GladAfrica
Consulting Engineers

HEKPOORT 504 JQ FARM
PORTIONS 79, 91, 96, 321 AND 322
TRAFFIC IMPACT ASSESSMENT
APRIL 2020

Rapid Land Release Programme: Packages A & B-Stage 2

RLRP-2019/07-06

GAUTENG PROVINCE
HUMAN SETTLEMENTS
REPUBLIC OF SOUTH AFRICA

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List of Acronyms

ACRONYM	DESCRIPTION
GDRT	Gauteng Department of Roads and Transport
GDHS	Gauteng Department of Human Settlement
RLRP	Rapid Land Release Programme
COTO	Committee of Transport Officials
NMT	Non-motorised Transport
MCM	Mogale City Municipality
UA	Universal Access
TIA	Traffic Impact Assessment
SDP	Site Development Plan
LoS	Level of Service
PCU	Passenger Car Unit
d.u.	Dwelling Unit
v/c	Volume to Capacity (Ratio)

1 EXECUTIVE SUMMARY

GladAfrica Consulting Engineers (Pty) Ltd was appointed by the Gauteng Department of Human Settlement to undertake the Traffic Impact Assessment (TIA) for the Rapid Land Release Programme (RLRP) for a mixed development on Portions 79, 91, 96, 321, and 322 Hekpoort 504 JQ farm under the jurisdiction of the Mogale City Municipality (MCM), Gauteng Province consisting of:

- Social housing Res 1 (293 erven) & Res 3 (551 dwelling units),
- 1 Business erf, and
- 1 Industrial. All the above form part of an Agri-tourist Node.

The purpose of this report is to identify the traffic impacts of the new development on the surrounding road network, intersections, non-motorised transport (NMT) requirements and to propose mitigation measures for the effective traffic operations conditions of vehicle and pedestrian traffic in the area of the development. Therefore, the report describes an investigation of the status quo scenario of the traffic as well as future scenarios concerning the Rapid Land Release mixed development. The location of the new mixed development is shown in the figure below.

Figure 1: Hekpoort Township Development Area

The capacity analysis was performed by using SIDRA Intersection software at Locations 1 to 5.

The results of the analysis showed that no upgrade is required at the five intersections on the R560 Road and the R563 Road for the existing 2019 traffic evaluation.

The results of the 2024 traffic evaluation show that a new T-junction access (Intersection 7) is required more than 450 m along the R560 east of the R563, (which is 600 m from the R401/R560 intersection), another T-junction (Intersection 6) located some 360 m west of the R401 to serve the northern part of the development site.

The current R401 will be forming a full 4-legged junction with the R560 (K24) in the future as part of the Hekpoort Agri-tourist Node.

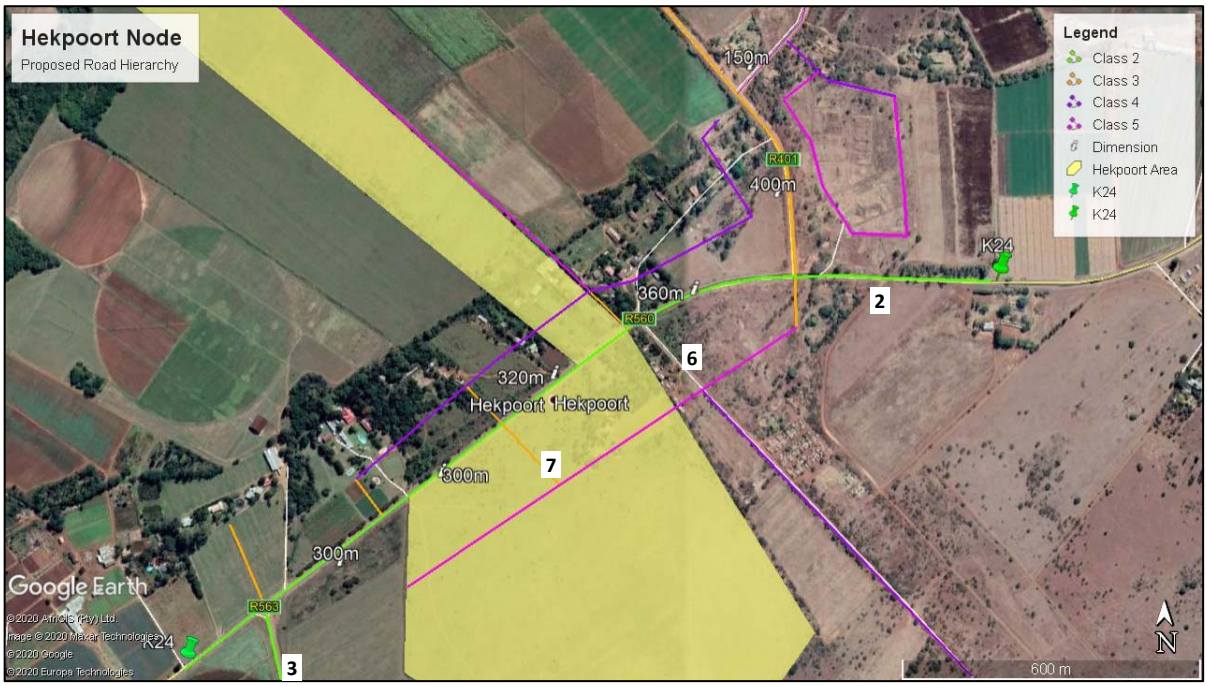


Figure 2: Proposed Road Hierarchy Surrounding the Hekpoort Agri-tourist Node

2 BACKGROUND

The Gauteng Province Department of Human Settlement has decided to implement the roll-out of a Rapid Land Release programme for a mixed development on Portions 79, 91, 96, 321, and 322 Hekpoort 504 JQ farm under the Jurisdiction of the Mogale City Municipality, Gauteng Province, as part of the National Public Low-Cost Housing Program. The proposed mixed development area will require supporting ancillary infrastructure such as laybys, public transport stops, pedestrian walkways and strategically placed pedestrian crossings, and speed calming measures.

GladAfrica Consulting Engineers (Pty) Ltd was appointed by the Gauteng Province Department of Human Settlement to undertake a Traffic Impact Assessment for mixed development on Portions 79, 91, 96, 321, and 322 Hekpoort 504 JQ farm.

The purpose of this report is to identify the traffic impacts of the new development project on the surrounding road network, intersections and at properties accesses points, and to propose mitigation measures for the effective satisfactory traffic operating conditions of vehicle and pedestrian traffic in the region of the development. Therefore, the report describes the investigation of the traffic status quo scenario as well as future scenarios concerning the implementation of the new mixed development project.

2.1 Location

The proposed development site is located on Portions 79, 91, 96, 321, and 322 of the farm Hekpoort 504 JQ on the southern side and the northern side of the R560 Road (Rd) between the R563 Rd and the R401 Rd, under the Jurisdiction of the Mogale City Municipality, Gauteng Province. The coordinates of the new mixed development project are 25°53'6.66"S and 27° 37'1.44"E. Refer to **Figure 2** for the regional context locality map.

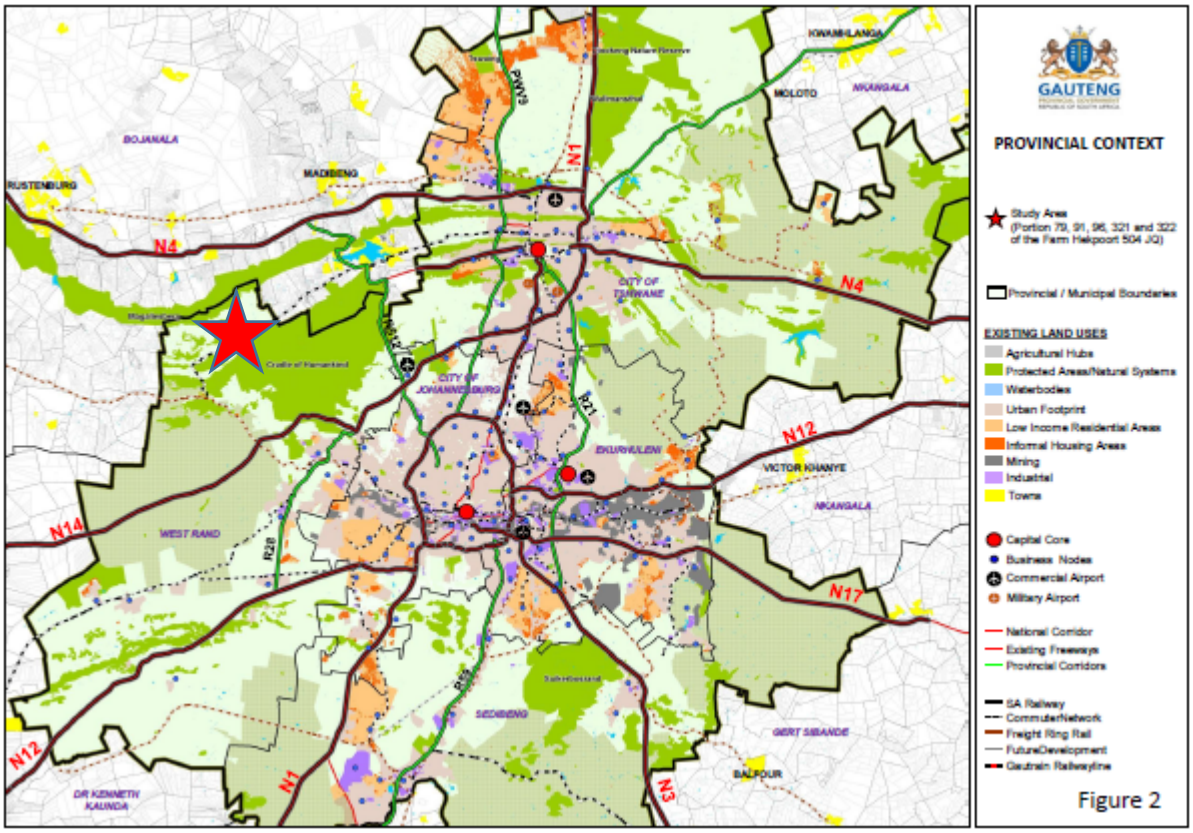


Figure 3: Regional Context Locality Plan

2.2 Project Brief

The study area is restricted to several intersections around the proposed development that the traffic and pedestrians would use to access the proposed development (refer to **Figure 4**). This TIA includes the following:

- Analysis of the status quo – scenario 2019.
- Analysis of the traffic impact of the development in 2024.
- Analysis of the Public Transport and NMT.
- Link capacity analysis. Recommendations for traffic impact mitigation where required. Development access including NMT and internal road requirements.

3 STATUS QUO ASSESSMENT

3.1 Data Collection

The manual turning movements traffic counts were undertaken on Thursday 22 August 2019. These comprised 12 hours classified turning movement counts for the period 06:00-18:00, recorded in 15 minutes intervals at the following key intersections/ locations (Locs) (refer to **Figure 4**):

- Loc 1: R560 Rd/ Unnamed gravel Rd.
- Loc 2: R560 Rd/ R401 Rd.
- Loc 3: R560 Rd/ R563 Rd.
- Loc 4: R560 Rd/ R99 Rd.
- Loc 5: R563 Rd/ R96 Rd.

Figure 4:Key Intersection Locations for Data Collection

The morning (a.m.) peak and afternoon (p.m.) peak hour background traffic counts are shown schematically in **Annexure B**.

3.2 Descriptions of Key Intersections

- Loc 1: R560 Road/ Unnamed Gravel Road
  This is a 4-leg priority- controlled intersection. The R560 Road is a Class 3 rural minor arterial main road and has one lane per direction on the eastern side of the intersection and a one lane per direction on the western side, with access generally allowed to big properties. The unnamed gravel road is a Class 5b local residential street into the township with access to properties and has one lane per direction to the north, and one lane per direction to the south with no formal road structure.

- Loc 2: R560 Road/ R401 Road
  This is a 3-leg priority- controlled intersection. The R560 Road is a Class 3 rural minor arterial main road and has one lane per direction on the eastern side of the intersection, and a one lane per direction on the western side, with access to big properties generally allowed. The R401 Road is a Class 3 rural gravel minor arterial main road and has one lane per direction on the northern side of the intersection.

- Loc 3: R560 Road/ R563 Road
  This is a 3-leg priority- controlled intersection. The R560 Road is a Class 3 rural minor arterial main road and has one lane per direction on the eastern side of the intersection, and a one lane per direction on the western side, with access to big properties generally allowed. The R563 Road is a Class 3 rural minor arterial main road and has one lane per direction on the southern side of the intersection, with access to big properties generally allowed.

- Loc 4: R560 Road/ R99 Road
  This is a 3-leg priority- controlled intersection. The R560 Road is a Class 3 rural minor arterial main road and has one lane per direction on the eastern side of the intersection, and a one lane per direction on the western side, with access to big properties generally allowed. The R99 Road is a Class 3 gravel rural minor arterial main road and has one lane per direction on the northern side of the intersection, with access to big properties allowed.

- Loc 5: R563 Road/ R96 Road
  This is a 3-leg priority- controlled intersection. The R563 Road is a Class 3 rural minor arterial main road and has one lane per direction on the northern side of the intersection, and a one lane per direction on the southern side, with access to big properties generally allowed. The R96 Road is a Class 3 rural minor arterial main road and has one lane per direction on the western side of the intersection.

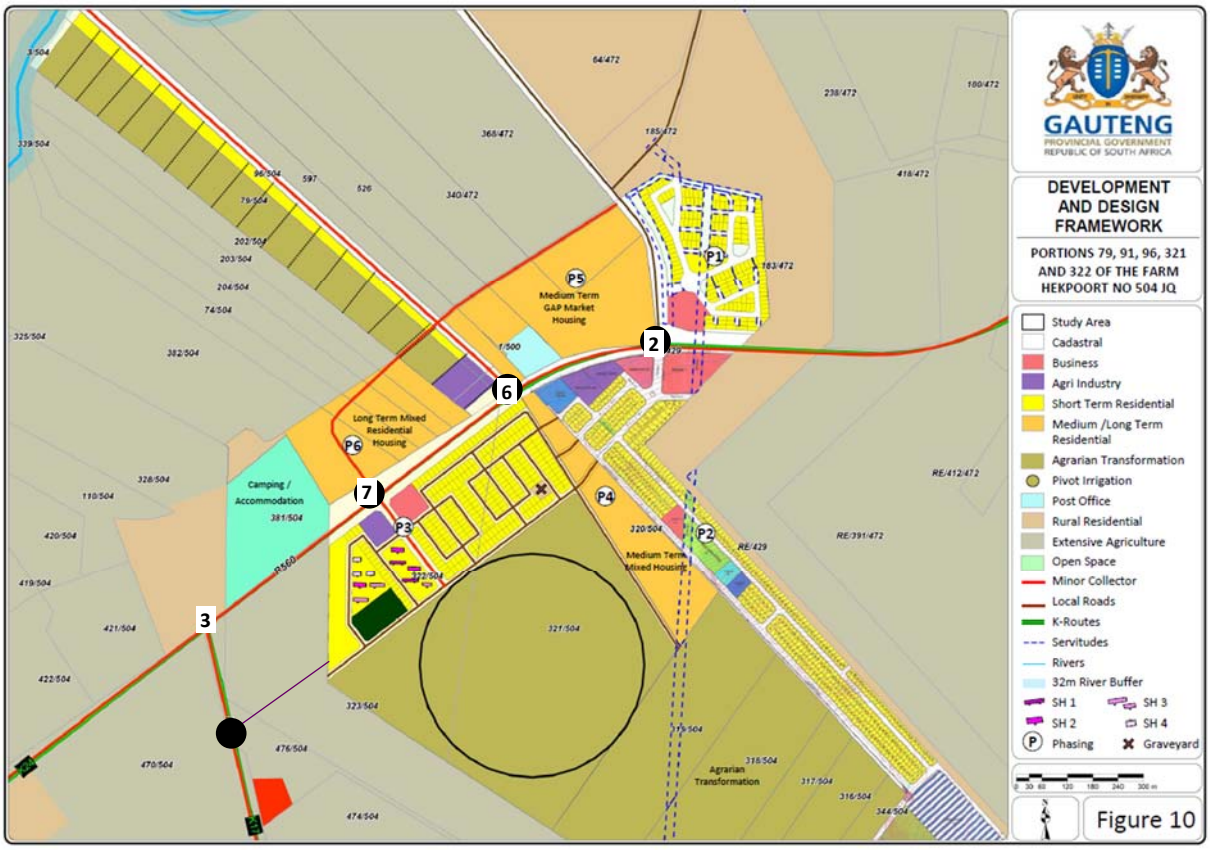


Figure 5: Future Provincial Planning and Development Framework for Hekpoort Agri-tourist Node

The proposed future local roads network on the Hekpoort farm mixed development will have two connections to the north on the R560 Road, one more than 450 m east of the R563 Road, the other 200 m south of the R560 Road along the R563 Road, and a new connection to the east of the R401 Road.

All new intersections for the Hekpoort 504 JQ farm mixed development will be side road stop controlled.

3.3 Intersection Capacity Analysis

The SIDRA Intersection V7.0 software was used to analyse the operation and capacity of the individual intersections under investigation. The SIDRA software is widely used as a micro-analytical evaluation tool to assess the performance measures of an intersection, including the Level of Service (LoS), delays and volumes to capacity (v/c) ratio.

SIDRA was used to analyse each intersection as discussed in Section 3.2 for current 2019 traffic operations and future scenarios. The 2019 morning and afternoon peak hour background traffic volumes are shown schematically in Annexure D. The following scenarios have been tested:

- Status quo scenario 2019 was analysed with SIDRA to test the level of service and other performance measurements of the current intersection operations.
- The other scenario analysed was to determine the impact of the traffic that will be generated by the new development on the road network with 5 years of background traffic growth in 2024.
- The recommendations in terms of the traffic signal design optimisation and intersection geometric interventions were identified and conceptual designs were included.

The LoS depends on the traffic delays at the intersection, either due to low capacity on the approaches, or due to inadequate signal timings for signalised intersections. LoS A represents the best operating conditions with minor or no delays while LoS F represents the worst operating condition with serious delays. Delays of 55, 50 and 35 seconds for signalised, roundabout and sign control intersection respectively are deemed acceptable as it is not lower than LoS D. The criterion for acceptable LoS is shown in Table 1. The Volume Demand to Capacity Ratio (v/c) is a measure that compares roadway demand (vehicle volumes) with roadway supply (carrying capacity). For example, v/c 1.00 indicates that the roadway facility is operating at its capacity. The output modelling summaries and comments in terms of the interventions that could take place to improve the operations are provided in Table 2.

Table 1: SIDRA Level of Service Criterion and Definition

Level of Service	Control delay per vehicle in seconds (d)		
	Signals	Roundabout	Sign Control
A	d ≤ 10	d ≤ 10	d ≤ 10
B	10 < d ≤ 20	10 < d ≤ 20	10 < d ≤ 15
C	20 < d ≤ 35	20 < d ≤ 35	15 < d ≤ 25
D	35 < d ≤ 55	35 < d ≤ 50	25 < d ≤ 35
E	55 < d ≤ 80	55 < d ≤ 70	35 < d ≤ 50
F	80 < d	70 < d	50 < d

The following peak hours were considered for traffic volumes in the SIDRA capacity analysis:

- Morning peak hour: 06:45- 07:45
- Afternoon peak hour: 15:30-16:30.

The intersections and road geometry were derived from Google Earth images and confirmed on site observations for each intersection layout and configuration.

The intersections' performance measures are summarised in **Table 2**. Existing traffic profiles for the a.m. and p.m. peak hour are given in **Annexure B** respectively. Detailed SIDRA lanes summaries for Intersections 1 to 5 are given in **Annexure F**.

Table 2: Existing 2019 Traffic Evaluation Results

Intersection			a.m. Peak					p.m. Peak				
			Volume	v/c	Delay (s)	LoS	Queue (veh)	Volume	v/c	Delay (s)	LoS	Queue (veh)
01: R560 Rd/ Unnamed Gravel Rd (Priority Control)	P	South	3	0,00	8	A	0	3	0,00	8	A	0
	P	East	96	0,05	0	A	0	84	0,04	1	A	0
	P	North	43	0,04	9	A	1	24	0,02	9	A	1
	P	West	96	0,05	2	A	0	131	0,06	2	A	0
	P	**Total**	**142**	**0,05**	**3**	A		**111**	**0,03**	**2**	A	
		Comment	**Acceptable Level of Service**									
02: R560 Rd/ R401 Rd (Priority Control)	P	South	3	0,00	9	A	0	7	0,01	9	A	0
	P	East	132	0,06	0	A	0	98	0,05	0	A	0
	P	North	8	0,01	9	A	0	14	0,01	9	A	0
	P	West	108	0,05	1	A	0	135	0,07	1	A	0
	P	**Total**	**251**	**0,05**	**1**	A		**254**	**0,06**	**1**	A	
		Comment	**Acceptable Level of Service**									
03: R560 Rd/ R563 Rd (Priority Control)	P	South	131	0,07	7	A	0	159	0,09	7	A	2
	P	East	133	0,07	3	A	0	108	0,05	4	A	0
	P	West	118	0,07	4	A	0	94	0,05	3	A	2
	P	**Total**	**382**	**0,07**	**5**	A		**361**	**0,07**	**5**	A	
		Comment	**Acceptable Level of Service**									
04: R560 Rd/ R99 Rd (Priority Control)	P	East	79	0,04	1	A	1	79	0,04	2	A	1
	P	North	40	0,03	8	A	1	20	0,01	8	A	0
	P	West	46	0,02	0	A	1	58	0,03	1	A	0
	P	**Total**	**165**	**0,03**	**3**	A		**157**	**0,03**	**2**	A	
		Comment	**Acceptable Level of Service**									
05: R563 Rd/ R96 Rd (Priority Control)	P	South	124	0,03	3	A	1	159	0,05	2	A	1
	P	North	135	0,04	3	A	2	104	0,03	2	A	1
	P	West	133	0,15	9	A	5	140	0,16	9	A	5
	P	**Total**	**392**	**0,07**	**5**	A		**403**	**0,08**	**5**	A	
		Comment	**Acceptable Level of Service**									

3.4 Status Quo Traffic Appraisal

Location 1: R560 Rd/ Unnamed Gravel Rd: The LoS A is acceptable for the overall intersection and all the approaches during the a.m. peak and p.m. peak hour for the existing scenario at a LoS A.

Location 2: R560 Rd/ R401 Rd: This intersection operates at an acceptable LoS A for the overall intersection and all the approaches during the a.m. peak and p.m. peak hour at an acceptable LoS A.

Location 3: R560 Rd/ R563 Rd: This intersection during the a.m. peak and p.m. peak hour is operating at an overall acceptable LoS A and all the approaches at acceptable LoS A for both peak hours.

Location 4: R560 Rd/ R99 Rd: This intersection during the a.m. peak and p.m. peak hour is operating at an overall acceptable LoS A, and all approaches at an acceptable LoS A for the a.m peak and p.m peak hour.

Location 5: R563 Rd/ R96 Rd: This intersection is operating at an overall acceptable LoS A for the a.m. peak and the p.m. peak hour and all approaches at an acceptable LoS A during the a.m. peak and p.m. peak hour.

4 FUTURE ROAD PLANNING AND ROAD HIERARCHY

The future Gauteng road planning for the Hekpoort area has been extracted from the 2010 1:50 000 GDRT) maps. This is shown in **Figure 6** below.

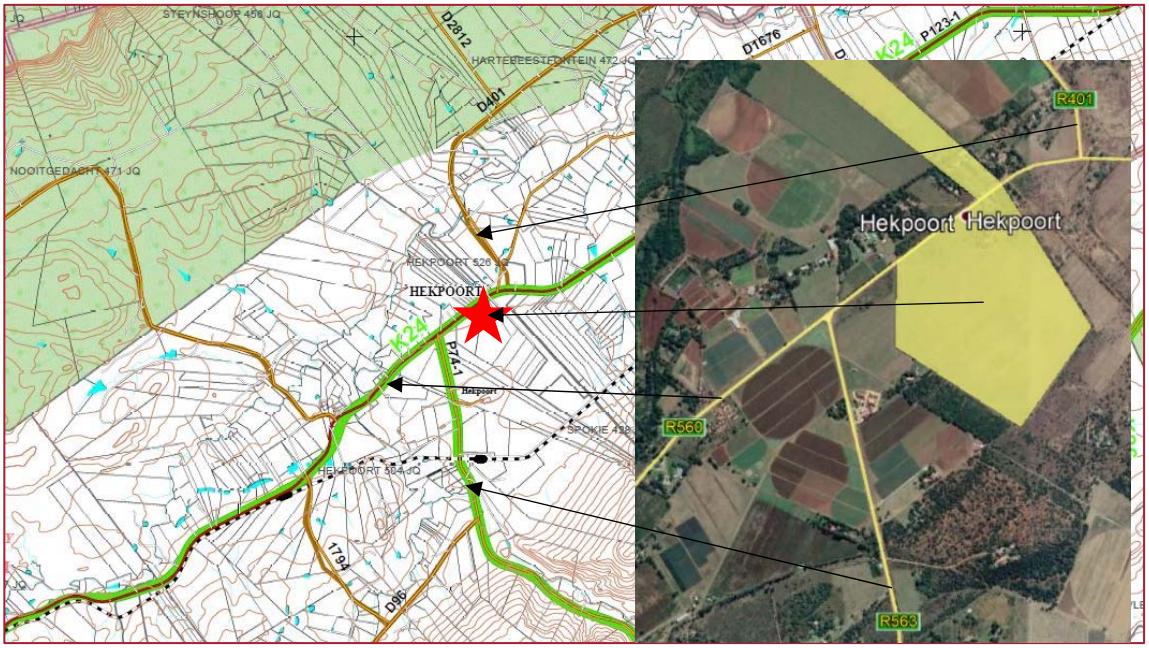


Figure 6: GDRT Future Road Planning for the Hekpoort Area (Source GDRT 2010 1:50 000 Maps)

The red star indicates the site location under consideration. The current R560 is designated (K24).

There is no Basic Planning available for the K24 and, as best can be determined, the road reserve width varies between 24 to 40 m wide.

This implies that it is very far down the priority scale for future upgrading. However, when undertaking any development planning, one must consider TRH26 Access Management intersection spacing. In this regard the following is proposed for the whole future Agri-tourist Node.

Road R401 will become a full four-legged intersection in order to provide access to the planned townships to the south. It is proposed that the new access to the southern portion of the new site will also be a full 4-legged access in the future and it is spaced 600 m away from the R401 full intersection. Then a further 680 m away the K17 and extension will become a future 4-legged full intersection on the K24.

In all cases, the new site access will be constructed as a T-junction and the R560/R563 is an existing T-junction. In order to obtain access to the northern site strip and the corner of development north of the K24 up to the R401, this is proposed to be served with a Class 3 T-junction which is spaced 360 m from the R401 intersection and 320 m from the new southern site access.

The current local accesses onto the K24 (mainly Intersection 2) will have to be redirected and re-aligned as the node develops. The new proposed road hierarchy, which does comply to TRH26 Rural road standards, is shown in **Figure 7** below.

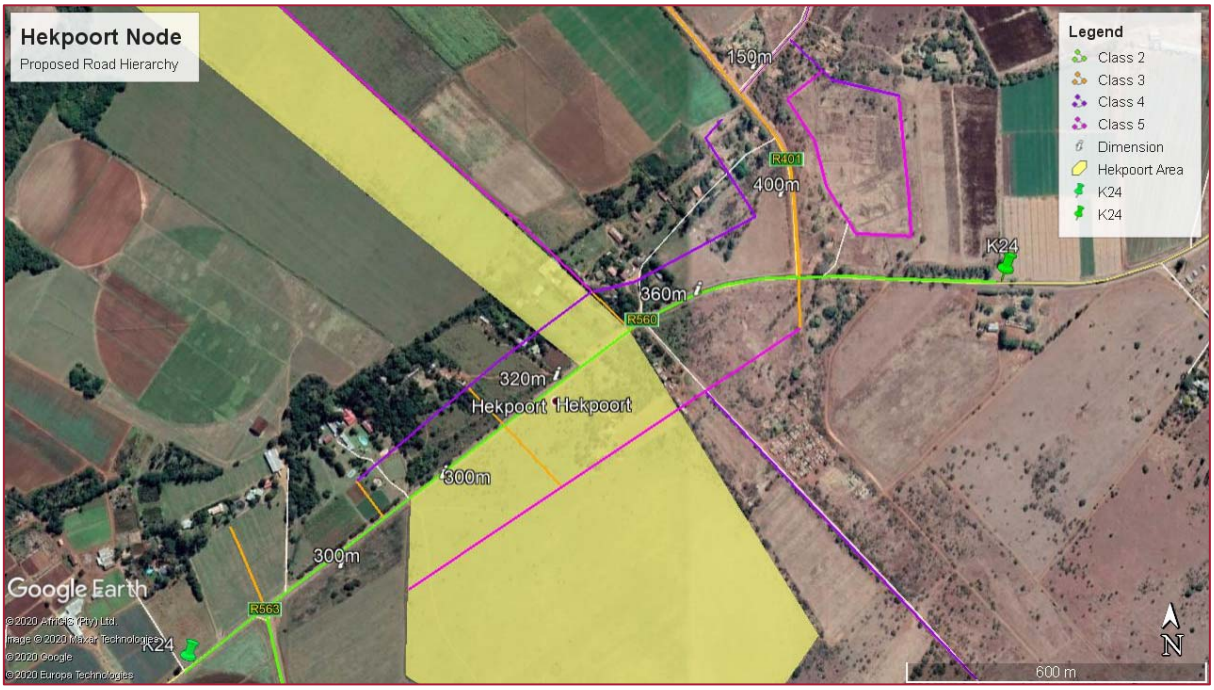


Figure 7: Proposed Road Hierarchy for the Hekpoort Agri-tourist Node

5 PROPOSED DEVELOPMENT MODELLING

5.1 Trip Generation

It should be noted that all development in the Hekpoort vicinity will be part of an Agri-tourist Node. This implies that in general all residents will be locally employed in the agricultural industry sector, hence the application of the highest reduction of car trips from this and the surrounding developments.

The trip generation is based on the number of vehicles to be generated by the new development. In terms of calculating the vehicles expected to be generated by the proposed new mixed development, the criteria specified in COTO manual "Committee of Transport Officials" TMH17 South Africa Trip Data Manual, September 2013 were applied in conjunction with other assumed basic criteria being:

- Vehicle trip generation rate for Apartments and Flats, 1 dwelling/ unit = 0,65
- Vehicle trip generation rate for Single (Res 1), 1 dwelling/ unit = 1
- Vehicle trip generation rate for Business Centre 100 sqm GLA= 1,50
- Vehicle Trip generation rate for Industrial Centre 100 sqm GLA= 0,8.

Trip Adjustment Factors

- Trip generation adjustment factor for very low car ownership (Apartments and Flats) at 50%
- Trip generation adjustment factor for very low car ownership (Res 1) at 70%
- Trip generation adjustment factor for very low car ownership (Business Centre) at 30%
- Trip generation adjustment factor for very low car ownership (Industrial Centre) at 30%
- Public Transit Node reduction factor at 15%.

293 Trips will be generated during the peak hour for Hekpoort 504 JQ farm Portions 79, 91, 96, 321, and 322 under the jurisdiction of the Mogale City Municipality, Gauteng Province. The current inbound to outbound split to be used is as contained in the COTO manual and the number of trips generated is shown in the table below.

Table 3: Trip Generation

Description	Size/ Units	Period Weekday	Trip Generation						Trip (veh/h)		
			Trip Rate	Reduction Factor for very low car ownership	Reduct. transit corridor	Combined Reduction Factor	Final Trip Gen. rate	Gen. Traffic	Direction Movement In/out (%)	In	Out
Residential 1 (d.u.)	293	AM Peak	1	0,7	0,15	0,745	0,255	75	25/75	19	56
		PM Peak	1	0,7	0,15	0,745	0,255	75	70/30	52	22
Residential 3 (d.u.)	551	AM Peak	0,65	0,5	0,15	0,575	0,276	152	25/75	38	114
		PM Peak	0,65	0,5	0,15	0,575	0,276	152	70/30	107	46
Industrial (100 sqm GLA)	4216	AM Peak	0,8	0,3	0,15	0,405	0,476	20	70/30	14	6
		PM Peak	0,8	0,3	0,15	0,405	0,476	20	25/75	5	15
Business Centre (100 sqm GLA)	5125	AM Peak	1,5	0,3	0,15	0,405	0,893	46	85/15	39	7
		PM Peak	1,5	0,3	0,15	0,405	0,893	46	20/80	9	37
									AM PEAK IN	110	
									AM PEAK OUT		183
									PM PEAK IN	173	
									PM PEAK IN		120

In terms of trip distribution, it was assumed that traffic expected to be generated by the proposed developments would distribute onto the existing road network in accordance with traffic distribution evident in terms of existing am peak and pm peak traffic demands as determined from the 2019 traffic count surveys for the Hekpoort 504 JQ farm Portions 79, 91, 96, 321, and 322.

The existing traffic profile for the Hekpoort 504 JQ farm new mixed development is shown in **Figure 1/2 of Annexure B**, the background traffic is shown in **Figure 3/4 of Annexure C**. The generated and latent traffic is shown in **Figures 5, 6, 7, 8, 9, 10 of Annexure D** and the forecast total 2024 traffic in **Figure 11/12 of Annexure E.**

When adding the development related traffic onto the existing traffic, the latter trip movements were also increased to account for existing traffic growth between the time the traffic counts were conducted until the time when the developments could be expected to be completed. In this regard, the assumed background traffic growth rate along the major routes only was 2% per annum for five years.

The maximum scenario has been modelled together with the background and latent traffic for the highest impact to be evaluated.

6 TRAFFIC IMPACT ASSESSMENT

6.1 2024 Forecast Traffic Evaluation

The trip assignment for the forecast year 2024 scenarios was further analysed to evaluate the impact on the intersection capacity and discussed under this chapter. The capacity analysis was performed using SIDRA Intersection V7.0 software package. The results for the mixed development 2024 traffic, morning and afternoon peak hour are shown in the following section.

6.1.1 Intersection Capacity Analysis

The intersections performance measures are summarised in **Table 4**. The forecast development traffic profile for the am and pm peak hour is given in **Annexure E** respectively. Detailed SIDRA lanes summaries for Intersections 1 to 7 are provided in **Annexure G**.

Table 4:Results of 2024 Forecast Intersection Evaluation

Intersection				a.m. Peak					p.m. Peak			
			Volume	v/c	Delay (s)	LOS	Queue (veh)	Volume	v/c	Delay (s)	LOS	Queue (veh.)
01: R 560 Rd / Unnamed gravel Rd (Priority Control)	P	South	3	0,00	9	A	0	3	0,00	9	A	0
	P	East	185	0,10	0	A	0	140	0,07	0	A	0
	P	North	47	0,06	10	A	2	40	0,05	9	A	1
	P	West	177	0,09	1	A	0	194	0,10	1	A	0
	P	**Total**	**412**	**0,09**	**2**	A		**377**	**0,08**	**2**	A	
		Comment	Acceptable Level of Service									
02: R 560 Rd / R 401 Rd (Priority Control)	P	South	86	0,11	10	A	3	57	0,07	10	A	2
	P	East	193	0,10	1	A	0	200	0,10	2	A	1
	P	North	38	0,04	9	A	1	42	0,04	9	A	1
	P	West	167	0,08	1	A	0	202	0,10	1	A	1
	P	**Total**	**484**	**0,09**	**3**	A		**501**	**0,09**	**3**	A	
		Comment	Acceptable Level of Service									
03: R 560 Rd / R 563 Rd (Priority Control)	P	South	183	0,10	8	A	3	202	0,12	8	A	3
	P	East	243	0,12	2	A	0	155	0,08	3	A	0
	P	West	182	0,11	4	A	4	181	0,10	3	A	3
	P	**Total**	**608**	**0,11**	**4**	A		**538**	**0,10**	**5**	A	
		Comment	Acceptable Level of Serviceop									
04: R 560 Rd / R 99 Rd (Priority Control)	P	East	258	0,13	1	A	1	143	0,07	1	A	1
	P	North	44	0,03	9	A	1	29	0,02	9	A	1
	P	West	103	0,05	0	A	0	139	0,07	0	A	0
	P	**Total**	**405**	**0,10**	**1**	A		**311**	**0,07**	**1**	A	
		Comment	Acceptable Level of Service									

05: R 563 Rd / R 96 Rd (Priority Control)	P	South	162	0,05	2	A	1	214	0,08	2	A	1
	P	North	222	0,07	3	A	3	149	0,05	3	A	2
	P	West	164	0,21	10	B	6	185	0,23	10	B	7
	P	**Total**	**548**	**0,11**	**5**	A		**548**	**0,12**	**5**	A	
		Comment	Acceptable Level of Service									
06: R 560 Rd / Int Nber 6 new Junction (Priority Control)	P	East	221	0,11	0	A	0	161	0,07	0	A	0
	P	North	20	0,02	10	A	1	24	0,03	10	A	1
	P	West	167	0,08	0	A	0	201	0,09	0	A	0
	P	**Total**	**408**	**0,09**	**1**	A		**386**	**0,08**	**1**	A	
		Comment	Acceptable Level of Service									
07: R 560 Rd / Int Nber 7 new Junction (Priority Control)	P	South	71	0,14	10	A	4	28	0,05	9	A	2
	P	East	219	0,10	1	A	0	161	0,08	1	A	0
	P	West	168	0,07	2	A	2	211	0,09	2	A	2
	P	**Total**	**458**	**0,10**	**3**	A		**400**	**0,08**	**2**	A	
		Comment	Acceptable Level of Service									

6.1.2 2024 Forecast Opening Year Appraisal

Location 1: R560 Rd/ Unnamed Gravel Rd: The LoS A is acceptable for the overall intersection and all the approaches during the a.m. peak and p.m. peak hour for the forecast scenario at a LoS A.

Location 2: R560 Rd/ R401 Rd: This intersection operates at an acceptable LoS A for the overall intersection and all the approaches during the a.m. peak and p.m. peak hour at an acceptable LoS A.

Location 3: R560 Rd/ R563 Rd: This intersection during the a.m. peak and p.m. peak is operating at an overall acceptable LoS A and all the approaches at acceptable LoS A for both peak hours.

Location 4: R560 Rd/ R99 Rd: This intersection during the a.m. peak and p.m. peak is operating at an overall acceptable LoS A, and all approaches at an acceptable LoS A for the a.m peak and p.m peak hour.

Location 5: R563 Rd/ R96 Rd: This intersection is operating at an overall acceptable LoS A for the a.m. peak and the p.m. peak hour and all approaches at an acceptable LoS A during the a.m. peak and p.m. peak hour.

Location 6: R560 Rd/ new access Rd: The LoS A is acceptable for the overall intersection and all the approaches during the a.m. peak and p.m. peak hour for the forecast scenario at a LoS A

Location 7: R560 Rd/ new Access Rd: This intersection during the a.m. peak and p.m. peak is operating at an overall acceptable LoS A and all the approaches at acceptable LoS A for both peak hours.

The new intersection layout as shown below was provided for the northern access to the development site.

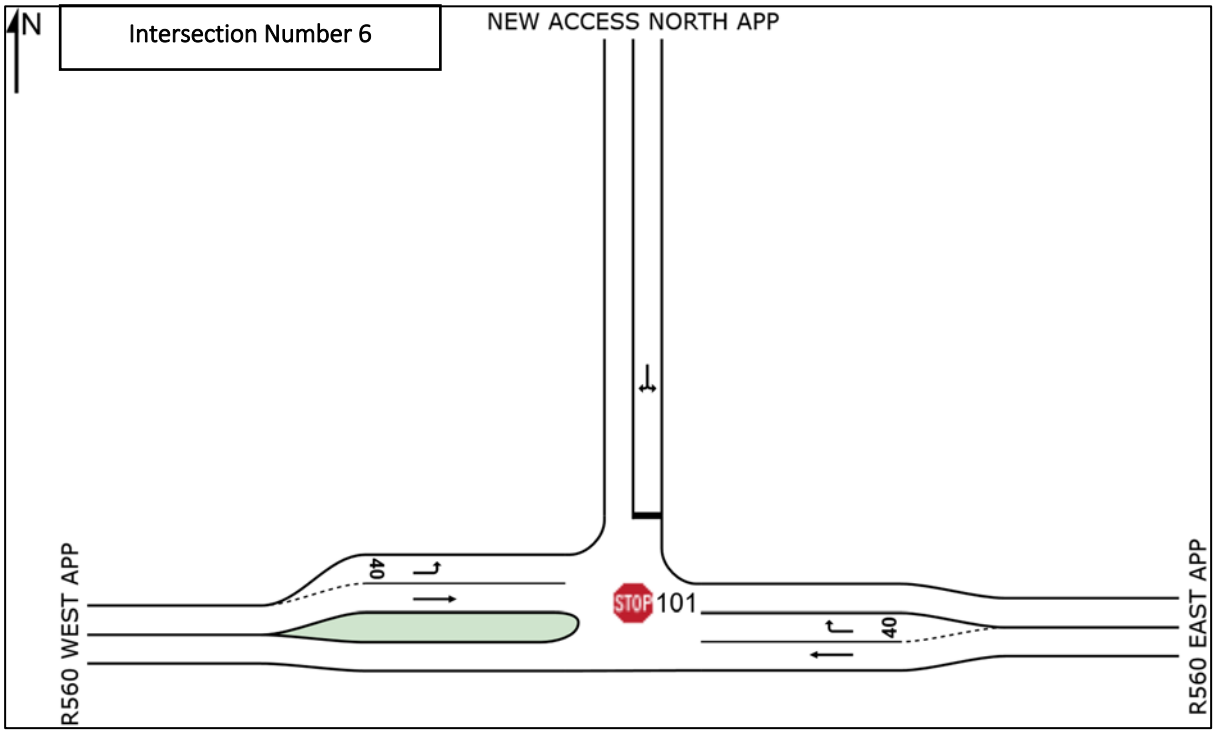


Figure 8: Proposed Intersection 6 Layout

The new intersection layout as shown below was provided for the southern access to the new development site.

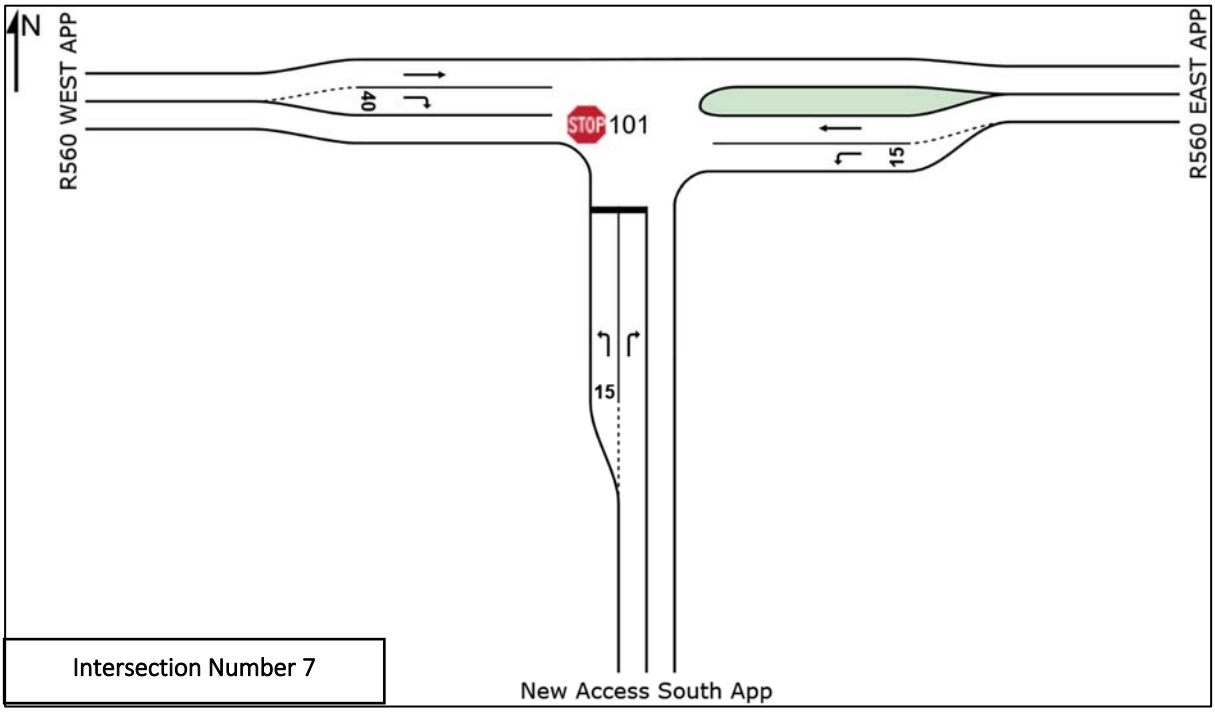


Figure 9: Proposed Intersection 7 Layout

The new intersection layout as shown below was provided for the access to the south west of the proposed new development site.

6.2 Public Transport

The Hekpoort 504 JQ farm Portions 79,91,96, 321 and 322 areas are served by predominantly minibus-taxis public transport mode and scholar buses transporting school children to and from the Hekpoort Laerskool.

Access to the Hekpoort primary school is of the R560 Road with road zebra crossing at the school gate with insufficient warning signs, road signages, faded road markings and no pedestrian pathways.

The Hekpoort 504 JQ farm does not have a public transport infrastructure in the area nor a bus/ taxi layby. Minibus taxis are holding to pick up passengers at the intersection of the R563 Road and R560 Road north eastern corner.

Due to this new site development, there is a need to introduce an efficient transportation system in the area to serve existing and future residents of the new mixed development to improve the linkage of the north/ south and east/ west. therefore making this region suitable as the extension of other surrounding areas. Internal pedestrian connections and local minibus-taxi transport will be required as per the typical complete streets design principles. There will be several residents travelling and working at local Agri industries, which form part of the Hekpoort Agri-tourist Node.

The future predominant movement from Hekpoort new mixed development will be north and south towards the employment opportunities, i.e. to Rustenburg, Pretoria, Magaliesburg, Krugersdorp, Randburg and Hartbeespoort area, etc.

Figure 10: Proposed Public Transport Routes

Residents of the new mixed development on Hekpoort 504 JQ farm Portions 79, 91, 96, 321 and 322 will be served by existing and forecast public transport routes along the R560, R563, R401 and R99.

The existing and future taxi routes and buses within the area are shown in the figure above. The predominant movement is expected for buses and minibus-taxis to feed directly to places of work opportunities.

For this scale of the new mixed development and the future demand in this area, a taxi/ bus layby rank facility should be erected along the main road (R560) as per GDRT standard requirements.

7 PARKING PROVISION

The City of Johannesburg Land Use Scheme 2017 "City planning and Development Division Premier's draft June 2017" were applied in conjunction with other assumed basic criteria, these being:
The parking provision for Hekpoort 504 JQ farm Portions 79, 91, 96, 321 and 322 as per the Site Development Plans (SDPs) included in Annexure A. As per trip generation table, a maximum of 293 trip vehicles will be generated for this development. Therefore, a provision for parking bays will be required for the new development project.

It shall be noted that the Hekpoort mixed development falls under social/ inclusionary for areas as defined in the Spatial Development Framework (SDF). This means that 651 parking bays should be provided under the town planning scheme.

The number of parking bays required for the Hekpoort 504 JQ farm Portions 79, 91, 96, 321 and 322 new mixed development is shown in the following table.

Table 5: Parking Provision

Description	Units/ size	Standard	Remainder of City Parking Ratio	Parking Bays
Residential 3 (d.u.)	551	Inclusionary	0,75	413
Industrial (100 sqm GLA)	4 216	100 sqm GLA	2	84
Business Centre (100 sqm GLA)	5 125	100 sqm GLA	3	154

8 DEVELOPMENT ACCESS AND INTERNAL CIRCULATION

The preliminary concept design of the Hekpoort 504 JQ farm access intersections is provided in Annexure A. From the capacity analysis it was concluded that all access intersections would be stop-controlled. The intersection configuration proposed will allow efficient and effective/ safe use of the road reserve by residents (pedestrians and cyclists) and motorists.

The internal road circulation requires a 7 m wide paved road with road signs, traffic calming measures, speed humps of 50 m to 100 m spacing, 2 m wide paved pedestrian sidewalk at least one side of the road, and a minimum speed of 15 km/hour.

Provision should be made for a refuse truck or fire truck to be able to use the internal road to avoid truck having to turn around.

If access control is considered for Residential 3, a control boom should be placed some 12 m from the edge of the local street. Allowance must be made for one of the lanes (probably inbound) to be at least 4,5 m wide for fire truck access and no roof structure with a clearance less than 4,2 m would be allowed.

The 7 m wide access width at the property boundary (3,5 m per direction) would widen to 4,5 m inbound, 3 m outbound and a 2 m wide central median for a guard house placed at least 12 m inside the property boundary.

Annexure A shows the proposed Hekpoort 504 JQ farm new mixed development roads network connecting east/ west and north/ south.

9 NON-MOTORISED TRANSPORT

Non-motorised Transport plays an important role in the first and last mile (kilometre) of travel, especially for public transport users. The implementation of NMT involves the application of universal access (UA) design; a principle that enables all citizens to reach their destination without a hindrance in their physical environment.

With regards to the residents of this new housing development, travel by means of cycling, walking, including travel by persons living with any visual or physical disability, should be accommodated. This has the beneficial effect of promoting transportation equity, maximising independence and improving community liveability.

In order to provide NMT facilities, all street infrastructures ought to comply with complete streets cross-section as per the City of Johannesburg standards requirement.

The various complete streets cross-sections are shown below for the required road reserve widths.

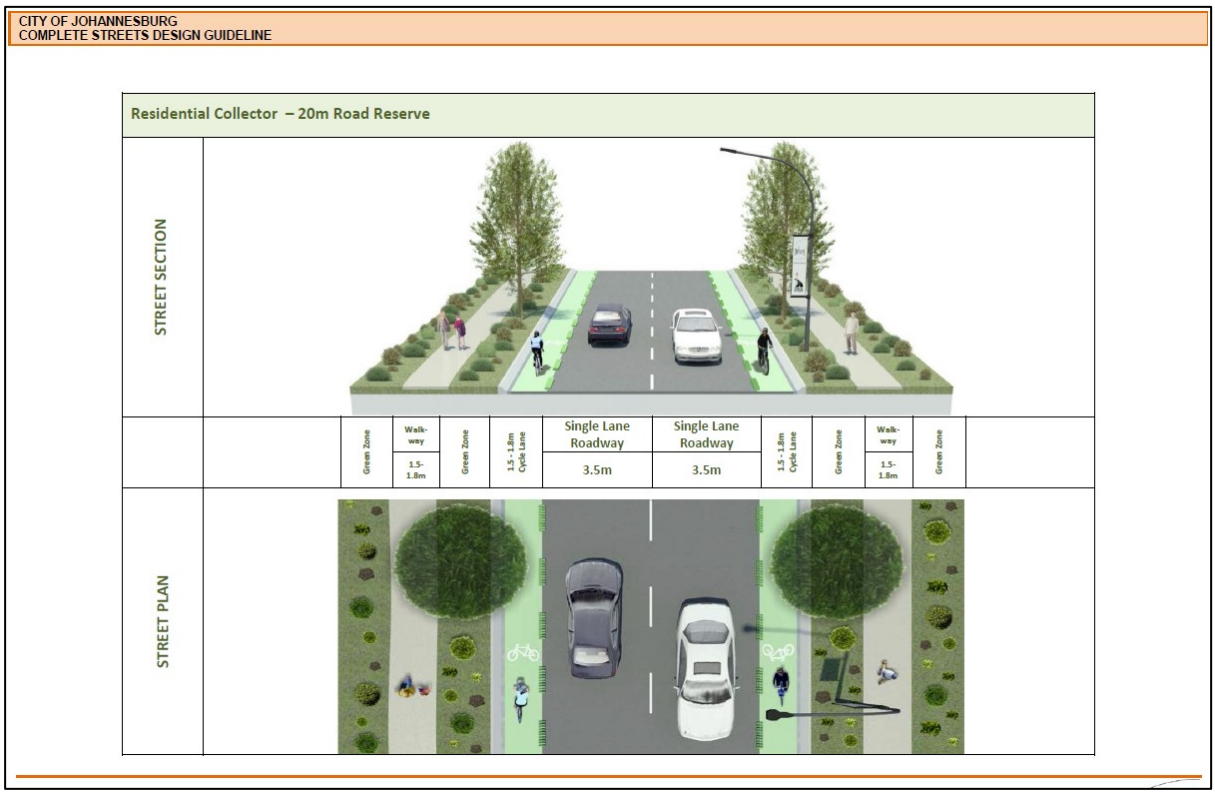


Figure 11: 20 m Wide Reserve Residential Collector

Safety and security are to be included as two of the key aspects of the NMT facility designs. Safety of pedestrians over the level crossings/ security in general need to be maximised throughout the infrastructure designs.

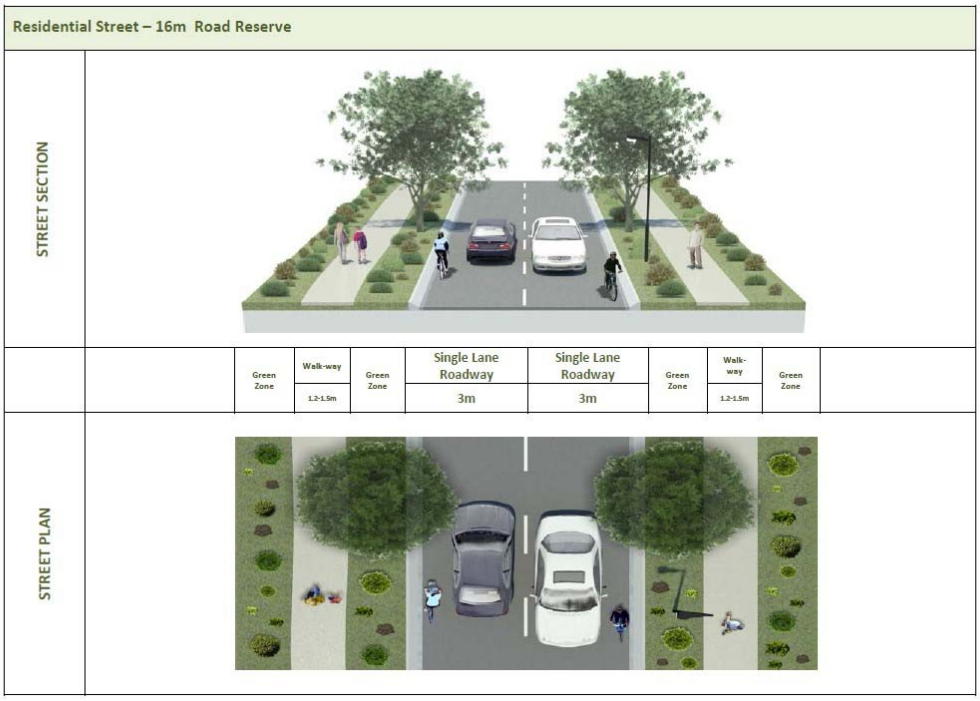


Figure 12: 16 m Wide Reserve Local Residential Street

All facilities that will be provided for public transport users and Non-motorised Transport users residing at the Hekpoort 504 JQ farm Portions 79, 91, 96, 321 and 322 new development, should be accessible and safe.

This will be the predominent street cross-section and pedestrian sidewalks on at least one side of the roadway is essential. There will be a lot of pedestrian and local public transport required to provide the residents access to the work opportunities in the immediately surrounding agri-industries and for scholar/ learner transport to schools external to the immediate vicinity.

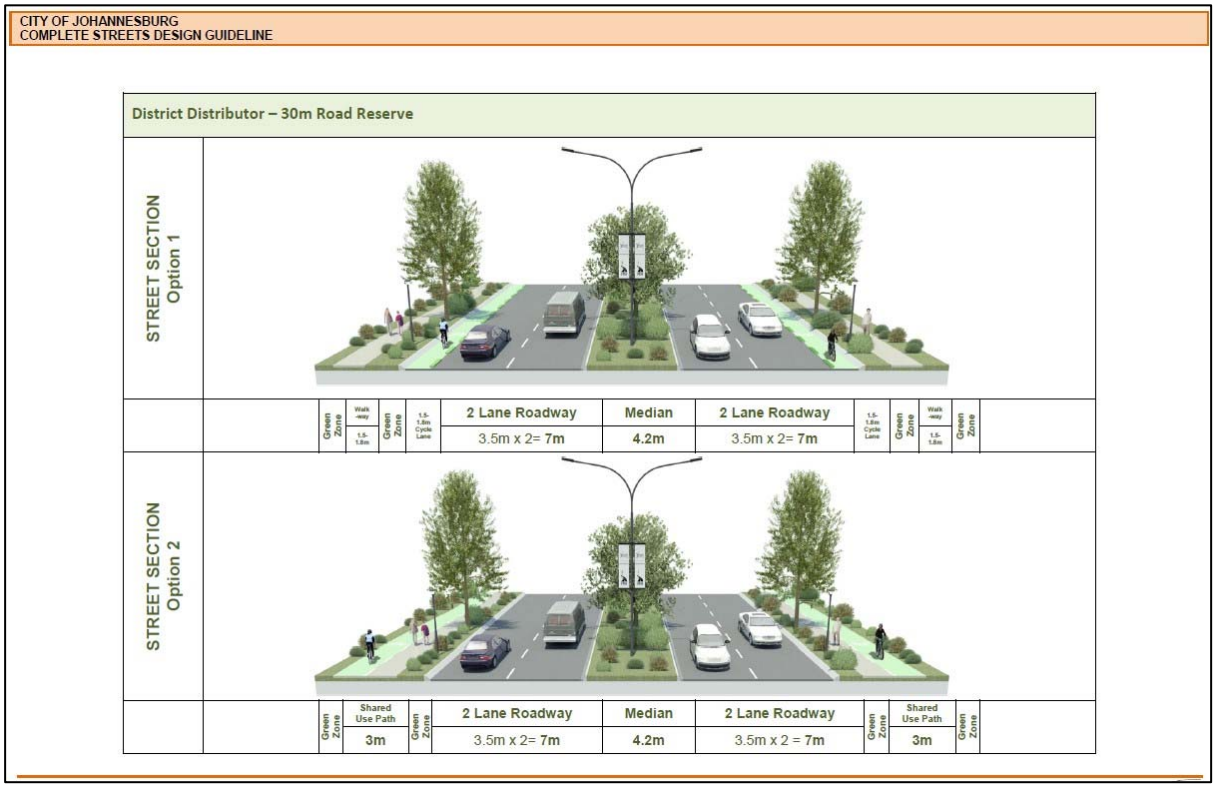


Figure 13: 30 m Reserve District Distributor

9.1 Recommendations for Non-motorised Transport

The following recommendations should be provided from an NMT and public transport perspective:

- It is recommended that a minimum paved sidewalk width of 2 m be provided on at least one side of the road for the new Hekpoort development.
- It is recommended that lighting along all future roads be provided to ensure that safety and security is enhanced for all NMT users of the new development.
- Providing tactile pavers at different intersections leading to the new development for guidance and warning, making sure that the transfer of pedestrians from taxi/ bus to walking is done seamlessly and as safe as possible.
- Traffic calming measures (speed humps, yield controlled pedestrian crossing table, road signs, speed restriction and enough laybys for passenger/ learner drop-off and collection) should be provided for the safety of NMT users and around all learning institutions.

10 CONCLUSIONS AND RECOMMENDATIONS

Summary of findings includes:

- All intersections for the Hekpoort 504 JQ farm new development operate at acceptable LoS A for the existing evaluation during the a.m. peak and p.m. peak hour.
- The forecast traffic evaluations for Intersections 1 to 7 operate at acceptable LoS A for the future evaluation during the a.m. peak and p.m. peak hour.
- The intersection layout for Junctions 6, 7 and 8 were provided.
- The number of trips generated for the new mixed development is 293 trips.

The Hekpoort 504 JQ farm Portions 79, 91, 96, 321 and 322 new development, which will form part of the proposed Hekpoort Agri-tourist Node, has the intention for most of its residents to be employed at local agricultural industries and tourist facilities. This means that for the trip generation the maximum trip reduction factors have been applied to obtain a realistic overall trip generation for the development. This also means the transport of residents to external nodes for external job opportunities, which are significantly far (greater than 40 km away). The Residential 3 portions of the development will require 651 parking bays. Parking utilisation was calculated by assuming that the new Hekpoort development falls under social/ Inclusionary for areas as defined in the Spatial Development Framework.

The following conclusions and recommendations are made based on the forecast year 2024 modelling and capacity analysis of the intersections:

The intersection and road upgrades required due to the impact of the new housing development:

The Hekpoort 504 JQ should be provided with 2 new intersections for the easy access and exit from the new development area to and from the R560.

Public transport facility bus/ taxi laybyes should be erected at a proper designated place according to standard requirements.

Residents of the new development are to use existing and future public transport routes and NMT facilities to be provided as discussed for residents of the new Hekpoort 504 JQ development.

It is recommended that the roads and intersections be upgraded as described in Section 6.1.2.

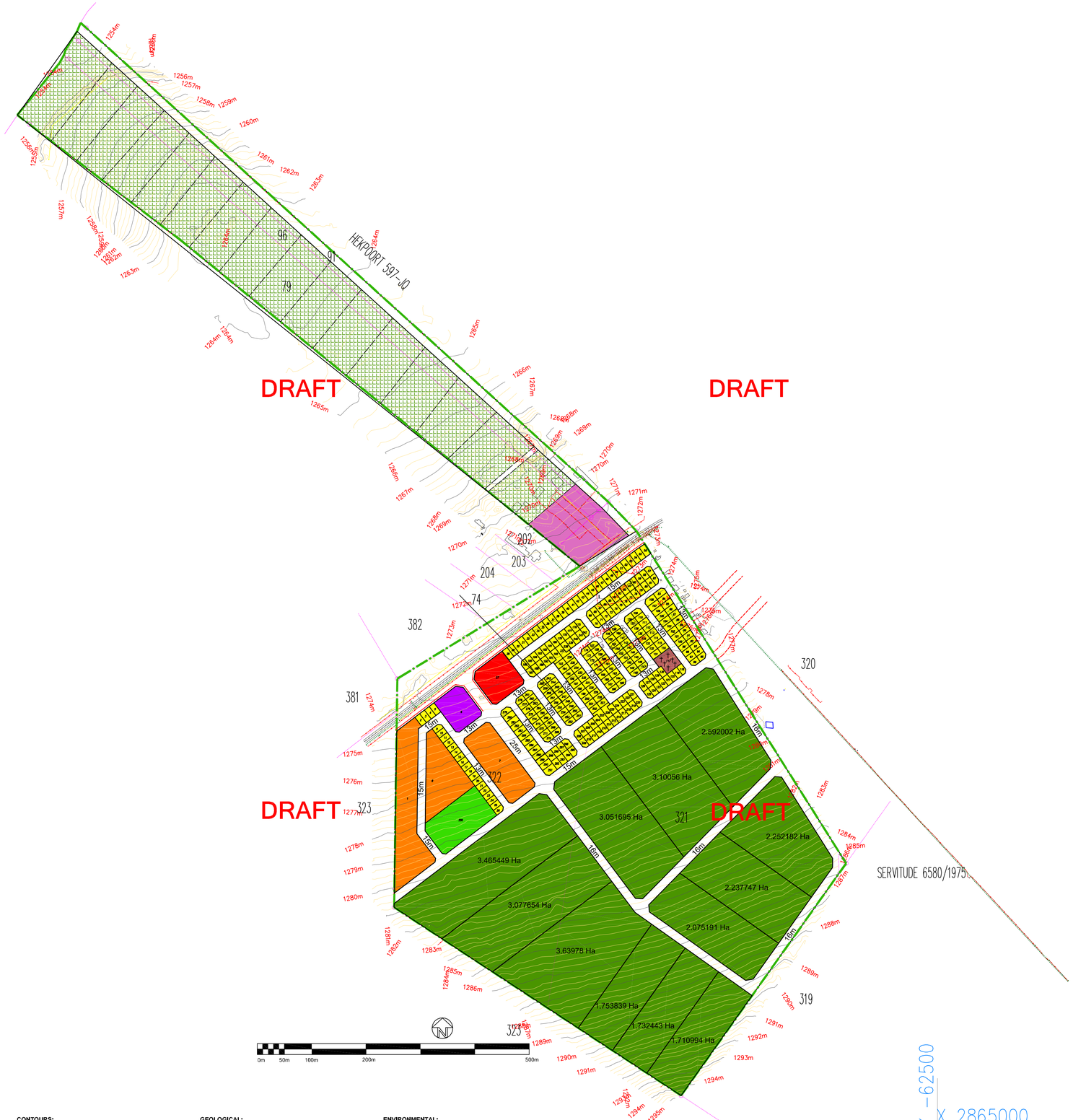
It is recommended that this Traffic Impact Study be accepted and approved for the new Hekpoort 504 JQ farm Portions 79, 91, 96, 321 and 322 development projects.

ANNEXURE A

PROPOSED TOWNSHIP LAYOUT PLANS

Draft Layout:
Hekpoort Township

Situated on Portion 79, 91, 96, 321 and 322 Hekpoort 504 JQ approximately 74ha in extent, under the jurisdiction of the Mogale City Municipality, Gauteng Province.



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Notation

Land Use / Zoning	Notation	No of Erven	No of Units	Density	Average size in m²	Area in m²	% of Township
Residential 1		294	293		217,5	63939,41	9%
Residential 3		3	551	180	10197,4	30592,23	4%
Business 1		1			5125,8	5125,77	1%
Industrial		1			4216,1	4216,11	1%
Open Space (Soccer Field)		1			8298,1	8298,14	1%
Cemetery		1			1266,2	1266,23	0%
Agriculture: Demarcated (1ha/1h)		16			11075,0	177199,38	24%
Agriculture: Agro Processing		1			14006,2	14006,18	2%
Agriculture		12			25574,6	306894,61	41%
Roads						129390,43	17%
Total		330	844			740928,49	100%

Note

Agriculture Demarcation (1ha/1hh)

1	All erf sizes are approximate pending final survey.
2	All road reserves are as indicated on the layout plan. Road reserves are 13m, 15m, and 25m , unless indicated otherw ise.
3	Road splays are 10m and 16m or as indicated on the plan.
4	All building lines are 5m along any boundary w ith a public street, and 2m along any boundary w ith a private road. All other building lines w ill be 2m except w here the local authority approve its relaxation.
5	All development w ill be subject to a further geo-technical assessment as required .
6	Lines of no access are indicated as follow s on the layout plan ----------
7	The proposed tow nship boundary is indicated as follow s on the layout plan:
8	All erf numbers are temporary, and subject to final numbering by the office of the Gauteng Surveyor General.

SCALE: 1: 4000 (A 1 Paper)

PLAN NO: HP Rev 3

Town Planner:
Herman Strydom
Pr Pln A 2027/2015
Date: 03 February 2020

PLAN MEDEWERKERS
PLAN ASSOCIATES
PLAN

PRETORIA
Posbus / P O Box 14732
Hatfield 0028
Tel (012) 342 8701
Fax (012) 342 8714
E-mail / E-pos:
info@planassociates.co.za

Client:

GladAfrica Project Managers

Local Authority:

Mogale City Local Municipality

CERTIFICATION

FLOOD LINE:

With reference to Section 144 of the National Water Act (Act no. 36 of 1998) it is hereby certified that the proposed development, as indicated on this drawing, is not affected by flood lines representing the maximum flood level likely to be reached by flood water in the event of a flood with a recurrence interval of 100 years.

Prof. Reg. Number Date: Signature:

CONTOURS:

Interval: 0.25 m
Date AHSL: Sea level
Coordinate System: LO27
Provided by: Samsara Survey Solutions:

GEOLOGICAL:

It is hereby certified that the layout of the township complies with the recommendations and requirements set out in the geotechnicial report dated:

Firm: GCS Water and Environmentalist

Engineering Geologist: _____

Prof. Reg. Number:_____

Date:_____

Signature:

ENVIRONMENTAL:

It is hereby certified that the layout of the township complies with the final recommendations set out in the Environmental Impact Assessment Report, _____.

Firm:
Environmentalist Geologist:

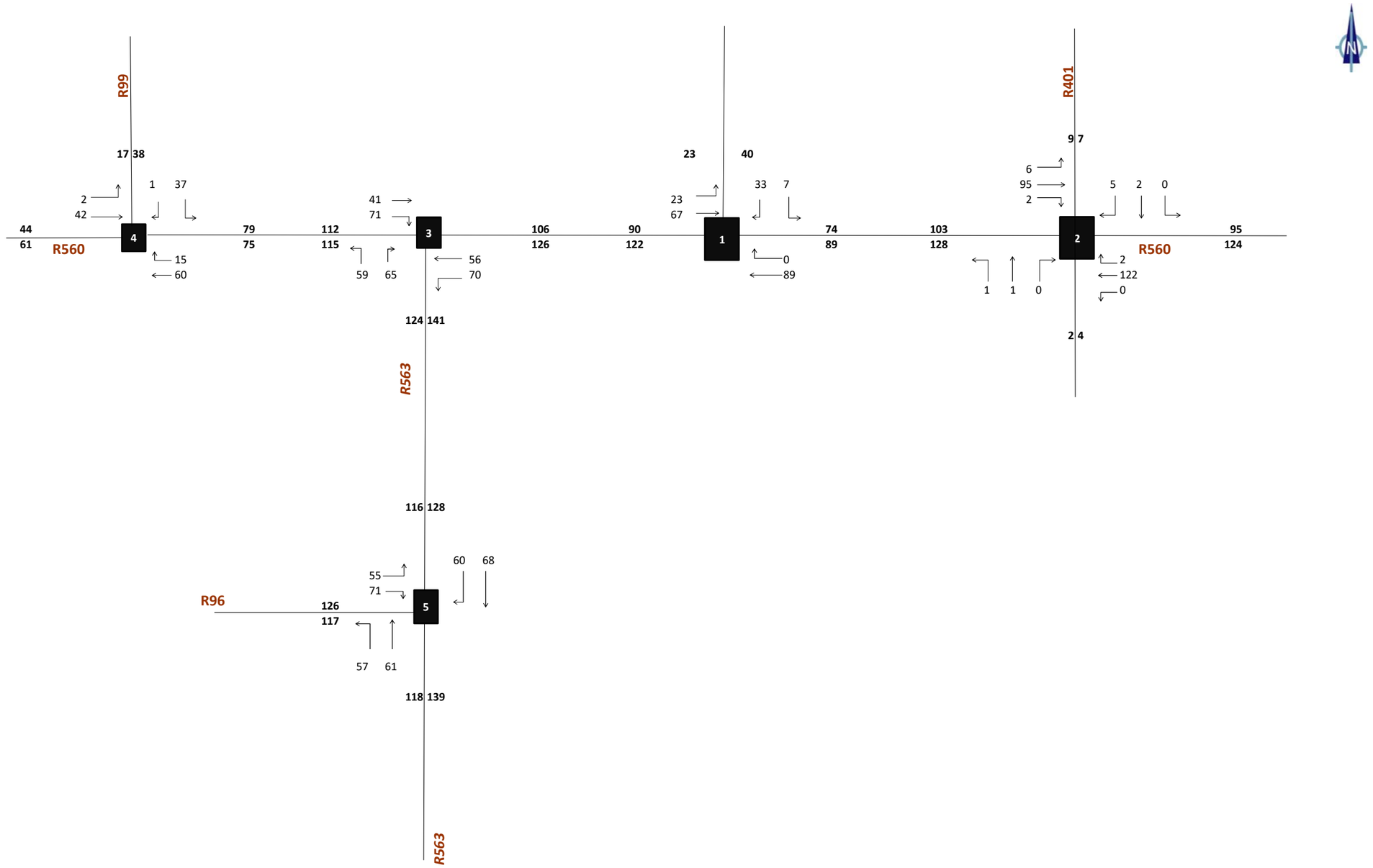
Prof. Reg. Number:_____

Date:_____

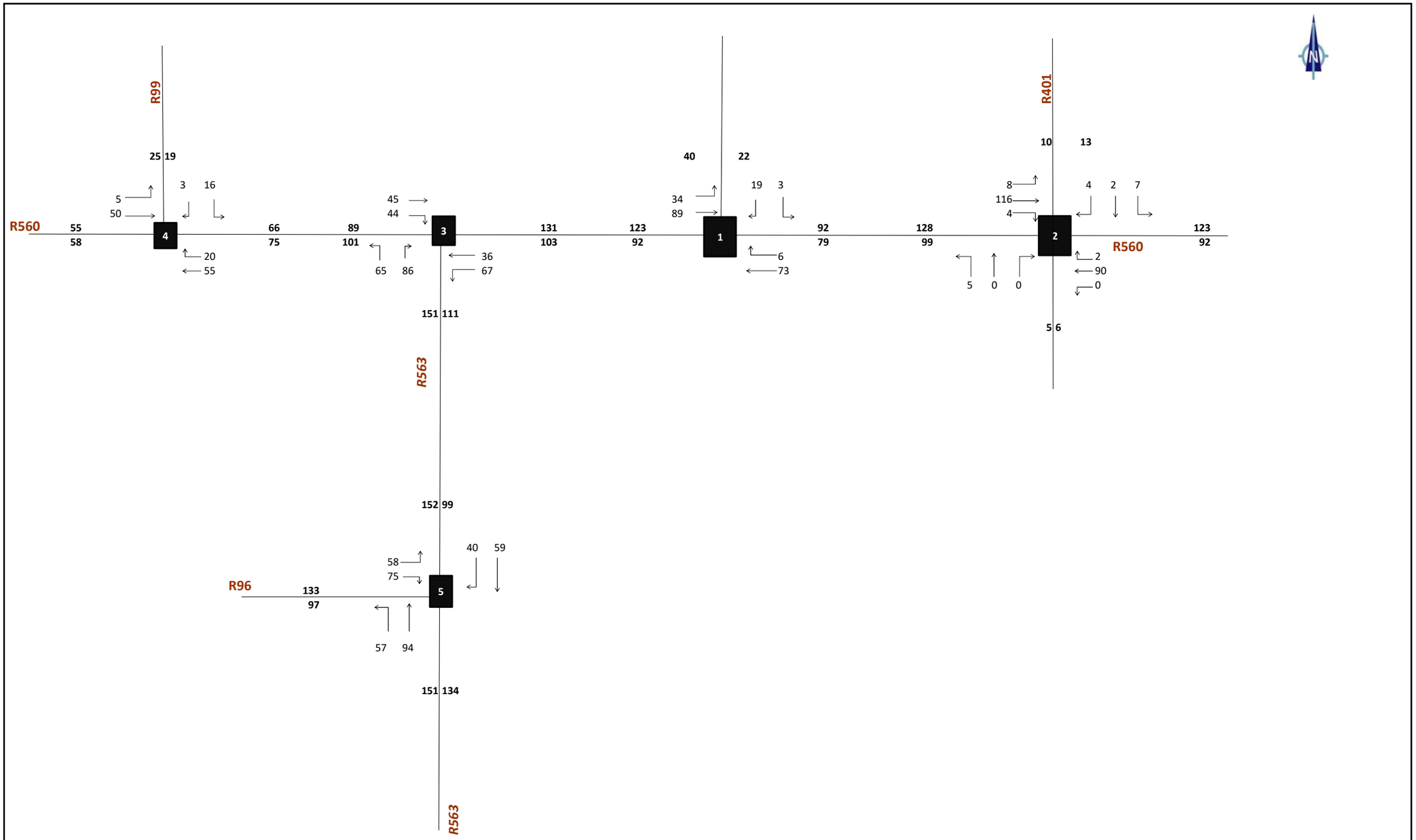
Signature:

ANNEXURE B

AM AND PM PEAK HOUR EXISTING TRAFFIC PROFILE



GladAfrica Project Managers	EXISTING HEKPOORT 2019 TRAFFIC VOLUMES	Proj. Nber
	AM PEAK 06:45 - 07:45	Fig 1AM



GladAfrica Project Managers	EXISTING HEKPOORT 2019 TRAFFIC VOLUMES	Proj. Nber
	PM PEAK 15:30 - 16:30	Fig 2PM

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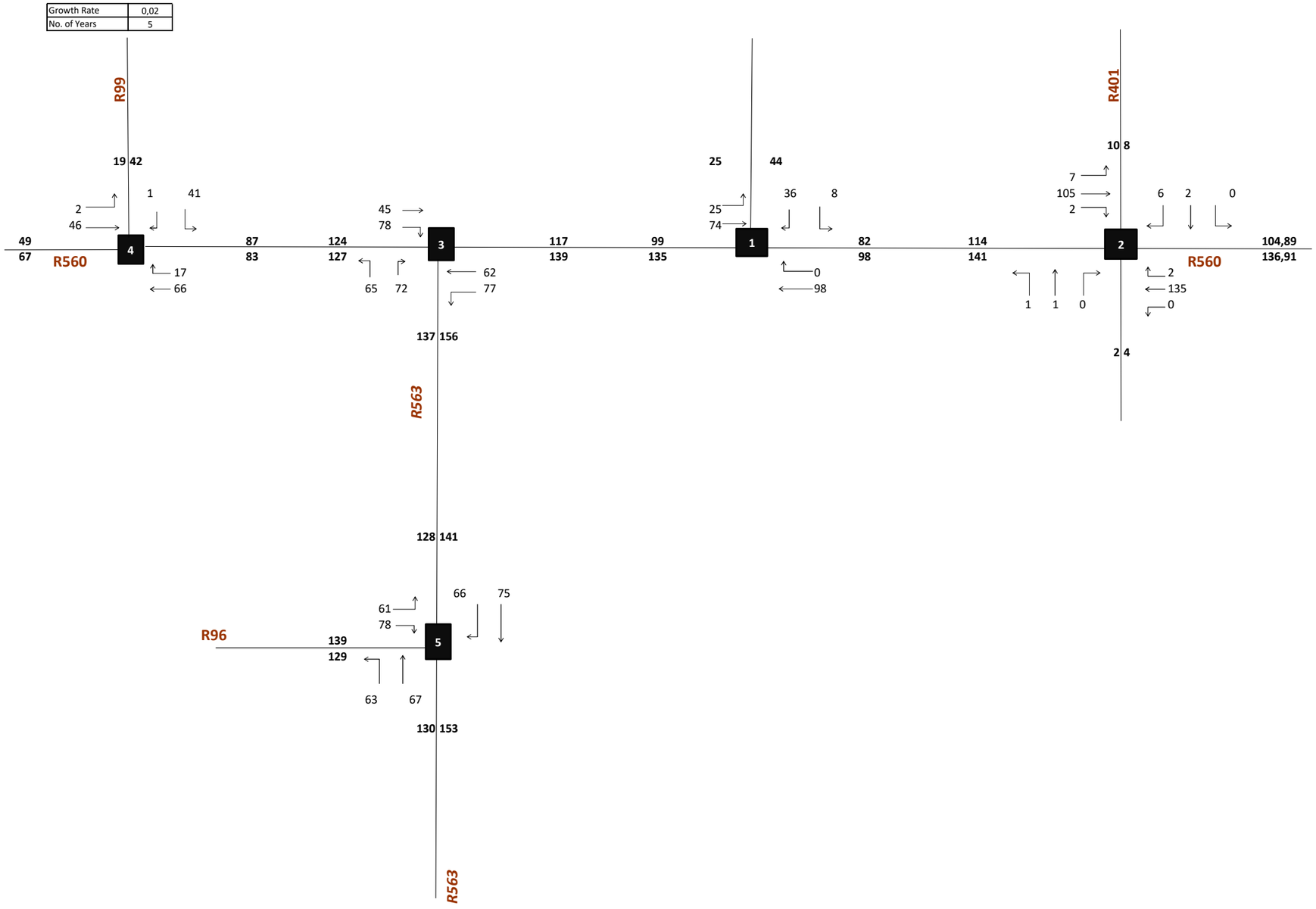
ANNEXURE C

TRAFFIC GROWTH

Growth Rate	0,02
No. of Years	5



GladAfrica Project Managers	AM PEAK 2024 BACKGROUNG INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 3AM

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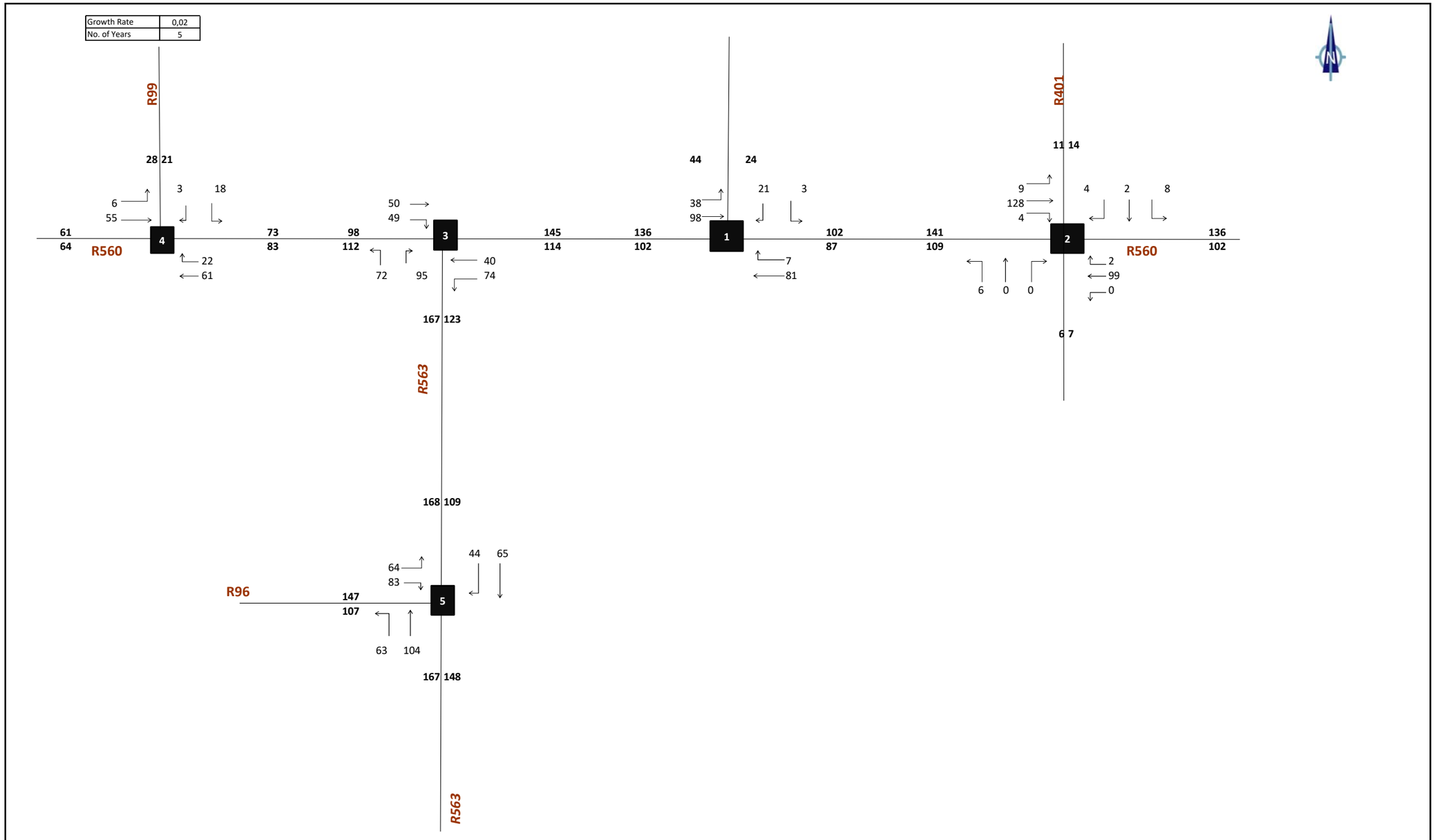
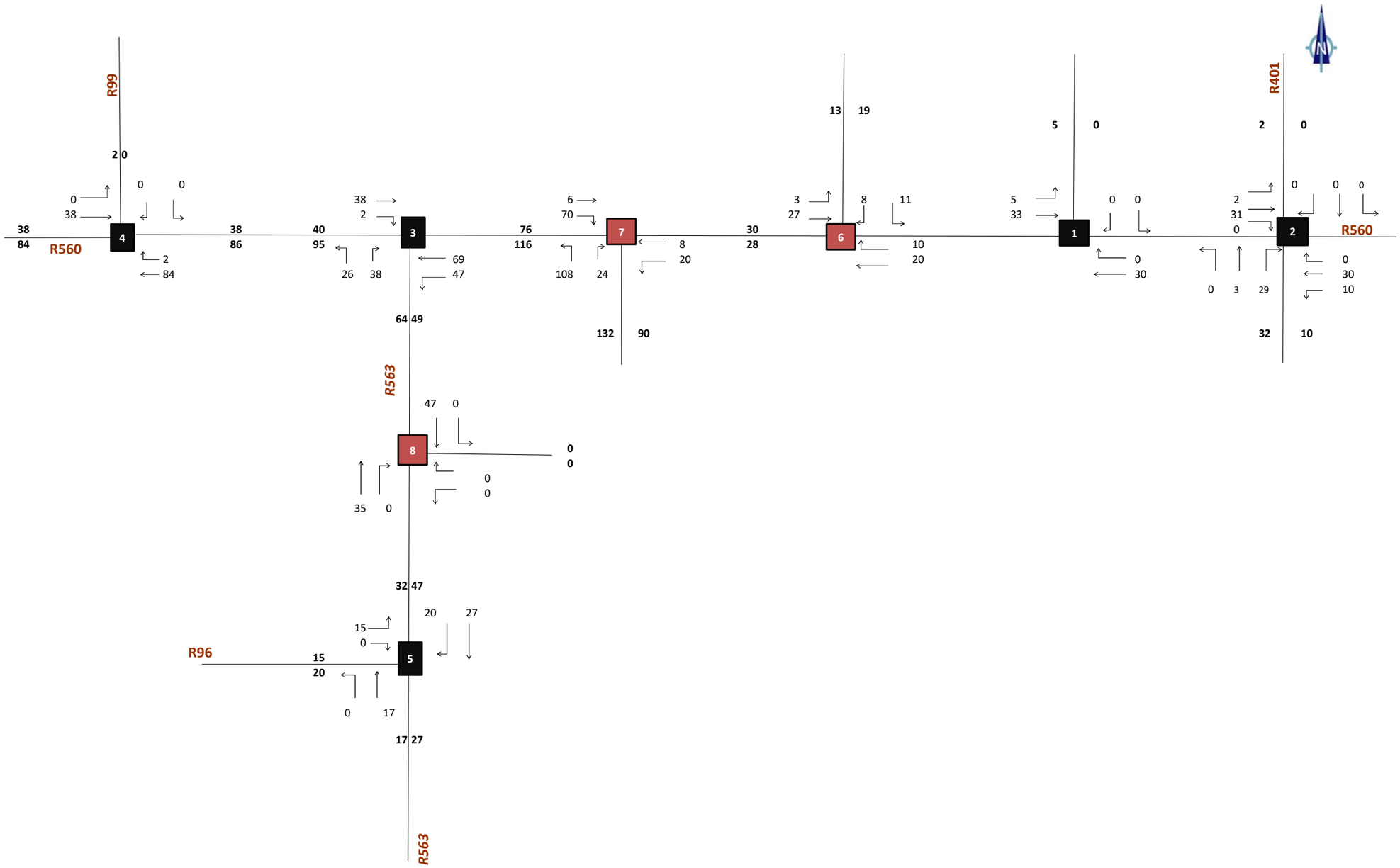


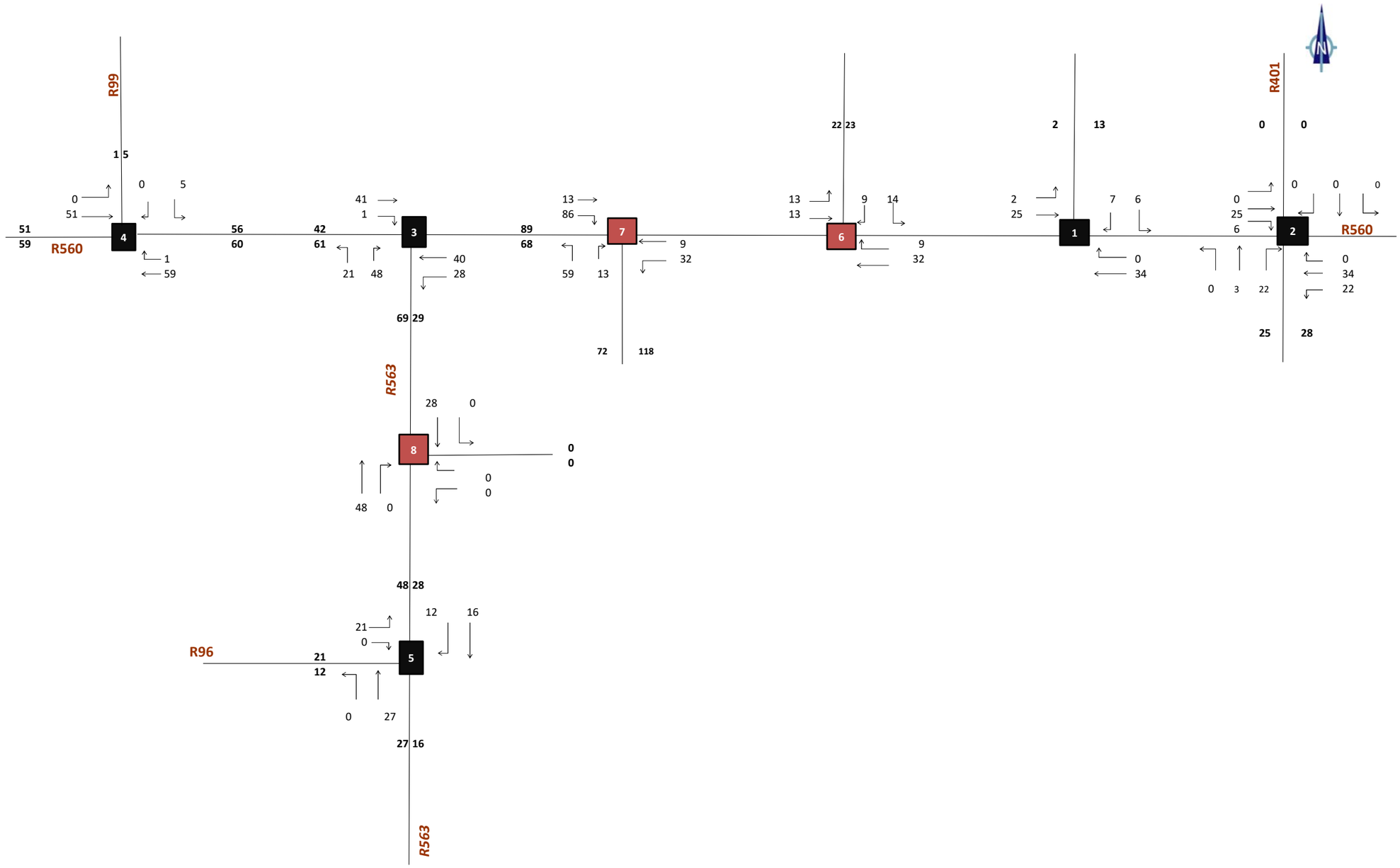
GladAfrica Project Managers	PM PEAK 2024 BACKGROUNG INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 4PM

ANNEXURE D

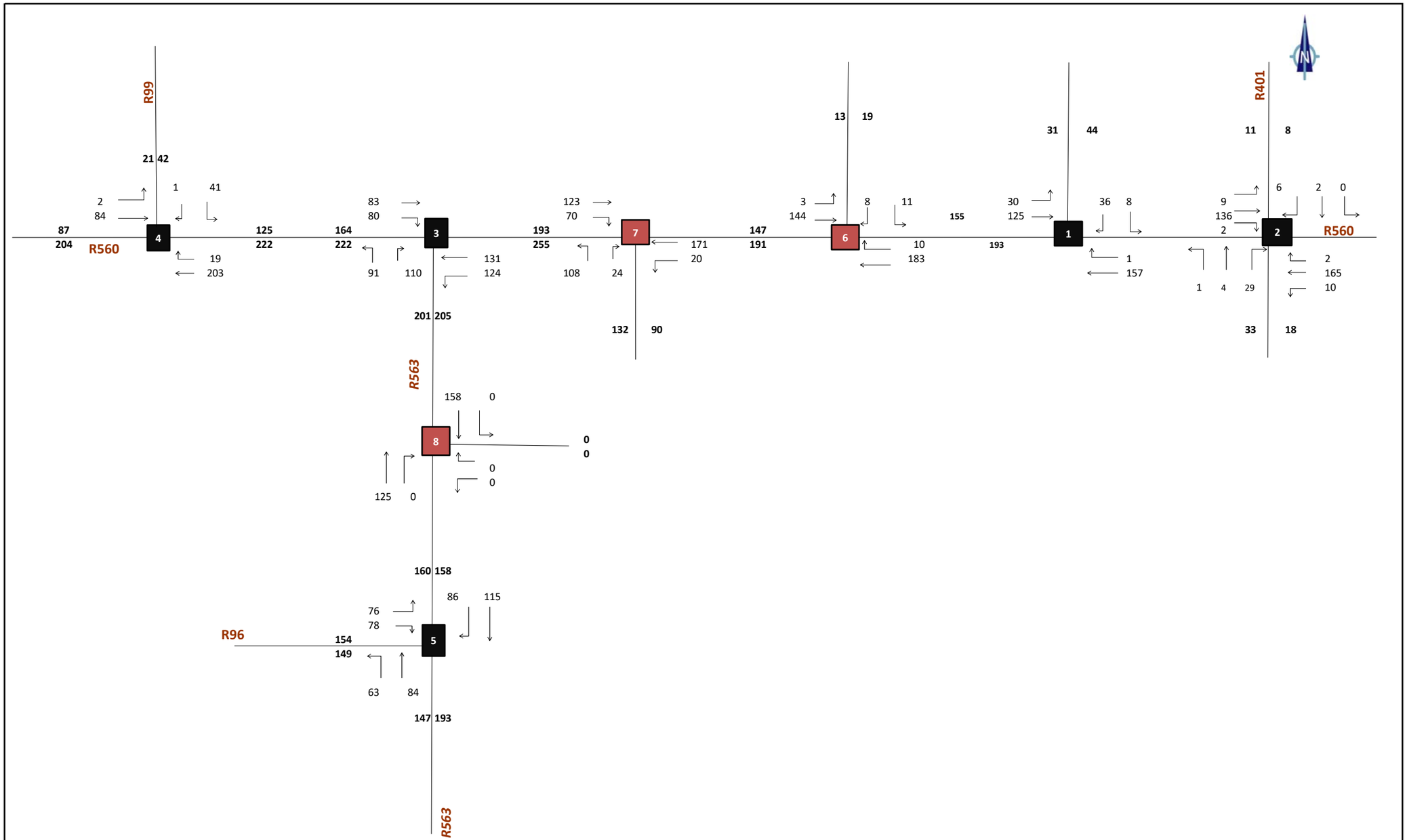
GENERATED TRAFFIC PROFILE



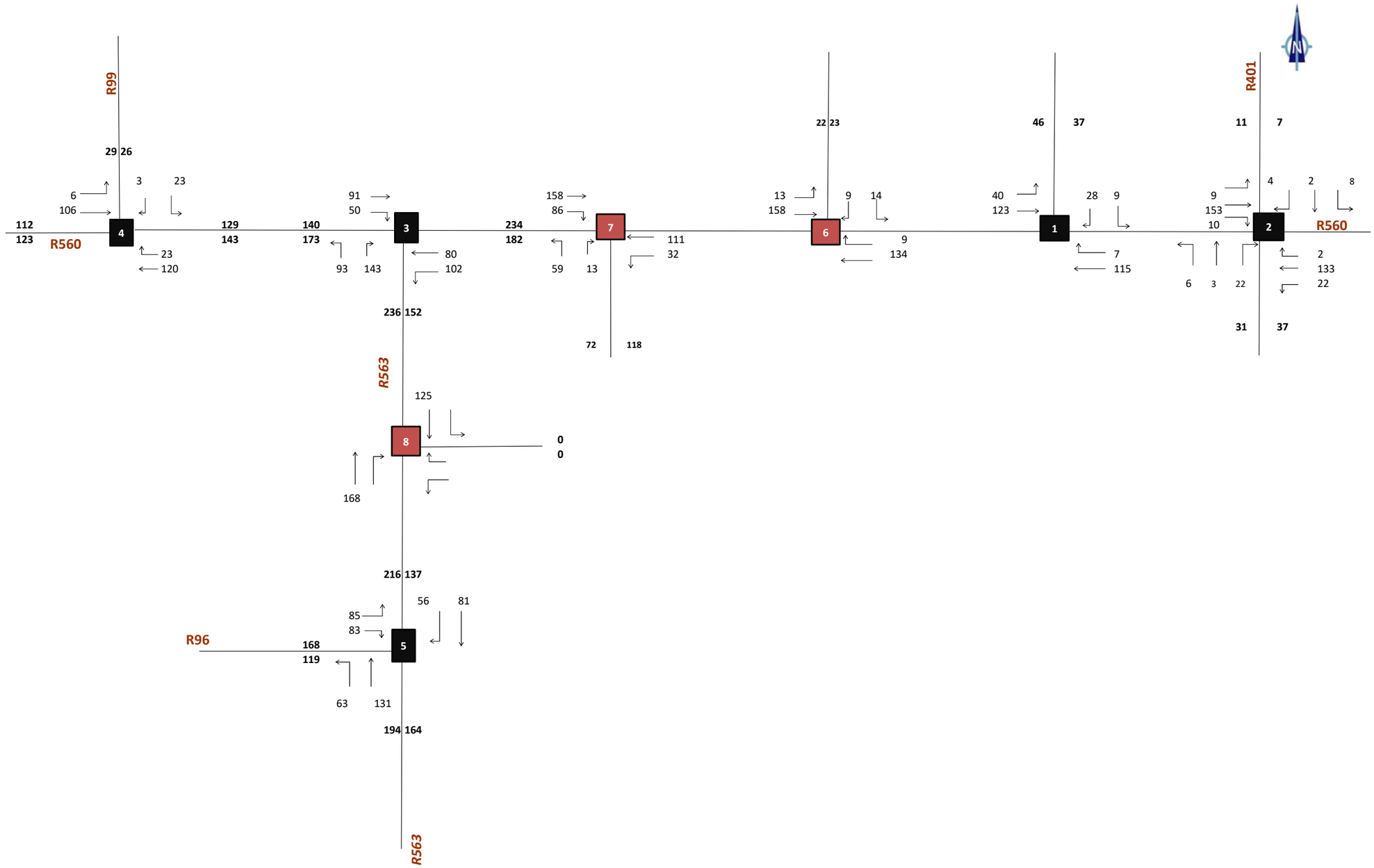
GladAfrica Project Managers	AM PEAK DEVELOPMENT INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 5AM



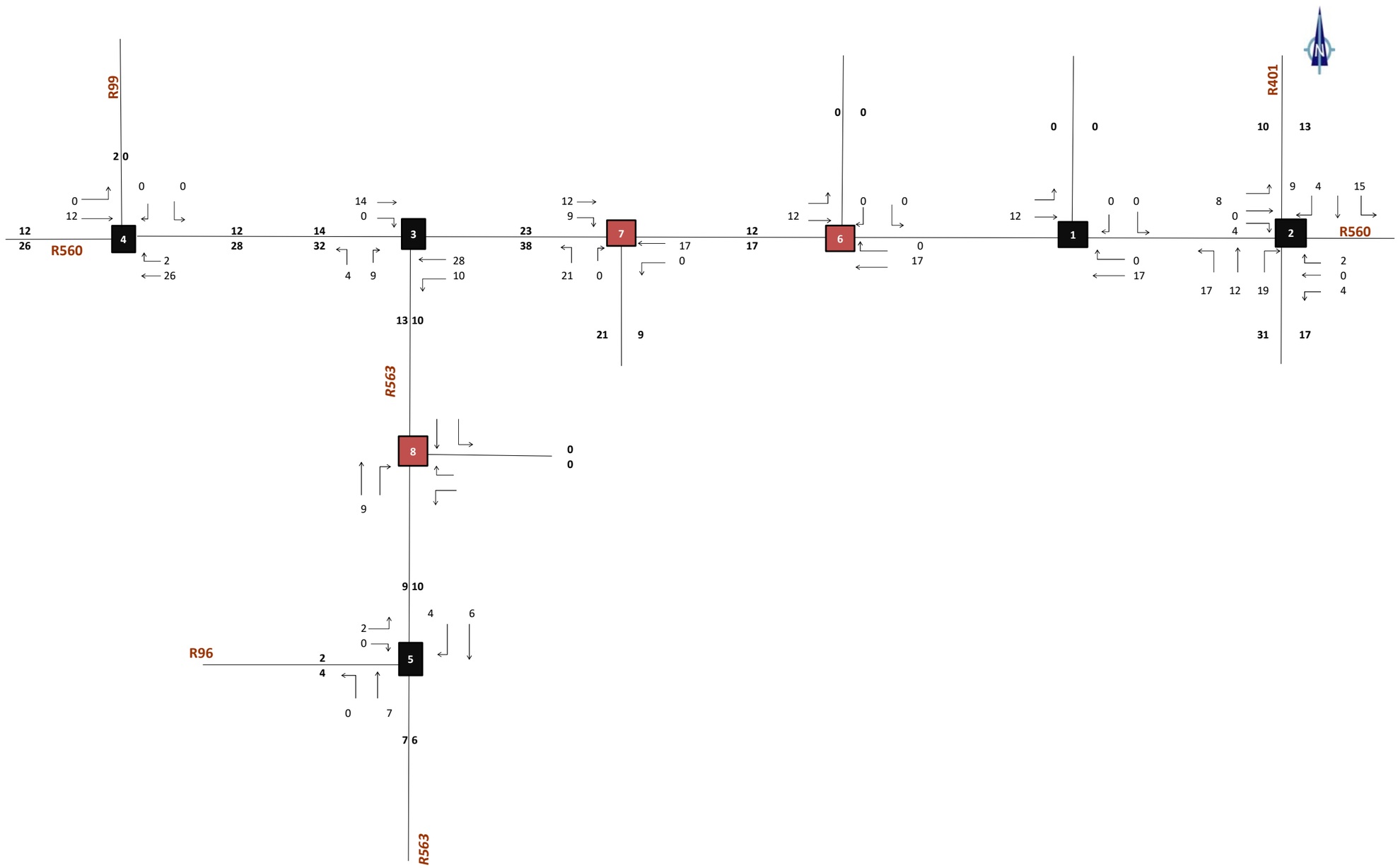
GladAfrica	PM PEAK DEVELOPMENT INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 6AM



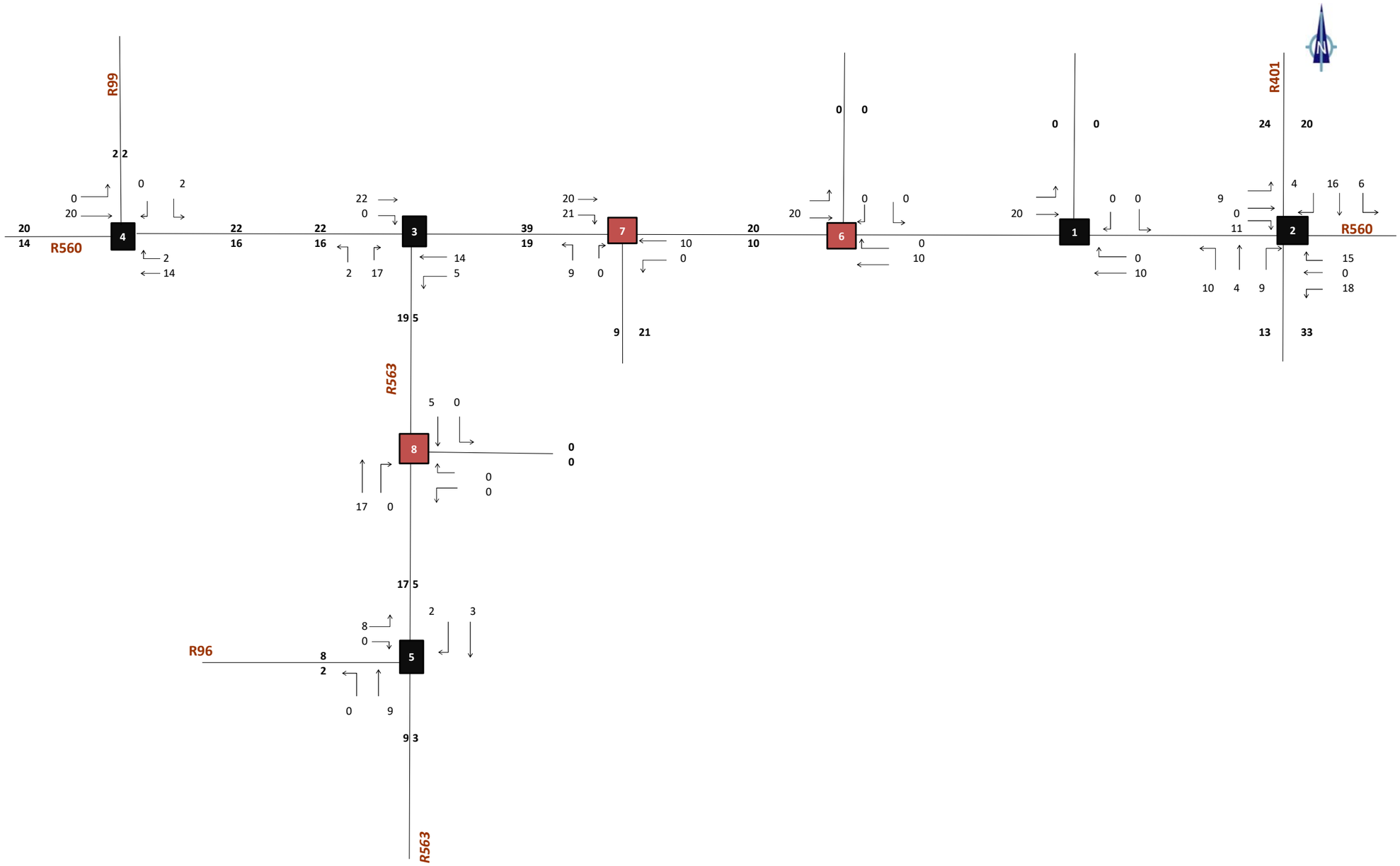
GladAfrica Project Managers	AM PEAK TOTAL INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 7AM



GladAfrica	PM PEAK TOTAL INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 8AM



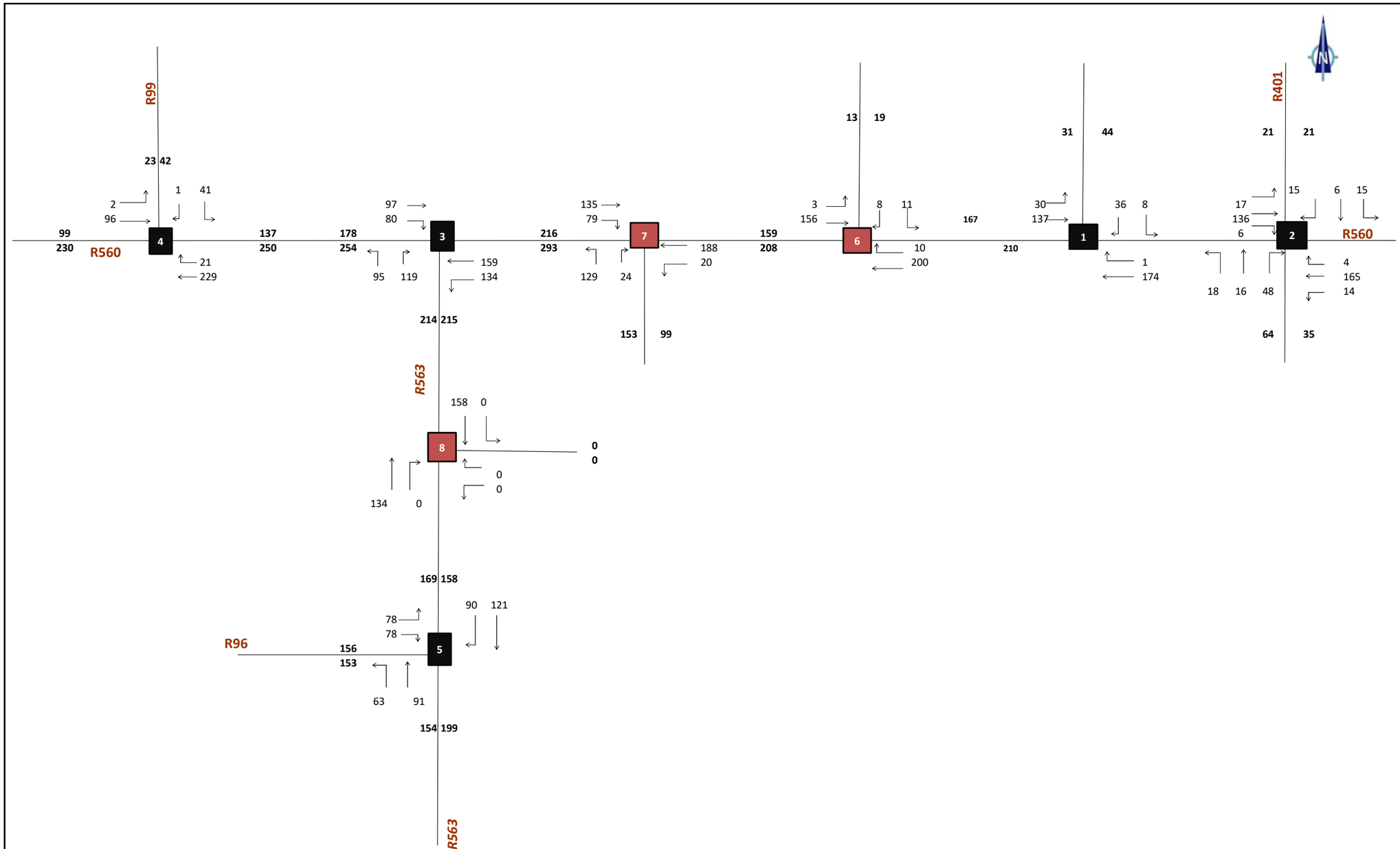
GladAfrica Project Managers	AM PEAK LATENT INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 9AM



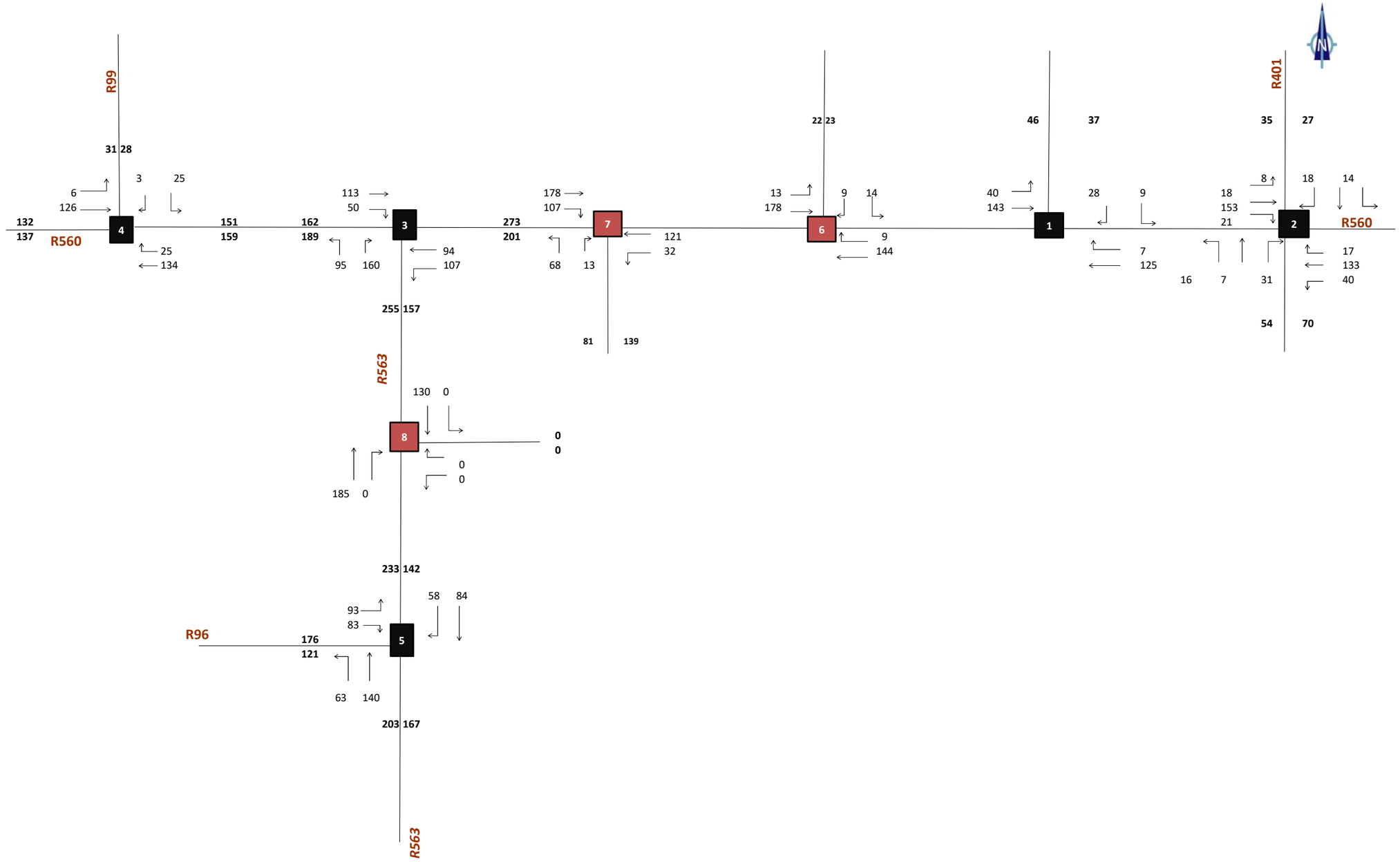
GladAfrica Project Managers	PM PEAK LATENT INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 10 AM

ANNEXURE E

FORECAST TOTAL TRAFFIC



GladAfrica Project Managers	AM PEAK FINAL INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 11AM



GladAfrica Project Managers	PM PEAK FINAL INTERSECTION TURNING VOLUMES	Proj. Nber
	HEKPOORT HOUSING PROJECT	Fig 12AM

ANNEXURE F

MOVEMENT SUMMARY EXISTING EVALUATION INTERSECTION 1 TO 5

LANE SUMMARY

Site: 101 [INT 1 EX AM]

AM PEAK EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: SOUTH APP													
Lane 1	3	0,0	1016	0,003	100	8,4	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	3	0,0		0,003		8,4	LOS A	0,0	0,1				
East: R560 EAST APP													
Lane 1	96	2,0	1920	0,050	100	0,1	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	96	2,0		0,050		0,1	NA	0,0	0,1				
North: NORTH APP													
Lane 1	43	1,6	894	0,048	100	8,5	LOS A	0,2	1,2	Full	500	0,0	0,0
Approach	43	1,6		0,048		8,5	LOS A	0,2	1,2				
West: R560 WEST APP													
Lane 1	96	1,5	1903	0,050	100	1,5	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	96	1,5		0,050		1,5	NA	0,0	0,1				
Intersection	238	1,7		0,050		2,3	NA	0,2	1,2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 1 EX PM]

PM PEAK EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: SOUTH APP													
Lane 1	3	0,0	1007	0,003	100	8,4	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	3	0,0		0,003		8,4	LOS A	0,0	0,1				
East: R560 EAST APP													
Lane 1	84	1,8	1891	0,045	100	0,5	LOS A	0,0	0,3	Full	500	0,0	0,0
Approach	84	1,8		0,045		0,5	NA	0,0	0,3				
North: NORTH APP													
Lane 1	24	1,7	864	0,028	100	8,6	LOS A	0,1	0,7	Full	500	0,0	0,0
Approach	24	1,7		0,028		8,6	LOS A	0,1	0,7				
West: R560 WEST APP													
Lane 1	131	1,4	1903	0,069	100	1,6	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	131	1,4		0,069		1,6	NA	0,0	0,1				
Intersection	242	1,6		0,069		2,0	NA	0,1	0,7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 2 AM EX]

AM PEAK EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: R401 SOUTH APP													
Lane 1	3	0,0	960	0,003	100	8,7	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	3	0,0		0,003		8,7	LOS A	0,0	0,1				
East: R560 EAST APP													
Lane 1	132	2,0	1918	0,069	100	0,1	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	132	2,0		0,069		0,1	NA	0,0	0,1				
North: R401 NORTH APP													
Lane 1	8	0,0	864	0,010	100	8,7	LOS A	0,0	0,2	Full	500	0,0	0,0
Approach	8	0,0		0,010		8,7	LOS A	0,0	0,2				
West: R560 WEST APP													
Lane 1	108	1,8	1912	0,057	100	0,5	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	108	1,8		0,057		0,5	NA	0,0	0,1				
Intersection	252	1,8		0,069		0,7	NA	0,0	0,2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

MOVEMENT SUMMARY

Site: 101 [INT 2 PM EX]

PM PEAK EX
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: R401 SOUTH APP											
1	L2	5	0,0	0,006	8,3	LOS A	0,0	0,2	0,20	0,89	51,7
2	T1	1	0,0	0,006	8,7	LOS A	0,0	0,2	0,20	0,89	51,5
3	R2	1	0,0	0,006	8,7	LOS A	0,0	0,2	0,20	0,89	51,2
Approach		7	0,0	0,006	8,5	LOS A	0,0	0,2	0,20	0,89	51,6
East: R560 EAST APP											
4	L2	1	0,0	0,051	5,8	LOS A	0,0	0,1	0,01	0,02	58,1
5	T1	95	2,0	0,051	0,0	LOS A	0,0	0,1	0,01	0,02	59,8
6	R2	2	0,0	0,051	5,8	LOS A	0,0	0,1	0,01	0,02	57,5
Approach		98	1,9	0,051	0,2	NA	0,0	0,1	0,01	0,02	59,7
North: R401 NORTH APP											
7	L2	7	0,0	0,013	8,4	LOS A	0,0	0,3	0,25	0,88	51,7
8	T1	2	0,0	0,013	8,7	LOS A	0,0	0,3	0,25	0,88	51,4
9	R2	4	0,0	0,013	8,8	LOS A	0,0	0,3	0,25	0,88	51,2
Approach		14	0,0	0,013	8,6	LOS A	0,0	0,3	0,25	0,88	51,5
West: R560 WEST APP											
10	L2	8	0,0	0,071	5,6	LOS A	0,0	0,3	0,02	0,06	57,8
11	T1	122	2,0	0,071	0,0	LOS A	0,0	0,3	0,02	0,06	59,4
12	R2	4	0,0	0,071	5,7	LOS A	0,0	0,3	0,02	0,06	57,2
Approach		135	1,8	0,071	0,5	NA	0,0	0,3	0,02	0,06	59,2
All Vehicles		254	1,7	0,071	1,1	NA	0,0	0,3	0,03	0,11	58,7

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.

LANE SUMMARY

Site: 101 [INT 3 AM EX]

AM PEAK EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: R563 SOUTH APP													
Lane 1	62	2,0	1542	0,040	100	5,8	LOS A	0,2	1,2	Short	25	0,0	NA
Lane 2	68	2,0	932	0,073	100	8,5	LOS A	0,2	1,7	Full	500	0,0	0,0
Approach	131	2,0		0,073		7,2	LOS A	0,2	1,7				
East: R560 EAST APP													
Lane 1	133	2,0	1872	0,071	100	3,1	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	133	2,0		0,071		3,1	NA	0,0	0,0				
West: R560 WEST APP													
Lane 1	118	2,0	1676	0,070	100	3,9	LOS A	0,3	2,3	Full	500	0,0	0,0
Approach	118	2,0		0,070		3,9	NA	0,3	2,3				
Intersection	381	2,0		0,073		4,8	NA	0,3	2,3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 3 PM EX]

PM PEAK EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: R563 SOUTH APP													
Lane 1	68	2,0	1570	0,044	100	5,7	LOS A	0,2	1,3	Short	25	0,0	NA
Lane 2	91	2,0	978	0,093	100	8,3	LOS A	0,3	2,2	Full	500	0,0	0,0
Approach	159	2,0		0,093		7,2	LOS A	0,3	2,2				
East: R560 EAST APP													
Lane 1	108	2,0	1863	0,058	100	3,6	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	108	2,0		0,058		3,6	NA	0,0	0,0				
West: R560 WEST APP													
Lane 1	94	2,0	1740	0,054	100	3,0	LOS A	0,2	1,6	Full	500	0,0	0,0
Approach	94	2,0		0,054		3,0	NA	0,2	1,6				
Intersection	361	2,0		0,093		5,0	NA	0,3	2,2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 4 AM EX]

AM EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: R560 EAST APP													
Lane 1	79	2,0	1863	0,042	100	1,2	LOS A	0,1	0,6	Full	500	0,0	0,0
Approach	79	2,0		0,042		1,2	NA	0,1	0,6				
North: R99 NORTH APP													
Lane 1	40	2,0	1356	0,030	100	8,3	LOS A	0,1	0,8	Full	500	0,0	0,0
Approach	40	2,0		0,030		8,3	LOS A	0,1	0,8				
West: R560 WEST APP													
Lane 1	46	1,9	1922	0,024	100	0,3	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	46	1,9		0,024		0,3	NA	0,0	0,0				
Intersection	165	2,0		0,042		2,6	NA	0,1	0,8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

MOVEMENT SUMMARY

Site: 101 [INT 4 PM EX]

PM EX
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	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 per veh	Average Speed km/h
East: R560 EAST APP											
5	T1	58	2,0	0,043	0,1	LOS A	0,1	0,8	0,08	0,16	58,3
6	R2	21	2,0	0,043	5,6	LOS A	0,1	0,8	0,08	0,16	56,0
Approach		79	2,0	0,043	1,6	NA	0,1	0,8	0,08	0,16	57,7
North: R99 NORTH APP											
7	L2	17	2,0	0,016	8,3	LOS A	0,1	0,4	0,14	0,91	51,7
9	R2	3	2,0	0,016	8,1	LOS A	0,1	0,4	0,14	0,91	51,2
Approach		20	2,0	0,016	8,2	LOS A	0,1	0,4	0,14	0,91	51,7
West: R560 WEST APP											
10	L2	5	0,0	0,030	5,5	LOS A	0,0	0,0	0,00	0,05	57,9
11	T1	53	2,0	0,030	0,0	LOS A	0,0	0,0	0,00	0,05	59,5
Approach		58	1,8	0,030	0,5	NA	0,0	0,0	0,00	0,05	59,3
All Vehicles		157	1,9	0,043	2,0	NA	0,1	0,8	0,06	0,22	57,4

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.

LANE SUMMARY

Site: 101 [INT 5 AM EX]

AM EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: R563 SOUTH APP													
Lane 1	60	2,0	1536	0,039	100	5,8	LOS A	0,2	1,1	Short	120	0,0	NA
Lane 2	64	2,0	1925	0,033	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	124	2,0		0,039		2,8	LOS A	0,2	1,1				
North: R563 NORTH APP													
Lane 1	55	2,0	1925	0,029	62[6]	0,0	LOS A	0,0	0,0	Short	70	0,0	NA
Lane 2	79	2,0	1716	0,046	100	4,5	LOS A	0,2	1,5	Full	500	0,0	0,0
Approach	135	2,0		0,046		2,7	NA	0,2	1,5				
West: R96 WEST APP													
Lane 1	133	2,0	857	0,155	100	9,3	LOS A	0,6	4,5	Full	500	0,0	0,0
Approach	133	2,0		0,155		9,3	LOS A	0,6	4,5				
Intersection	392	2,0		0,155		5,0	NA	0,6	4,5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

6 Lane under-utilisation due to downstream effects

LANE SUMMARY

Site: 101 [INT 5 PM EX]

PM EX
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: R563 SOUTH APP													
Lane 1	60	2,0	1564	0,038	100	5,7	LOS A	0,2	1,1	Short	120	0,0	NA
Lane 2	99	2,0	1925	0,051	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	159	2,0		0,051		2,2	LOS A	0,2	1,1				
North: R563 NORTH APP													
Lane 1	43	2,0	1925	0,022	62[6]	0,0	LOS A	0,0	0,0	Short	70	0,0	NA
Lane 2	61	2,0	1697	0,036	100	4,1	LOS A	0,2	1,2	Full	500	0,0	0,0
Approach	104	2,0		0,036		2,4	NA	0,2	1,2				
West: R96 WEST APP													
Lane 1	140	2,0	842	0,166	100	9,4	LOS A	0,7	4,8	Full	500	0,0	0,0
Approach	140	2,0		0,166		9,4	LOS A	0,7	4,8				
Intersection	403	2,0		0,166		4,7	NA	0,7	4,8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

6 Lane under-utilisation due to downstream effects

ANNEXURE G

MOVEMENT SUMMARY FORECAST EVALUATION INTERSECTION 1 TO 7

LANE SUMMARY

Site: 101 [INT 1 Fut AM]

AM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: SOUTH APP													
Lane 1	3	0,0	856	0,004	100	9,2	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	3	0,0		0,004		9,2	LOS A	0,0	0,1				
East: R560 EAST APP													
Lane 1	185	2,0	1921	0,096	100	0,1	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	185	2,0		0,096		0,1	NA	0,0	0,1				
North: NORTH APP													
Lane 1	47	1,6	741	0,064	100	9,7	LOS A	0,2	1,5	Full	500	0,0	0,0
Approach	47	1,6		0,064		9,7	LOS A	0,2	1,5				
West: R560 WEST APP													
Lane 1	177	1,6	1909	0,093	100	1,0	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	177	1,6		0,093		1,0	NA	0,0	0,1				
Intersection	413	1,8		0,096		1,7	NA	0,2	1,5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 1 FUT PM]

PM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: SOUTH APP													
Lane 1	3	0,0	894	0,004	100	9,0	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	3	0,0		0,004		9,0	LOS A	0,0	0,1				
East: R560 EAST APP													
Lane 1	140	1,9	1894	0,074	100	0,4	LOS A	0,1	0,4	Full	500	0,0	0,0
Approach	140	1,9		0,074		0,4	NA	0,1	0,4				
North: NORTH APP													
Lane 1	40	1,5	792	0,051	100	9,3	LOS A	0,2	1,2	Full	500	0,0	0,0
Approach	40	1,5		0,051		9,3	LOS A	0,2	1,2				
West: R560 WEST APP													
Lane 1	194	1,6	1907	0,102	100	1,2	LOS A	0,0	0,1	Full	500	0,0	0,0
Approach	194	1,6		0,102		1,2	NA	0,0	0,1				
Intersection	377	1,7		0,102		1,9	NA	0,2	1,2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 2 AM FUT]

AM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: R401 SOUTH APP													
Lane 1	86	0,0	781	0,110	100	9,6	LOS A	0,4	2,8	Full	500	0,0	0,0
Approach	86	0,0		0,110		9,6	LOS A	0,4	2,8				
East: R560 EAST APP													
Lane 1	193	1,8	1908	0,101	100	0,6	LOS A	0,0	0,3	Full	500	0,0	0,0
Approach	193	1,8		0,101		0,6	NA	0,0	0,3				
North: R401 NORTH APP													
Lane 1	38	0,0	863	0,044	100	9,3	LOS A	0,2	1,1	Full	500	0,0	0,0
Approach	38	0,0		0,044		9,3	LOS A	0,2	1,1				
West: R560 WEST APP													
Lane 1	167	1,7	1896	0,088	100	0,9	LOS A	0,1	0,4	Full	500	0,0	0,0
Approach	167	1,7		0,088		0,9	NA	0,1	0,4				
Intersection	484	1,3		0,110		3,0	NA	0,4	2,8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 2 PM FUT]

PM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: R401 SOUTH APP													
Lane 1	57	0,0	779	0,073	100	9,7	LOS A	0,3	1,8	Full	500	0,0	0,0
Approach	57	0,0		0,073		9,7	LOS A	0,3	1,8				
East: R560 EAST APP													
Lane 1	200	1,4	1863	0,107	100	1,8	LOS A	0,2	1,2	Full	500	0,0	0,0
Approach	200	1,4		0,107		1,8	NA	0,2	1,2				
North: R401 NORTH APP													
Lane 1	42	0,0	861	0,049	100	9,4	LOS A	0,2	1,2	Full	500	0,0	0,0
Approach	42	0,0		0,049		9,4	LOS A	0,2	1,2				
West: R560 WEST APP													
Lane 1	202	1,6	1860	0,109	100	1,3	LOS A	0,2	1,4	Full	500	0,0	0,0
Approach	202	1,6		0,109		1,3	NA	0,2	1,4				
Intersection	501	1,2		0,109		3,1	NA	0,3	1,8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 3 AM FUT]

AM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: R563 SOUTH APP													
Lane 1	100	2,0	1399	0,071	100	6,2	LOS A	0,3	2,1	Short	25	0,0	NA
Lane 2	125	2,0	737	0,170	100	10,1	LOS B	0,6	4,2	Full	500	0,0	0,0
Approach	225	2,0		0,170		8,3	LOS A	0,6	4,2				
East: R560 EAST APP													
Lane 1	308	2,0	1881	0,164	100	2,6	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	308	2,0		0,164		2,6	NA	0,0	0,0				
West: R560 WEST APP													
Lane 1	186	2,0	1582	0,118	100	3,5	LOS A	0,5	3,9	Full	500	0,0	0,0
Approach	186	2,0		0,118		3,5	NA	0,5	3,9				
Intersection	720	2,0		0,170		4,6	NA	0,6	4,2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 3 PM FUT]

PM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: R563 SOUTH APP													
Lane 1	100	2,0	1489	0,067	100	5,9	LOS A	0,3	2,0	Short	25	0,0	NA
Lane 2	168	2,0	825	0,204	100	9,4	LOS A	0,7	5,3	Full	500	0,0	0,0
Approach	268	2,0		0,204		8,1	LOS A	0,7	5,3				
East: R560 EAST APP													
Lane 1	212	2,0	1874	0,113	100	3,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	212	2,0		0,113		3,0	NA	0,0	0,0				
West: R560 WEST APP													
Lane 1	172	2,0	1739	0,099	100	2,2	LOS A	0,3	2,5	Full	500	0,0	0,0
Approach	172	2,0		0,099		2,2	NA	0,3	2,5				
Intersection	652	2,0		0,204		4,9	NA	0,7	5,3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 4 AM FUT]

AM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: R560 EAST APP													
Lane 1	263	2,0	1888	0,139	100	0,5	LOS A	0,2	1,1	Full	500	0,0	0,0
Approach	263	2,0		0,139		0,5	NA	0,2	1,1				
North: R99 NORTH APP													
Lane 1	44	2,0	1274	0,035	100	8,5	LOS A	0,1	1,0	Full	500	0,0	0,0
Approach	44	2,0		0,035		8,5	LOS A	0,1	1,0				
West: R560 WEST APP													
Lane 1	103	2,0	1924	0,054	100	0,1	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	103	2,0		0,054		0,1	NA	0,0	0,0				
Intersection	411	2,0		0,139		1,3	NA	0,2	1,1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 4 PM FUT]

PM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
East: R560 EAST APP													
Lane 1	167	2,0	1848	0,091	100	1,0	LOS A	0,2	1,3	Full	500	0,0	0,0
Approach	167	2,0		0,091		1,0	NA	0,2	1,3				
North: R99 NORTH APP													
Lane 1	29	2,0	1192	0,025	100	8,6	LOS A	0,1	0,7	Full	500	0,0	0,0
Approach	29	2,0		0,025		8,6	LOS A	0,1	0,7				
West: R560 WEST APP													
Lane 1	139	1,9	1922	0,072	100	0,3	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	139	1,9		0,072		0,3	NA	0,0	0,0				
Intersection	336	2,0		0,091		1,4	NA	0,2	1,3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 5 AM FUT]

AM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: R563 SOUTH APP													
Lane 1	66	2,0	1495	0,044	100	5,9	LOS A	0,2	1,3	Short	120	0,0	NA
Lane 2	96	2,0	1925	0,050	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	162	2,0		0,050		2,4	LOS A	0,2	1,3				
North: R563 NORTH APP													
Lane 1	92	2,0	1925	0,048	62[6]	0,0	LOS A	0,0	0,0	Short	70	0,0	NA
Lane 2	130	2,0	1692	0,077	100	4,3	LOS A	0,4	2,6	Full	500	0,0	0,0
Approach	222	2,0		0,077		2,5	NA	0,4	2,6				
West: R96 WEST APP													
Lane 1	164	2,0	779	0,211	100	10,1	LOS B	0,9	6,2	Full	500	0,0	0,0
Approach	164	2,0		0,211		10,1	LOS B	0,9	6,2				
Intersection	548	2,0		0,211		4,8	NA	0,9	6,2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

6 Lane under-utilisation due to downstream effects

LANE SUMMARY

Site: 101 [INT 5 PM FUT]

PM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: R563 SOUTH APP													
Lane 1	66	2,0	1539	0,043	100	5,8	LOS A	0,2	1,2	Short	120	0,0	NA
Lane 2	147	2,0	1925	0,077	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	214	2,0		0,077		1,8	LOS A	0,2	1,2				
North: R563 NORTH APP													
Lane 1	63	2,0	1925	0,033	62[6]	0,0	LOS A	0,0	0,0	Short	70	0,0	NA
Lane 2	86	2,0	1638	0,053	100	4,3	LOS A	0,2	1,7	Full	500	0,0	0,0
Approach	149	2,0		0,053		2,5	NA	0,2	1,7				
West: R96 WEST APP													
Lane 1	185	2,0	786	0,236	100	10,1	LOS B	1,0	7,1	Full	500	0,0	0,0
Approach	185	2,0		0,236		10,1	LOS B	1,0	7,1				
Intersection	548	2,0		0,236		4,8	NA	1,0	7,1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

6 Lane under-utilisation due to downstream effects

LANE SUMMARY

Site: 101 [INT 6 Fut AM]

AM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: R560 EAST APP													
Lane 1	211	2,0	1925	0,109	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Lane 2	11	0,0	1224	0,009	100	6,0	LOS A	0,0	0,2	Short	40	0,0	NA
Approach	221	1,9		0,109		0,3	NA	0,0	0,2				
North: NEW ACCESS NORTH APP													
Lane 1	20	0,8	764	0,026	100	9,9	LOS A	0,1	0,7	Full	500	0,0	0,0
Approach	20	0,8		0,026		9,9	LOS A	0,1	0,7				
West: R560 WEST APP													
Lane 1	3	0,0	1857	0,002	100	5,5	LOS A	0,0	0,0	Short	40	0,0	NA
Lane 2	164	2,0	1925	0,085	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	167	2,0		0,085		0,1	NA	0,0	0,0				
Intersection	408	1,9		0,109		0,7	NA	0,1	0,7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 6 Fut PM]

PM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
East: R560 EAST APP													
Lane 1	152	2,0	1925	0,079	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Lane 2	9	0,0	1183	0,008	100	6,2	LOS A	0,0	0,2	Short	40	0,0	NA
Approach	161	1,9		0,079		0,4	NA	0,0	0,2				
North: NORTH APP													
Lane 1	24	0,8	787	0,031	100	9,7	LOS A	0,1	0,8	Full	500	0,0	0,0
Approach	24	0,8		0,031		9,7	LOS A	0,1	0,8				
West: R560 WEST APP													
Lane 1	14	0,0	1857	0,007	100	5,5	LOS A	0,0	0,0	Short	40	0,0	NA
Lane 2	187	2,0	1925	0,097	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	201	1,9		0,097		0,4	NA	0,0	0,0				
Intersection	386	1,8		0,097		1,0	NA	0,1	0,8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 7 AM FUT]

AM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: New Access South App													
Lane 1	136	2,0	959	0,142	100	9,2	LOS A	0,5	3,9	Short	15	0,0	NA
Lane 2	25	2,0	535	0,047	100	12,0	LOS B	0,2	1,2	Full	500	0,0	0,0
Approach	161	2,0		0,142		9,7	LOS A	0,5	3,9				
East: R560 EAST APP													
Lane 1	21	2,0	1831	0,011	100	5,6	LOS A	0,0	0,0	Short	15	0,0	NA
Lane 2	198	2,0	1925	0,103	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	219	2,0		0,103		0,5	NA	0,0	0,0				
West: R560 WEST APP													
Lane 1	142	2,0	1925	0,074	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Lane 2	83	2,0	1147	0,073	100	6,4	LOS A	0,3	2,1	Short	40	0,0	NA
Approach	225	2,0		0,074		2,4	NA	0,3	2,1				
Intersection	605	2,0		0,142		3,7	NA	0,5	3,9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

LANE SUMMARY

Site: 101 [INT 7 PM FUT]

PM PEAK FUT
Stop (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: New Access South App													
Lane 1	72	2,0	1260	0,057	100	8,6	LOS A	0,2	1,6	Short	15	0,0	NA
Lane 2	14	2,0	607	0,023	100	10,9	LOS B	0,1	0,6	Full	500	0,0	0,0
Approach	85	2,0		0,057		9,0	LOS A	0,2	1,6				
East: R560 EAST APP													
Lane 1	161	2,0	1905	0,085	100	1,2	LOS A	0,0	0,0	Full	500	0,0	0,0
Approach	161	2,0		0,085		1,2	NA	0,0	0,0				
West: R560 WEST APP													
Lane 1	187	2,0	1925	0,097	100	0,0	LOS A	0,0	0,0	Full	500	0,0	0,0
Lane 2	113	2,0	1541	0,073	100	6,0	LOS A	0,3	2,4	Short	35	0,0	NA
Approach	300	2,0		0,097		2,3	NA	0,3	2,4				
Intersection	546	2,0		0,097		3,0	NA	0,3	2,4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.