TRAFFIC IMPACT & ACCESS STUDY

Portion 22 of the Farm Mooifontein 14 IR

November 2017

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QUALITY MANAGEMENT

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Project No.:	TRAF 1262
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FIGURES

ANNEXURES

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1 PURPOSE AND OVERVIEW

1.1 Introduction

Route^2 – Transport Strategies have been appointed by GKM Consulting to undertake a Traffic Impact Study for the proposed 'Residential 2" development on the Portion 22 of the Farm Mooifontein 14 IR.

The Traffic Impact Study is submitted in support of the development to the relevant municipal-, transport- and planning authorities.

1.2 Objectives of the Traffic Impact Study

The objectives of the study are as follow:

- To determine the impact of the additional traffic generated by the proposed development on the existing road network;
- To propose measures that could be put in place to mitigate the impact that the proposed development will have on the existing traffic and road conditions;
- To determine a suitable access regime for the proposed development; and
- To provide sufficient information for the approval of the proposed development.

1.3 Report Structure

The remainder of the report is structured as follows:

- The scope of the report, study area and roads affected are provided in **Chapter 2**.
- The surrounding road network is provided in **Chapter 3**.
- The development and site access is discussed in **Chapter 4**.
- The additional development traffic and distribution are provided in **Chapter 5**.
- The traffic impact and capacity analysis are provided in **Chapter 6**.
- The access arrangement and analysis are provided in **Chapter 7**.
- The Site Traffic Impact assessment is provided in **Chapter 8**.
- Provision for public transport and pedestrians are discussed in **Chapter 9**.
- The summary and recommendations are provided in **Chapter 10**.

2 SCOPE OF THE REPORT

The purpose of this report is to identify the traffic impact of the proposed 40 units on the site. The study area, development trip generation, trip distribution, capacity analysis and site access requirements are assessed in the rest of this report.

2.1 Study Area

The extent of the study area is driven by an estimation of the traffic generated by the proposed development and the intersections likely to be affected by the additional traffic. The development is expected to generate 40 additional peak hour trips, therefore a Traffic Impact Statement is required. The study includes the intersections of:

1. Bergeend Street and Suikerbekkie Street – 3-way stop controlled.
2. Suikerbekkie Street and Pikkewyn Road – priority controlled.
3. Pikkewyn Road and Bergpatrys Street – priority controlled.

2.2 Peak Hours Analysed

Peak morning and afternoon traffic counts were conducted on Tuesday 21 November 2017 at the intersections mentioned above.

The existing weekday AM (07:30 – 08:30) and PM (16:30 – 17:30) peak hour traffic are summarised in **Figures 2 & 3**. The peak hours were derived from the highest peak hour traffic that was counted during the morning and afternoon peak periods.

2.3 Assessment Scenarios

The following two scenarios were analysed:

- **Scenario 1a & 1b: Existing 2017** AM and PM peak hour traffic flows.
- **Scenario 2a & 2b: Base 2017** AM and PM peak hour traffic flows with development traffic.

3 SURROUNDING ROAD NETWORK

Suikerbekkie Street

Suikerbekkie Street is a Class 4b distributer road. Access into the development can be provided off this road.

Pikkewyn Road and Bergpatrys Street

Both these streets are Class 5 local access streets and access can also be taken from Bergpatrys Street where is has a dead end as shown below.

4 DEVELOPMENT

It is proposed to develop 'Residential 2" units on the site as per **Table 1** below.

Table 1: Development Controls

Land Use	Area GLA or units
Residential 2	40

5 TRAFFIC FLOWS & TRIP GENERATION

5.1 Trip Generation

The COTO *Trip Generation Manual (September 2012 TMH 17 Volume 1) was used to determine the trip generation.*

The predicted peak hour traffic to and from the site is summarised in **Tables 2 & 3** below. **Annexure D** gives a detailed breakdown of the trip generation.

Table 2: Proposed Development AM Peak Hour Trip Generation

Land use	Extend	Units	Pc Factor	Trip Rate	Split	Split	Trips	Trips	Adjusted Total in & out
					In	Out	In	Out	
Residential 2	40	units	0.225	1.0	25%	75%	10	30	40

Table 3: Proposed Development PM Peak Hour Trip Generation

Land use	Extend	Units	Pc Factor	Trip Rate	Split	Split	Trips	Trips	Adjusted Total in & out
					In	Out	In	Out	
Residential 2	40	units	0.225	1.0	70%	30%	28	12	40

5.2 Expected Trip Distribution

The following distribution was used as summarised in **Figures 4 & 5**:

- 100% from the west along Bergeend Street.

Figures 8 & 9 illustrates the **Base 2017** traffic with the additional development traffic and an expected 3% growth in background traffic.

6 TRAFFIC IMPACT & CAPACITY ANALYSES

6.1 Assessment Criteria

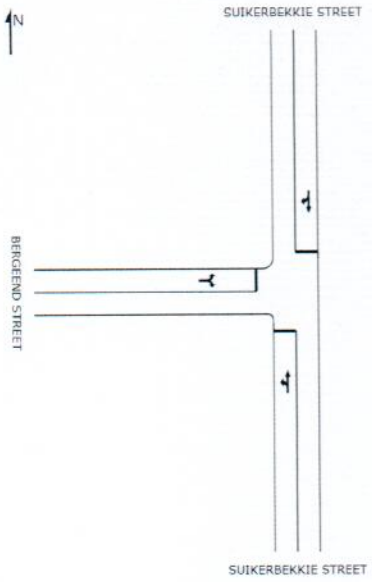
The intersection of Bergeend Street and Suikerbekkie Street was analysed using aaSIDRA. The reason for leaving the other two intersections out is as a result of the very low peak hour traffic going through them as well as the potential access positions off both Suikerbekkie Street and Bergpartys Street. aaSIDRA is a computer software program that provides several performance measures including v/c ratios, delays, level of service (LOS), etc.

When elements of a road network such as intersections are analyzed, their operating conditions are described in terms of LOS. The six letters from A to F are used to indicate different LOS. LOS A indicates very light traffic with correspondingly low delays. LOS E reflects capacity conditions, with high delays and unstable flow. LOS F reflects conditions where traffic demand exceeds capacity and traffic experiences congestion and delays. Generally, LOS A to D is considered acceptable in accordance with international standards. LOS E and F on the other hand are deemed unacceptable.

A further measure of the operating conditions prevailing at any one point in a road network is the volume to capacity ratio (v/c). As the name implies it is the traffic demand volume divided by the available capacity of the roadway element. Generally, ratios of up to approximately 0.9 are internationally deemed acceptable.

Results of the aaSIDRA capacity analyses at the intersection are discussed in the following sub section, with details of the outputs enclosed in **Annexure A**.

6.2 Bergeend Street and Suikerbekkie Street Intersection



Existing Layout

Results of Analysis:

Scenario	AM Peak Hour					PM Peak Hour				
	NB	WB	SB	EB	TOTAL	NB	WB	SB	EB	TOTAL
Existing 2017	C {0.25}		B {0.16}	D {0.12}	C {0.25}	F {1.00}		C {0.16}	C {0.39}	F {1.00}
Base 2017 + Development	A {0.16}		B {0.15}	A {0.03}	B {0.16}	A {0.04}		B {0.07}	A {0.25}	A {0.25}

Legend	
A	Level of Service
(12.7)	Delay in Seconds
{0.95}	Volume / Capacity
[20]	Longest Average Queue in meters

With the existing **2017** the operation of the intersection will be within acceptable ranges for the AM peak but will struggle during the PM peak hour. To mitigate this, it is proposed that a mini-roundabout is provided which is solely as a result of background traffic and not the additional development traffic. With this in place the operation of the intersection will improve considerably.

7 ACCESS REQUIREMENTS

7.1 Access Location

The proposed access can be either off Suikerbekkie Street or off the extension of Bergpatrys Street.

The expected additional peak hour flows through the access point are as follow:

- AM Peak Hour: 10 inbound and 30 outbound
- PM Peak Hour: 28 inbound and 12 outbound

The document COTO TMH 16 Volume 2 was used to guide the design of the access point. The following should be provided:

- Incoming lanes 1 x 3,5m (4,5m clearance) & 1 x 3,5m (visitors).
- Stacking length from edge of road reserve 6m.
- Outgoing lane 1 x 3,5m (4,5m clearance)
- Width of access should be 10m.

7.2 Sight Distance and Layout

The proposed accesses will have sufficient sight distance in both directions.

7.1 Stacking Distance

Table 3 below gives a breakdown of the queuing analysis as per **Annexure B**. The results show that the delay of 0 seconds falls well below the 18 seconds that will be allowed as delay for access control.

Table 3: Queuing Analysis

Description	Access Controls
Peak Hour Inbound Traffic Volume	28
Service Rate per Hour	350
Service Rate per Second	7.2
Number of Entry Lanes	2
Number of Vehicles Waiting	0
Average Delay in Seconds	0
Stacking Required	6m if access controlled

8 SITE TRAFFIC IMPACT ASSESSMENT

The following applies:

- Parking will be provided in accordance of the Town Planning Scheme. Normally one (1) parking bay is provided per unit and one (1) bay for every three (3) units for visitors. In total 54 parking bays will be have to be provided.
- Refuse removal will also be provided on the site.
- The isles should be 7m wide.

9 ACCESS TO PUBLIC TRANSPORT

9.1 Background

In terms of the "National Land Transport Act" (NLTA) (Act No.5 of 2009), it is required that an assessment of public transport be included in traffic impact studies.

9.2 Availability of Public Transport & Development Trips

Since the site is within walking distance from Modderfontein Road no facilities are proposed for public transport near the site.

9.3 Non-motorised Transport (NMT)

A pedestrian sidewalk should be provided along the site frontage in Suikerbekkie Street.

10 CONCLUSION & RECOMMENDATIONS

The Traffic Impact & Access Study investigated the expected transport related impacts of the proposed 40 "Residential 2" units on Portion 22 Farm Mooifontein 14 IR.

With regards to traffic generation and impact, it is estimated that the development will generate as a worst case 40 additional AM and PM peak hour trips (total in and out) during a typical weekday.

Based on our site observations, the existing and base traffic volumes shown in the figures, as well as the capacity analysis, it is concluded that the development will not have any impact on the weekday AM and PM peak hour traffic flows past the site. The intersection of Bergeend Street and Suikerbekkie Street can be upgraded to a mini-roundabout although it is because of existing and background traffic and not development traffic.

The analysis shows that there will be no Traffic Impact because of the additional traffic.

It can be concluded and is proposed:

- ***The access road should have two lanes in and one lane out with 6m stacking which will be sufficient. This access can be off either Suikerbekkie Street or the extension of Bergpatrys Street.***
- ***Parking is provided in accordance with the Town Planning Scheme. In total 54 bays should be provided.***
- ***Provision of a pedestrian sidewalk along the site frontage in Suikerbekkie Street.***
- ***Refuse removal should be on site.***
- ***A detailed SDP should be compiled showing access, circulation and parking.***

11 REFERENCES

- COTO, September 2012, TMH 17 Volume 1, "South African Trip Data Manual".
- Institute of Transportation Engineers. "Trip Generation, 8th Edition, 2008".
- Transportation Research Board. "Highway Capacity Manual, 2010".
- COTO, December 2011, TMH 26, "South African Road Classification and Access Management Manual".
- National Land Transport Act (NLTA) (Act No. 5 of 2009).

Figures

Annexure A

OUTPUTS OF aaSIDRA INTERSECTION ANALYSES

LANE SUMMARY

Site: 2017AM

BERGEEND STREET / SUIKERBEKKIE STREET
Stop (All-Way)

Lane Use and Performance

	Demand Flows				HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Length	SL Type	Cap. Adj.	Prob. Block.
	L	T	R	Total							Vehicles	Distance				
	veh/h	veh/h	veh/h	veh/h	%	veh/h	v/c	%	sec		veh	m	m		%	%
South: SUIKERBEKKIE STREET																
Lane 1	163	8	0	172	0.0	690	0.249	100	17.6	LOS C	0.9	6.0	500	–	0.0	0.0
Approach	163	8	0	172	0.0		0.249		17.6	LOS C	0.9	6.0				
North: SUIKERBEKKIE STREET																
Lane 1	0	13	173	185	0.0	1170	0.158	100	14.3	LOS B	0.4	3.0	500	–	0.0	0.0
Approach	0	13	173	185	0.0		0.158		14.3	LOS B	0.4	3.0				
West: BERGEEND STREET																
Lane 1	23	0	12	35	0.0	281	0.124	100	25.3	LOS D	0.4	3.0	500	–	0.0	0.0
Approach	23	0	12	35	0.0		0.124		25.3	LOS D	0.4	3.0				
Intersection				392	0.0		0.249		16.7	LOS C	0.9	6.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2017PM

BERGEEND STREET / SUIKERBEKKIE STREET
Stop (All-Way)

Lane Use and Performance

	Demand Flows				HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Length	SL Type	Cap. Adj.	Prob. Block.
	L	T	R	Total							Vehicles	Distance				
	veh/h	veh/h	veh/h	veh/h	%	veh/h	v/c	%	sec		veh	m	m		%	%
South: SUIKERBEKKIE STREET																
Lane 1	36	13	0	48	0.0	48[2]	1.000[4]	100	343.6	LOS F	13.9	97.1	500	–	0.0	0.0
Approach	36	13	0	48	0.0		1.000		343.6	LOS F	13.9	97.1				
North: SUIKERBEKKIE STREET																
Lane 1	0	16	49	65	0.0	397	0.164	100	21.4	LOS C	0.6	4.0	500	–	0.0	0.0
Approach	0	16	49	65	0.0		0.164		21.4	LOS C	0.6	4.0				
West: BERGEEND STREET																
Lane 1	145	0	217	362	0.0	925	0.391	100	17.0	LOS C	1.5	10.6	500	–	0.0	0.0
Approach	145	0	217	362	0.0		0.391		17.0	LOS C	1.5	10.6				
Intersection				476	0.0		1.000		50.9	LOS F	13.9	97.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2017AM + Development

BERGEEND STREET / SUIKERBEKKIE STREET
Roundabout

Lane Use and Performance

	Demand Flows				HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Length	SL Type	Cap. Adj.	Prob. Block.
	L	T	R	Total							Vehicles	Distance				
	veh/h	veh/h	veh/h	veh/h	%	veh/h	v/c	%	sec		veh	m	m		%	%
South: SUIKERBEKKIE STREET																
Lane 1	163	8	0	172	0.0	1087	0.158	100	9.8	LOS A	0.7	4.6	500	–	0.0	0.0
Approach	163	8	0	172	0.0		0.158		9.8	LOS A	0.7	4.6				
North: SUIKERBEKKIE STREET																
Lane 1	0	13	204	217	0.0	1484	0.146	100	10.5	LOS B	0.6	4.0	500	–	0.0	0.0
Approach	0	13	204	217	0.0		0.146		10.5	LOS B	0.6	4.0				
West: BERGEEND STREET																
Lane 1	34	0	12	45	0.0	1365	0.033	100	9.4	LOS A	0.1	0.8	500	–	0.0	0.0
Approach	34	0	12	45	0.0		0.033		9.4	LOS A	0.1	0.8				
Intersection				434	0.0		0.158		10.1	LOS B	0.7	4.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2017PM + Development

BERGEEND STREET / SUIKERBEKKIE STREET
Roundabout

Lane Use and Performance

	Demand Flows				HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Length	SL Type	Cap. Adj.	Prob. Block.
	L	T	R	Total							Vehicles	Distance				
	veh/h	veh/h	veh/h	veh/h	%	veh/h	v/c	%	sec		veh	m	m		%	%
South: SUIKERBEKKIE STREET																
Lane 1	36	13	0	48	0.0	1271	0.038	100	5.3	LOS A	0.1	0.8	500	–	0.0	0.0
Approach	36	13	0	48	0.0		0.038		5.3	LOS A	0.1	0.8				
North: SUIKERBEKKIE STREET																
Lane 1	0	16	62	78	0.0	1185	0.066	100	10.5	LOS B	0.2	1.5	500	–	0.0	0.0
Approach	0	16	62	78	0.0		0.066		10.5	LOS B	0.2	1.5				
West: BERGEEND STREET																
Lane 1	175	0	217	392	0.0	1585	0.247	100	8.6	LOS A	0.9	6.3	500	–	0.0	0.0
Approach	175	0	217	392	0.0		0.247		8.6	LOS A	0.9	6.3				
Intersection				518	0.0		0.247		8.6	LOS A	0.9	6.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Annexure B

QUEUING ANALYSIS

Portion 22 Farm Mooifontein 14 IR

Analysis of queues at the Main Entrance

		1 Gate		2 Gates		3 Gates		4 Gates	
Peak hour traffic volume	=	28 veh / h		28 veh / h		28 veh / h		28 veh / h	
Peak hour factor	=	1		1		1		1	
Average arrival rate at peak	Q =	28 veh / h		28 veh / h		28 veh / h		28 veh / h	
Average service rate		**7.2** sec / veh		**7.2** sec / veh		**7.2** sec / veh		**7.2** sec / veh	
	C =	350 services/h		350 services/h		350 services/h		350 services/h	
Traffic intensity	ϕ =	0.08		0.08		0.08		0.08	
Number of channels	N =	1 gate		2 gates		3 gates		4 gates	
Traffic intensity per service channel	θ =	na		0.04		0.03		0.02	
Probability that n vehicles will be in the system	n	$P(x=n)$	$P(x \leq n)$	$P(x=n)$	$P(x \leq n)$	$P(x=n)$	$P(x \leq n)$	$P(x=n)$	$P(x \leq n)$
	P_0 =	0.92	0.08	0.92	0.08	0.89	0.11	0.88	0.12
	P_1 =	0.07	0.93	0.07	0.93	0.07	0.93	0.07	0.93
	P_2 =	0.01	0.99	0.00	1.00	0.00	1.00	0.00	1.00
	P_3 =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_4 =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_5 =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_6 =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_7 =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_8 =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_9 =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_{10} =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	P_{11} =	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Average number in the system E(n)	=	0.1 vehicles		0.0 vehicles		0.0 vehicles		0.0 vehicles	
Average delay	=	11.2 seconds		0.0 seconds		0.0 seconds		0.0 seconds	
Average Vehicles per gate	=	0.1 vehicles		0.0 vehicles		0.0 vehicles		0.0 vehicles	

Annexure C

AERIAL LOCALITY


Finkvink-St
Flamink-Rd
Wewer-Weg
Roibekkie-St
Makou-Ave
Swawel-St
Pikkewyn-Ave
Ebus-Rd
Bennie-Jacobs-Ave
James-Wright-Ave
Silverleaf-St
Kwikstert-Ave
Bontelsie-Ave
Kiewiet-Crescent
Glansspreeu-Ave
Suikerbekkie-Rd
R25
Buffelsgras-St
Mooirivier-Dr
Blouvalk-Ave
Loerie-St
Melba-St
Ratel-St
Boswell-St
Euwer-Rd
Mavis-St
Adrian-St
Valerie-Rd
Owl-St
Tiger-Rd
Lucy-St
M86
Kwartel-Rd
Oranjerivier-Dr
Swael-St
Linda-St
Elgin-Rd
M89
Bosloerie-St
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Google Earth

Annexure D

TRIP GENERATION CALCULATIONS

TRIP GENERATION TABLE: Portion 22 Farm Mooifontein 14 IR

PROJECT NO: TRAF 1262

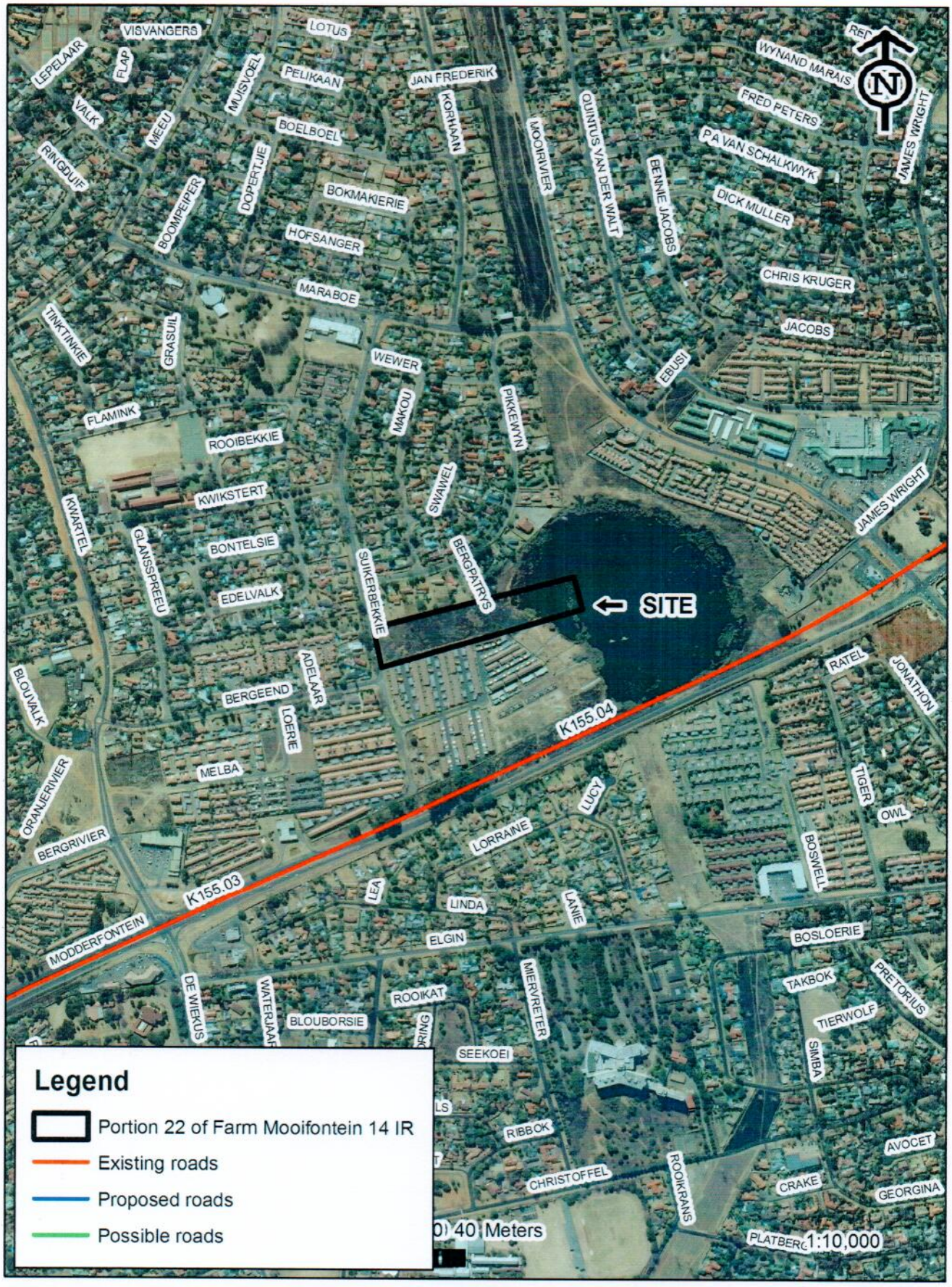
TMH17: Ver 1.01 September 2013

AM PEAK HOUR

Land-Use	Extent Phase 1	Unit	Trip Rate		Total Trips Phase 1	AM Split (%)		Phase 1 AM Trips (vph)		Phase 1 AM Total (vph)
						In	Out	In	Out	
Single Dwelling Units	40	D/Unit	1.00	1 D/Unit	40	25%	75%	10	30	40
Totals					**40**			**10**	**30**	**40**

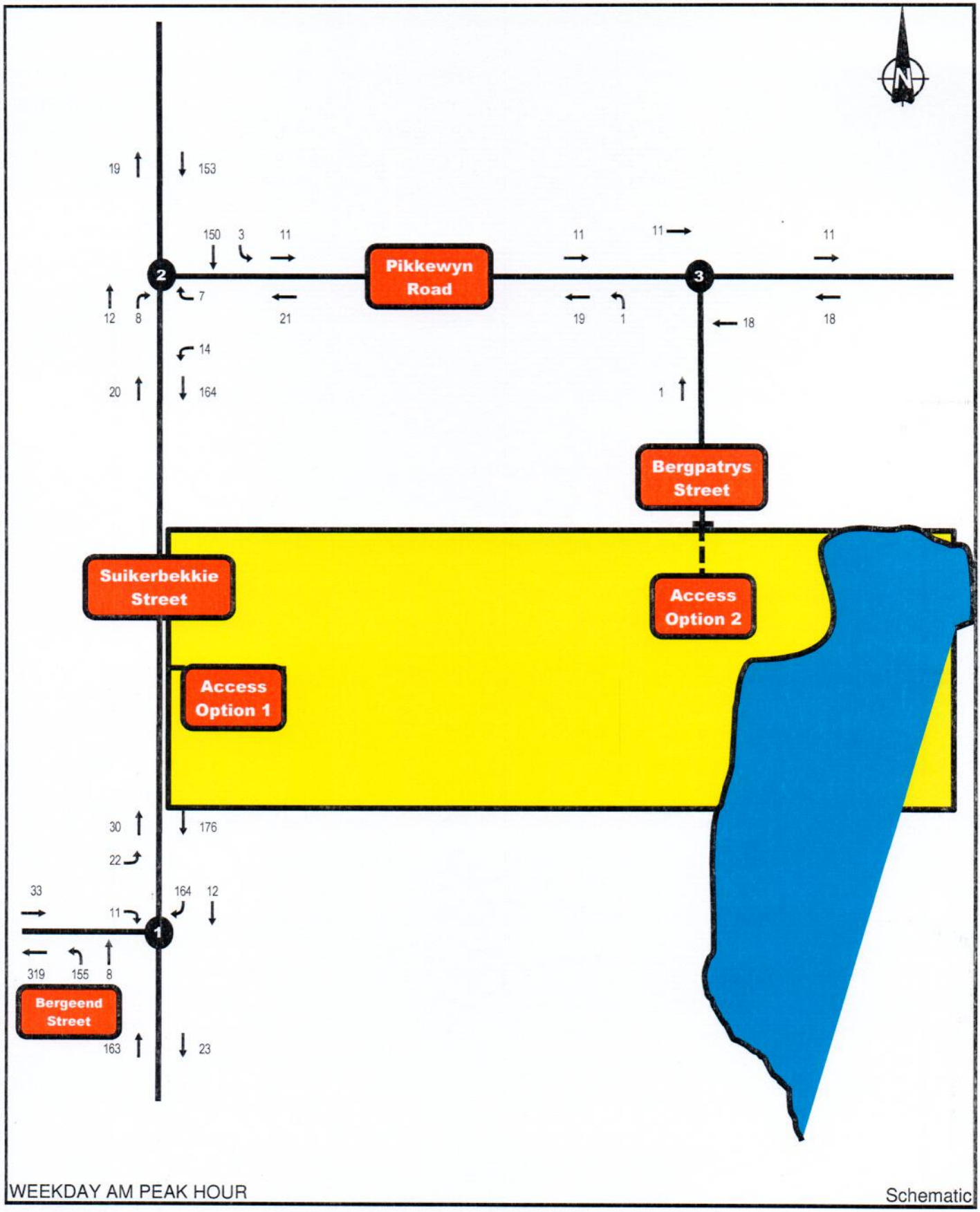
PM PEAK HOUR

Land-Use	Extent Phase 1	Unit	Trip Rate		Total Trips Phase 1	PM Split (%)		Phase 1 PM Trips (vph)		Phase 1 PM Total (vph)
						In	Out	In	Out	
Single Dwelling Units	40	D/Unit	1.00	1 D/Unit	40	70%	30%	28	12	40
Totals					**40**			**28**	**12**	**40**



Project:	Figure:	No.
Portion 22 of Farm Mooifontein 14 IR	**Site Location**	**1**

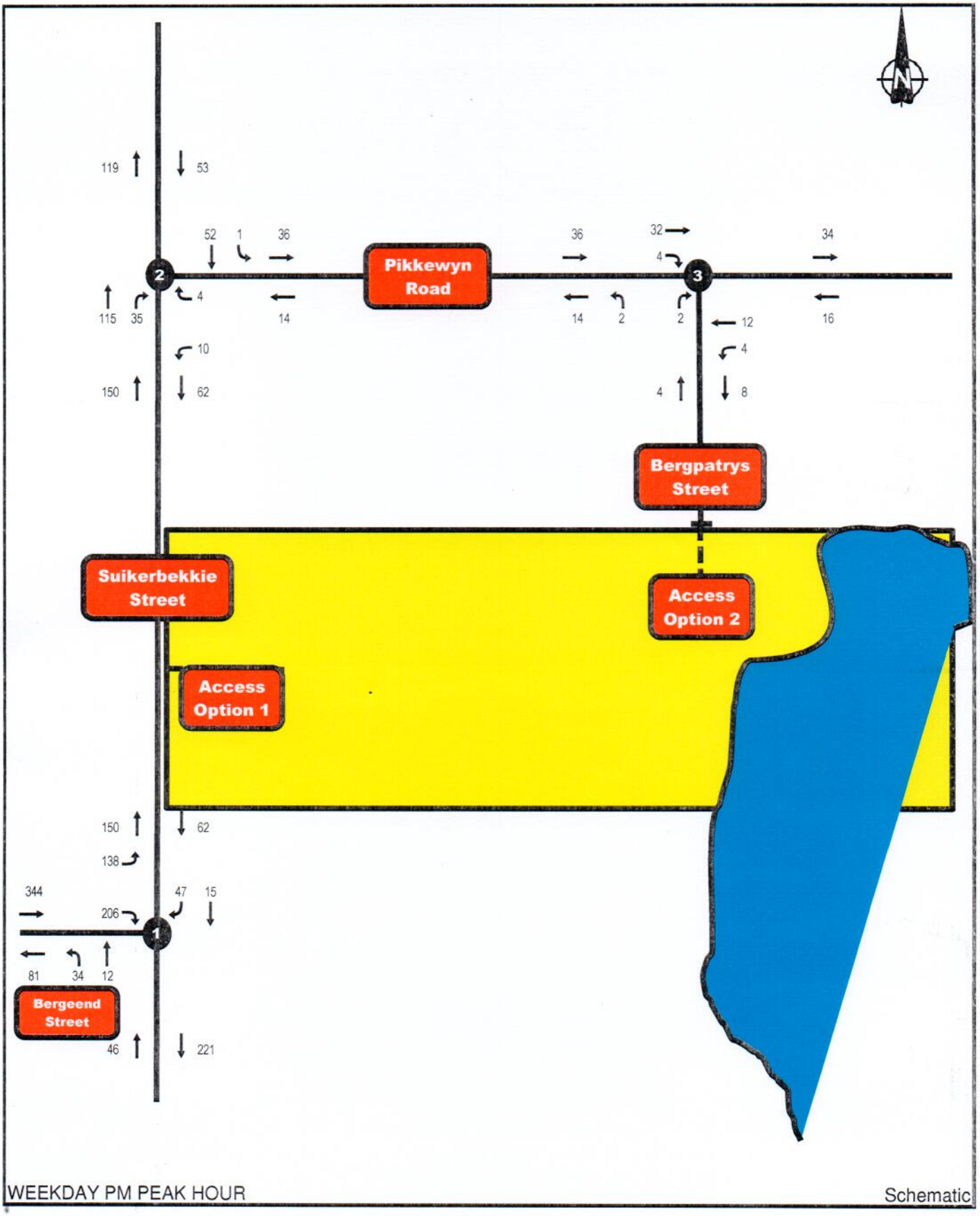
route 2
transport strategies



WEEKDAY AM PEAK HOUR

Schematic

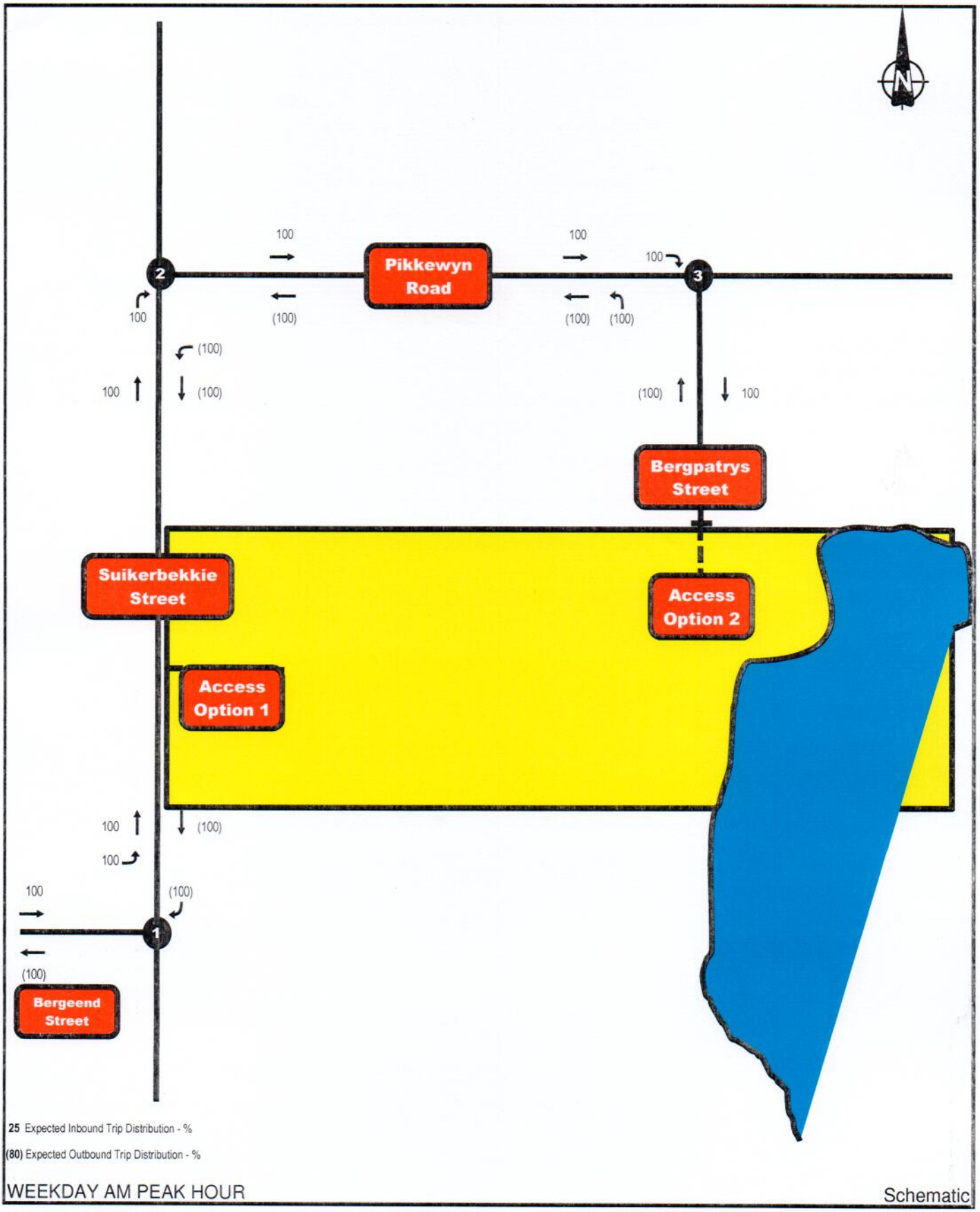
route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: TRAF 1262
	Present Traffic Demand (2017)	Fig: **2**



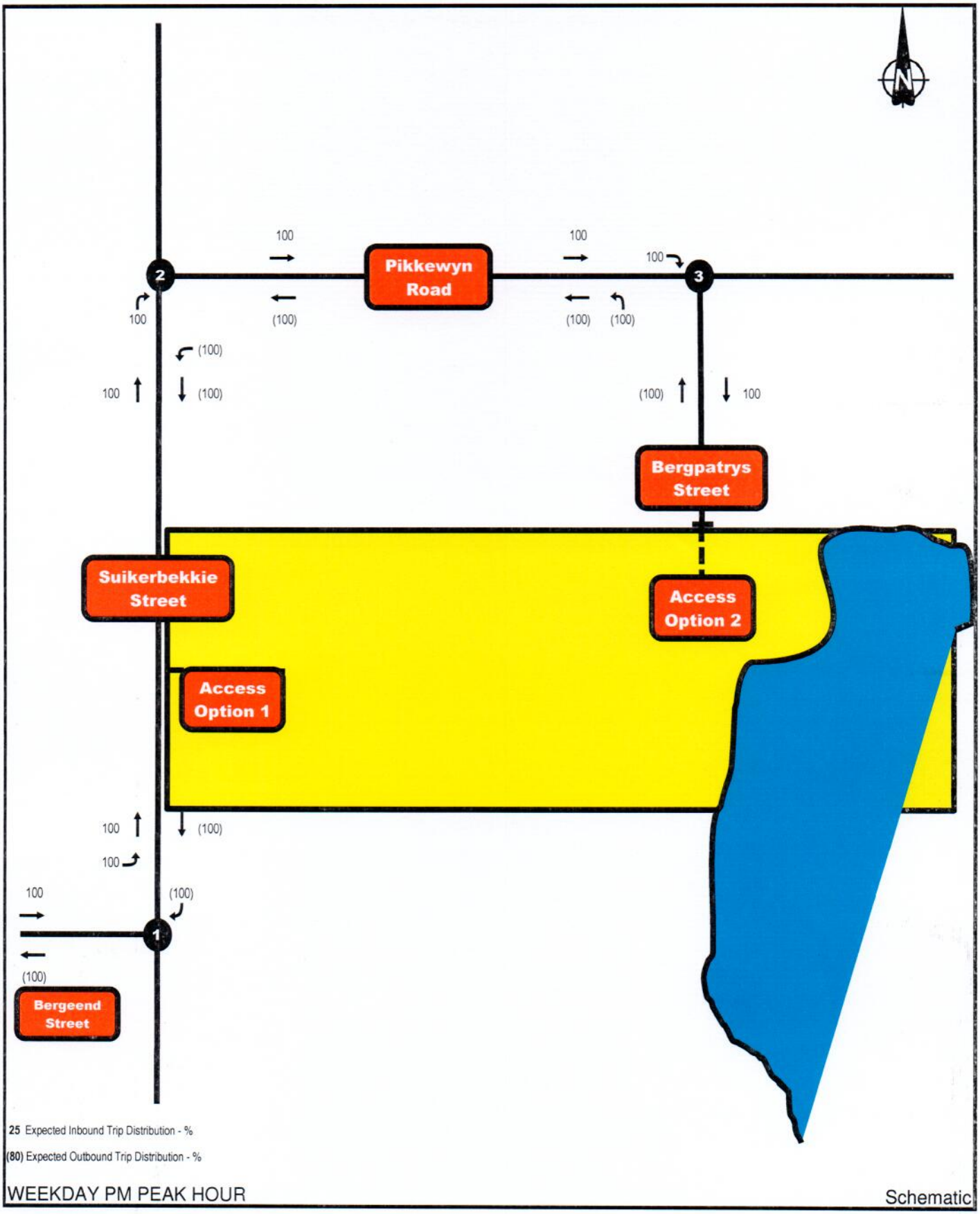
WEEKDAY PM PEAK HOUR

Schematic

route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: TRAF 1262
	Present Traffic Demand (2017)	Fig: **3**



route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: TRAF 1262
	Expected Trip Distribution	Fig: **4**



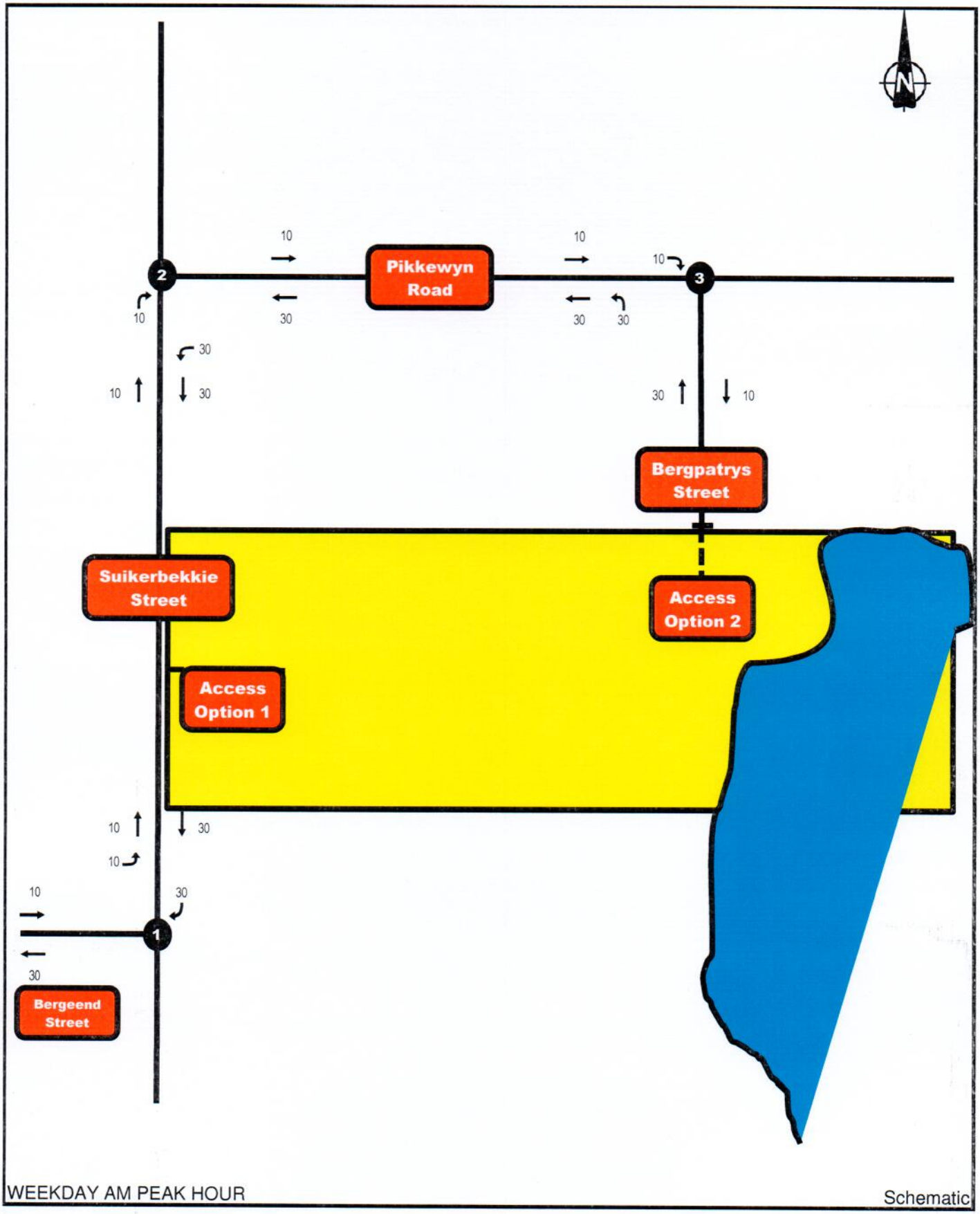
25 Expected Inbound Trip Distribution - %

(80) Expected Outbound Trip Distribution - %

WEEKDAY PM PEAK HOUR

Schematic

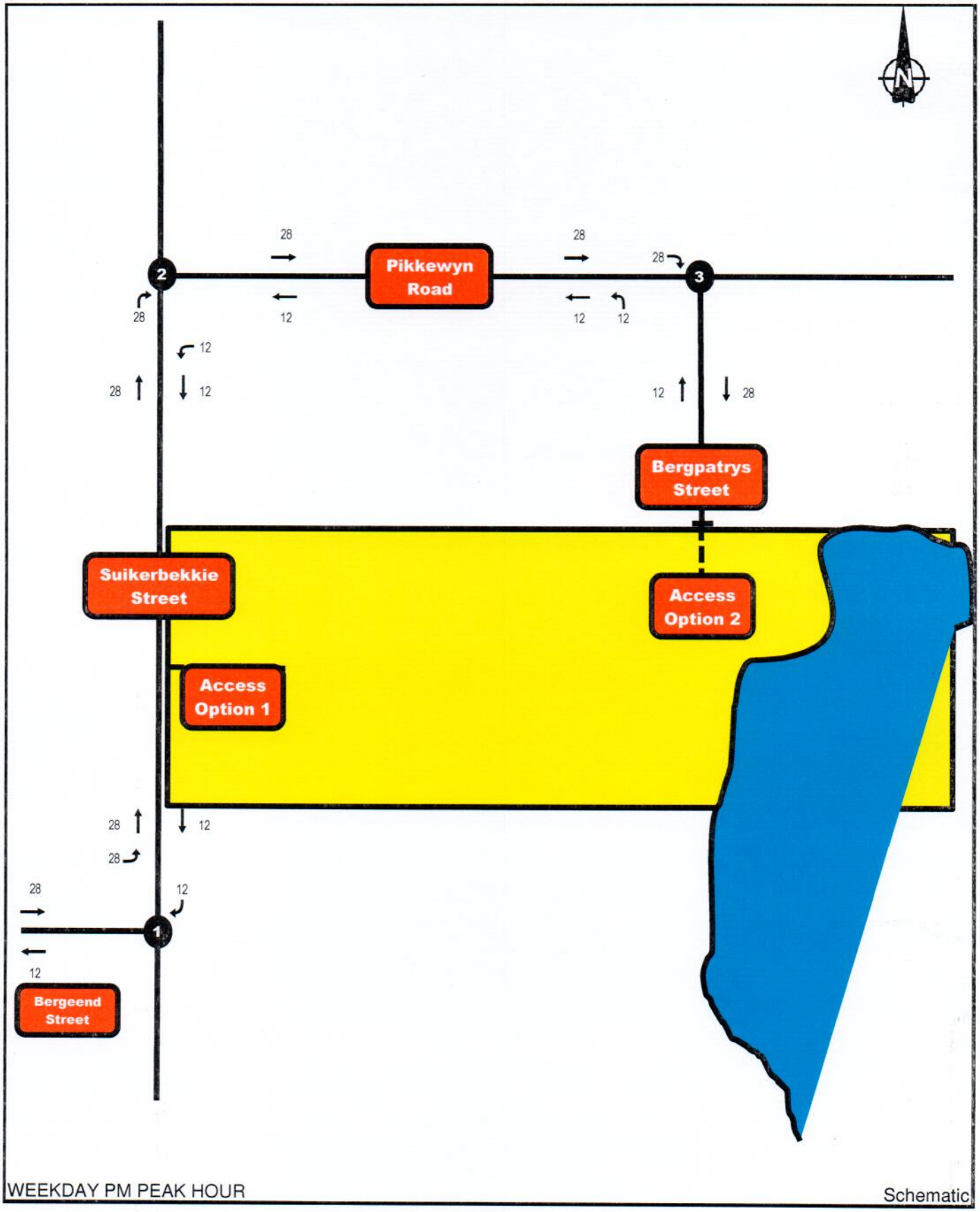
route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: **TRAF 1262**
	Expected Trip Distribution	Fig: **5**



WEEKDAY AM PEAK HOUR

Schematic

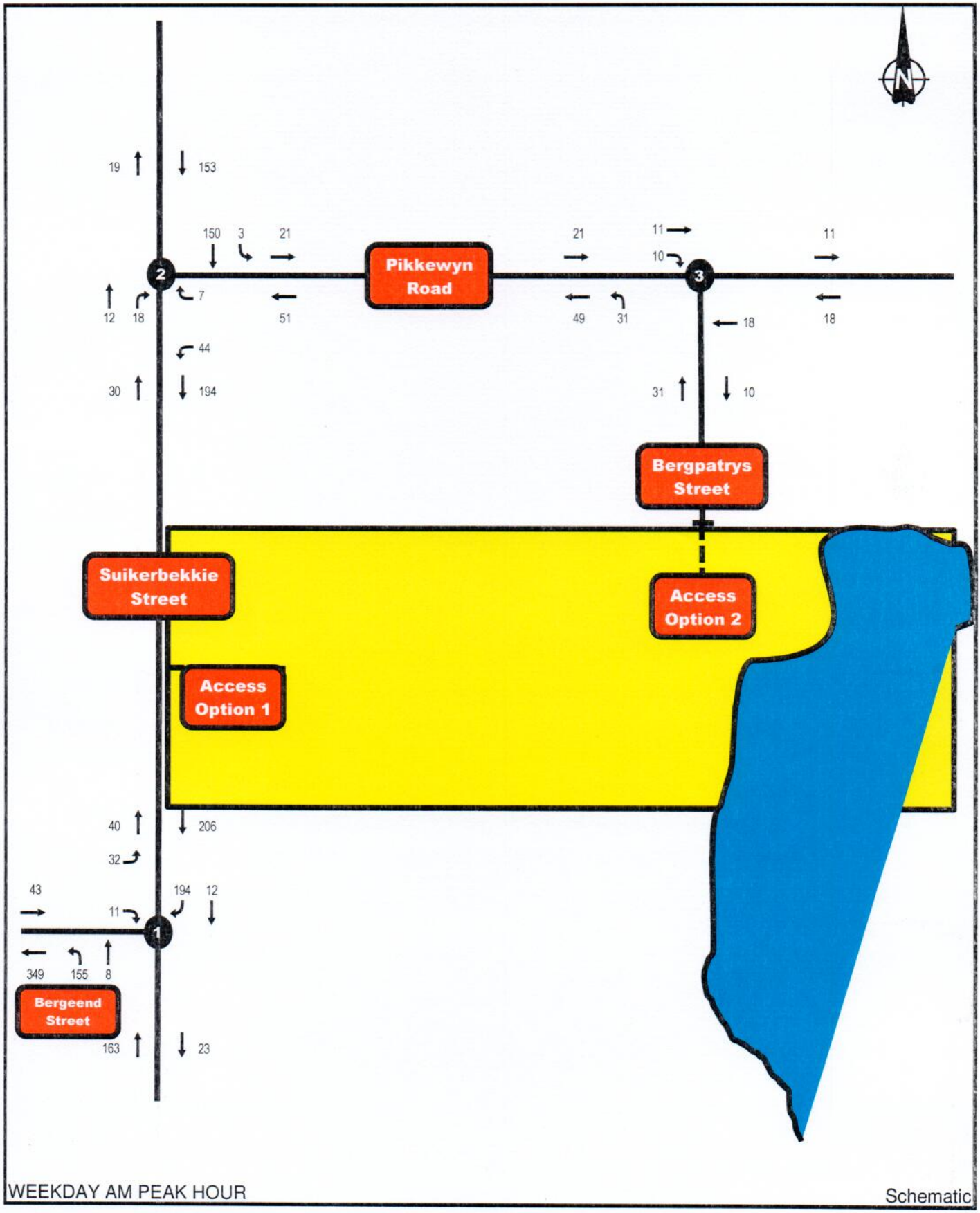
route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: **TRAF 1262**
	Development Traffic	Fig: **6**



WEEKDAY PM PEAK HOUR

Schematic

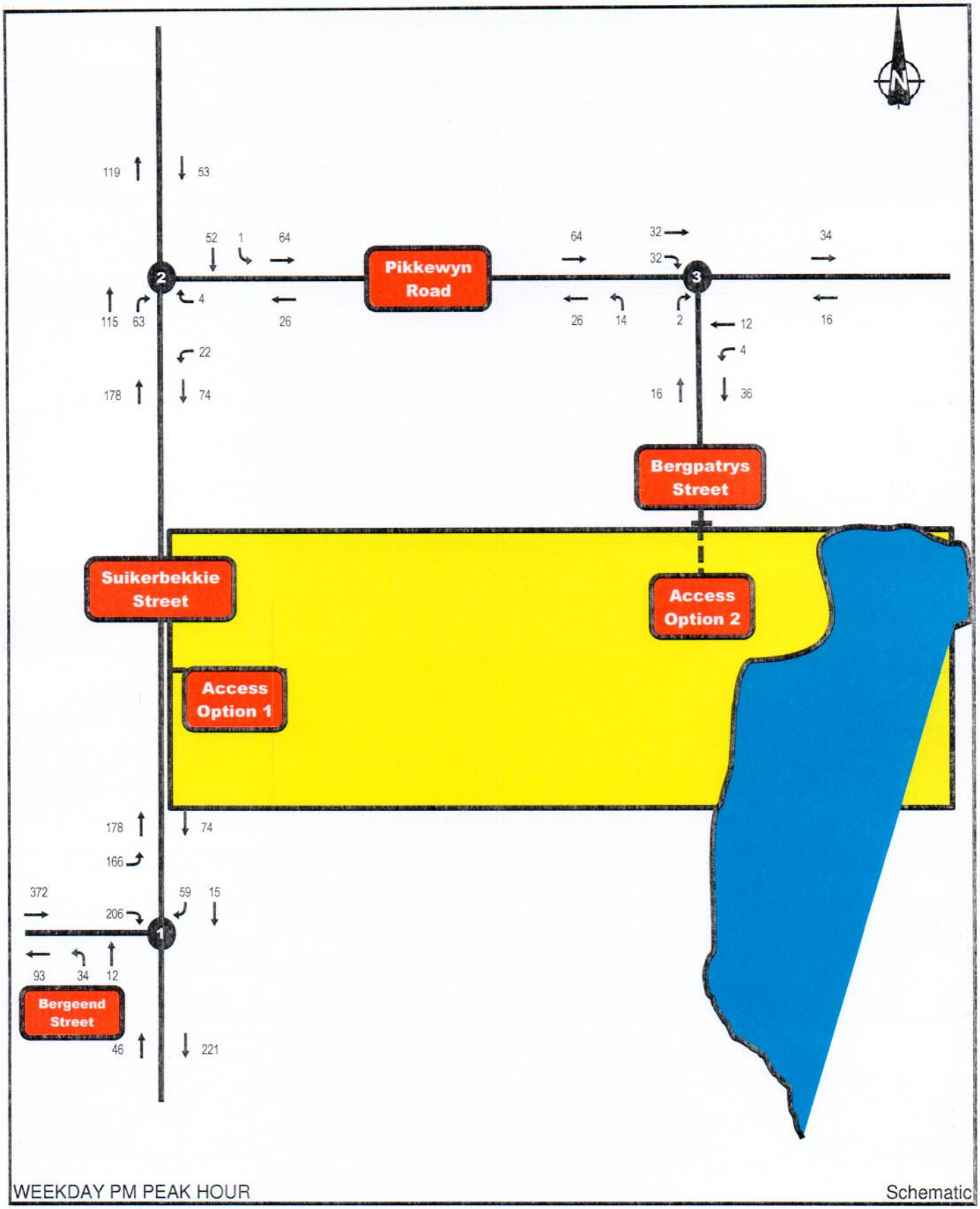
route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: TRAF 1262
	Development Traffic	Fig: **7**



WEEKDAY AM PEAK HOUR

Schematic

route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: TRAF 1262
	Present Traffic Demand plus Development	Fig: **8**



WEEKDAY PM PEAK HOUR

Schematic

route 2 transport strategies	Portion 22 Farm Mooifontein 14 IR	Job Ref No: TRAF 1262
	Present Traffic Demand plus Development	Fig: **9**