0,03	59,5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [06_2029 PM + Operations]

N4/Gravel Road
Site Category: -
Stop (Two-Way)



Organisation: INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING | Created: Monday, 08 July 2024 15:16:42
Project: C:\Users\chamo\Dropbox\2_Projects\518_Malelane Gas Power Plant, Mpumalanga EIA TIA\01_Report\Sidra\N4_Site Access Rd.sip8

MOVEMENT SUMMARY

Site: 1 [06_2029 PM + Operations]

N4/Gravel Road
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	18	3,0	0,065	10,7	LOS B	0,2	1,3	0,56	0,93	0,56	47,9
3	R2	6	3,0	0,065	26,5	LOS D	0,2	1,3	0,56	0,93	0,56	47,7
Approach		24	3,0	0,065	14,8	LOS B	0,2	1,3	0,56	0,93	0,56	47,8
East: N4												
4	L2	3	3,0	0,224	5,6	LOS A	0,0	0,0	0,00	0,00	0,00	58,1
5	T1	768	20,0	0,224	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	59,9
Approach		772	19,9	0,224	0,0	NA	0,0	0,0	0,00	0,00	0,00	59,9
West: N4												
11	T1	778	20,0	0,230	0,1	LOS A	0,1	0,8	0,01	0,00	0,02	59,8
12	R2	5	3,0	0,230	11,0	LOS B	0,1	0,8	0,03	0,01	0,03	57,6
Approach		783	19,9	0,230	0,2	NA	0,1	0,8	0,01	0,00	0,02	59,8
All Vehicles		1579	19,6	0,230	0,3	NA	0,2	1,3	0,02	0,02	0,02	59,6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.