Greater Tzaneen Local Municipality

TRAFFIC IMPACT ASSESSMENT (TIA) REPORT

FOR PROPOSED TOWNSHIP DEVELOPMENT ON PORTIONS 24 AND 28 OF FARM MOHLABA 567 – LT, LIMPOPO PROVINCE.

REV 1

OCTOBER 2022

PREPARED BY:
NATCO Investments
110B Nahoon Crescent
Moreleta Park
0044
Cell 083 382 6752
Email:
darlington@natcoinvestments.co.za

PREPARED FOR:
Greater Tzaneen Local Municipality
Roads and Stormwater Department

	TITLE OF REPORT: **TRAFFIC IMPACT STUDY: PROPOSED TOWNSHIP DEVELOPMENT ON PORTIONS 24 AND 28 OF FARM MOHLABA 567 – LT, LIMPOPO PROVINCE.**
Report File Name:	P2201/TIA/Proposed Mohlaba Township Development
Client/Developer:	VAXUMI CONSULTING

Consultants:
NATCO INVESTMENTS
110B NAHOON CRESCENT
MORELETA PARK
0044

Prepared by: D G Gwangwadza, Pr. Eng (ECSA) - 20180336

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Study	Traffic Impact Assessment (TIA)
Title	Proposed township development on portions 24 and 28 of farm Mohlaba 567 – LT, Greater Tzaneen Local Municipality
Location	Limpopo Province
Date	October 2022
Report Status	Final

It is herewith certified that this Traffic Impact Assessment has been prepared according to requirements of the South African Traffic Impact and Site Traffic Assessment Manual.

Prepared and approved by:

D G Gwangwadza, Pr. Eng (ECSA) - 20180336

EXECUTIVE SUMMARY

Traffic Impact Study was conducted to determine the effect of traffic flow from the proposed township development on portions 24 and 28 of farm Mohlaba 567 – LT, Greater Tzaneen Local Municipality. The proposed township will offer multiple land uses which will generate trips that will affect the surrounding road networks.

In the study, it was noted that during peak hours, the existing main road R36 is currently not capable of managing the current trips. This was noted by the Level of Service F for the existing intersection of R36 and D673 roads.

Due to the large size of the proposed development and the high number of generated trips, it is recommended that the development have a minimum of two accesses.

The following conclusions were derived from the assessment:

a) Trip generation from the proposed development will affect the performance of R36 road but within the acceptable limits of Level of Service D.
b) The Level of Service of the R36 and D673 intersection is currently F. Proposed upgrades to the intersection by means of signalised control and slip lanes will only reduce the delay but cannot improve the Level of Service.

The following recommendations should be considered:

a) Two accesses from the proposed development should be provided at distance of 671m apart along R36.
b) The accesses should be of minimum class 4b and the proposed configuration is shown in Chapter 9.
c) The bulk services contribution by the developer should be used towards the upgrade of the R36 as suggested in this report while the developer will meet the cost of the access roads.
d) A global route upgrade should be considered by SANRAL to improve the function of intersection R36 and D673.
e) A site traffic assessment should be done after the approval of the site development plan to manage on-site traffic.

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1 INTRODUCTION

NATCO Investments was appointed to prepare a Traffic Impact Assessment (TIA) for the proposed township development on portions 24 and 28 of farm Mohlaba 567 – LT, Greater Tzaneen Local Municipality.

For the purposes of this report, we will refer to the proposed township development on portions 24 and 28 of farm Mohlaba 567 – LT, Greater Tzaneen Local Municipality as the Proposed Development.

The TIA seeks to investigate any potential impacts of the Proposed Development on the existing transportation infrastructure within the study area.

2 SITE DESCRIPTION

The proposed site for the development is currently unoccupied. The site gently slopes from south and north towards a stream within the site.

2.1 Locality

The Proposed Development will be situated on portions 24 and 28 of farm Mohlaba 567 – LT, Greater Tzaneen Local Municipality, Limpopo Province.

The locality plan of the Proposed Development is shown in Figure 1.

Figure 1: Proposed Township Development Locality on Portions 24 and 28 of Farm Mohlaba 567 – LT.

2.2 The Required Zoning

According to the Site Development Plan (SDP) shown in Appendix A, the Proposed Development will consist of the following land uses:

Table 1: Proposed land use areas

Use Zone/ Reservation	Land Uses	No. of Units / Net Floor Area (Ha)
Residential 1	Single residential	1345 units
Residential 2	Residential	416 units
Residential 3	Residential	99 units
Business 1	Business	4.28 ha
Business 2	Business	5.03 ha
Institutional	Primary school	4.89 ha
	High school	2.14 ha
	Church	0.56 ha
	Library	0.14 ha
	Hall	0.13 ha
	Creche	0.31 ha
	Other	1.53 ha
Industrial	Industrial	0.19 ha
Municipal	Municipal	0.3 ha
Open space	Open space	42.63 ha
Road	Road	28.16 ha

2.3 Phasing of the Development

The implementation of the development will not be done through any phased stages.

3 SITE DESCRIPTION

A Site Development Plan (SDP) was obtained from the Town Planner and is shown in Appendix B. Any traffic engineering input from this report will be included in the final SDP

4 STUDY AREA

The study area considered for the traffic impact analysis of the Proposed Development will consist of the existing road infrastructure shown in Figure 2.

Figure 2: The study area for traffic analysis

4.1 Existing Roads

The study area considered for the traffic impact analysis of the Proposed Development consist of the following road infrastructure.

a) R36 Road

The R36 is a provincial road that links the N1 (between Louis Trichardt and Polokwane) with Ermelo, via Tzaneen and Lydenburg. The

R36 starts at a junction with the N1 national route in Bandelierkop (just north of the N1's Capricorn Toll Plaza), 70 kilometres north of Polokwane and 35 kilometres south of Louis Trichardt. The road is a two-way road with lanes generally about 3.5m in width in each direction. The road consists of surfaced shoulders of about 1.2m on either side of the road. The shoulder sight distance is generally adequate on the section of the road adjacent to the proposed site. The posted speed is 60 km/hr on the section of the road adjacent to the proposed housing development. The road surface is in a relatively good condition but requires routine maintenance. The road markings are slightly visible on this section of the road. The section of R36 road close to the Proposed Development is shown in Figure 3.

Figure 3: Section of R36 road, adjacent to the Proposed Development

b) D673 Road

D673 road is a district collector road that connects Letsiele Valley and Nkowankowa. D673 road crosses R36 road between Letsiele Valley and Nkowankowa. The road is two way with lanes generally about 3,5m in width in each direction. The posted speed is 60 km/hr on the section of the road adjacent to R3l and D673 intersection. The road surface is in good condition but requires routine maintenance to keep it in a good state. The road markings are slightly visible. The section of D673 road close to R36 and D673 intersection is shown in Figures 4 and 5.

Figure 4: Section of D673 / Road R36 towards Nkowankowa

Figure 5: Section of D673 / Road R36 towards Letsiele Valley

4.2 Existing Intersections

a) R36 and D673 Roads Intersection

R36 road is the major road, and D673 road is the minor road. The intersection is controlled by a STOP sign on all approaches. The intersection site distance is generally adequate. A view of the intersection is shown in Figure 6.

Figure 6: R36 & D673 Roads Intersection

4.3 Future Road Network Improvements

There are no future road improvements that have been identified within the study area and considered in the traffic analysis in this study.

4.4 Latent Development Rights

There are no latent rights that were considered in the analysis of the traffic flow within the study area. To consider any latent rights in the area, above average growth rate of 4% was assumed as per the recommendations from TMH 17: South African Trip Data Manual, September 2013.

5 DATA COLLECTION

5.1 Traffic Surveys

The counts were done on Wednesday 17 May 2022 and Thursday 18 May 2022 over the following intersections:

- R36 and D673 Roads Intersection.

The counting periods were as follows:

- AM peak period - 6:00am to 8:00am; and
- PM peak period - 16:00pm to 18:00pm.

The peak traffic flow period was determined as between 6:30am and 7:30am in the morning (AM) and between 16:30pm and 17:30pm in the evening (PM).

6 TRAFFIC GENERATION, ASSIGNMENT AND DISTRIBUTION

The trip characteristics of the development are discussed in this section. The route choice from the generated trips depends on the land use code within the proposed area as follows:

6.1 Trip generation

1) Existing land use

There are no trips that are being generated by the existing land use. The trips that were considered in this study are those generated by the proposed development land use.

2) Proposed Development land use

The proposed land uses for the Proposed Development and their corresponding trip rates are as follows:

a) Residential 1 (Low density single dwelling units) – Number of units = 1345

Land use COTO code used is 210.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 1.0 person trips per unit

Trips generated (TG) = 1.0 * 1345

= 1345 vehicular trips Split (in / out) = 25: 75

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 1.0 person trips per unit

Trips generated (TG) = 1.0 person trips * 1345

= 1345 vehicular trips Split (in / out) = 70: 30

NB: Trip generation factors that correspond to mixed use development of 10% will be used for land use code 210, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
High vehicle ownership will be assumed for this land use; hence no trip reduction factor will be used corresponding to vehicle ownership.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.1) * (1 – 0.15) = 0.24 = 24%*

b) Residential 2 (Medium density – townhouses, simplexes) – Number of units = 435

Land use COTO code used is 231.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.85 person trips per unit

Trips generated (TG) = 0.85 * 416

= 354 vehicular trips Split (in / out) = 25: 75

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.85 person trips per unit

Trips generated (TG) = 0.85 person trips * 416

= 354 vehicular trips Split (in / out) = 70: 30

NB: Trip generation factors that correspond to mixed use development of 15% will be used for land use code 210, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
High vehicle ownership will be assumed for this land use; hence no trip reduction factor will be used corresponding to vehicle ownership.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.15) * (1 – 0.15) = 0.28 = 28%*

c) Residential 3 (Medium to high density – townhouses, duplexes) – Number of units = 99

Land use COTO code used is 231.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.85 person trips per unit

Trips generated (TG) = 0.85 * 99
= 85 vehicular trips Split (in / out) = 25: 75

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.85 person trips per unit

Trips generated (TG) = 0.85 person trips * 99

= 85 vehicular trips Split (in / out) = 70: 30

Trip generation factors that correspond to mixed use development and low vehicle ownership of 15% and 30% respectively will be used for land use

code 231, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.15) * (1 – 0.3) * (1 – 0.15) = 0.49 = 49%*

d) Business 1 – (Net Floor Area = 42 800m^2 x 0.7) =29 960m^2

Land use COTO code used is 770.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 1.5 person trips per 100m^2
Trips Generated (TG) = 1.5 person trips * 29 960/100
= 450 vehicular trips with split (in / out) = 85: 15

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 1.5 person trips per 100m^2

Trips Generated (TG) = 1.5 person trips * 29 960/100
= 450 vehicular trips with split (in / out) = 20: 80

NB: Trip generation factors that correspond to mixed use development will be 15% for land use code 770, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.15) * (1 – 0.15) = 0.28 = 28%*

e) Business 2 – (Net Floor Area = 50 300m^2 x 0.7) =35 210m^2

Land use COTO code used is 820.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.6 person trips per $100m^2$

Trips Generated (TG) = 0.6 person trips * 35 210/100
= 212 vehicular trips with split (in / out) = 65: 35

- Friday PM Weekday Peak Trip Generation (TG)

Peak trip rate = 3.4 person trips per $100m^2$

Trips Generated (TG) = 3.4 person trips * 35 210/100
= 1 198 vehicular trips with split (in / out) = 50: 50

NB: The pass-by and diverted trips will be 13% and 29% respectively during Friday PM period, resulting in 58% being primary trips.

Trip generation factors that correspond to mixed use will be 10% for land use code 820, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.1) * (1 – 0.15) = 0.24 = 24%*

f) Institutional, 2 x Primary School – (Each school assumed capacity = 621 students as per South African Minimum Uniform Norms and Standards for Public School Infrastructure)

Land use COTO code (TMH 17, South African Trip Data Manual) used is 520.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.85 per student

Trips Generated (TG) = 0.85 person trips * 621 * 2 schools
= 1056 vehicular trips with split (in / out) = 50: 50

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.30 per student

Trips Generated (TG) = 0.30 person trips * 621 * 2 schools
= 373 vehicular trips with split (in / out) = 50: 50

NB: Trip generation factors that correspond to mixed use development will be 30% for land use code 520, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.3) * (1 – 0.15) = 0.41 = 41%*

g) Institutional, 1 x High School – (Each school assumed capacity = 601 students as per South African Minimum Uniform Norms and Standards for Public School Infrastructure)

Land use COTO code (TMH 17, South African Trip Data Manual) used is 530.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.75 per student

Trips Generated (TG) = 0.75 person trips * 601 * 1 school
= 451 vehicular trips with split (in / out) = 50: 50

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.25 per student

Trips Generated (TG) = 0.25 person trips * 601 * 1 school

= 151 vehicular trips with split (in / out) = 50: 50

NB: Trip generation factors that correspond to mixed use development will be 30% for land use code 530, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.3) * (1 – 0.15) = 0.41 = 41%*

h) Institutional, Church – (Net floor area = 5 600m^2 x 0.7 = 3 920m^2, number of congregants = 784)

Land use COTO code used is 561.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.05 person trips per seat

Trips generated (TG) = 0.05 * 784

= 40 vehicular trips Split (in / out) = 50: 50

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.05 person trips per seat

Trips generated (TG) = 0.05 * 784

= 40 vehicular trips Split (in / out) = 50: 50

NB: Trip generation factors that correspond to mixed use development will be 10% for land use code 561, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.

*The combined reduction factor = 1 – (1 – 0.1) * (1 – 0.15) = 0.24 = 24%*

i) Institutional, Library – (Net floor area = 1 400m^2 x 0.7 = 980m^2, number of congregants = 98)

Land use COTO code used is 550.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.2 person trips per student

Trips generated (TG) = 0.2 * 98

= 20 vehicular trips Split (in / out) = 80: 20

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.2 person trips per student

Trips generated (TG) = 0.2 * 98

= 20 vehicular trips Split (in / out) = 30: 70

NB: Trip generation factors that correspond to mixed use development will be 20% for land use code 561, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.2) * (1 – 0.15) = 0.32 = 32%*

j) Institutional, Hall – (Net floor area = 1 300m^2 x 0.7 = 910m^2, number of congregants = 91)

Land use COTO code used is 780.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.5 person trips per student

Trips generated (TG) = 0.5 * 91

= 46 vehicular trips Split (in / out) = 90: 10

Trip generation factors that correspond to mixed use development will be 10%, as recommended by the TMH 17: South African Trip Data Manual, September 2013.

Transit node factor of 10% will be applied.

*The combined reduction factor = 1 – (1 – 0.1) * (1 – 0.1) = 0.19 = 19%*

k) Institutional, Creche – (Net floor area = 3 100m^2 x 0.7 = 2170m^2, number of students = 217)

Land use COTO code (TMH 17, South African Trip Data Manual) used is 565.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 1.0 per student

Trips Generated (TG) = 1.0 person trips * 217

= 217 vehicular trips with split (in / out) = 50: 50

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.80 per student

Trips Generated (TG) = 0.80 person trips * 217

= 174 vehicular trips with split (in / out) = 50: 50

Trip generation factors that correspond to mixed use development will be 5%, as recommended by the TMH 17: South African Trip Data Manual, September 2013.

Transit node factor of 15% will be applied.

*The combined reduction factor = 1 – (1 – 0.05) * (1 – 0.15) = 0.19 = 19%*

l) Industrial 1 - (Warehousing and Distribution) – Net Floor Area = 1900m^2 x 0.7 = 1330m^2.

Land use COTO code used is 150.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.5 person trips per unit

Trips generated (TG) = 0.5 * 1330/100

= 7 vehicular trips Split (in / out) = 60: 40

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 0.5 person trips per unit

Trips generated (TG) = 0.5 person trips * 1330/100

= 7 vehicular trips Split (in / out) = 45: 55

Trip generation factors that correspond to mixed use development will be 5%, as recommended by the TMH 17: South African Trip Data Manual, September 2013.

Transit node factor of 15% will be applied.

*The combined reduction factor = 1 – (1 – 0.05) * (1 – 0.15) = 0.19 = 19%*

m) Municipal & Other institution - (Offices) – Net Floor Area = 3 000m^2 x 0.7 = 2 100m^2.

Land use COTO code used is 710.

- AM Weekday Peak Trip Generation (TG)

Peak trip rate = 2.1 person trips per $100m^2$

Trips generated (TG) = 2.1 * 2100/100

= 45 vehicular trips Split (in / out) = 85: 15

- PM Weekday Peak Trip Generation (TG)

Peak trip rate = 2.1 person trips per m^2

Trips generated (TG) = 2.1 person trips * 2100/100

= 45 vehicular trips Split (in / out) = 20: 80

Trip generation factors that correspond to mixed use development will be 20%, as recommended by the TMH 17: South African Trip Data Manual, September 2013.
Transit node factor of 15% will be applied.
*The combined reduction factor = 1 – (1 – 0.2) * (1 – 0.15) = 0.32 = 32%*

6.2 Trip reduction factors

Trip generation reduction factors that correspond to mixed–use development and low vehicle ownership were used as discussed above.

6.3 Generated Pass-By, Diverted, Transferred Primary Trips

Unless stated otherwise above, pass by, diverted, and transferred trips were primary since all the trips generated by the proposed housing development are likely to be new in the study area. The summary of generated trips is shown in Table 2.

Table 2: Summary of generated primary peak hour trips

Component	Primary trips			
	Trips in		Trips Out	
	AM Peak	PM Peak	AM Peak	PM Peak
i) Residential 1	255	716	767	307
ii) Residential 2	64	178	191	76
iii) Residential 3	11	30	33	13
iv) Business 1	275	65	49	259
v) Business 2	105	264	56	264
vi) Primary school	312	110	312	110
vii) High school	133	45	133	45
viii) Church	15	15	15	15
ix) Library	11	4	3	10
x) Hall	34	-	4	-
xii) Creche	88	70	88	70
xiii) Industrial 1	3	3	2	3
xiv) Offices	26	6	5	24
Total	**1332**	**1506**	**1658**	**1196**

6.4 Trips distribution

It was assumed that 65% of the generated trips from the proposed development will be distributed towards R36 north (towards Tzaneen) and 35% towards R36 south from the 2 accesses. Considering the proximity of the land uses to the proposed two accesses, it was assumed that 70% of traffic will be directed towards the northern access (first access from Tzaneen along R36 road), while 30% will be directed towards the other access.

The trip distribution and assignment of trips are shown in Figures 7 and 8 respectively.

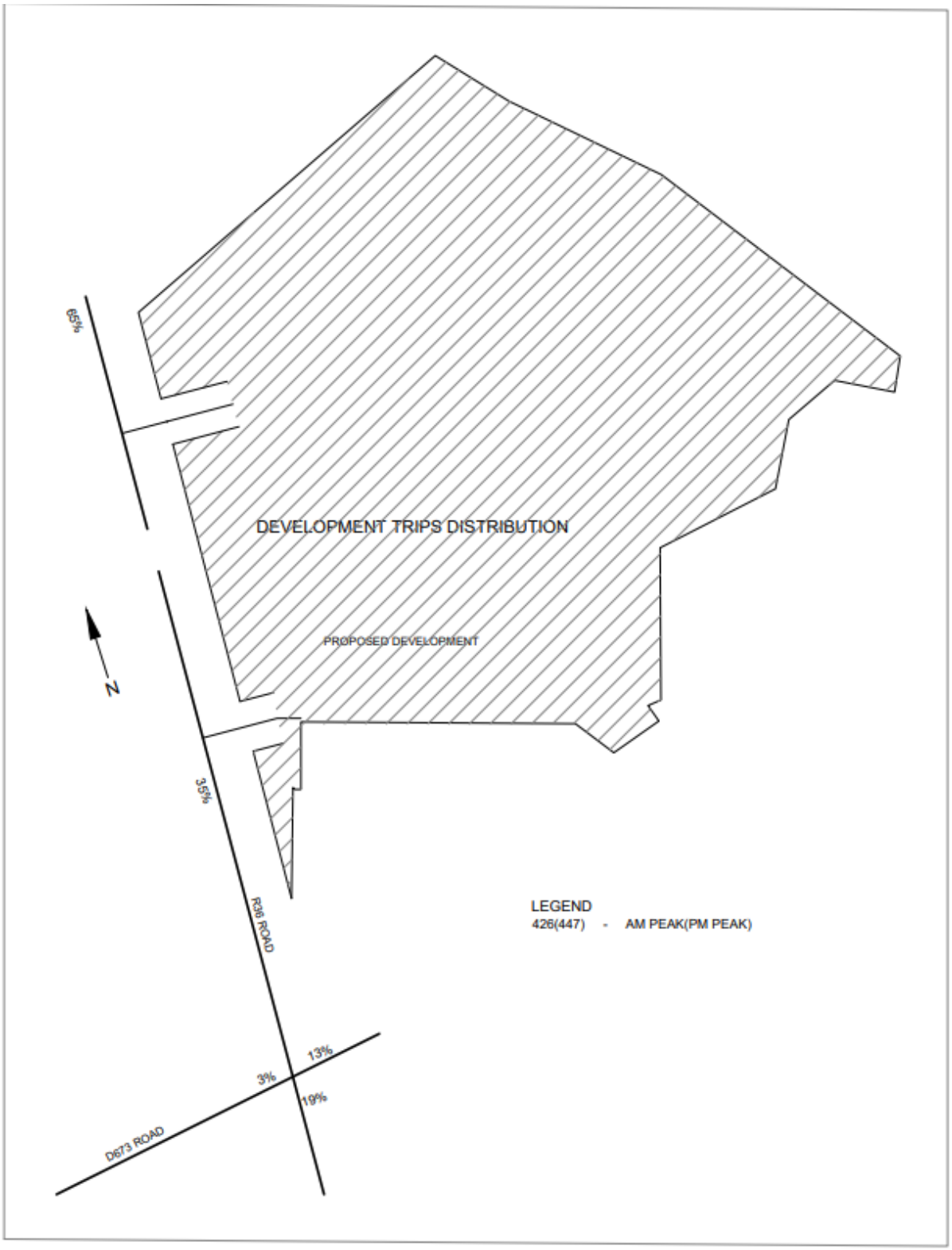


Figure 7: Proposed Mohlaba development trip distribution during AM and PM peak periods

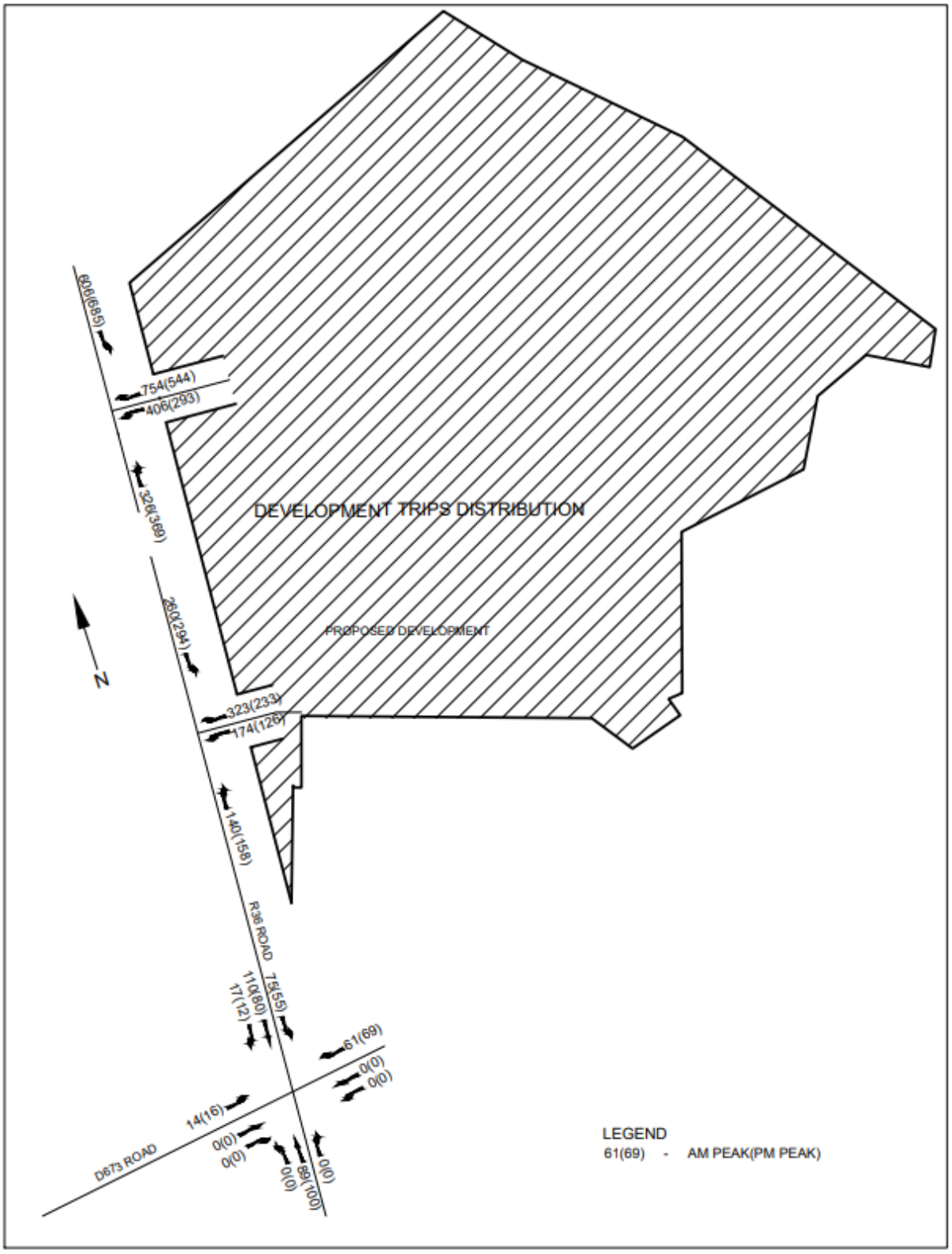


Figure 8: Proposed Mohlaba development trip assignment during AM and PM peak periods

7 TRAFFIC IMPACT AND CAPACITY ANALYSIS

This section details the analysis of traffic generated from the proposed development on the existing road network. The estimated date of completion of construction is within the next two years, that is year 2024. An annual growth rate of 4% was assumed as per the recommendations from (TMH 17: South African Trip Data Manual, September 2013).

The parameter used in determining the level of service (LOS) is the delay using the Sidra Intersection 8.

The target LOS is LOS D.

Table 3 shows different categories of LOS and the corresponding delays.

Table 3: Level of service for vehicles (Highway Capacity Manual (7) method

Level of service (LOS)	Control delay per vehicle in seconds (d)	
	Signals and roundabouts	Stop signs and yield signs
A	d ≤ 10	d ≤ 10
B	10 < d ≤ 20	10 < d ≤ 15
C	20 < d ≤ 35	15 < d ≤ 25
D	35 < d ≤ 55	25 < d ≤ 35
E	55 < d ≤ 80	35 < d ≤ 50
F	80 < d	50 < d

The following scenarios were considered in determining approach and intersection capacities in the study area:

- Base year 2022- without development AM & PM peak hours.
- Opening year 2024 - with development and latent rights traffic AM & PM peak hours.
- Design horizon year 2029 - with development and latent rights AM & PM peak hours.

7.1 Capacity analysis at existing intersection

During the 2022 base year, all intersections and approaches are operating at an undesirable LOS F. The results are attached at Appendix F.

To improve the LOS at the intersection during the base year 2022, traffic signals were introduced for the opening year 2024 and horizon year 2029. The intersection will still operate at LOS F with improved delay after introduction of traffic signals. The results are shown below, and LOS obtained are shown in Table 5.

Table 4: Summary of LOS at R36 & D673

Intersection		Delay		Critical Approach		LOS		Final Intersection LOS
R36 / D673	**Type of Intersection**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	
Base year (2022)	4-way Stop	538.2	405.4	2.13	1.79	F	F	F
Opening year (2024)	Signalised	240.0	53.9	1.79	1.11	F	D	F
Horizon year (2029)	Signalised	395.0	89.9	2.24	1.64	F	F	F

8 ACCESS TO PROPOSED DEVELOPMENT

The site will consist of two accesses from R36 road. The accesses to the proposed development are proposed to be class 4a and will form a T intersection with R36 road. R36 will be the major road and the Access Road 1 and Access Road 2 will be the minor roads controlled by traffic signals.

8.1 Capacity analysis at access intersection

The intersection of R36 road and Access Road 1 and 2 were analysed separately for the design horizon period year 2029 during the AM and PM peak traffic flows shown in Figure 9.

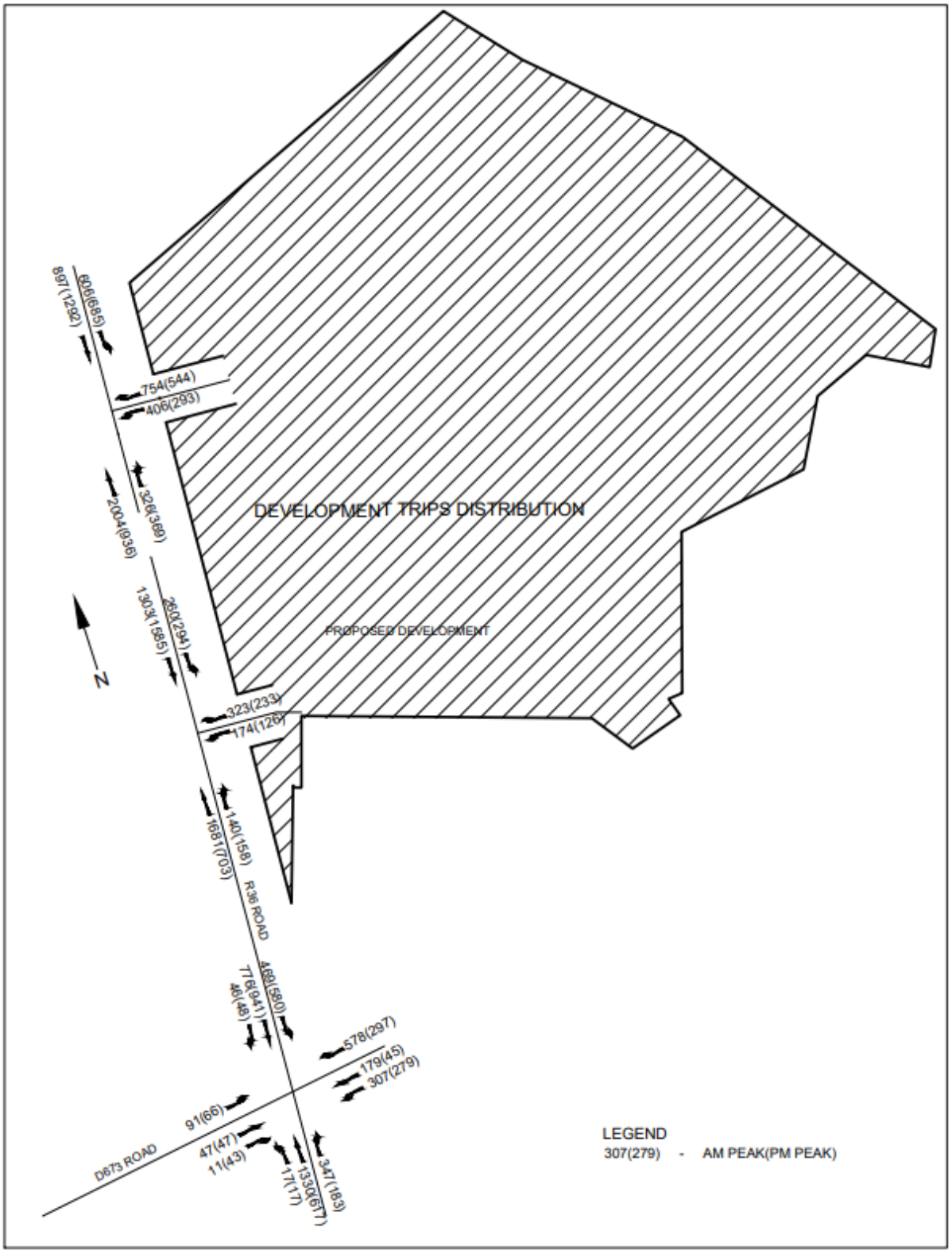


Figure 9: Proposed Mohlaba development trip assignment during AM and PM peak periods

The LOS that were achieved are acceptable and shown in Table 5.

Table 5: LOS at Access 1 and Access 2 at the design horizon year 2029 (with development and latent rights traffic)

Intersection	Type of Intersection	Delay		Critical Approach		LOS		Final Intersection LOS
		AM	PM	AM	PM	AM	PM	
R36 & Access Road 1	Signalised	53.1	50.8	0.97	0.95	D	D	D
R36 & Access Road 2	Signalised	17.4	20.7	0.84	0.83	B	C	C

8.2 Development access width

The heavy vehicle (WB-15/Wb-20) will be the largest vehicle to access the site.

According to the TMH 16 Volume 2 South African Traffic Impact and Site Impact Assessment Standards and Requirements Manual, the required minimum proposed access driveway width is 7.0m, which will be provided on the access to the proposed development from R36 road. The road reserve of the proposed access from R36 Road to the proposed development is 25 metres as shown in Table 6.

Table 6: Functional classification of the proposed Mohlaba Access

Description	Access	Class No.	Function	Reserve Width	Minimum Roadway Width
Mohlaba development Access	Access 1	Proposed class 4b	Proposed collector road	25m	7.0m
	Access 2	Proposed class 4b	Proposed collector road	25m	7.0m

8.3 Development access width

The spacings between Access 1 and Access 2 along R36 Road is 670m and is within the recommended minimum values.

8.4 Gap acceptance sight distance

Assuming a design vehicle WB-15/Wb-20 and a design speed less than 60km/hr, the minimum gap acceptance sight distance that should be achieved at all intersections, including the signalised intersection is 160 metres.

8.5 Queuing analysis

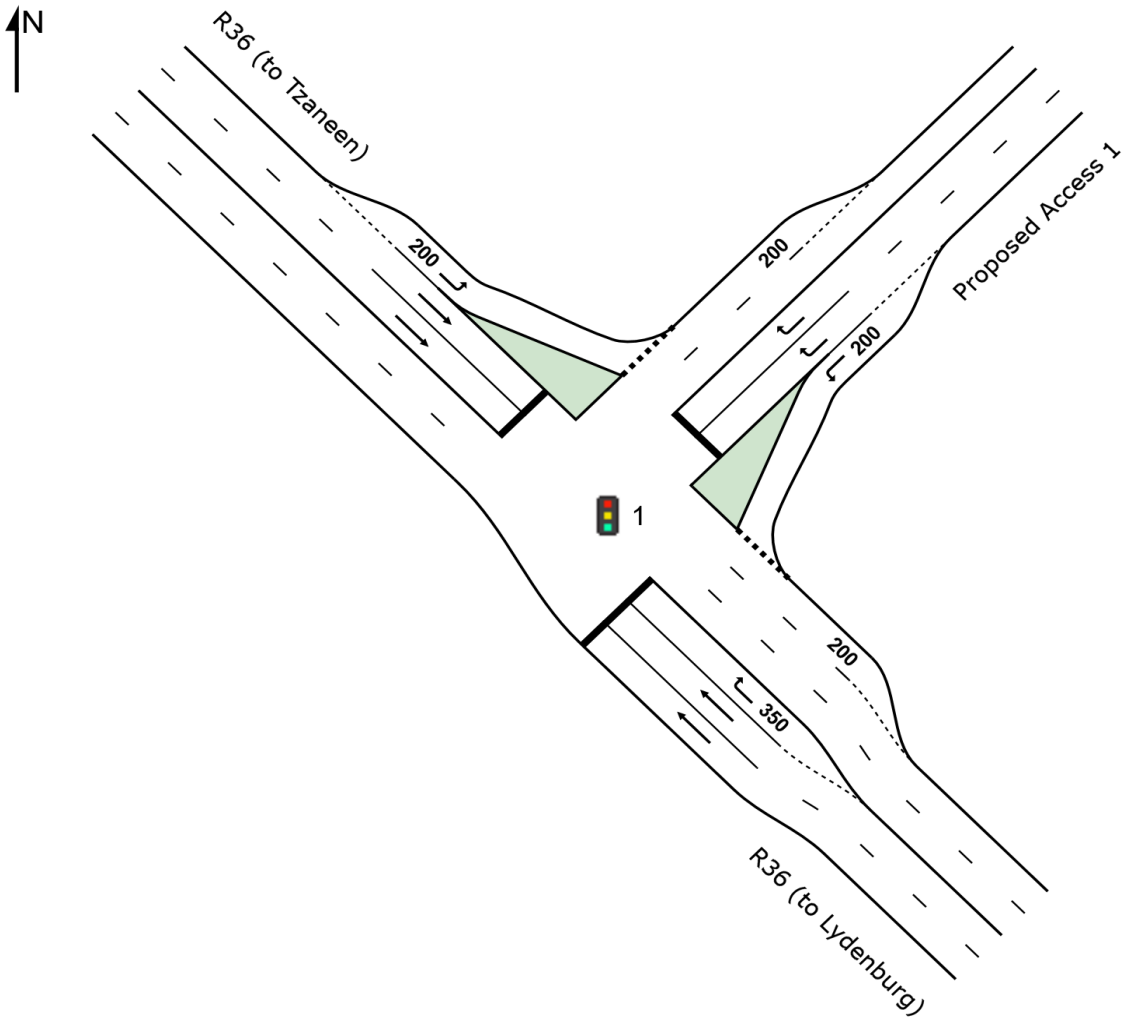
From the analysis of R36 road and proposed development accesses during the design horizon year of 2029 AM peak period, the queue lengths obtained on all the intersection approaches are shown in Table 7. Only the worst cases have been tabulated.

Table 7: Queue lengths obtained during design horizon year 2029

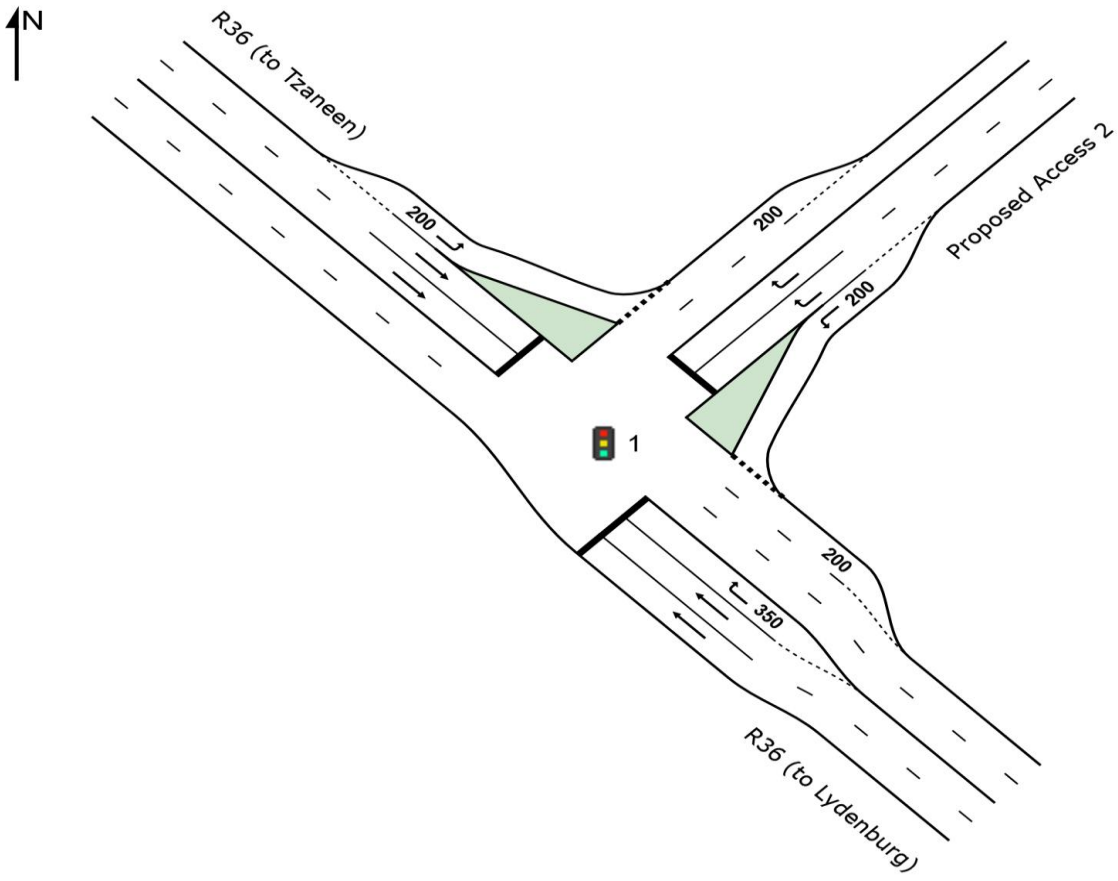
Configuration	Queue Distances (m)			
	R36 Road from NW	**R36 Road from SE**	**Access Road**	**Intersection Average**
R36 and Access 1	Straight lanes – 19.1 Left turn lanes – 12.7	Straight lanes – 55.3m Right turn lanes – 14.6m	Left turn lanes 8.4m Right turn lanes – 21.2m	55.3
R36 and Access 2	Straight lanes – 21.8 Left turn lanes – 2.1	Straight lanes – 3.2 Right turn lanes – 6.0	Left turn lanes - 2.4 Right turn lanes – 4.4	21.8

9 PROPOSED INTERSECTION LAYOUTS

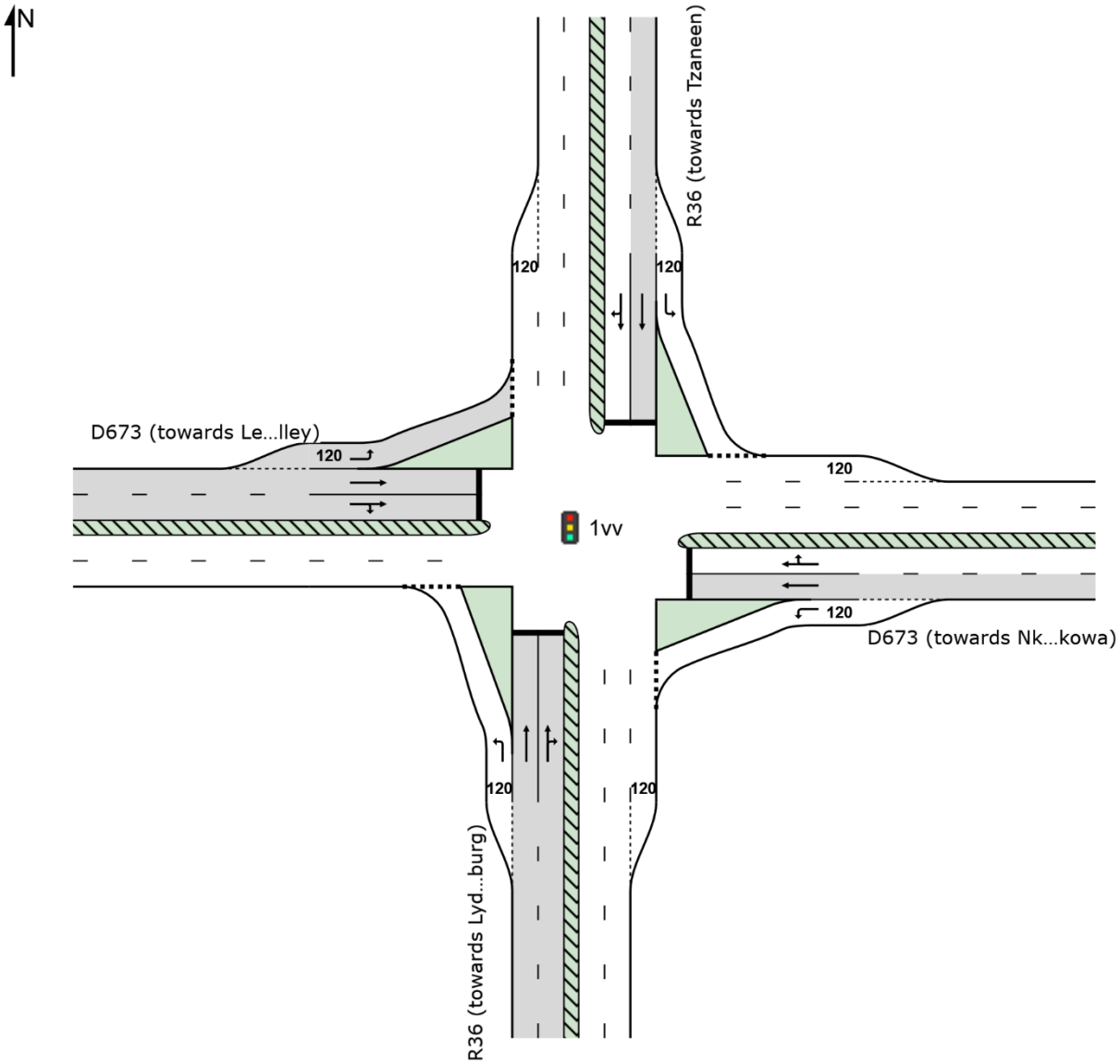
9.1 R36 & Access 1



9.2 R36 & Access 2



9.3 R36 & D673


N
R36 (towards Tzaneen)
120
120
D673 (towards Le...lley)
120
120
1vv
120
D673 (towards Nk...kowa)
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120
R36 (towards Lyd...burg)

10 ROAD IMPROVEMENTS AND MITIGATION MEASURES

10.1 Access Road

The existing access road to the proposed development is unsurfaced and must be rehabilitated to a surfaced road. The rehabilitation of the road will be part of the proposed development and the cost of the rehabilitation will be covered through the bulk services contribution paid by the municipality.

10.2 R36 and D673

The existing intersection is operating at LOS F as a 4-way STOP intersection. The introduction of traffic signals and slip lanes, improved the delay on the intersection but did not improve the overall operation of the intersection from LOS F. A global R36 route upgrade is thereof required to improve the operation of the intersection. Such improvements are outside the scope of this report.

11 PUBLIC TRANSPORT, PEDESTRIAN AND CYCLING NETWORKS

11.1 Demand for public transport facilities

Walking distances to the public transport designated parking area should preferably be within 400m but not more than 800m. Public transport areas will be provided along R36 road, on either side of proposed accesses.

11.2 Pedestrian and NMT Facilities

It is anticipated that the volume of pedestrians will be more than 20 pedestrians per hour. The objectives of the National Transport Policy of 1996 are to limit walking distances to less than 1km.

A sidewalk of 1.8 metres in width will be provided on either side of the Access Road from R36 / Access roads. A buffer width of 0,6 metres wide will be provided between the sidewalk and the Access Road to protect pedestrians from vehicular traffic.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 Conclusions

The following conclusions were derived from the assessment:

a) Trip generation from the proposed development will affect the performance of R36 road but within the acceptable limits of Level of Service D.
b) The Level of Service of the R36 and D673 intersection is currently F. Proposed upgrades to the intersection by means of signalised control and slip lanes will only improve the delay but cannot improve the Level of Service.

12.2 Recommendations

The following recommendations should be considered:

a) Two accesses from the proposed development should be provided at distance of 670m apart along R36.
b) The accesses should be of minimum class 4b and the proposed configuration as shown in Chapter 9.
c) The bulk services contribution by the developer should be used towards the upgrade of the R36 as suggested in this report while the developer will meet the cost of the access roads.
d) A global route upgrade should be considered by SANRAL to improve the function of intersection R36 and D673.
e) A site traffic assessment should be done after the approval of the site development plan to manage on-site traffic.

13 REFERENCES

1. De Leuw Cather & SENA, SADC Road Traffic Signs Manual, Department of Transport, June 1999.
2. TMH 16 Volumes 1 & 2 South African Traffic Impact and Site Impact Assessment Standards and Requirements Manual.
3. TMH 17 South African Trip Generation Manual.
4. Transportation Research Board, Highway Capacity Manual, 2000.
5. TRH 26 South African Road Classification and Access Management Manual of COTO (2012).
6. Pedestrian and Bicycle Facility Guidelines of the Department of Transport (2002).
7. Ekurhuleni Metropolitan Municipality, Regional Spatial Development Framework: Region C of 2015.
8. Ekurhuleni Town Planning Scheme 2014

APPENDIX A – PROPOSED SITE DEVELOPMENT PLAN

APPENDIX B – MOVEMENT SUMMARY

a) R36 & Access 1 Intersection

MOVEMENT SUMMARY

Site: 1 [Proposed Mohlaba Access 1_AM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 140 seconds (Site Optimum Cycle Time - Minimum Delay)

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
SouthEast: R36 (to Lydenburg)												
22	T1	2109	26.9	0.968	58.9	LOS E	90.3	777.7	1.00	1.12	1.23	23.6
23	R2	343	26.9	0.825	62.4	LOS E	23.9	205.7	1.00	0.94	1.12	22.9
Approach		2453	26.9	0.968	59.4	LOS E	90.3	777.7	1.00	1.10	1.21	23.5
NorthEast: Proposed Access 1												
24	L2	427	26.9	0.481	14.8	LOS B	13.7	117.9	0.56	0.69	0.56	36.4
26	R2	794	26.9	0.954	89.8	LOS F	34.6	298.4	1.00	1.09	1.39	18.8
Approach		1221	26.9	0.954	63.6	LOS E	34.6	298.4	0.85	0.95	1.10	22.7
NorthWest: R36 (to Tzaneen)												
27	L2	638	26.9	0.619	12.9	LOS B	20.7	178.0	0.59	0.71	0.59	37.3
28	T1	944	26.9	0.821	50.5	LOS D	31.1	268.3	0.98	0.93	1.05	25.3
Approach		1582	26.9	0.821	35.4	LOS D	31.1	268.3	0.82	0.84	0.86	29.0
All Vehicles		5256	26.9	0.968	53.1	LOS D	90.3	777.7	0.91	0.99	1.08	24.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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.

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MOVEMENT SUMMARY

Site: 1 [Proposed Mohlaba Access 1_PM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)

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
SouthEast: R36 (to Lydenburg)												
22	T1	985	26.9	0.404	9.5	LOS A	13.6	117.2	0.42	0.50	0.42	38.9
23	R2	388	26.9	0.949	92.3	LOS F	35.4	305.2	1.00	1.08	1.35	18.6
Approach		1374	26.9	0.949	32.9	LOS C	35.4	305.2	0.58	0.67	0.68	29.7
NorthEast: Proposed Access 1												
24	L2	308	26.9	0.418	23.6	LOS C	12.8	110.0	0.66	0.72	0.66	32.9
26	R2	573	26.9	0.941	94.5	LOS F	25.6	220.6	1.00	1.07	1.38	18.3
Approach		881	26.9	0.941	69.7	LOS E	25.6	220.6	0.88	0.95	1.13	21.7
NorthWest: R36 (to Tzaneen)												
27	L2	721	26.9	0.704	18.1	LOS B	28.7	247.3	0.70	0.80	0.74	35.0
28	T1	1360	26.9	0.950	73.9	LOS E	60.7	523.3	1.00	1.11	1.25	21.1
Approach		2081	26.9	0.950	54.6	LOS D	60.7	523.3	0.90	1.00	1.07	24.4
All Vehicles		4336	26.9	0.950	50.8	LOS D	60.7	523.3	0.79	0.88	0.96	25.2

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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.

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b) R36 & Access 2 Intersection

MOVEMENT SUMMARY

Site: 1 [Proposed Mohlaba Access 2_AM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

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
SouthEast: R36 (to Lydenburg)												
22	T1	1769	26.9	0.754	8.6	LOS A	19.4	167.3	0.69	0.71	0.69	39.4
23	R2	147	26.9	0.819	43.7	LOS D	5.8	49.7	1.00	1.02	1.41	25.5
Approach		1917	26.9	0.819	11.3	LOS B	19.4	167.3	0.71	0.73	0.75	38.0
NorthEast: Proposed Access 2												
24	L2	183	26.9	0.320	13.1	LOS B	3.4	29.3	0.65	0.70	0.65	36.4
26	R2	340	26.9	0.840	44.2	LOS D	6.7	58.1	1.00	1.05	1.44	25.2
Approach		523	26.9	0.840	33.3	LOS C	6.7	58.1	0.88	0.93	1.16	28.2
NorthWest: R36 (to Tzaneen)												
27	L2	274	26.9	0.236	5.7	LOS A	2.0	17.6	0.33	0.57	0.33	40.6
28	T1	1372	26.9	0.818	22.3	LOS C	22.9	197.3	0.91	0.94	1.04	33.3
Approach		1645	26.9	0.818	19.5	LOS B	22.9	197.3	0.82	0.88	0.92	34.2
All Vehicles		4085	26.9	0.840	17.4	LOS B	22.9	197.3	0.78	0.82	0.87	35.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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.

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MOVEMENT SUMMARY

Site: 1 [Proposed Mohlaba Access 2_PM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site Optimum Cycle Time - Minimum Delay)

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
SouthEast: R36 (to Lydenburg)												
22	T1	740	26.9	0.279	4.4	LOS A	5.2	44.9	0.29	0.41	0.29	41.7
23	R2	166	26.9	0.830	62.8	LOS E	9.8	84.7	1.00	0.98	1.29	21.5
Approach		906	26.9	0.830	15.1	LOS B	9.8	84.7	0.42	0.51	0.47	36.1
NorthEast: Proposed Access 2												
24	L2	133	26.9	0.282	18.2	LOS B	3.9	33.3	0.62	0.69	0.62	33.9
26	R2	245	26.9	0.779	62.5	LOS E	7.1	61.2	1.00	0.93	1.23	21.4
Approach		378	26.9	0.779	46.9	LOS D	7.1	61.2	0.87	0.84	1.02	24.6
NorthWest: R36 (to Tzaneen)												
27	L2	309	26.9	0.252	6.0	LOS A	3.4	29.0	0.28	0.56	0.28	40.5
28	T1	1668	26.9	0.817	20.4	LOS C	35.6	306.8	0.84	0.83	0.86	34.0
Approach		1978	26.9	0.817	18.2	LOS B	35.6	306.8	0.76	0.79	0.77	34.8
All Vehicles		3262	26.9	0.830	20.7	LOS C	35.6	306.8	0.68	0.72	0.72	33.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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.

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c) R36 & D673 Intersection

MOVEMENT SUMMARY

Site: 1v [R36 & D673 - 2022 Background Peak AM]

Intersection 1
Site Category: (None)
Stop (All-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: R36 (towards Lydenburg)												
1	L2	14	46.2	0.731	34.1	LOS D	5.4	47.0	1.00	1.85	4.40	39.1
2	T1	926	27.6	2.130	740.9	LOS F	212.5	1851.7	1.00	11.51	43.05	4.5
3	R2	278	30.7	2.130	1043.8	LOS F	212.5	1851.7	1.00	15.64	59.57	3.3
Approach		1218	28.5	2.130	802.1	LOS F	212.5	1851.7	1.00	12.34	46.38	4.2
East: D673 (towards Nkowankowa)												
4	L2	368	14.9	1.492	497.0	LOS F	58.2	459.3	1.00	6.32	23.22	6.6
5	T1	143	2.9	1.398	411.6	LOS F	54.0	419.6	1.00	6.23	23.03	7.7
6	R2	245	18.5	1.398	412.1	LOS F	54.0	419.6	1.00	6.23	23.03	7.7
Approach		757	13.8	1.492	453.4	LOS F	58.2	459.3	1.00	6.28	23.12	7.1
North: R36 (towards Tzaneen)												
7	L2	259	30.1	0.849	61.3	LOS F	8.4	74.2	1.00	2.22	5.87	30.1
8	T1	449	41.5	1.340	355.3	LOS F	57.0	540.8	1.00	7.32	25.34	8.8
9	R2	9	44.4	1.340	355.5	LOS F	57.0	540.8	1.00	7.32	25.34	8.8
Approach		718	37.4	1.340	249.2	LOS F	57.0	540.8	1.00	5.48	18.32	11.8
West: D673 (towards Letsitele Valley)												
10	L2	51	43.8	0.265	24.2	LOS C	1.0	10.1	1.00	1.35	2.35	43.5
11	T1	38	16.7	0.285	25.2	LOS D	1.1	9.4	1.00	1.34	2.38	42.7
12	R2	8	37.5	0.285	25.8	LOS D	1.1	9.4	1.00	1.34	2.38	42.5
Approach		97	32.6	0.285	24.7	LOS C	1.1	10.1	1.00	1.34	2.36	43.1
All Vehicles		2789	26.9	2.130	538.2	LOS F	212.5	1851.7	1.00	8.55	31.32	6.1

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

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MOVEMENT SUMMARY

Site: 1v [R36 & D673 - 2022 Background Peak PM]

Intersection 1
Site Category: (None)
Stop (All-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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: R36 (towards Lydenburg)												
1	L2	146	23.0	0.495	20.9	LOS C	2.4	20.4	0.97	1.48	2.91	45.0
2	T1	342	32.0	1.442	394.5	LOS F	82.8	735.3	1.00	8.58	31.08	8.0
3	R2	278	30.7	1.442	436.6	LOS F	82.8	735.3	1.00	9.38	34.23	7.4
Approach		766	29.8	1.442	338.4	LOS F	82.8	735.3	0.99	7.51	26.84	9.2
East: D673 (towards Nkowankowa)												
4	L2	192	12.6	1.087	201.6	LOS F	17.2	133.4	1.00	2.99	9.36	14.0
5	T1	36	17.6	1.289	340.3	LOS F	32.6	262.6	1.00	4.39	15.04	9.1
6	R2	223	17.5	1.289	340.3	LOS F	32.6	262.6	1.00	4.39	15.04	9.1
Approach		451	15.4	1.289	281.3	LOS F	32.6	262.6	1.00	3.79	12.63	10.7
North: R36 (towards Tzaneen)												
7	L2	382	18.7	1.148	203.1	LOS F	31.7	257.5	1.00	4.74	16.42	13.9
8	T1	633	27.0	1.792	746.6	LOS F	127.4	1092.9	1.00	11.28	42.40	4.5
9	R2	19	5.6	1.792	746.3	LOS F	127.4	1092.9	1.00	11.28	42.40	4.5
Approach		1034	23.5	1.792	545.7	LOS F	127.4	1092.9	1.00	8.86	32.80	6.0
West: D673 (towards Letsitele Valley)												
10	L2	28	33.3	0.201	25.1	LOS D	0.8	6.9	1.00	1.31	2.24	43.0
11	T1	38	16.7	0.440	34.8	LOS D	2.0	16.6	1.00	1.42	2.73	38.3
12	R2	35	21.2	0.440	35.0	LOS D	2.0	16.6	1.00	1.42	2.73	38.2
Approach		101	22.9	0.440	32.1	LOS D	2.0	16.6	1.00	1.39	2.59	39.5
All Vehicles		2352	24.0	1.792	405.4	LOS F	127.4	1092.9	1.00	7.13	25.69	7.8

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

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MOVEMENT SUMMARY

Site: 1vv [R36 & D673 - 2024 Opening Peak AM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

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: R36 (towards Lydenburg)												
1	L2	15	42.9	0.012	7.2	LOS A	0.1	0.9	0.21	0.57	0.21	52.5
2	T1	1096	25.3	1.788	282.3	LOS F	154.7	1317.5	1.00	2.52	3.05	10.5
3	R2	301	30.8	1.788	745.2	LOS F	76.3	673.1	1.00	2.43	5.17	4.4
Approach		1412	26.6	1.788	378.1	LOS F	154.7	1317.5	0.99	2.48	3.47	8.2
East: D673 (towards Nkowankowa)												
4	L2	266	18.6	0.402	23.3	LOS C	8.2	66.4	0.74	0.77	0.74	42.9
5	T1	155	2.7	1.332	348.0	LOS F	24.4	175.0	1.00	1.79	3.61	8.7
6	R2	462	12.8	1.429	428.3	LOS F	80.5	624.8	1.00	2.16	3.93	7.1
Approach		883	12.8	1.429	292.1	LOS F	80.5	624.8	0.92	1.68	2.91	10.0
North: R36 (towards Tzaneen)												
7	L2	359	23.5	0.293	8.3	LOS A	3.2	26.6	0.37	0.66	0.37	52.1
8	T1	602	33.6	0.740	25.3	LOS C	13.7	123.9	0.80	0.71	0.85	42.4
9	R2	27	15.4	0.740	49.8	LOS D	9.9	88.2	1.00	0.90	1.17	34.3
Approach		988	29.4	0.740	19.8	LOS B	13.7	123.9	0.65	0.70	0.68	45.1
West: D673 (towards Letsitele Valley)												
10	L2	69	34.8	0.184	34.6	LOS C	2.5	23.1	0.86	0.74	0.86	38.0
11	T1	40	15.8	0.275	49.8	LOS D	1.4	11.7	0.98	0.72	1.09	32.9
12	R2	8	37.5	0.275	54.2	LOS D	1.4	11.7	0.99	0.75	1.20	32.7
Approach		118	28.6	0.275	41.2	LOS D	2.5	23.1	0.91	0.73	0.96	35.7
All Vehicles		3401	23.9	1.788	240.0	LOS F	154.7	1317.5	0.87	1.69	2.43	11.8

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

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MOVEMENT SUMMARY

Site: 1vv [R36 & D673 - 2024 Opening Peak PM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

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: R36 (towards Lydenburg)												
1	L2	15	14.3	0.010	6.4	LOS A	0.1	0.5	0.17	0.57	0.17	53.6
2	T1	464	25.6	1.077	41.8	LOS F	19.0	162.2	0.96	0.91	1.13	34.5
3	R2	158	22.7	1.077	118.2	LOS F	18.0	151.2	1.00	1.24	2.29	17.2
Approach		637	24.6	1.077	59.9	LOS E	19.0	162.2	0.95	0.98	1.39	27.8
East: D673 (towards Nkowankowa)												
4	L2	241	17.5	0.263	15.1	LOS B	5.2	42.2	0.55	0.71	0.55	47.5
5	T1	38	16.7	0.355	52.3	LOS D	1.9	15.3	1.00	0.73	1.00	32.4
6	R2	280	9.4	0.813	47.4	LOS D	13.6	102.8	1.00	0.92	1.19	33.5
Approach		559	13.4	0.813	33.8	LOS C	13.6	102.8	0.81	0.82	0.90	38.3
North: R36 (towards Tzaneen)												
7	L2	472	16.5	0.356	8.0	LOS A	4.8	38.2	0.35	0.66	0.35	52.3
8	T1	768	24.0	1.111	90.0	LOS F	37.1	308.6	0.98	1.23	1.61	23.7
9	R2	33	3.2	1.111	167.2	LOS F	37.1	308.6	1.00	1.67	2.38	15.8
Approach		1273	20.7	1.111	61.6	LOS E	37.1	308.6	0.75	1.03	1.17	29.2
West: D673 (towards Letsitele Valley)												
10	L2	47	22.2	0.066	19.3	LOS B	1.2	9.7	0.60	0.68	0.60	45.1
11	T1	40	15.8	0.326	45.2	LOS D	2.2	17.7	0.98	0.71	0.98	34.1
12	R2	37	20.0	0.326	41.2	LOS D	2.2	17.7	0.97	0.73	0.97	35.9
Approach		124	19.5	0.326	34.2	LOS C	2.2	17.7	0.83	0.71	0.83	38.2
All Vehicles		2593	20.0	1.111	53.9	LOS D	37.1	308.6	0.81	0.96	1.15	30.8

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

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MOVEMENT SUMMARY

Site: 1vv [R36 & D673 - 2029 Horizon AM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

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: R36 (towards Lydenburg)												
1	L2	18	47.1	0.016	7.3	LOS A	0.1	1.1	0.21	0.57	0.21	52.4
2	T1	1313	25.7	2.241	562.7	LOS F	266.5	2276.2	1.00	3.61	4.42	5.8
3	R2	365	30.5	2.241	1149.7	LOS F	109.3	962.7	1.00	2.72	6.13	2.9
Approach		1696	26.9	2.241	683.3	LOS F	266.5	2276.2	0.99	3.38	4.74	4.8
East: D673 (towards Nkowankowa)												
4	L2	323	18.6	0.481	24.1	LOS C	10.4	84.3	0.77	0.79	0.77	42.5
5	T1	188	2.8	1.562	547.7	LOS F	110.5	859.5	1.00	2.14	4.50	5.9
6	R2	548	13.1	1.562	548.1	LOS F	110.5	859.5	1.00	2.42	4.43	5.8
Approach		1060	12.9	1.562	388.3	LOS F	110.5	859.5	0.93	1.87	3.33	7.9
North: R36 (towards Tzaneen)												
7	L2	419	24.4	0.341	8.3	LOS A	3.9	32.9	0.37	0.67	0.37	52.1
8	T1	707	34.7	0.864	30.4	LOS C	16.7	152.1	0.85	0.81	0.97	40.0
9	R2	31	17.2	0.864	57.6	LOS E	14.4	129.4	1.00	1.04	1.37	32.0
Approach		1157	30.5	0.864	23.1	LOS C	16.7	152.1	0.68	0.76	0.77	43.4
West: D673 (towards Letsitele Valley)												
10	L2	81	35.1	0.157	21.1	LOS C	2.2	19.6	0.66	0.71	0.66	44.2
11	T1	49	17.0	0.347	49.7	LOS D	1.7	14.3	0.99	0.74	1.11	32.9
12	R2	12	36.4	0.347	53.6	LOS D	1.7	14.3	0.99	0.77	1.24	32.8
Approach		142	28.9	0.347	33.7	LOS C	2.2	19.6	0.80	0.72	0.87	38.5
All Vehicles		4055	24.4	2.241	395.0	LOS F	266.5	2276.2	0.88	2.15	3.10	7.9

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

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MOVEMENT SUMMARY

Site: 1vv [R36 & D673 - 2029 Horizon PM]

Intersection 1
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

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: R36 (towards Lydenburg)												
1	L2	18	17.6	0.013	6.5	LOS A	0.1	0.6	0.18	0.58	0.18	53.5
2	T1	546	26.4	0.887	21.4	LOS C	18.3	157.0	0.79	0.72	0.83	44.4
3	R2	193	23.0	0.887	65.8	LOS E	11.9	99.7	1.00	1.18	1.91	28.8
Approach		757	25.3	0.887	32.4	LOS C	18.3	157.0	0.83	0.83	1.09	39.1
East: D673 (towards Nkowankowa)												
4	L2	294	17.6	0.448	26.9	LOS C	9.9	79.8	0.80	0.79	0.80	41.2
5	T1	47	17.8	0.447	52.8	LOS D	2.4	19.4	1.00	0.74	1.00	32.3
6	R2	324	9.7	1.643	611.7	LOS F	68.2	517.2	1.00	2.22	4.73	5.2
Approach		665	13.8	1.643	313.7	LOS F	68.2	517.2	0.91	1.48	2.73	9.4
North: R36 (towards Tzaneen)												
7	L2	561	16.9	0.464	9.4	LOS A	6.3	50.5	0.48	0.71	0.48	51.3
8	T1	917	24.5	0.908	33.8	LOS C	24.6	205.3	0.88	0.88	1.05	38.6
9	R2	37	2.9	0.908	59.6	LOS E	24.6	205.3	1.00	1.13	1.41	31.5
Approach		1515	21.1	0.908	25.4	LOS C	24.6	205.3	0.73	0.82	0.84	42.2
West: D673 (towards Letsitele Valley)												
10	L2	55	23.1	0.094	21.5	LOS C	1.4	12.1	0.66	0.69	0.66	44.0
11	T1	49	17.0	0.441	49.1	LOS D	2.9	24.0	0.99	0.73	0.99	32.9
12	R2	45	20.9	0.441	49.1	LOS D	2.9	24.0	0.99	0.75	0.99	33.3
Approach		149	20.4	0.441	39.0	LOS D	2.9	24.0	0.87	0.72	0.87	36.4
All Vehicles		3086	20.5	1.643	89.9	LOS F	68.2	517.2	0.80	0.96	1.31	23.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
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Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
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