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APPLICATION FOR THE REZONING AND SUB-DIVISION OF

ERF 3122 HARTENBOS

IN THE MOSSEL BAY LOCAL MUNICIPALITY

TRAFFIC IMPACT ASSESSMENT

PROJECT NO: J012/627-3
JUNE 2021

TECH IQ CONSULTING ENGINEERS

TECH IQ CONSULTING ENGINEERS
CK 2001/027954/23

199 Silver Oak Avenue
WATERKLOOF 0181
P O Box 2731
BROOKLYN SQUARE 0075
Tel: + 27 (12) 346 5336
Fax: 086 517 3132
e-mail: hsj@tiq.co.za

DOCUMENT CONTROL SHEET

PROJECT NAME	:	**APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS IN THE MOSSEL BAY LOCAL MUNICIPALITY**
DOCUMENT TITLE	:	**TRAFFIC IMPACT ASSESSMENT**
PROJECT NUMBER	:	**J012/627-3**

	NAME	REGISTRATION	DATE
ORIGINAL	**Dr H S Joubert Pr Eng**	**ECSA: 790439**	**JUNE 2021**

	NAME	REGISTRATION	DATE
ADDENDUM			

	NAME	REGISTRATION	DATE
REVISION			

TECH IQ CONSULTING ENGINEERS
CK 2001/027954/23

199 Silver Oak Avenue
WATERKLOOF 0181
P O Box 2731
BROOKLYN SQUARE 0075
Tel: + 27 (12) 346 5336
Fax: 086 517 3132
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DECLARATION OF TRAFFIC ENGINEER RESPONSIBLE FOR THE REPORT

PROJECT NAME	:	**Application for the rezoning and sub-division of Erf 3122 Hartenbos in the Mossel Bay Local Municipality**
APPLICANT	:	**Hartenbos Garden Estate (Contact Dr AJ Kruger)**
COMPILATION OF REPORT	:	**Dr H S Joubert PrEng, PhD Engineering, Pretoria**

I, HERMANUS STEFANUS JOUBERT, author of this traffic impact study / statement, hereby certify that I am a professional traffic engineer (ECSA Registration Number 790439) and that I have the required experience and training in the field of traffic and transportation engineering, as required by the Engineering Council of South Africa (ECSA), to compile this traffic impact study / statement and I take full responsibility for the content, including all calculations, conclusions and recommendations made therein.

SIGNED AT **PRETORIA** ON **2021-06-11**

DR H S JOUBERT

APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS IN THE MOSSEL BAY LOCAL MUNICIPALITY

TRAFFIC IMPACT ASSESSMENT REPORT

CONTENTS

APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS IN THE MOSSEL BAY LOCAL MUNICIPALITY

TRAFFIC IMPACT ASSESSMENT REPORT

JUNE 2021

1. HISTORIC OVERVIEW

A Traffic Impact Assessment (TIA) report (Tech IQ Consulting Engineers, Project No J012/627/2, Revision 1, May 2018) in respect of a proposed retirement estate on Erf 3122 Hartenbos in Mossel Bay, Western Cape, was accepted by the Roads and Stormwater Department of the Mossel Bay Local Municipality (2018-05-28).

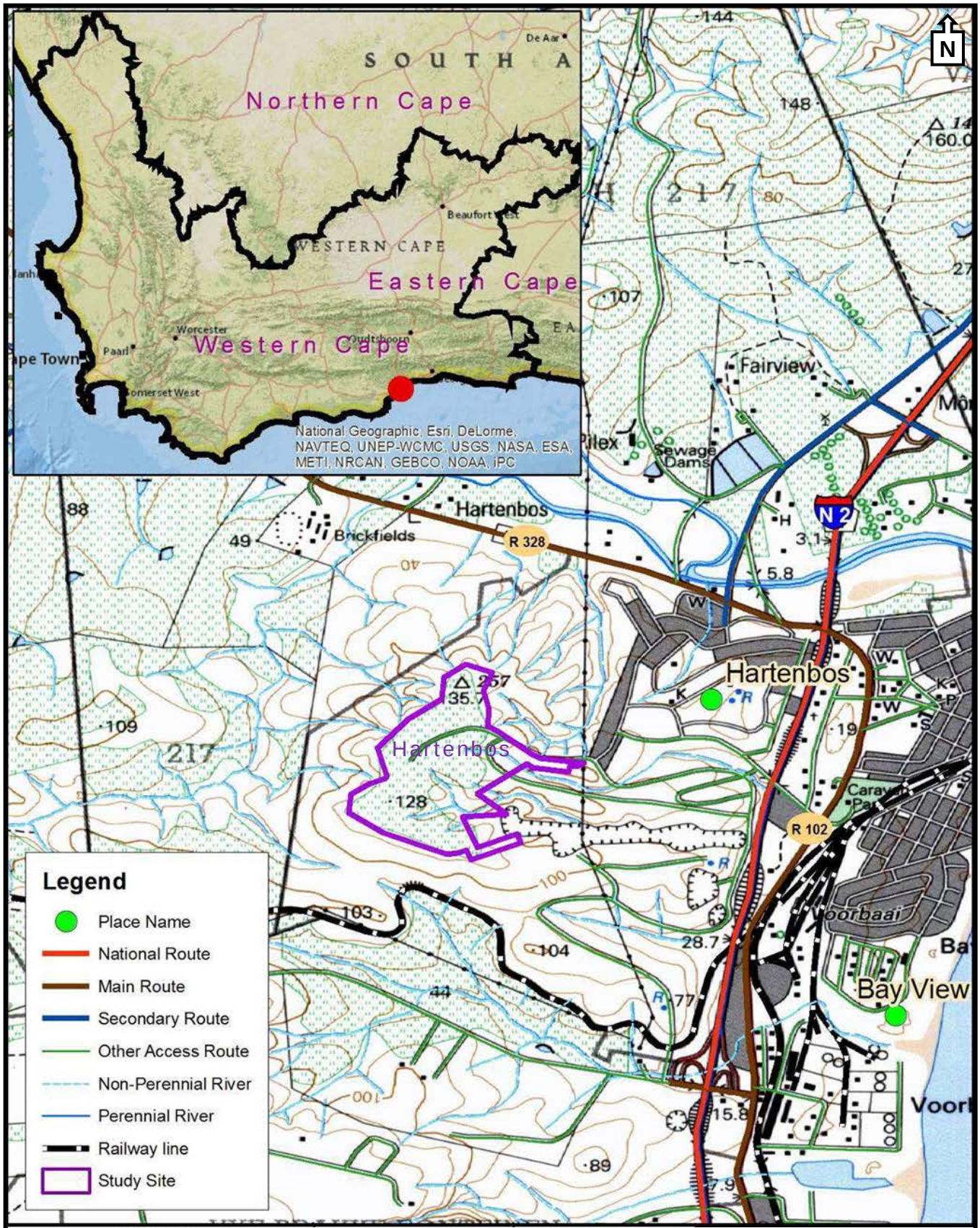
A locality plan of the site is illustrated on Figure 1.

The Site Development Plan (SDP) of the development proposed in 2018 included the following land uses:

Residential erven (500m²-700m²)	187 dwelling units
Residential erven (200m²)	162 dwelling units
Sectional title units at the medial centre	72 units
Medical centre	600m² maximum
Clubhouse and facilities for residents	1000m² maximum

The development did not proceed and the land owners have now embarked on a renewed initiative to obtain approval for the proposed development and in the process have reviewed the composition of land uses that form part of the proposed development.

A copy of the sub-division plan is attached in Figure 2 and the land uses are indicated in the table below.



OBTAINED FROM WETLAND ASSESSMENT PREPARED BY STRATEGIC ENVIRONMENTAL FOCUS (SEF) (REF 504632)

NOT TO SCALE

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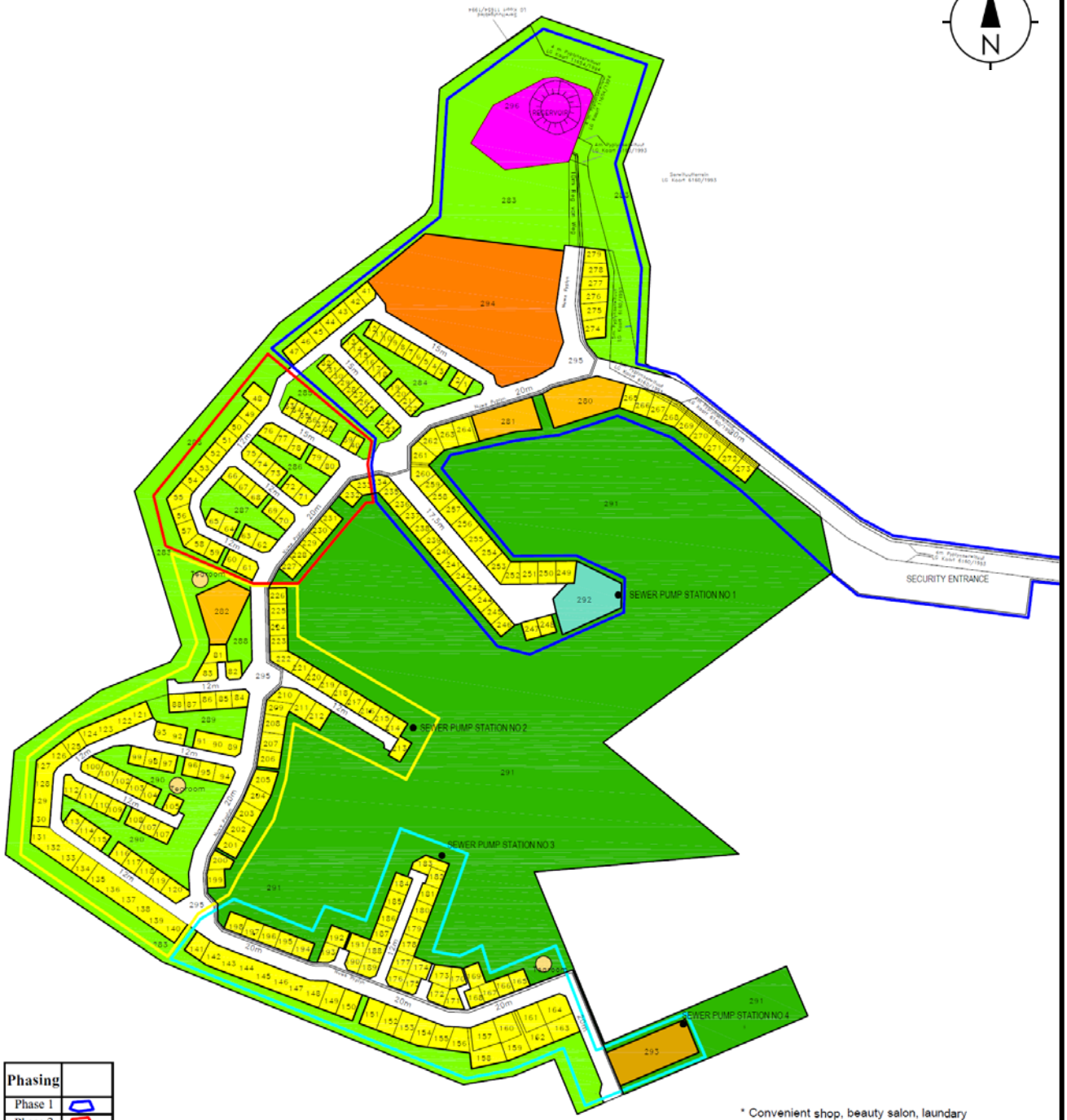
Locality plan

FIGURE 1



Phasing	
Phase 1	
Phase 2	
Phase 3	
Phase 4	

Notes:

1. A servitude right of way and services to be registered over Erf 3122 in favour of Mossel Bay Municipality for services and to access the municipal infrastructure (reservoir) (to be surveyed)
2. All dimentions and areas are provisional and are subject to cadastral survey

* Convenient shop, beauty salon, laundary

Ptn Nos	No of Units	Extent (ha)	%	Zoning	Land Use	
1-279	279	±10,9151	18,0	Single Residential I (SRI)	Dwelling house	
280-282	3	±0.8394	1,4	General Residential Zone III (RZIII)	Terrace Apartments (Flats)	
283-290	8	±12,0308	19,9	Open Space Zone II (OSZII)	Private Open Space with tearooms, telecom station	
291	1	±23,9230	39,6	Open Space Zone III (OSZIII)	Nature conservation area with tearoom and utility	
292	1	±0,3686	0,6	Open Space Zone II (OSZII)	Sport Facilities, clubhouse, restaurant, bar, offices utility	
293	1	±0,3720	0,6	Open Space Zone II (OSZII)	Maintenance Shed/Store, utility	
294	1	±2,4333	4,0	General Residential Zone III (RZIII)	Village precinct, flats, clubhouse, frailcare & recreation *	
295	1	±8,7082	14,4	Transport Zone III (TZIII)	Private Road	
296	1	±0,9286	1,5	Utility Zone (UZ)	Municipal Reservoir	
TOTAL	296	60,5190ha	100			

P-J Le Roux
STADS-EN STREEKBEPLANNER/ TOWN AND REGIONAL PLANNER
Hoofstraat 262 Main Road, Paarl
(t) 021-8722499 (f) 086 605 8431
(email) pj@pjleroux.co.za

Project: **Application for Rezoning & Subdivision: Erf 3122 Hartenbos**

Description: **Subdivision Plan**

HARTENBOS Garden Estate Natuur-Landgoed

Skaal	NTS	*Leer nr.*	H 10-113
Teken	PJLR	*Datum*	MAY 2021
Keur	PJLR	*Tekening nr.*	H 10-113 SUB 1-REV 10

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APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS

Sub-divisional Plan

FIGURE 2

Single residential units Type 1 (200m²)	40 dwelling units
Single residential units Type 2 (350-600m²)	239 dwelling units
General residential zone (0.8394 ha)	54 terrace flats
Private open space with tea rooms and telecom station	12.0308 ha
Nature conservation area with tearoom and utility	23.9230 ha
Open space zone II with sport facilities, clubhouse, restaurant, bar, offices and utility	0.3686 ha
Maintenance shed / store, utility	0.3720 ha
General residential zone III with village precinct, flats, clubhouse, frail care and recreation (4.0 ha)	147 apartments 20 assisted living units 34 frail care units
Private road	14.4 ha
Utility zone for municipal reservoir	1.5 ha

In view of the amended number and type of residential units, a revision of the TIA is required, which forms the subject of this report.

2. LAND USE

For the purpose of the traffic analysis, it is assumed that the amenities provided within the development would largely provide in the needs of residents and that these facilities are for the exclusive use of residents or their guests. Non-residential uses would not attract significant external traffic and the provision of amenities on site can be expected to reduce the need of residents to visit similar facilities elsewhere.

The trip generation of the development will be based on the sum of the trip generation of the various residential types within the development only, but on the other hand, no adjustment will be made for the potential reduction in the trip generation as a result of internal (mixed-use) trips.

The residential land uses are tabulated below.

TYPE	NUMBER
Townhouses	**40**
Single dwelling units (retirement)	**239**
Terrace flats	**54**
Apartment blocks (attached senior adult housing) 1-bed 2-bed 3-bed TOTAL	 31 96 20 **147**
Assisted living	**20**
Frail care	**34**

3. TRAFFIC ANALYSIS

3.1 Study Area

It was agreed with the Municipality that the study area should include the following intersections:

- Waboom Street and R328 (Route to N2 and Oudtshoorn)
- Boekenhout Avenue and Kameeldoring Avenue
- Kameeldoring Avenue and Geelhout Avenue
- Boekenhout Avenue and Louis Fourie Road.

3.2 Traffic Counts

It was agreed with the Municipality that, in view of the reduction in vehicle travel due to the Covid-19 pandemic, historic traffic counts should be used rather than to undertake traffic counts under current depressed traffic conditions.

No counts were available at the junction of Kameeldoring Avenue and Geelhout Avenue and traffic counts were undertaken during the AM and PM peak hours during May 2021. This is the intersection of two minor local residential access streets and as expected, traffic counts were insignificant.

Traffic counts are illustrated on Figure 3.

3.3 Horizon Year

A five-year study period should be considered with 2021 as base year and 2026 as horizon year.

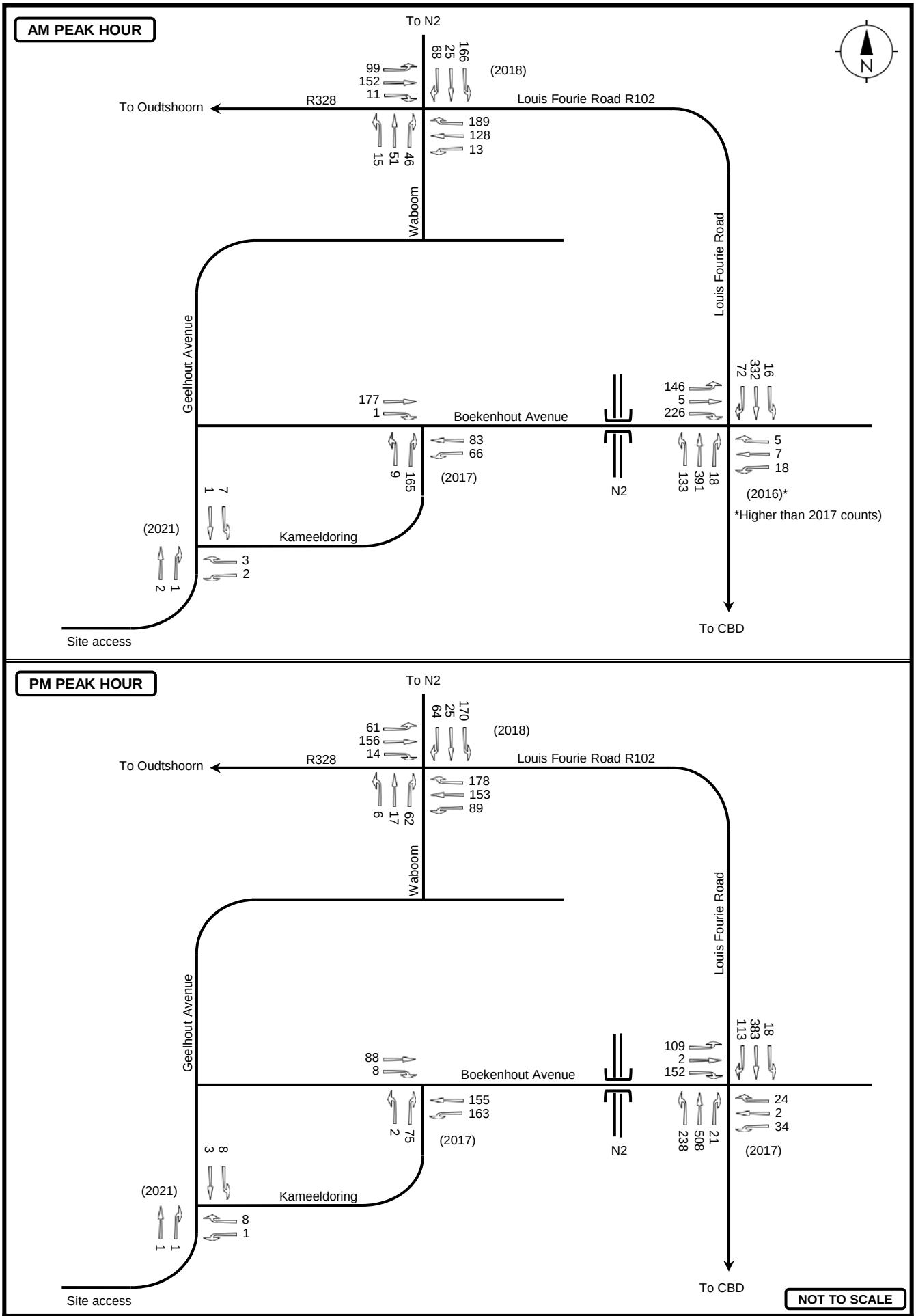
3.4 Background Traffic Growth

A growth rate of 4% p.a. was applied along Louis Fourie Road and R328 and a growth rate of 3% p.a. on residential streets. Background traffic growth was calculated for the period from the date of traffic counts to the horizon year at the appropriate traffic growth rate.

3.5 Latent Rights

The Municipality indicated that the following recent projects may impact on the traffic demand at intersections in the study area:

- Outeniquasbosch development (ITS, 2018)
- Renosterbos Estate (ITS, 2018)
- Rivierplaas, Ptn 36, Farm 217 Hartenbos (ITS, 2013).



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Traffic counts

FIGURE 3

Copies of the most recent traffic impact study reports at the various intersections in the study area were obtained from ITS and the trip generation figures of the various projects were included in the traffic analysis as latent demand. Latent demand is illustrated on Figure 4.

3.6 2026 Horizon year background traffic

Latent traffic demand was added to the traffic counts and background traffic growth to determine the 2026 horizon year background traffic as shown in Figure 5.

3.7 Trip Distribution

Based on comments received from the Municipality and the trip distribution percentages applied in previous studies by Tech IQ and ITS in the area, the following trip distribution will be applied:

AREA / ROUTE	PERCENTAGE
Hartenbos area west of N2	5%
R328 Oudtshoorn	5%
R102 to Klein Brak and N2 eastbound and westbound	35%
Hartenbos east of N2	15%
Louis Fourie Road south of CBD	40%
TOTAL	100%

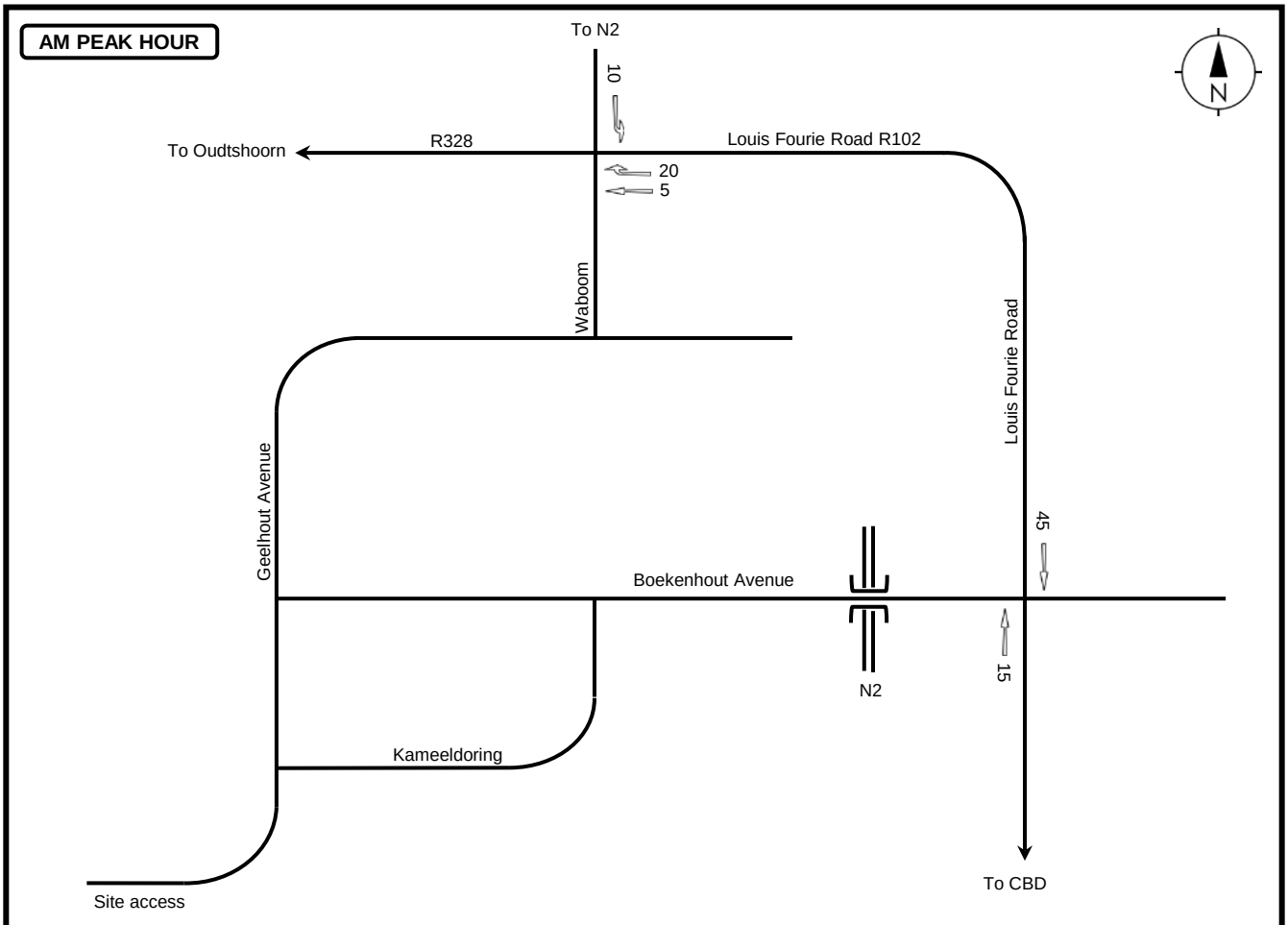
3.8 Trip Generation Rates

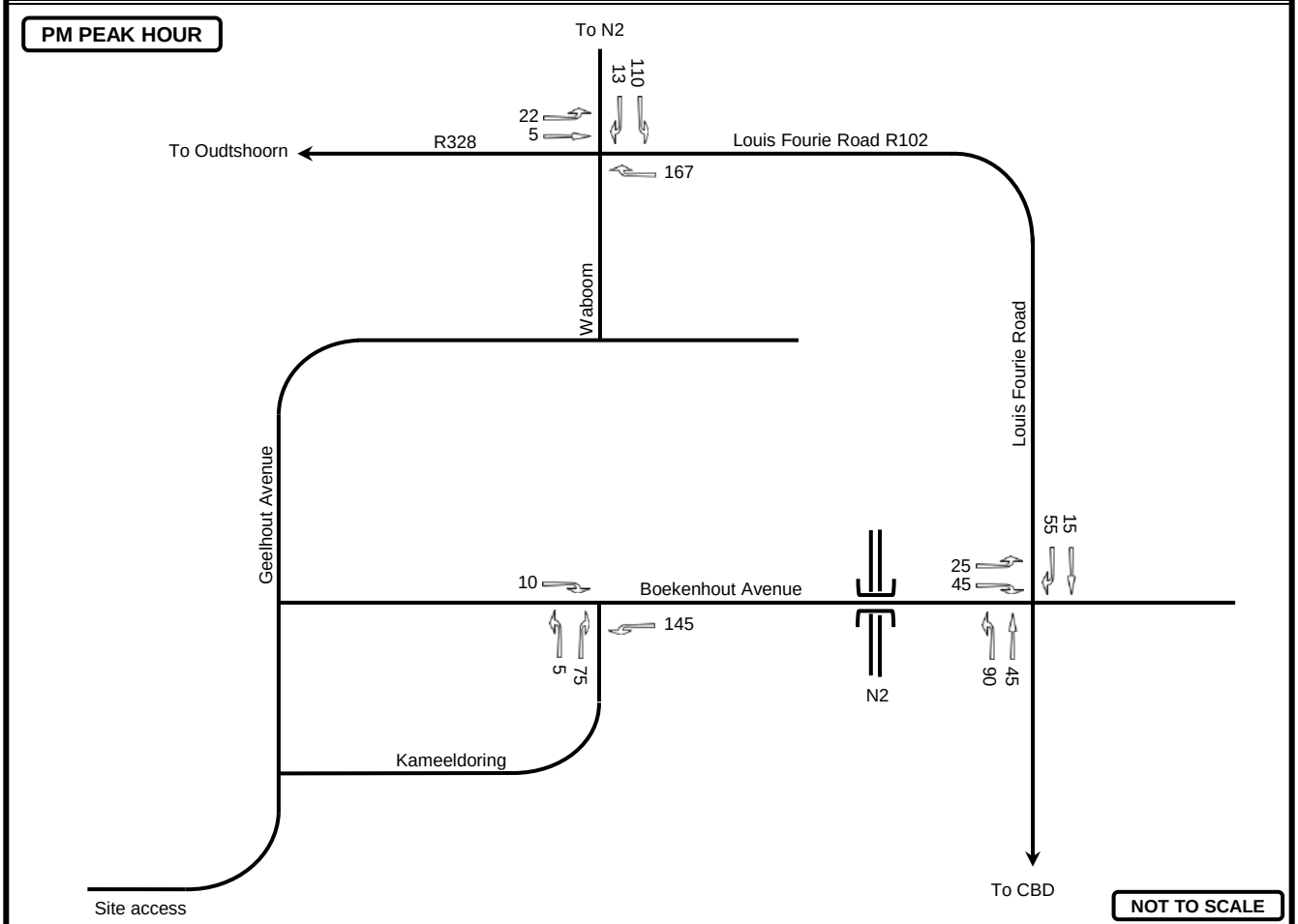
The following trip generation rates will be applied in the traffic analysis:

Single residential (both types)	TMH17, Land Use Code 251: Retirement Village
General residential: Terrace apartments	TMH17, Land Use Code 251: Retirement Village
General residential III: Flats	ITE, Trip Generation 7th Edition, Land Use Code 252: Senior Adult Housing - Attached
Assisted living units*	ITE, Trip Generation 7th Edition, Land Use Code 254: Assisted Living
Frail Care*	TMH17, Land Use Code 620: Nursing Home

** It is assumed that 1Bed = 1 Unit*

Trip generation parameters are tabulated below.





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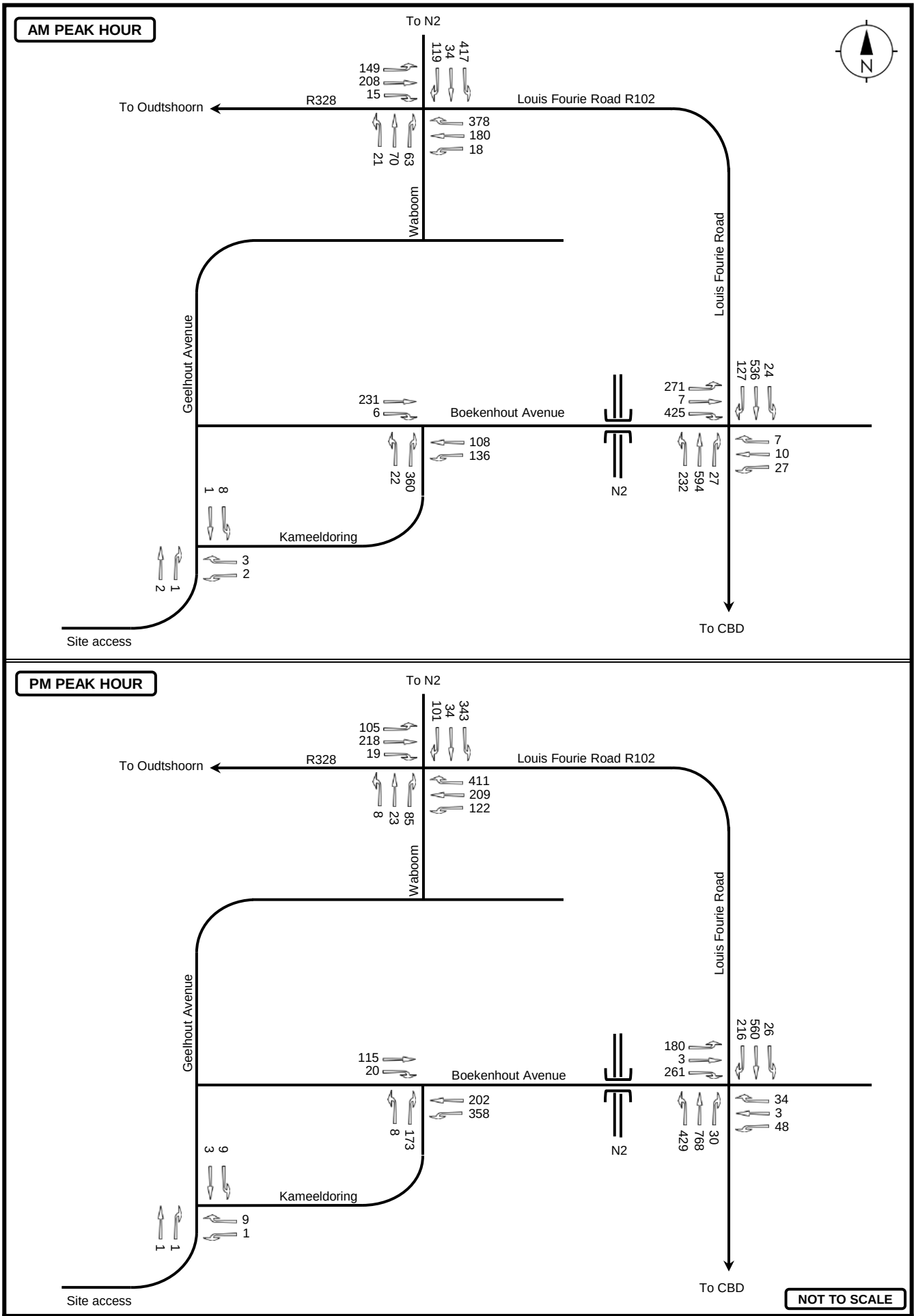
Latent demand

FIGURE 4



APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS

2026 Horizon year background traffic, including background growth and latent rights

FIGURE 5

LAND USE	UNIT	PERIOD	RATE	SPLIT
Retirement Village (251)	Dwelling unit	AM PM	0.35 / du 0.35 / du	40:60 50:50
Senior Adult Housing – Attached (252)	Dwelling unit	AM PM	0.08 / du 0.11 / du	45:55 61:39
Assisted living (254)	Unit (bed)	AM PM	0.14 0.22	65:35 44:56
Nursing home (620) (Frail care)	Unit (bed)	AM PM	0.20 0.20	70:30 40:60

No adjustment is applied for low vehicle ownership, mixed land use or public transport use and the above trip generation rates are assumed to make provision for all external travel to and from the retirement facilities, as well as ancillary and the subservient land uses.

3.9 Trip Generation Volumes

The trip generation of the proposed development is tabulated below.

LAND USE AND RATE	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Retirement Village (251) AM 333 @ 0.35 (40:60) PM 333 @ 0.35 (50:50)	47	70	117	59	58	117
Senior Adult – Attached (252) AM 147 @ 0.08 (45:55) PM 147 @ 0.11 (61:39)	5	7	12	10	6	16
Assisted living (254) AM 20 @ 0.14 (65:35) PM 20 @ 0.22 (44:56)	2	1	3	2	2	4
Nursing home (620) AM 34 @ 0.20 (70:30) PM 34 @ 0.20 (40:60)	5	2	7	3	4	7
TOTAL	59	80	139	74	70	144

The trip generation of the land use previously applied for and which was the basis of the previous Traffic Impact Study (Tech IQ Project No: J012/627/2 May 2018) was 148 trips during both the AM and PM peak hours, which is slightly more than the trip generation of the land use rights currently proposed.

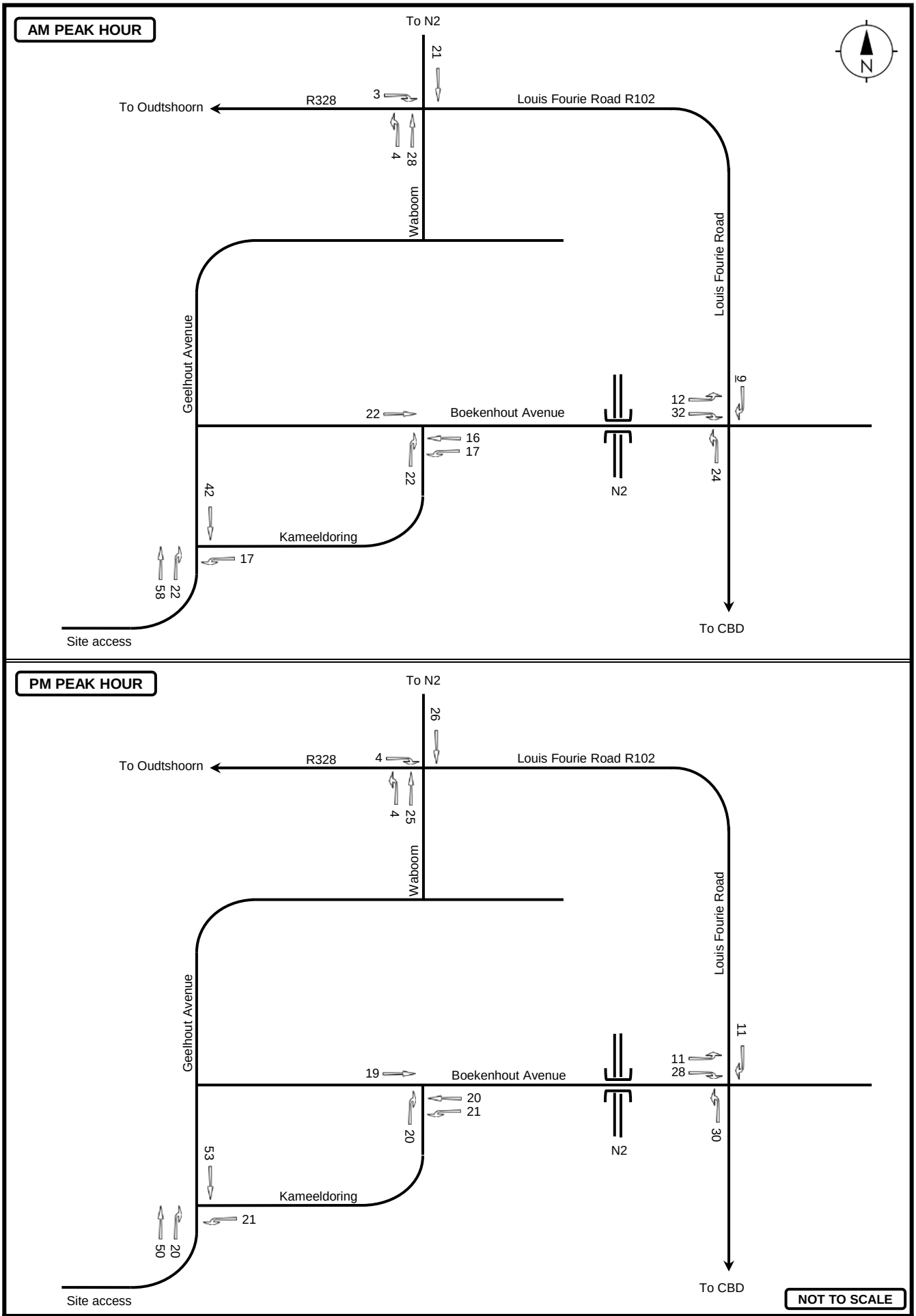
3.10 Traffic Assignment

The assignment of generated traffic to the road network according to trip distribution percentages is illustrated on Figure 6.

3.11 Total Traffic Demand

The 2026 horizon year total traffic demand comprising observed traffic counts, growth in background traffic, latent land use rights and traffic generated by the proposed development is illustrated on Figure 7.

Annexure A includes the calculation of traffic growth and traffic assignment.



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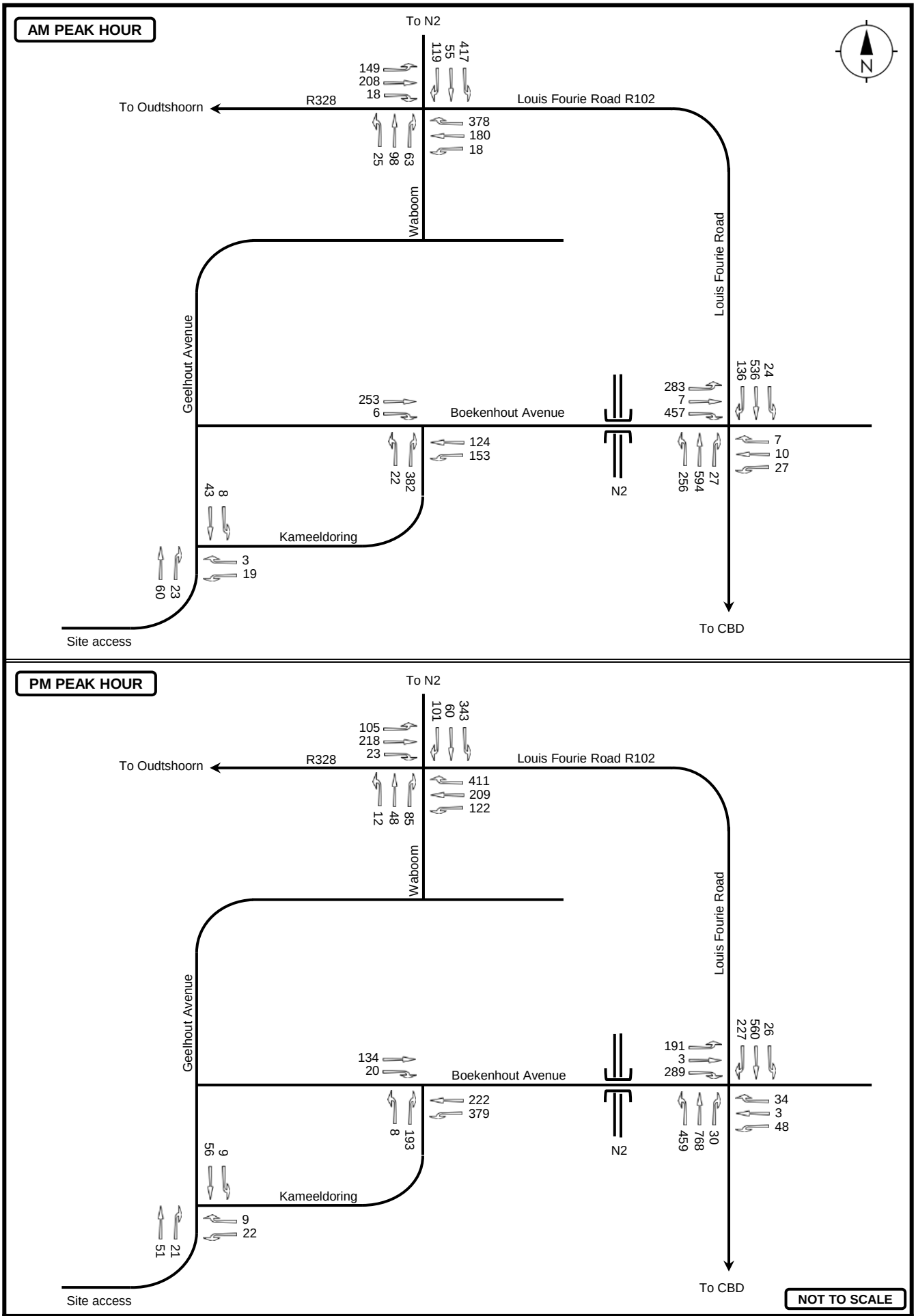
APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS

Traffic assignment

FIGURE 6



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APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS

2026 Horizon year total traffic

FIGURE 7

4. CAPACITY ANALYSIS

The capacity analysis at intersections in the study area was done by means of the SIDRA Intersection programme. Results are attached in Annexure B and discussed below.

4.1 Intersection of Kameeldoring Avenue and Geelhout Avenue

This T-junction is the intersection of two minor internal residential streets with one lane per direction.

The SIDRA results are summarised below.

INTERSECTION OF KAMEELDORING AVENUE AND GEELHOUT AVENUE: AM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Kameeldoring Ave	0.050	3.1	NA	3.1	A
East: Kameeldoring Ave	0.011	1.0	B	13.0	B
North: Geelhout Ave	0.290	1.3	NA	1.3	A
TOTAL	0.050	4.4	NA		

INTERSECTION OF KAMEELDORING AVENUE AND GEELHOUT AVENUE: PM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Kameeldoring Ave	0.043	3.3	NA	3.3	A
East: Kameeldoring Ave	0.017	12.9	B	12.9	B
North: Geelhout Ave	0.037	1.0	NA	1.0	A
TOTAL	0.043	4.6	NA		

The results indicate that no upgrading is required at this intersection.

4.2 Intersection of Kameeldoring Avenue and Boekenhout Avenue

Both roads are local residential streets and do not carry long distance external though traffic. The intersection serves both the application property and the Renosterbos development and combined with background growth, the total traffic demand passing through the intersection is expected to almost double.

The SIDRA results are summarised below.

INTERSECTION OF KAMEELDORING AVENUE AND BOEKENHOUT AVENUE: AM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Kameeldoring Ave	0.336	15.3	C	15.3	C
East: Boekenhout Ave	0.188	5.7	NA	5.7	A
West: Boekenhout Ave	0.163	1.2	NA	1.2	A
TOTAL	0.336	8.6	NA		

INTERSECTION OF KAMEELDORING AVENUE AND BOEKENHOUT AVENUE: PM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Kameeldoring Ave	0.196	158	C	15.8	C
East: Boekenhout Ave	0.410	6.5	NA	6.5	A
West: Boekenhout Ave	0.112	5.1	NA	5.1	A
TOTAL	0.410	8.2	NA		

Results confirm the conclusion of ITS (Renosterbos TIA) that no improvements are required at the intersection. The proposed development adds only approximately 70 peak hour trips to the traffic demand at this junction.

4.3 Intersection of Louis Fourie Road and Boekenhout Avenue

Exclusive right turn lanes have been provided on all approaches to the signalised junction of Boekenhout Avenue and Louis Fourie Road.

The SIDRA analysis indicated that an exclusive left turn lane is required on the southern approach of Louis Fourie Road.

Results of the upgraded intersection are summarised below.

INTERSECTION OF LOUIS FOURIE ROAD AND BOEKENHOUT AVENUE: AM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Louis Fourie Road	0.862	21.5	C	37.4	D
East: Boekenhout Avenue	0.147	30.7	C	32.3	C
North: Louis Fourie Road	0.572	10.9	B	17.2	B
West: Boekenhout Avenue	0.861	29.4	C	37.2	D
TOTAL	0.862	21.4	C		

INTERSECTION OF LOUIS FOURIE ROAD AND BOEKENHOUT AVENUE: PM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Louis Fourie Road	0.822	18.8	B	16.7	D
East: Boekenhout Avenue	0.242	41.1	D	45.1	D
North: Louis Fourie Road	0.515	10.3	B	16.3	B
West: Boekenhout Avenue	0.528	30.1	C	34.6	C
TOTAL	0.822	19.0	B		

Results confirm that with the construction of a left turn lane on the southern approach of Louis Fourie Road, the intersection will have sufficient capacity to provide an acceptable level of service in the 2026 horizon year.

4.4 Intersection of R328 and Waboom Street

The TIA for the Outeniquasbosch development (ITS, 2018) indicated the need to install traffic signal control at the intersection and to provide an exclusive right turn lane on Waboom Street. This conclusion was confirmed by the SIDRA analysis.

Results of the SIDRA analysis of the intersection, including the upgrades recommended for the Outeniquasbosch development and the 2026 horizon year total traffic demand are tabulated below.

INTERSECTION OF R328 AND WABOOM STREET: AM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Waboom Street	0.406	22.2	C	28.2	C
East: Louis Fourie Road	0.805	17.7	B	23.5	C
North: R102	0.772	15.4	B	29.5	C
West: R328	0.751	22.3	C	31.0	C
TOTAL	0.805	18.4	B		

INTERSECTION OF R328 AND WABOOM STREET: PM PEAK HHOUR					
APPROACH	AVERAGE			WORST	
	V/C	DELAY (s)	LOS	DELAY (s)	LOS
South: Waboom Street	0.357	26.5	C	29.7	C
East: Louis Fourie Road	0.758	16.0	B	21.2	C
North: R102	0.721	15.4	B	27.8	C
West: R328	0.744	22.0	C	31.0	C
TOTAL	0.758	17.8	B		

The results confirm that the road improvements that have been proposed can accommodate the Outeniquasbosch development, as well as the additional background growth and the proposed development on Erf 3122 Hartenbos.

4.5 Conclusion

Based on the capacity analysis for the 2026 horizon year, including background growth, latent rights and the proposed development on Erf 3122 Hartenbos, it is concluded that the existing road network can accommodate the 2026 horizon year total traffic demand, provided that the following road improvements are implemented:

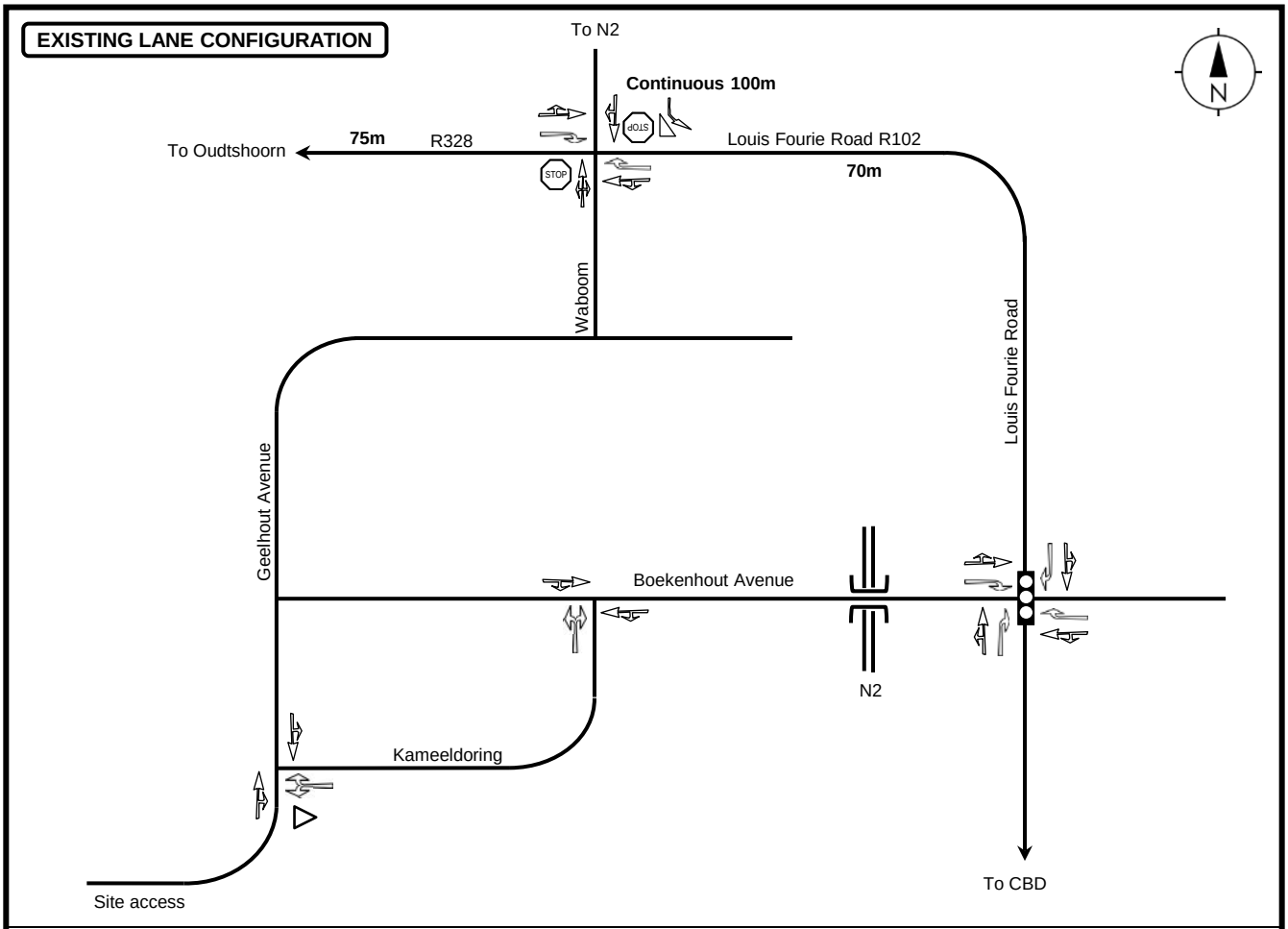
i. Intersection of Louis Fourie Road and Boekenhout Avenue

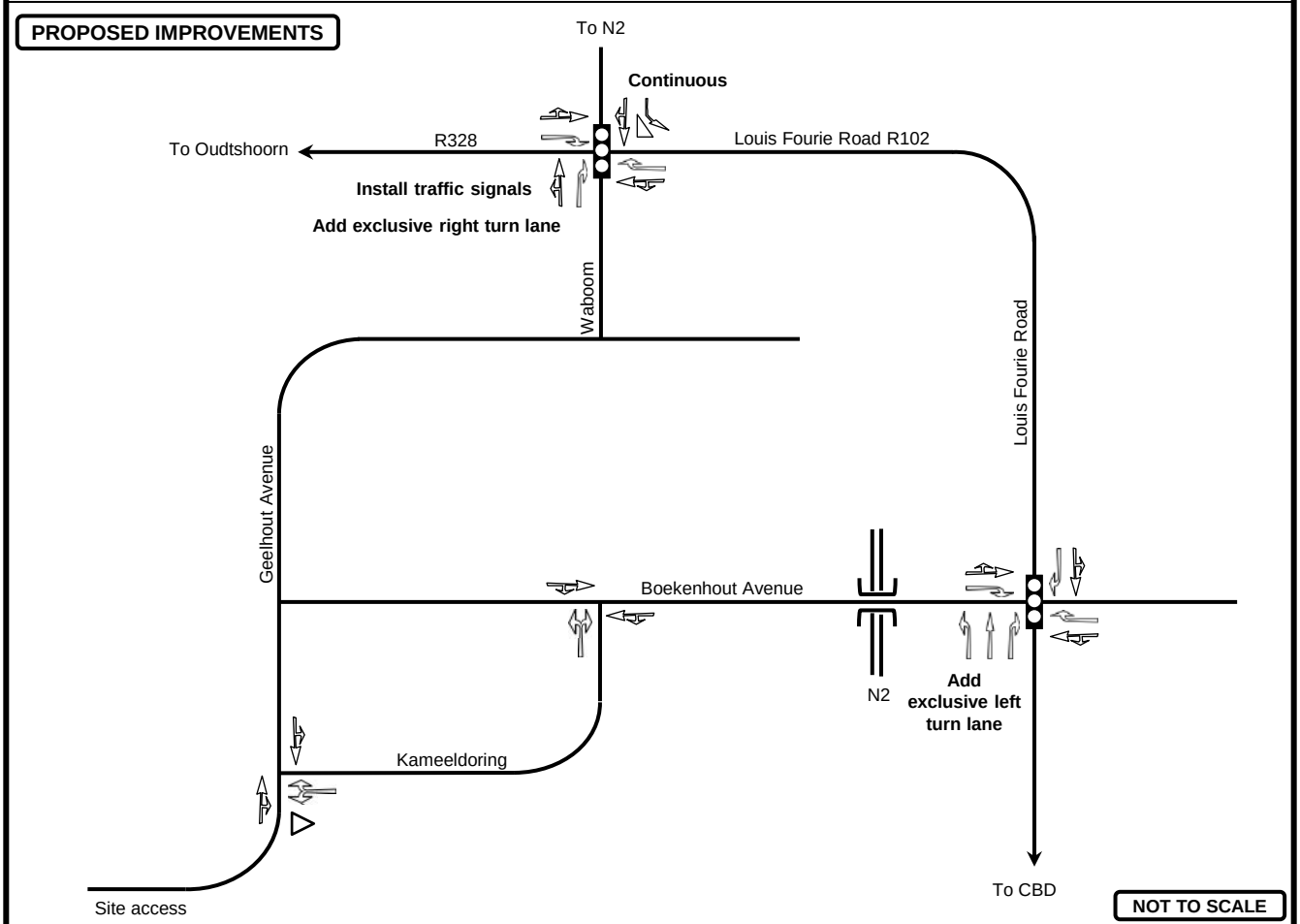
An exclusive 60 metre left turn lane with 60 metre taper is required on the southern approach of Louis Fourie Road.

ii. Intersection of Louis Fourie Road (R102), R328 to Oudtshoorn, Waboom Street and R102 to Groot Brak

ITS recommended in 2018 (TIA for Outeniquasbosch development) that traffic signals be installed at the intersection and that an exclusive right turn lane be provided on Waboom Street. No further improvements are required to also accommodate the development of Erf 3122 Hartenbos.

Figure 8 illustrates the lane configuration at intersections in the study area.





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APPLICATION FOR THE REZONING AND SUB-DIVISION OF ERF 3122 HARTENBOS

Lane configuration

FIGURE 8

5. SITE TRAFFIC ASSESSMENT

The conceptual road layout is illustrated on Figure 9.

The proposed development as illustrated on the Subdivision Plan (Figure 2) and conceptual road layout network (Figure 9) was assessed in terms of TMH16, Volume 2, *South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual* and salient aspects are discussed below.

5.1 Functional Road Network

The internal circulation system comprises Class U5 residential access streets.

i. Driveway connections

Care was taken to eliminate driveway connections at intersections, particularly in the vicinity of roundabouts and opposite T-junctions. Care should be taken in the preparation of building plans to locate property accesses outside the intersection area.

ii. Design speed

The design speed should be 40 km / h.

iii. Design vehicle

The design vehicle is a LDV with provision made for occasional use by a SU-truck. This will accommodate service vehicles, refuse collection vehicles, pantechnicons and emergency vehicles (fire engines).

5.2 Capacity Analysis

The capacity analysis confirmed that an acceptable level of service can be expected at intersections on the external road network identified by the Municipality for inclusion in the study area. Traffic volumes on the internal road network are low and no capacity analysis is required.

5.3 Accesses and Intersections

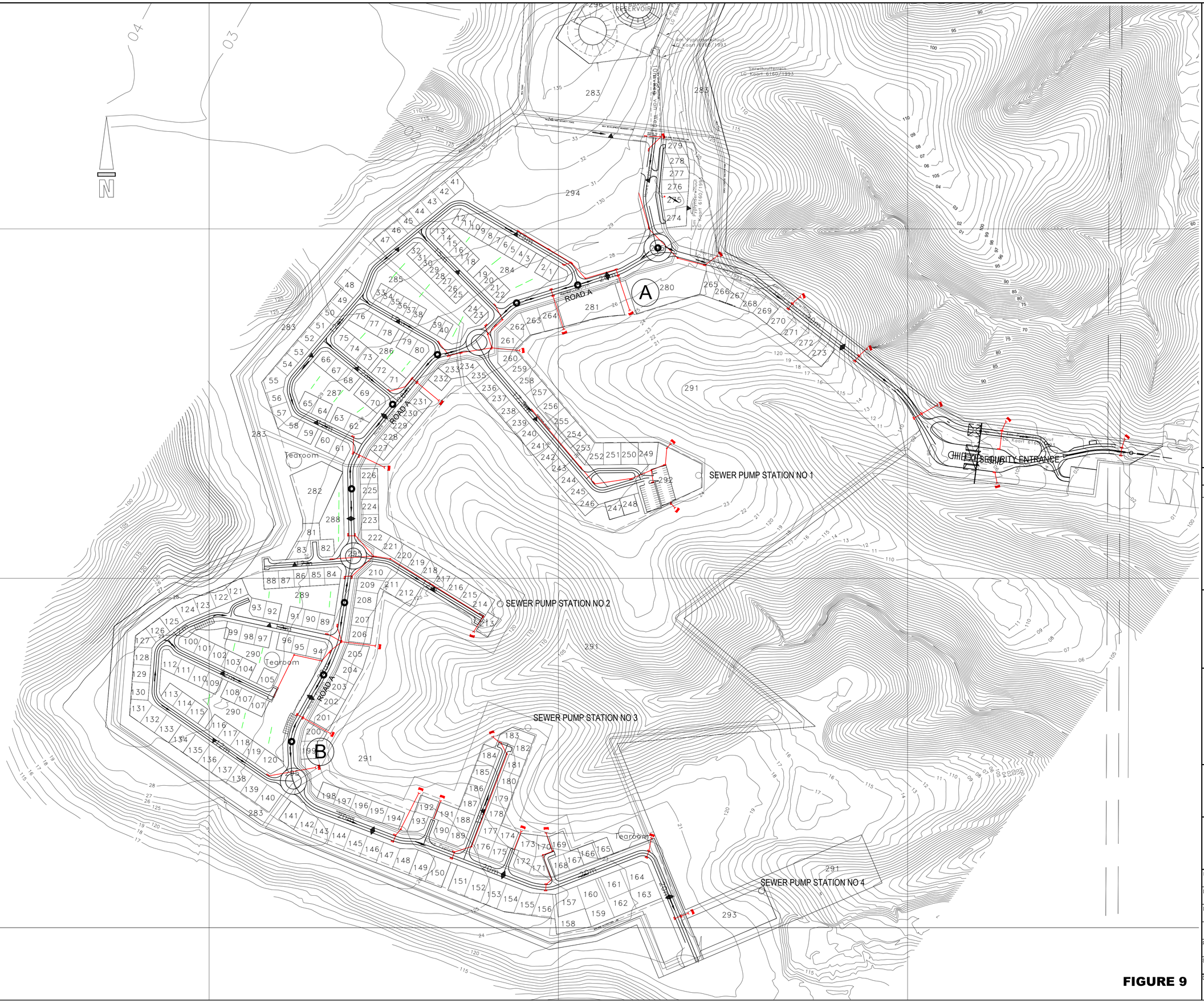
i. Access to the road network

All properties can be provided with access to the road network, subject to the location of access to properties opposite street junctions or close to roundabouts.

From a traffic engineering point of view, there is no requirement for an access road to Erven 274 to 279 opposite Erf 294 and it is recommended that the access road should be removed.

ii. U-turn facilities

U-turn facilities have been provided at all dead ends. Provision has also been made in the design of the access gate for U-turns if access to the estate is denied.



LEGEND

- STORMWATER PIPE
- KERB INLET
- STORMWATER OUTLET
- STORMWATER MANHOLE
- ENERGY DISSIPATION / DETENTION STRUCTURE
- HIGH POINTS ON ROAD
- ROAD CROSS FALL
- STORMWATER FLOW DIRECTION
- FLOW RETENTION CHANNELS
- RAINWATER STORAGE TANK
- WATER SHED
- STORMWATER CATCHMENT AREA

REVISIONS

NO.	DATE	INI.	DESCRIPTION
0	05/05/2021	LJR	ISSUE FOR APPROVAL

LJR Civil Consultants cc
DESIGN & DRAUGHTING ENGINEERING CONSULTANTS
2008/007738/23

55 LOUIS TRICHARDT STREET
PARKTOWN ESTATE
PRETORIA
0084

CELL : 083 283 7540
TEL : 012 804 1514
E-mail : ljr@ljr.co.za

CLIENT

HARTENBOS
Garden Estate
Natuur-Landgoed

PROJECT

HARTENBOS GARDEN ESTATE

TITLE

ROADS & STORMWATER LAYOUT PLAN

DESIGN	JL Roets — Prof Reg No: 937005
DRAWN	LJR
DATE	MAY 2021
PROJECT NUMBER	1704062
COMPUTER NAME	Hart Roads & Stormwater.dwg
SCALE	1:2000
DRAWING NUMBER	1704062/100
REVISION	0

FIGURE 9

iii. Spacing

Intersection spacing in the development is sufficient given the very low expected traffic demand.

iv. Intersection control

Priority control is sufficient for all intersections, but roundabouts / traffic circles may be installed for the convenience of residents.

Traffic circles have the added advantage that they act as traffic calming devices.

v. Intersection angle

Care must be taken in the detail design of roads to ensure acceptable intersection angles.

vi. Topography

The development is limited to areas within the property where the topography is relatively flat.

vii. Road gradient

The maximum allowable road gradient is 10% with a maximum of 12% over short sections of no longer than 50m. Road gradients at intersections should not exceed 6%.

viii. Road reserve widths

Road reserves comply with the minimum width standards and requirements.

ix. Kerb return radii

Kerb return radii (bell-mouth) should be at least 8m.

5.4 Traffic Management

i. Environmental capacity

The expected trip generation of the development is less than the preferred environmental capacity for Class 5b urban residential access roads of 200 vehicles / hour.

ii. Speed calming

Most of the roads are short and would not require speed calming.

Traffic circles proposed at a number of intersections will contribute to traffic calming. Additional speed calming may be considered at 150m spacing to achieve an operating speed of 40 km/hour. Raised pedestrian crossings may be considered as traffic calming devices.

5.5 Pedestrian and Bicycle Facilities

Paved pedestrian walkways have been recommended on at least one side of all roads.

There is no need for demarcated or dedicated bicycle facilities in view of the low expected demand and low design speed on internal roads.

5.6 Public Transport Facilities

Public transport services are expected to include the following:

- Minibus taxi vehicles that serve employees, visitors and some residents
- Meter taxis and Uber-type taxis-on-demand services.

The following public transport infrastructure should be considered:

- Minibus stop to load and off-load passengers as close as possible to all public facilities for the convenience of residents, particularly those with impaired mobility
- Minibus taxi drop-off and loading bay at the entrance gate. (No public transport lay-bys are required along the internal road network).

5.7 Parking Provision and Drop-off / Pick-Up Facilities

During 2018 the Municipality raised the issue of parking bay dimensions. The agreement that was reached with the Municipality is described below.

Parking should be provided according to the Town Planning Scheme and to the technical requirements of the Municipality, provided that a reduced parking ratio may be approved by the Municipality, based on a rational parking analysis.

Mossel Bay experiences an increased proportion of large LDVs. SUVs and recreational vehicles that require parking bays with larger dimensions that the standard parking bay dimensions stipulated in the Town Planning Scheme. The provision of parking shall comply with the following:

- The parking ratios specified in the Mossel Bay Municipality: Integrated Zoning Scheme By-Law will be applied to all land uses included in the development.
- Garages at residential developments will be constructed according to market demand and will typically accommodate the space requirements of the current vehicle population.
- Paved parking areas in front of garages will be 3.0m wide per vehicle, i.e. 3.0m for single and 6.0m for double garages
- At non-residential uses, 30 percent of all parking spaces, excluding accessible parking bays, will be 2.7m wide and 6.0m in length.

5.8 Deliveries, Goods Transport and Refuse Collection

The design of roads must provide for the manoeuvres of regular refuse collection services, particularly turning facilities at cul-de-sac streets, as well as for the occasional use of SU trucks.

Parking and loading bays for goods vehicles must be provided according to the requirements of the Town Planning Scheme, but particular attention must be given to the specific requirements of the medical clinic, such as delivery of gas and diesel for emergency generators.

5.9 Access Control

The peak directional traffic demand is 74 inbound vehicles per hour (PM peak hour) and 89 vehicles per hour outbound (AM peak hour).The expected number of vehicles at access control gates during peak hours is tabulated below.

DESCRIPTION		INBOUND	OUTBOUND
Peak hour volume		74	80
Peak hour factor		0.75	0.75
Flow rate (vehicles / hour		99	119
Service time (seconds)		12	12
Number of gates		1	1
Probability P(x≤n)	n = 0	0.67	0.64
	n = 1	0.89	0.87
	n = 2	0.96	0.96
	n = 3	0.99	0.98

The access gate design should therefore provide the following:

- One boom gate per direction with a queue area for at least two (2) vehicles
- Waiting area for visitors, while permission to enter the estate is being confirmed, preferably in the form of an additional inbound lane and boom gate
- Facility for heavy vehicles (height) and emergency vehicles (4.5m minimum width).

6. CONCLUSION AND RECOMMENDATION

A Traffic Impact Assessment report (Tech IQ Consulting Engineers, Project No J012/617/2, May 2018) for the development of Erf 3122 Hartenbos was accepted by the Mossel Bay Municipality. The intended land use rights on the property have been slightly amended, but the layout of the development has remained practically the same from a traffic engineering point of view. The trip generation of the proposed development has remained practically unchanged (144 versus 148 peak hour trips).

Based on a capacity analysis of the proposed development for a 2026 horizon year, including latent land use rights, background traffic growth and the traffic generated by the proposed development on Erf 3122 Hartenbos, it is concluded that the existing external road network can accommodate the projected 2026 traffic demand, provided that the following road improvements should be implemented:

i. A 60m exclusive left turn lane with 60m taper on the southern approach of Louis Fourie Road at the intersection of Louis Fourie Road and Boekenhout Avenue. This left turn lane serves both Erf 3122 and the adjacent Renosterbos development

ii. Installation of traffic signals and the provision of an exclusive right turn lane on Waboom Street at the intersection of Waboom Street, Louis Fourie Road, the R328 to Oudtshoorn and the R102 to Groot Brak. This improvement was recommended by ITS in 2018 in the TIA for the Outeniquasbosch development.

A Site Traffic Assessment of the proposed Sub-Division Plan and Draft Roads and Stormwater Plan indicates that traffic engineering requirements and standards can be achieved, but that the following aspects need to be addressed in the detail design of the road network:

- Design of roundabouts
- Property access in the vicinity of roundabouts and opposite T-junctions
- Design of the road between Erf 294 and Erven 274 to 279, where it is recommended that the separate access road to the latter should be omitted.

From a traffic engineering point of view it is recommended that:

1. The application for the sub-division of Erf 3122 Hartenbos should be granted.
2. The contribution of the applicant to the provision at an exclusive left turn lane on the southern approach of Louis Fourie Road at its intersection with Boekenhout Avenue should be addressed in the Engineering Service Agreement.
3. The geometric design of the road network should be to the satisfaction of the Mossel Bay Municipality.
4. Attention be given to access to individual properties and provision of parking when building plans are submitted.

ANNEXURE A

Calculations

HARTENBOS HEUWELS TRAFFIC ASSIGNMENT: AM PEAK HOUR														
INTERSECTION	APPROACH	TURN	COUNTS		GROWTH		LATENT RIGHTS			2026 BG	TRAFFIC ASSIGNMENT			2026
			Volume	Year	Rate	Volume	Otqa	Reno	River		%In	%Out	Trips	TOTAL
1. Geelhout / Kameeldoring	South: Kameeldoring	Straight	2	2021	3.0%	0				2		72	58	60
		Right	1	2021	3.0%	0				1		28	22	23
	East: Kameeldoring	Left	2	2021	3.0%	0				2	28		17	19
		Right	3	2021	3.0%	0				3			0	3
	North: Geelhout	Left	7	2021	3.0%	1				8			0	8
		Straight	1	2021	3.0%	0				1	72		42	43
2. Boekenhout / Kameel-doring	South: Kameeldoring	Left	9	2017	3.0%	3		10		22			0	22
		Right	165	2017	3.0%	50		145		360		28	22	382
	East: Boekenhout	Left	66	2017	3.0%	20		50		136	28		17	153
		Straight	83	2017	3.0%	25				108	27		16	124
	West: Boekenhout	Straight	177	2017	3.0%	54				231		27	22	253
		Right	1	2017	3.0%	0		5		6			0	6
3. Boekenhout / Louis Fourie	South: Louis Fourie	Left	133	2016	4.0%	64		35		232	40		24	256
		Straight	391	2016	4.0%	188			15	594			0	594
		Right	18	2016	4.0%	9				27			0	27
	East: Boekenhout	Left	18	2016	4.0%	9				27			0	27
		Straight	7	2016	4.0%	3				10			0	10
		Right	5	2016	4.0%	2				7			0	7
	North: Louis Fourie	Left	16	2016	4.0%	8				24			0	24
		Straight	332	2016	4.0%	159			45	536			0	536
		Right	72	2016	4.0%	35		20		127	15		9	136
	West: Boekenhout	Left	146	2016	4.0%	70		55		271		15	12	283
		Straight	5	2016	4.0%	2				7			0	7
		Right	226	2016	4.0%	109		90		425		40	32	457
4. R328_Louis Fourie / Waboom	South: Waboom	Left	15	2018	4.0%	6				21		5	4	25
		Straight	51	2018	4.0%	19				70		35	28	98
		Right	46	2018	4.0%	17				63			0	63
	East: Louis Fourie (R102)	Left	13	2018	4.0%	5				18			0	18
		Straight	128	2018	4.0%	47			5	180			0	180
		Right	189	2018	4.0%	70	99		20	378			0	378
	North: N2 / R102	Left	166	2018	4.0%	61	180		10	417			0	417
		Straight	25	2018	4.0%	9				34	35		21	55
		Right	68	2018	4.0%	25	26			119			0	119
	West: Louis Fourie (R328 Oudtshoorn)	Left	99	2018	4.0%	36	14			149			0	149
		Straight	152	2018	4.0%	56				208			0	208
		Right	11	2018	4.0%	4				15	5		3	18

TRIP GENERATION	59	80

HARTENBOS HEUWELS TRAFFIC ASSIGNMENT: PM PEAK HOUR														
INTERSECTION	APPROACH	TURN	COUNTS		GROWTH		LATENT RIGHTS			2026 BG	TRAFFIC ASSIGNMENT			2026
			Volume	Year	Rate	Volume	Otqa	Reno	River		%In	%Out	Trips	TOTAL
1. Geelhout / Kameeldoring	South: Kameeldoring	Straight	1	2021	3.0%	0				1		72	50	51
		Right	1	2021	3.0%	0				1		28	20	21
	East: Kameeldoring	Left	1	2021	3.0%	0				1	28		21	22
		Right	8	2021	3.0%	1				9			0	9
	North: Geelhout	Left	8	2021	3.0%	1				9			0	9
		Straight	3	2021	3.0%	0				3	72		53	56
2. Boekenhout / Kameel-doring	South: Kameeldoring	Left	2	2017	3.0%	1		5		8			0	8
		Right	75	2017	3.0%	23		75		173		28	20	193
	East: Boekenhout	Left	163	2017	3.0%	50		145		358	28		21	379
		Straight	155	2017	3.0%	47				202	27		20	222
	West: Boekenhout	Straight	88	2017	3.0%	27				115		27	19	134
		Right	8	2017	3.0%	2		10		20			0	20
3. Boekenhout / Louis Fourie	South: Louis Fourie	Left	238	2017	4.0%	101		90		429	40		30	459
		Straight	508	2017	4.0%	215			45	768			0	768
		Right	21	2017	4.0%	9				30			0	30
	East: Boekenhout	Left	34	2017	4.0%	14				48			0	48
		Straight	2	2017	4.0%	1				3			0	3
		Right	24	2017	4.0%	10				34			0	34
	North: Louis Fourie	Left	18	2017	4.0%	8				26			0	26
		Straight	383	2017	4.0%	162			15	560			0	560
		Right	113	2017	4.0%	48		55		216	15		11	227
	West: Boekenhout	Left	109	2017	4.0%	46		25		180		15	11	191
		Straight	2	2017	4.0%	1				3			0	3
		Right	152	2017	4.0%	64		45		261		40	28	289
4. R328_Louis Fourie / Waboom	South: Waboom	Left	6	2018	4.0%	2				8		5	4	12
		Straight	17	2018	4.0%	6				23		35	25	48
		Right	62	2018	4.0%	23				85			0	85
	East: Louis Fourie (R102)	Left	89	2018	4.0%	33				122			0	122
		Straight	153	2018	4.0%	56				209			0	209
		Right	178	2018	4.0%	66	157		10	411			0	411
	North: N2 / R102	Left	170	2018	4.0%	63	90		20	343			0	343
		Straight	25	2018	4.0%	9				34	35		26	60
		Right	64	2018	4.0%	24	13			101			0	101
	West: Louis Fourie (R328 Oudtshoorn)	Left	61	2018	4.0%	22	22			105			0	105
		Straight	156	2018	4.0%	57			5	218			0	218
		Right	14	2018	4.0%	5				19	5		4	23

TRIP GENERATION	74	70

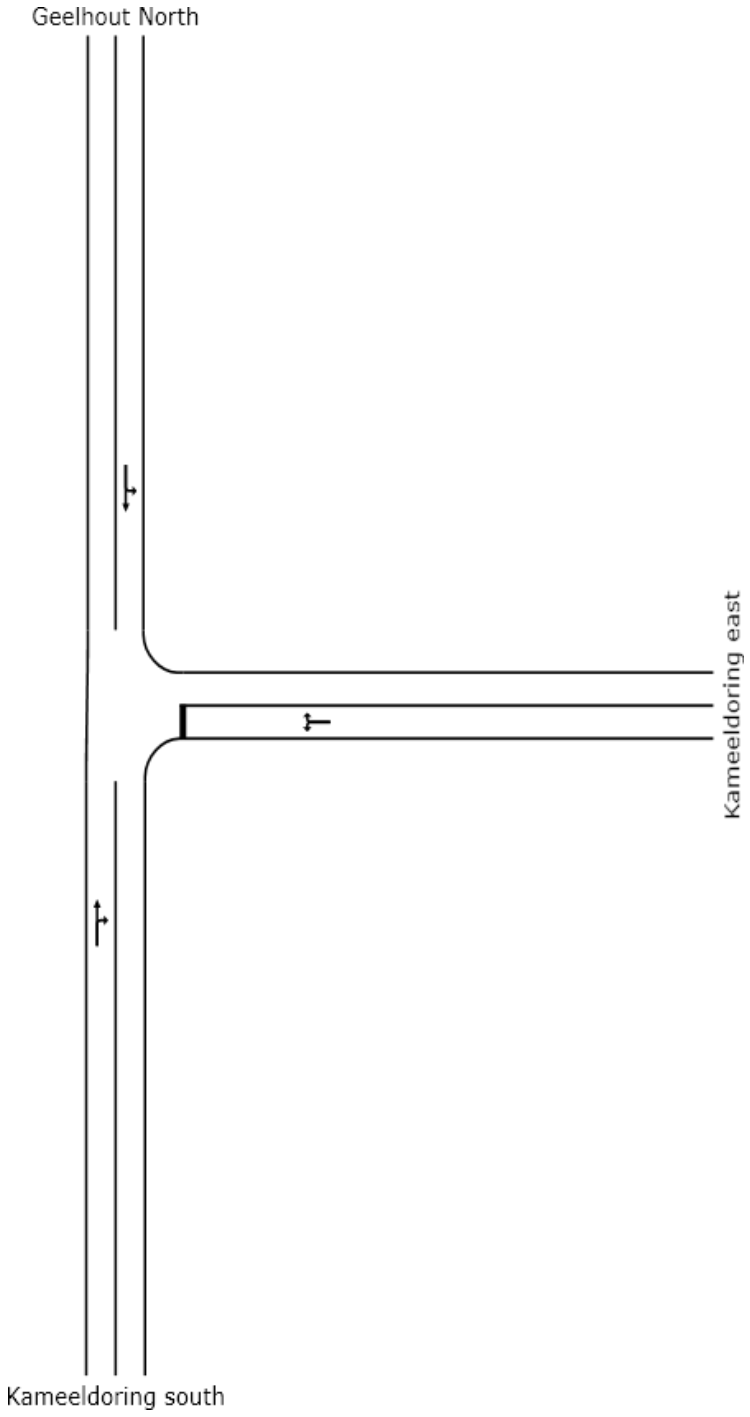
ANNEXURE B

SIDRA Results

SITE LAYOUT

Site: AM

Geelhout / Kameeldoring



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MOVEMENT SUMMARY

Site: AM

Geelhout / Kameeldoring
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	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: Kameeldoring south											
2	T1	67	0.0	0.050	3.1	LOS A	0.2	1.7	0.16	0.31	47.8
3	R2	26	4.0	0.050	3.1	LOS A	0.2	1.7	0.16	0.31	47.8
Approach		92	1.1	0.050	3.1	NA	0.2	1.7	0.16	0.31	47.8
East: Kameeldoring east											
4	L2	21	4.0	0.011	13.0	LOS B	0.1	0.8	0.23	0.82	41.6
6	R2	3	0.0	0.011	13.0	LOS B	0.1	0.8	0.23	0.82	41.6
Approach		24	3.5	0.011	13.0	LOS B	0.1	0.8	0.23	0.82	41.6
North: Geelhout North											
7	L2	9	0.0	0.029	1.3	LOS A	0.0	0.0	0.00	0.15	57.9
8	T1	48	0.0	0.029	1.3	LOS A	0.0	0.0	0.00	0.15	57.9
Approach		57	0.0	0.029	1.3	NA	0.0	0.0	0.00	0.15	57.9
All Vehicles		173	1.1	0.050	4.4	NA	0.2	1.7	0.12	0.33	50.9

Level of Service (LOS) Method: Delay (HCM 2000).
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.

MOVEMENT SUMMARY

Site: PM

Boekenhout / Kameeldoring
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: Kameldoring south											
2	T1	57	0.0	0.043	3.3	LOS A	0.2	1.5	0.18	0.31	47.0
3	R2	23	4.0	0.043	3.3	LOS A	0.2	1.5	0.18	0.31	47.0
Approach		80	1.2	0.043	3.3	NA	0.2	1.5	0.18	0.31	47.0
East: Kameldoring east											
4	L2	24	4.0	0.017	12.9	LOS B	0.1	1.1	0.27	0.81	41.6
6	R2	10	0.0	0.017	12.9	LOS B	0.1	1.1	0.27	0.81	41.6
Approach		34	2.8	0.017	12.9	LOS B	0.1	1.1	0.27	0.81	41.6
North: Geelhout North											
7	L2	9	0.0	0.037	1.0	LOS A	0.0	0.0	0.00	0.13	58.4
8	T1	62	0.0	0.037	1.0	LOS A	0.0	0.0	0.00	0.13	58.4
Approach		71	0.0	0.037	1.0	NA	0.0	0.0	0.00	0.13	58.4
All Vehicles		186	1.0	0.043	4.6	NA	0.2	1.5	0.13	0.33	51.0

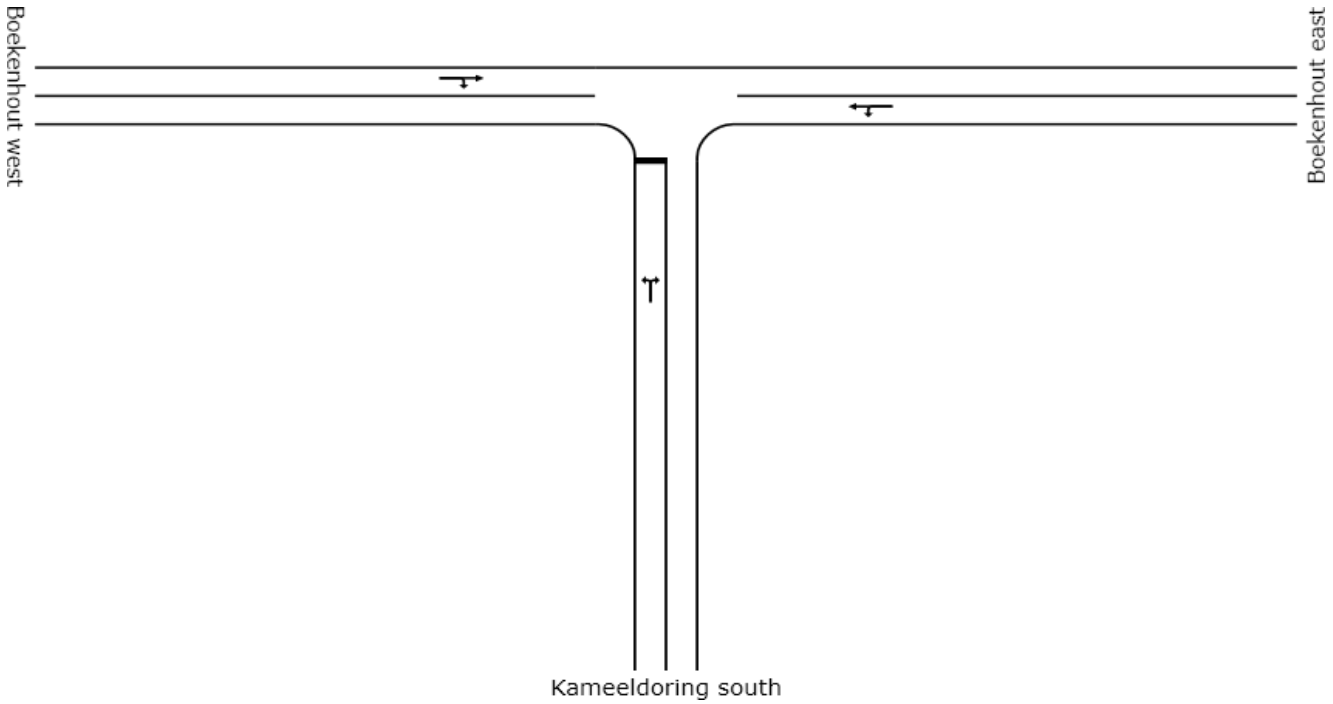
Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control 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.

SIDRA INTERSECTION 6

SITE LAYOUT

Site: AM

Boekenhout / Kameeldoring



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SIDRA
INTERSECTION 6

MOVEMENT SUMMARY

Site: AM

Boekenhout / Kameeldoring
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: Kameeldoring south											
1	L2	24	4.0	0.336	15.3	LOS C	2.2	16.1	0.60	0.89	34.2
3	R2	424	4.0	0.336	15.3	LOS C	2.2	16.1	0.60	0.89	34.2
Approach		449	4.0	0.336	15.3	LOS C	2.2	16.1	0.60	0.89	34.2
East: Boekenhout east											
4	L2	170	4.0	0.188	5.7	LOS A	0.0	0.0	0.00	0.51	50.3
5	T1	138	4.0	0.188	5.7	LOS A	0.0	0.0	0.00	0.51	50.3
Approach		308	4.0	0.188	5.7	NA	0.0	0.0	0.00	0.51	50.3
West: Boekenhout west											
11	T1	281	4.0	0.163	1.2	LOS A	0.9	6.8	0.45	0.03	47.8
12	R2	7	4.0	0.163	1.2	LOS A	0.9	6.8	0.45	0.03	47.8
Approach		288	4.0	0.163	1.2	NA	0.9	6.8	0.45	0.03	47.8
All Vehicles		1044	4.0	0.336	8.6	NA	2.2	16.1	0.38	0.54	42.9

Level of Service (LOS) Method: Delay (HCM 2000).
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.

SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: PM

Boekenhout / Kameeldoring
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	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: Kameeldoring south											
1	L2	9	4.0	0.196	15.8	LOS C	1.1	7.8	0.64	0.91	33.8
3	R2	214	4.0	0.196	15.8	LOS C	1.1	7.8	0.64	0.91	33.8
Approach		223	4.0	0.196	15.8	LOS C	1.1	7.8	0.64	0.91	33.8
East: Boekenhout east											
4	L2	421	4.0	0.410	6.5	LOS A	0.0	0.0	0.00	0.55	49.1
5	T1	247	4.0	0.410	6.5	LOS A	0.0	0.0	0.00	0.55	49.1
Approach		668	4.0	0.410	6.5	NA	0.0	0.0	0.00	0.55	49.1
West: Boekenhout west											
11	T1	149	4.0	0.112	5.1	LOS A	0.9	6.4	0.62	0.15	43.7
12	R2	22	4.0	0.112	5.1	LOS A	0.9	6.4	0.62	0.15	43.7
Approach		171	4.0	0.112	5.1	NA	0.9	6.4	0.62	0.15	43.7
All Vehicles		1062	4.0	0.410	8.2	NA	1.1	7.8	0.23	0.56	45.1

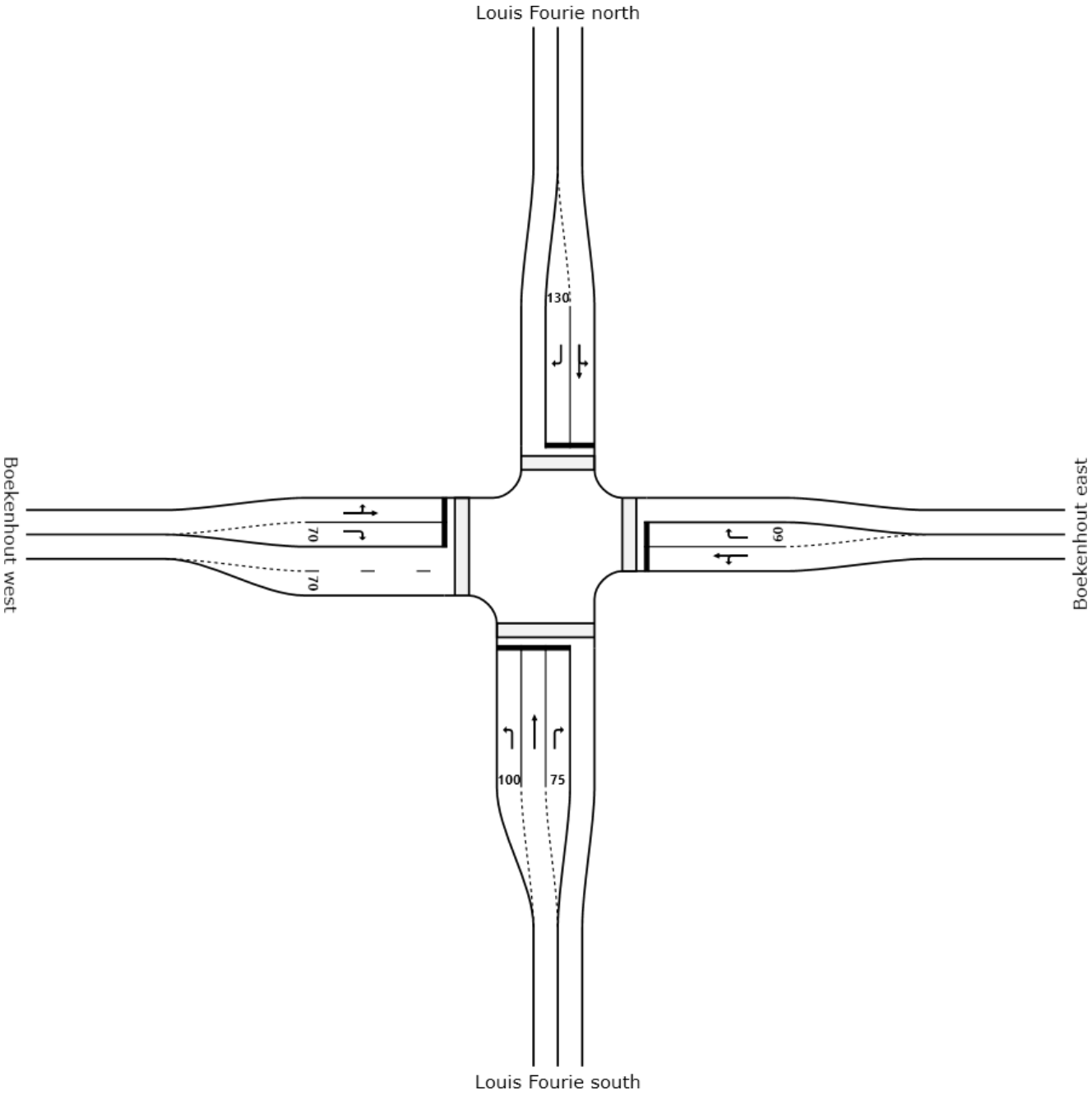
Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control 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.

SIDRA INTERSECTION 6

SITE LAYOUT

Site: AM peak hour

Boekenhout / Louis Fourie (R102)



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MOVEMENT SUMMARY

Site: AM peak hour

Boekenhout / Louis Fourie (R102)
Signals - Fixed Time Cycle Time = 55 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	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: Louis Fourie south											
1	L2	269	2.0	0.284	13.9	LOS B	2.3	16.7	0.59	0.78	39.8
2	T1	625	2.0	0.862	25.6	LOS C	19.5	138.9	0.99	1.04	27.9
3	R2	28	2.0	0.149	37.4	LOS D	0.8	5.4	0.97	0.70	25.0
Approach		923	2.0	0.862	22.5	LOS C	19.5	138.9	0.87	0.95	30.5
East: Boekenhout east											
4	L2	28	2.0	0.147	30.4	LOS C	1.0	6.9	0.91	0.72	21.3
5	T1	11	2.0	0.147	30.4	LOS C	1.0	6.9	0.91	0.72	21.3
6	R2	7	2.0	0.028	32.3	LOS C	0.2	1.3	0.88	0.67	21.1
Approach		46	2.0	0.147	30.7	LOS C	1.0	6.9	0.90	0.71	21.3
North: Louis Fourie north											
7	L2	25	2.0	0.572	9.4	LOS A	10.6	75.3	0.71	0.65	40.5
8	T1	564	2.0	0.572	9.4	LOS A	10.6	75.3	0.71	0.65	40.5
9	R2	143	2.0	0.159	17.2	LOS B	2.0	14.2	0.54	0.77	36.8
Approach		733	2.0	0.572	10.9	LOS B	10.6	75.3	0.68	0.67	39.7
West: Boekenhout west											
10	L2	298	2.0	0.319	17.0	LOS B	4.6	32.4	0.59	0.79	36.8
11	T1	7	2.0	0.319	17.0	LOS B	4.6	32.4	0.59	0.79	36.8
12	R2	481	2.0	0.861	37.2	LOS D	15.4	109.8	1.00	1.00	25.1
Approach		786	2.0	0.861	29.4	LOS C	15.4	109.8	0.84	0.92	28.6
All Vehicles		2488	2.0	0.862	21.4	LOS C	19.5	138.9	0.81	0.85	31.9

Level of Service (LOS) Method: Delay (HCM 2000).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	5	21.8	LOS C	0.0	0.0	0.89	0.89
P2	Across E approach	5	17.6	LOS B	0.0	0.0	0.80	0.80
P3	Across N approach	5	19.2	LOS B	0.0	0.0	0.84	0.84
P4	Across W approach	5	20.1	LOS C	0.0	0.0	0.85	0.85
All Pedestrians		21	19.7	LOS B			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: PM peak hour

Boekenhout / Louis Fourie (R102)
Signals - Fixed Time Cycle Time = 71 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Louis Fourie south											
1	L2	483	2.0	0.432	13.8	LOS B	5.3	37.6	0.55	0.79	39.9
2	T1	808	2.0	0.822	20.7	LOS C	26.8	190.9	0.92	0.90	30.8
3	R2	32	2.0	0.214	46.7	LOS D	1.1	8.0	0.99	0.71	21.7
Approach		1323	2.0	0.822	18.8	LOS B	26.8	190.9	0.79	0.86	33.2
East: Boekenhout east											
4	L2	51	2.0	0.192	38.4	LOS D	1.7	12.0	0.91	0.75	18.7
5	T1	3	2.0	0.192	38.4	LOS D	1.7	12.0	0.91	0.75	18.7
6	R2	36	2.0	0.242	45.1	LOS D	1.2	8.9	0.97	0.73	16.7
Approach		89	2.0	0.242	41.1	LOS D	1.7	12.0	0.93	0.74	17.8
North: Louis Fourie north											
7	L2	27	2.0	0.515	8.0	LOS A	11.6	82.5	0.59	0.55	42.7
8	T1	589	2.0	0.515	8.0	LOS A	11.6	82.5	0.59	0.55	42.7
9	R2	239	2.0	0.226	16.3	LOS B	3.6	26.0	0.47	0.78	37.5
Approach		856	2.0	0.515	10.3	LOS B	11.6	82.5	0.55	0.61	41.1
West: Boekenhout west											
10	L2	201	2.0	0.264	23.4	LOS C	4.5	32.3	0.67	0.79	32.1
11	T1	3	2.0	0.264	23.4	LOS C	4.5	32.3	0.67	0.79	32.1
12	R2	304	2.0	0.528	34.6	LOS C	9.3	65.9	0.91	0.82	26.2
Approach		508	2.0	0.528	30.1	LOS C	9.3	65.9	0.82	0.81	28.3
All Vehicles		2777	2.0	0.822	19.0	LOS B	26.8	190.9	0.73	0.77	33.5

Level of Service (LOS) Method: Delay (HCM 2000).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	5	28.9	LOS C	0.0	0.0	0.90	0.90
P2	Across E approach	5	14.3	LOS B	0.0	0.0	0.63	0.63
P3	Across N approach	5	26.2	LOS C	0.0	0.0	0.86	0.86
P4	Across W approach	5	16.2	LOS B	0.0	0.0	0.68	0.68
All Pedestrians		21	21.4	LOS C			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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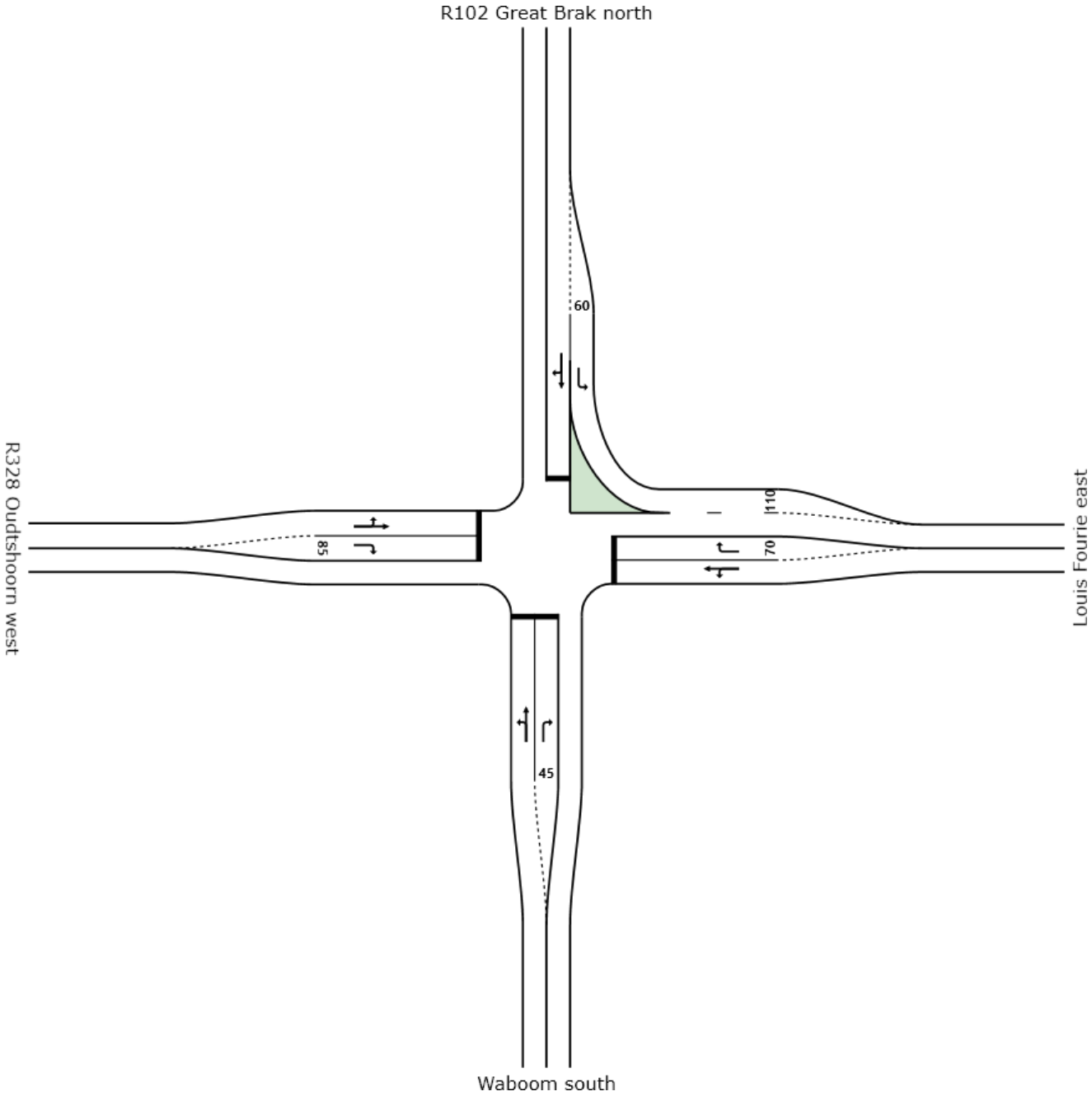
SITE LAYOUT

Site: AM SIGNAL

R102 / R328 (Louis Fourie / Waboom)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: AM SIGNAL

R102 / R328 (Louis Fourie / Waboom)
Signals - Fixed Time Cycle Time = 40 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	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: Waboom south											
1	L2	26	5.0	0.406	19.2	LOS B	2.4	17.7	0.93	0.75	26.1
2	T1	103	5.0	0.406	19.2	LOS B	2.4	17.7	0.93	0.75	26.1
3	R2	66	5.0	0.226	28.2	LOS C	1.2	8.9	0.92	0.75	23.5
Approach		196	5.0	0.406	22.2	LOS C	2.4	17.7	0.92	0.75	25.1
East: Louis Fourie east											
4	L2	19	5.0	0.217	6.6	LOS A	2.2	16.2	0.57	0.53	44.7
5	T1	189	5.0	0.217	6.6	LOS A	2.2	16.2	0.57	0.53	44.7
6	R2	398	5.0	0.805	23.5	LOS C	6.5	47.4	0.99	0.94	32.6
Approach		606	5.0	0.805	17.7	LOS B	6.5	47.4	0.84	0.80	36.0
North: R102 Great Brak north											
7	L2	439	5.0	0.265	9.6	LOS A	0.0	0.0	0.00	0.64	45.8
8	T1	58	5.0	0.772	29.5	LOS C	4.1	30.2	1.00	0.93	27.9
9	R2	125	5.0	0.772	29.5	LOS C	4.1	30.2	1.00	0.93	27.9
Approach		622	5.0	0.772	15.4	LOS B	4.1	30.2	0.29	0.72	38.6
West: R328 Oudtshoorn west											
10	L2	157	5.0	0.751	21.8	LOS C	7.8	56.8	0.97	0.92	31.3
11	T1	219	5.0	0.751	21.8	LOS C	7.8	56.8	0.97	0.92	31.3
12	R2	19	5.0	0.097	31.0	LOS C	0.4	2.7	0.96	0.68	28.2
Approach		395	5.0	0.751	22.3	LOS C	7.8	56.8	0.97	0.91	31.1
All Vehicles		1819	5.0	0.805	18.4	LOS B	7.8	56.8	0.69	0.79	34.5

Level of Service (LOS) Method: Delay (HCM 2000).
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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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: PM SIGNAL

R102 / R328 (Louis Fourie / Waboom)
Signals - Fixed Time Cycle Time = 40 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	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: Waboom south											
1	L2	12	5.0	0.227	19.4	LOS B	1.2	8.4	0.92	0.71	25.9
2	T1	51	5.0	0.227	19.4	LOS B	1.2	8.4	0.92	0.71	25.9
3	R2	89	5.0	0.357	29.7	LOS C	1.7	12.8	0.95	0.76	22.7
Approach		152	5.0	0.357	25.5	LOS C	1.7	12.8	0.94	0.74	23.9
East: Louis Fourie east											
4	L2	128	5.0	0.351	9.5	LOS A	3.9	28.3	0.59	0.67	42.2
5	T1	220	5.0	0.351	9.5	LOS A	3.9	28.3	0.59	0.67	42.2
6	R2	433	5.0	0.758	21.2	LOS C	6.5	47.1	0.95	0.91	34.3
Approach		781	5.0	0.758	16.0	LOS B	6.5	47.1	0.79	0.80	37.4
North: R102 Great Brak north											
7	L2	361	5.0	0.218	9.6	LOS A	0.0	0.0	0.00	0.64	45.8
8	T1	63	5.0	0.721	27.8	LOS C	3.7	27.0	1.00	0.89	28.6
9	R2	106	5.0	0.721	27.8	LOS C	3.7	27.0	1.00	0.89	28.6
Approach		531	5.0	0.721	15.4	LOS B	3.7	27.0	0.32	0.72	38.5
West: R328 Oudtshoorn west											
10	L2	111	5.0	0.744	21.4	LOS C	7.1	51.6	0.98	0.92	31.2
11	T1	229	5.0	0.744	21.4	LOS C	7.1	51.6	0.98	0.92	31.2
12	R2	23	5.0	0.119	31.0	LOS C	0.5	3.3	0.96	0.69	28.2
Approach		363	5.0	0.744	22.0	LOS C	7.1	51.6	0.97	0.90	31.0
All Vehicles		1826	5.0	0.758	17.8	LOS B	7.1	51.6	0.70	0.79	35.1

Level of Service (LOS) Method: Delay (HCM 2000).
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.

SIDRA INTERSECTION 6