

**Portion 1 of the Farm Sims No. 463,
Kuruman (Uitkoms)**

RESIDENTIAL DEVELOPMENT

TRAFFIC IMPACT STUDY

NOVEMBER 2015



Project: 6987.01

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REPORT SHEET

Property Description:	<i>Portion 1 of the Farm Sims No. 463, Kuruman (Uitkoms).</i>
Municipal Area:	<i>Gamagara Local Municipality</i>
Application:	<i>Rezoning and subdivision</i>
Type of Report:	<i>Traffic Impact Study</i>
Project Number:	<i>6987.01</i>
Compiled By:	<i>Koot Marais Pr Eng</i>
Declaration	<i>I, Koot Marais, author of this traffic impact study, hereby certify that I am a professional traffic engineer (registration No 920023) 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 and I take full responsibility for the content, including all calculations, conclusions and recommendations made herein.</i>
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TABLE OF CONTENTS

TABLE OF CONTENTS	3
1 INTRODUCTION	5
1.1 Aim of the Study	5
1.2 Background	5
1.3 Study Area	5
1.4 Proposed Development	6
1.5 Scope of Analysis	7
1.5.1 Period for Analysis	7
1.5.2 Warrants for a Traffic Impact Study	7
1.5.3 Extent of Analysis	7
1.5.4 Assessment Years and Scenarios	8
1.6 Available Information	9
1.6.1 Traffic Counts	9
1.6.1 Latent Rights	9
2 BACKGROUND INFORMATION	11
2.1 Existing Road Network	11
2.2 Existing Land Use	11
2.3 Road Planning	12
3 TRIP GENERATION	13
3.1 Trip Generation Rates	13
3.1.1 Single Dwelling Units 210	13
3.1.2 Town Houses Multi Level 232	13
3.1.3 Places of Public Worship 560 and 561	13
3.1 Trips Generated	14
4 TRIP DISTRIBUTION	15
5 TRIP ASSIGNMENT	18
6 CAPACITY ANALYSIS	23
6.1 Intersection A: Access from Frikkie Meyer Street	24
6.2 Intersection B: Rooisand Street / Frikkie Meyer Street Intersection	26
6.3 Intersection C: Hans Coetzee Street / Frikkie Meyer Street Intersection	28
6.4 Summary	31
7 OTHER ASPECTS	33

7.1	Trip Generation during Construction	33
7.2	Public Transport Operations	33
7.3	Pedestrian Activities	33
7.4	Access Road	34
8.	CONCLUSIONS AND RECOMMENDATIONS	35
9.	REFERENCES	36

1 INTRODUCTION

1.1 Aim of the Study

The aim of this study was to determine the traffic impact of a proposed rezoning and subdivision of the **Portion 1 of the Farm Sims No. 463, Kuruman (Uitkoms)** located in Kathu.

1.2 Background

It is the intention to mainly make provision for residential development in this area. Macroplan Town and Regional Planners appointed KMA Consulting Engineers to undertake a Traffic Impact Study in support of this planned development.

The developer is: Kumba Iron Ore: Anglo American

This document reports on the expected traffic impact of the development.

1.3 Study Area

The site is located to the north of Frikkie Meyer Street and to the west of the N14, adjacent to the Kathu Equestrian Club.



Figure 1.1: Location Plan

1.4 Proposed Development

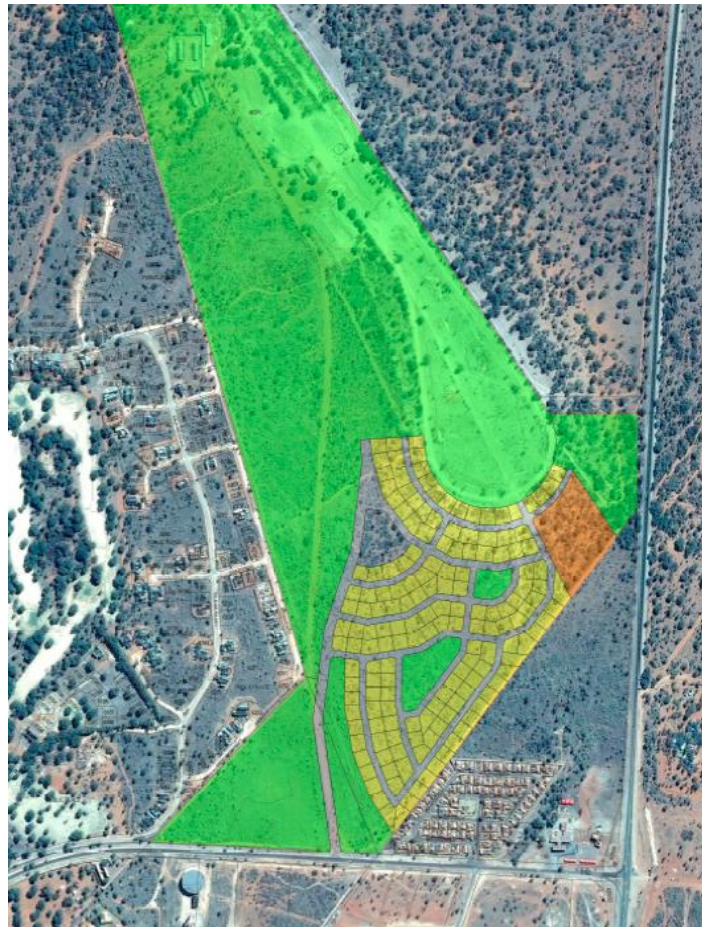


Figure 1.2 Planned Layout

In principle the development will consist of the follow:

	UITKOMS		Tot. Area		Land Units	
			Erf Size		Extent	
No	Zoning	Land Use	Total Size	Erven	Number	Units
1	Residential 1	Single Home	152261.3	163	163	Units
2	Residential 2	Group Housing	21413.7	1	64	Units
3	Open Space 1	Park	14029.8	2	2	
4	Open Space 2	Recreation	738018.7	1	1	
5	Open Space 3	Conservation	119976.1	3	3	
6	Institutional 2	Worship	8213.2	1	400	Seats
7	Transport 1	Public Street	65746.6	1	1	
	TOTAL		1119659.4			

Notes:

- The extent of development was as far as possible based on the Gamagara Scheme Regulations
- It was assumed that the church will have 400 seats
- The Open Spaces and Streets are not considered to be trip generators.

1.5 Scope of Analysis

1.5.1 Period for Analysis

Based on the type of proposed development both the morning and afternoon peak hours were investigated.

1.5.2 Warrants for a Traffic Impact Study

The development is expected to generate more than 150 peak hour trips and according to the “Manual for Traffic Impact Studies”¹, a Traffic Impact Study is warranted.

1.5.3 Extent of Analysis

All intersections where the increase in the critical lane volumes is expected to exceed 75, within 1.5 km of the development, should be analysed. Given the location of the development, the following intersections were investigated.



Figure 1.3: Intersections Analysed

- a) **Intersection A:** Access from Frikkie Meyer Street
- b) **Intersection B:** Rooisand Street / Frikkie Meyer Street Intersection
- c) **Intersection C:** Hans Coetzee Street / Frikkie Meyer Street Intersection

1.5.4 Assessment Years and Scenarios

As the development can potentially generate between 150 and 2000 trips, a 5 year horizon was assumed as recommended by the Manual.

Based on information, it is planned to start development in 2018 with 38 units. Further development will depend on the need for housing.

Due to the relatively limited size of the development phasing will not have a significant impact on the findings of the study and as a worst case scenario full development was assumed in the base year.

Although a 3% per annum growth rate is normally assumed, traffic in the Kathu area has grown at a higher rate in recent times. This growth can mostly be attributed to major developments in the area and as these are included as latent rights (See Section 1.6.2) assumption of a high traffic growth in addition to the latent rights might result in an overestimation. As a result, a 3% per annum growth rate was assumed.

1.6 Available Information

1.6.1 Traffic Counts

Traffic counts were undertaken during the period 8 to 10 November 2015.

1.6.1 Latent Rights

The following developments, which are expected to be implemented, but are not yet fully developed, were taken into consideration as latent rights. The details of these developments were obtained from the relevant professional teams and/or reports on the planned developments. It was however in some instances necessary to re-determine the trip generation and trip distribution of the relevant areas for the purposes of this report.

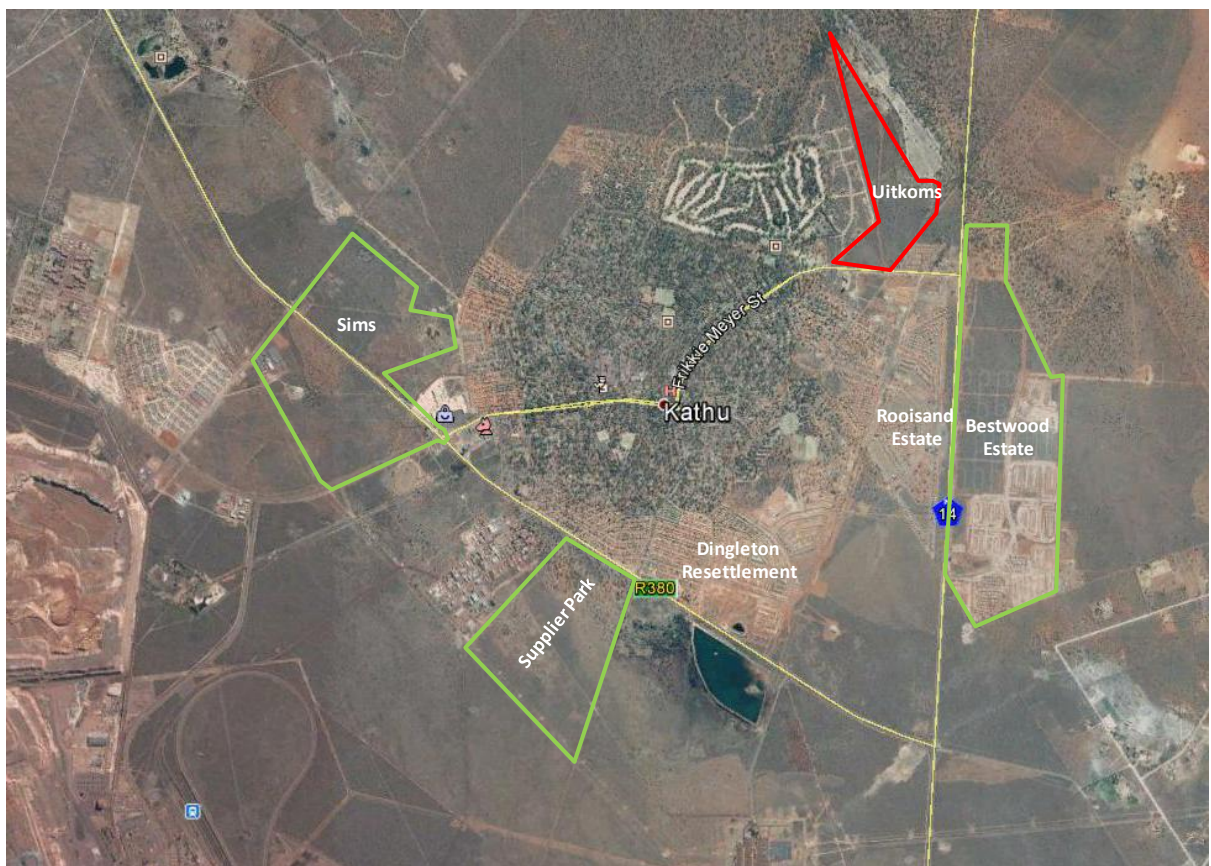


Figure 1.4 Possible Latent Rights

a) Rooisand Estate

It was assumed that this development was mostly completed at the time of the traffic counting and no additional trip generation was assumed.

b) Bestwood Estate

Based on information obtained, the development will consist of the following:

- **Phase 1** will consist of 1 600 single residential units and 1 600 flats. It was assumed that half of the development has been completed.

- **Phase 2** will include 2 000 single residential units, a primary and secondary school, as well as commercial development. This portion was still vacant at the time of traffic counting. The expected trip generation of this phase was included in the analysis.
- **Phase 3** is a long-term development of approximately 5 000 housing units as well as industrial development. As this is a long term project, of which the actual implementation is uncertain, the possible trip generation was not considered.

c) Kathu Supplier Park

This development will consist of industrial, warehousing, a logistics centre, etc. The development was not yet implemented at the time of the study. The expected trip generation of this development was included in the analysis.

d) Dingleton Re-settlement Project

Approximately 700 families from Dingleton were resettled in the Kathu area. It was assumed that this project was more or less completed at the time of traffic counting. It is also not expected that this development will have a significant impact on the development under consideration

e) Sims: Remainder and Portion 1 of the Farm Sims No. 462

This development was planned at the time of this study and is of a significant size. The development was not yet approved and due to its location will not have a noticeable impact in the study area of the development under consideration and was thus not included.

2 BACKGROUND INFORMATION

2.1 Existing Road Network

The most important roads in the area are the following:

a) N14

This road is a two-lane undivided road in the area and is the main road between Gauteng and the Northern Cape Province.

b) Frikkie Meyer Street

This is the main access road to Kathu and links the town with the N14. The road is a two-lane undivided road and has no sidewalks in the area of the development. Some sections are widened to four lanes.

c) Rooisand Street

This two-lane street has a south-north orientation and mainly provides access to the Rooisand Housing Development and shopping centres.

d) Hans Coetzee Street

This north-south road connects the golf course and residential areas with Frikkie Meyer Street.

2.2 Existing Land Use

The area to be developed is currently vacant apart from the Kathu Equestrian Club, which is also located on the site.



Photo 1: Development site as seen from the access road to the Equestrian Club

2.3 Road Planning

There is no known road planning that will directly affect the development, other than the new roads that will be developed as part of developments.

3 TRIP GENERATION

3.1 Trip Generation Rates

Relevant trip generation rate descriptions as per the TMH 17⁸ are as follows:

3.1.1 Single Dwelling Units 210

Single dwelling units are detached houses on individual erven. The units usually have individual accesses to streets.

3.1.2 Town Houses Multi Level 232

Dwelling units provided in clusters in multi-level complexes. Individual townhouses can be provided on different levels. Individual townhouse could consist of one storey or could be multi-storeyed.

3.1.3 Places of Public Worship 560 and 561

560: Places of public worship which normally operate on weekends (e.g. Saturdays or Sundays).

561: Places of public worship which normally operate during the week (e.g. Friday).

(Trip generation rates are very similar during the weekday peak hours.)

3.1 Trips Generated

The planned development could generate the following trips for the different options.

Table 3.1: Potential trip generation of development

No	Land Use	No	Unit	Reduction Factors					AM PEAK								PM PEAK							
				Pm Mixed	Pv Low	Pv V Low	Pt Transp	Pc	TGR	TGR Reduc	Split In Out		AM	AM Reduc	In	Out	TGR	TGR Reduc	Split		PM	PM Reduc	In	Out
Residential																								
210	Single Dwelling		unit	10%	40%	70%	15%		1.00		25%	75%					1.00		75%	25%				
210	Single Dwelling	163	unit	10%				0.1	1.00	0.90	25%	75%	163	147	37	110	1.00	0.90	75%	25%	163	147	110	37
232	Townhouses (multi level)		unit	15%	30%	50%	15%		0.75		25%	75%					0.75		70%	30%				
232	Townhouses (multi level)	64	unit	15%				0.15	0.75	0.64	25%	75%	48	41	10	31	0.75	0.64	70%	30%	48	41	29	12
Institutional																								
560	Places of Worship (weekday)		Seat	10%	50%	80%	15%		0.05		55%	45%					0.05		50%	50%				
560	Places of Worship (weekday)	400	Seat	10%	50%			0.55	0.05	0.02	55%	45%	20	9	5	4	0.05	0.02	50%	50%	20	9	5	5
Total													231	197	52	145					231	197	143	53

4 TRIP DISTRIBUTION

The following figures show the expected trip distribution. Trip distribution was based on the analogue method with consideration of graphical distributions.

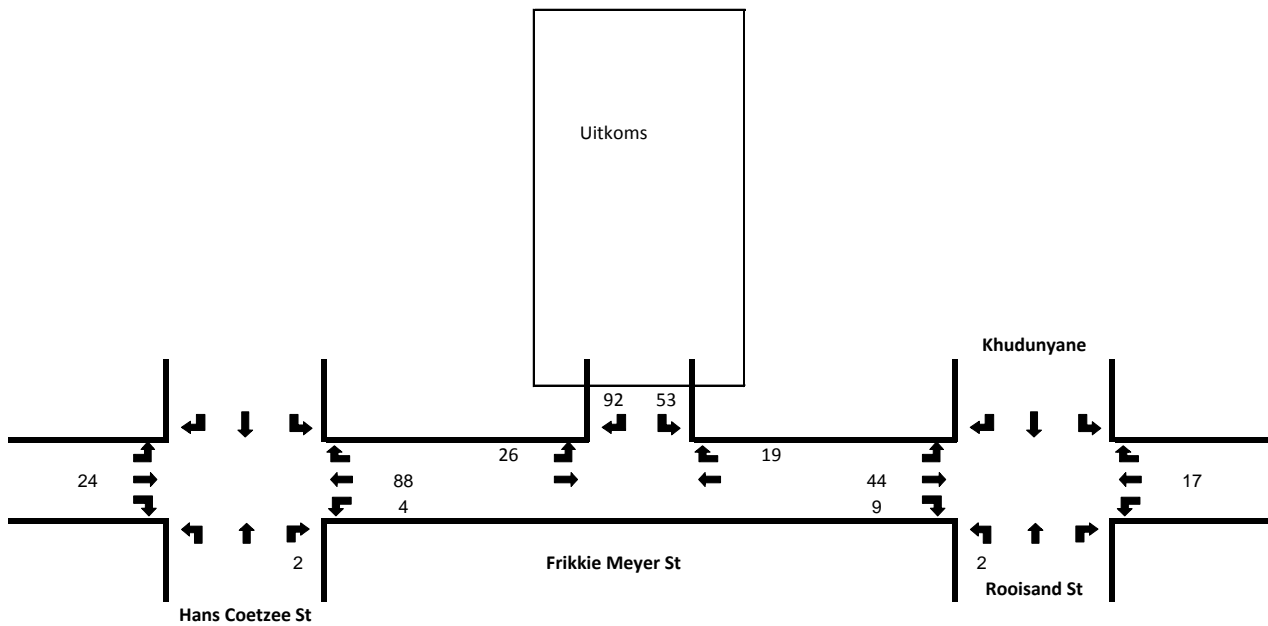


Figure 4.1a AM Peak Trip Distribution

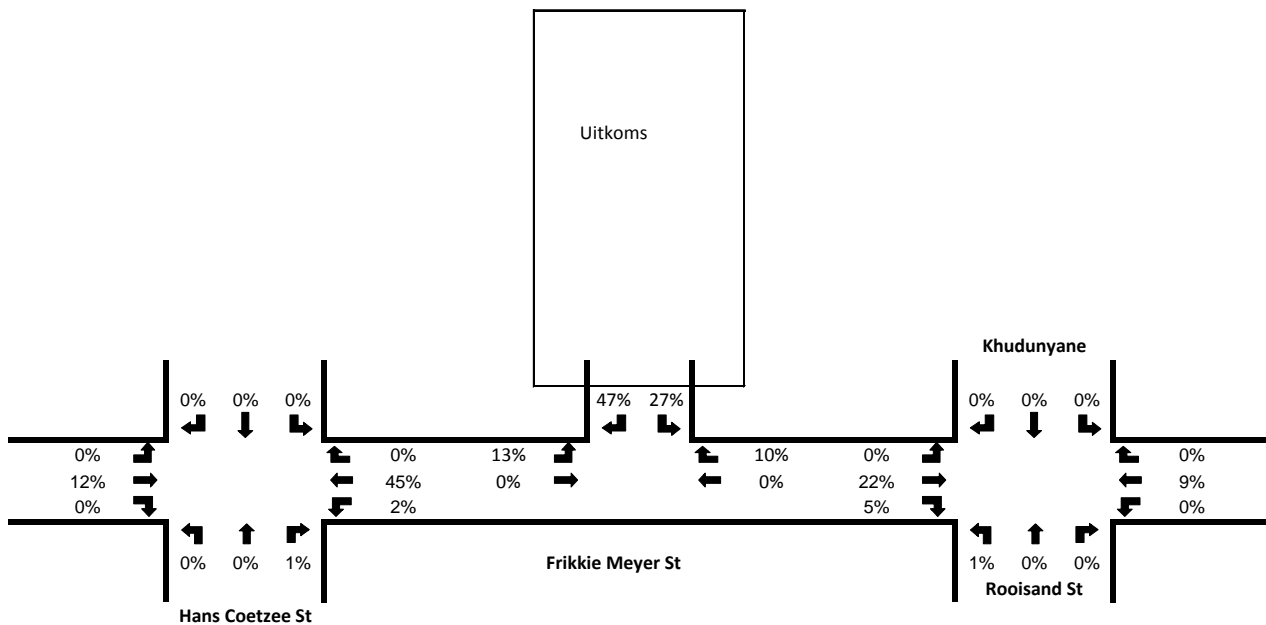


Figure 4.1b AM Peak Trip Distribution

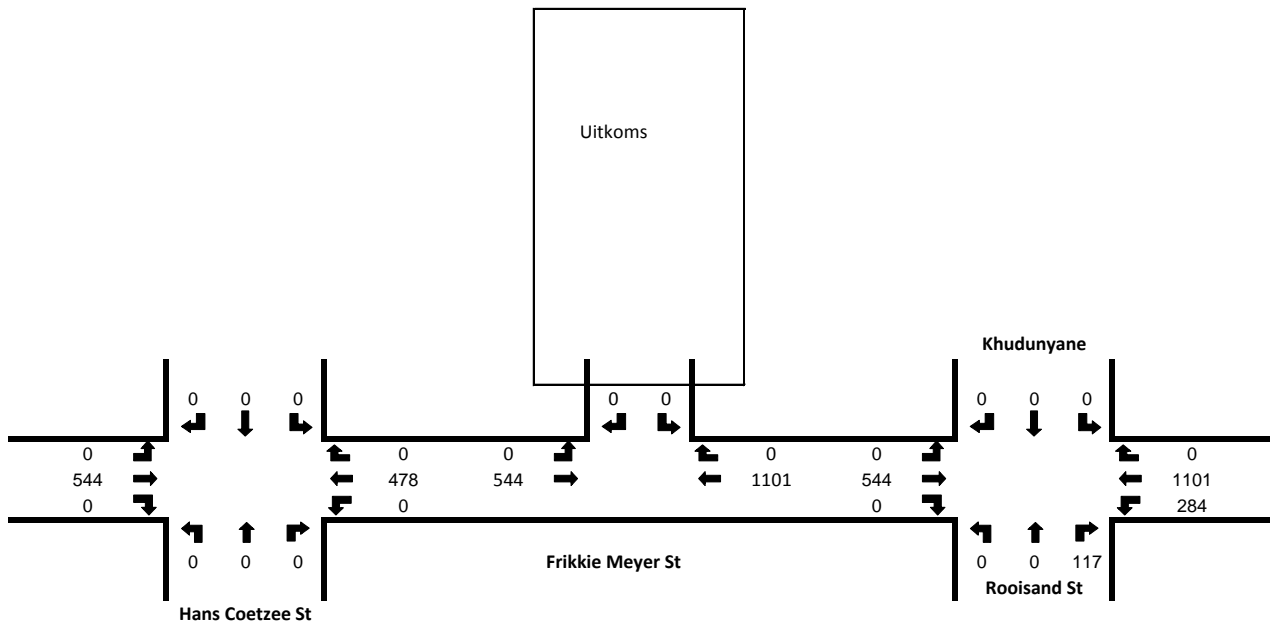


Figure 4.1c AM Latent Rights

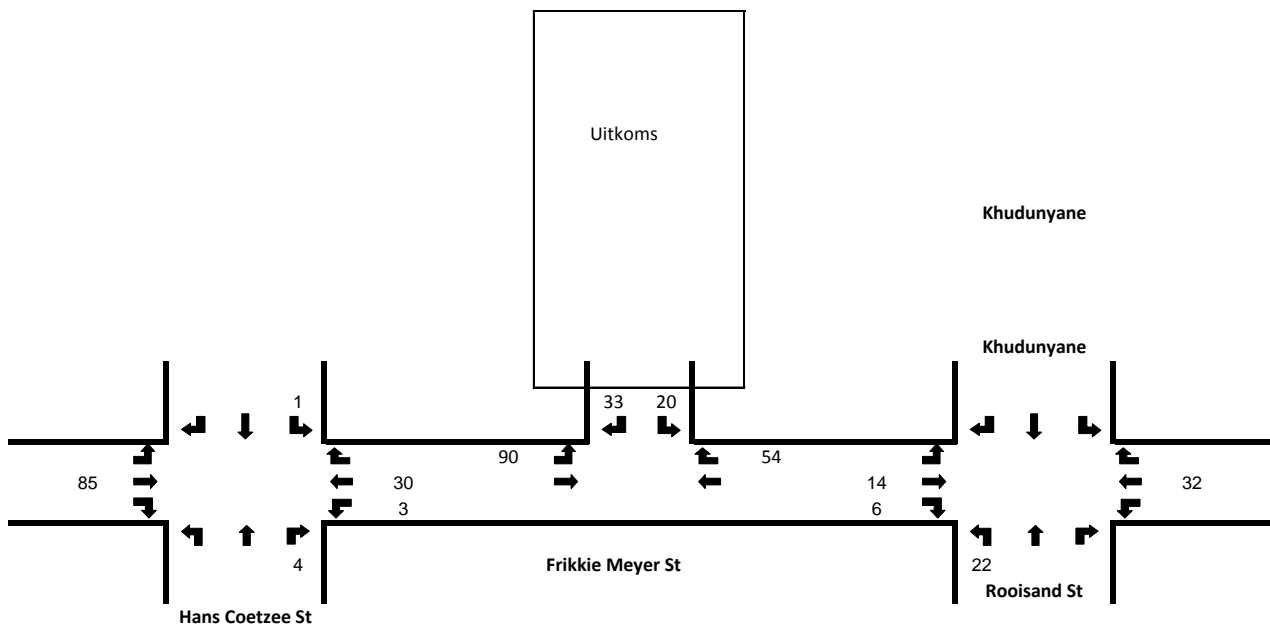


Figure 4.2a PM Peak Trip Distribution

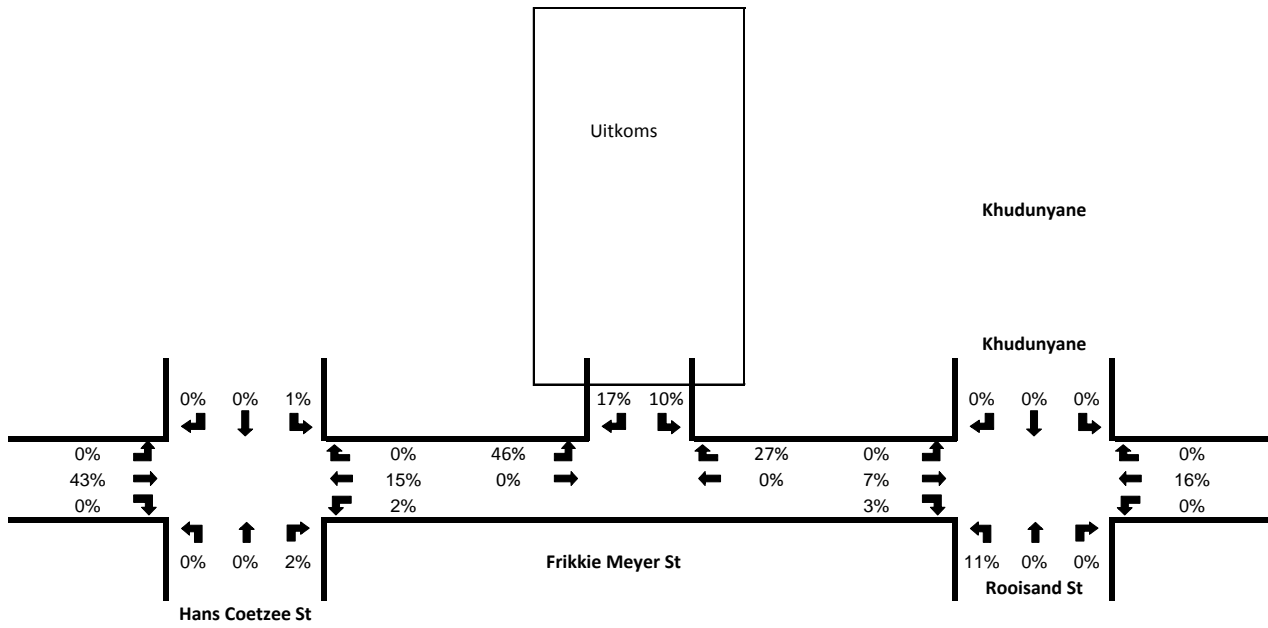


Figure 4.2b PM Peak Trip Distribution

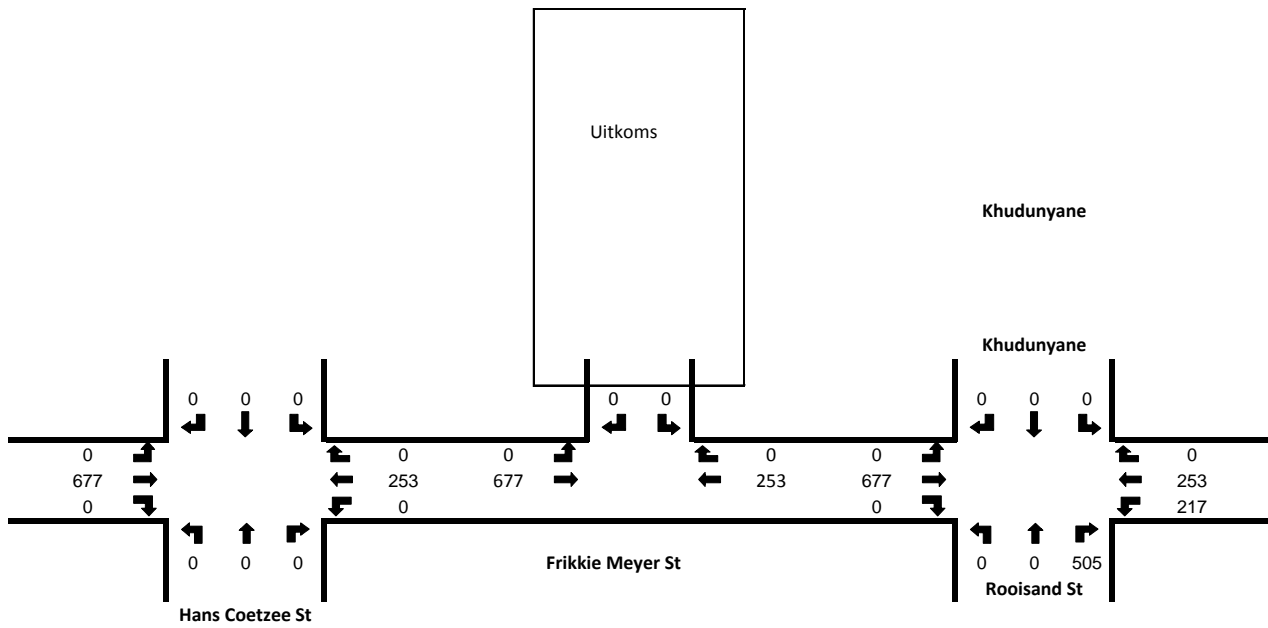


Figure 4.2c PM Latent Rights

5 TRIP ASSIGNMENT

The generated trips have been assigned to the background traffic volumes. The following figures show the traffic volumes for the different scenarios.

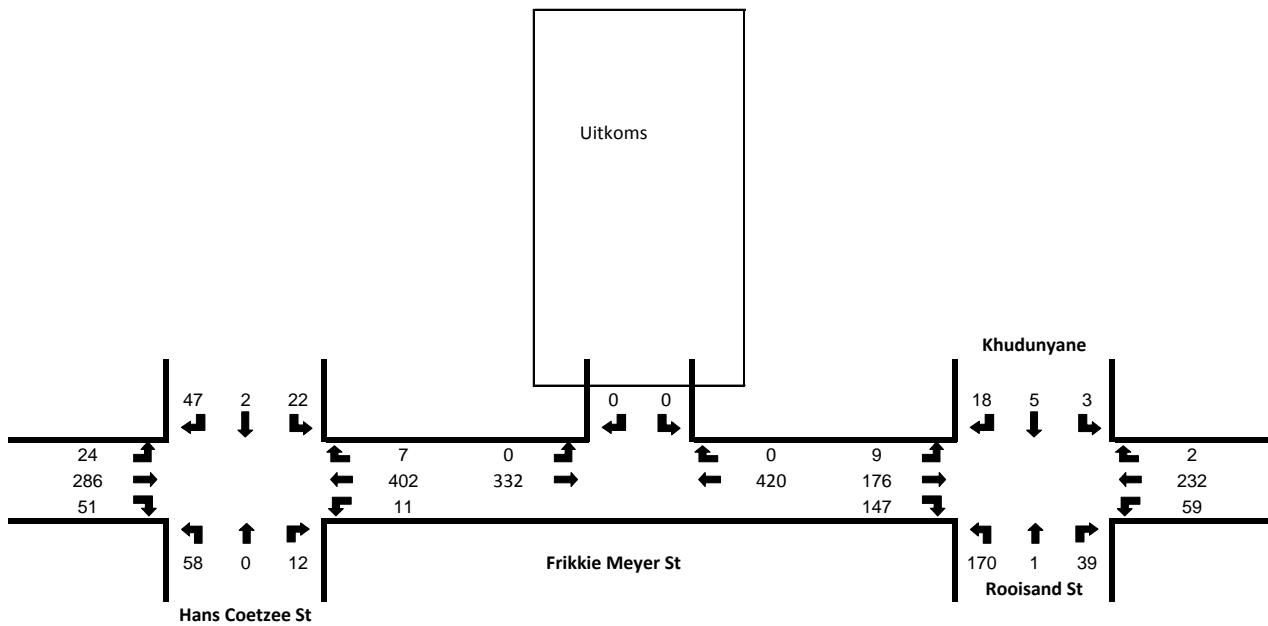


Figure 5.1a: 2015 AM Peak Volumes

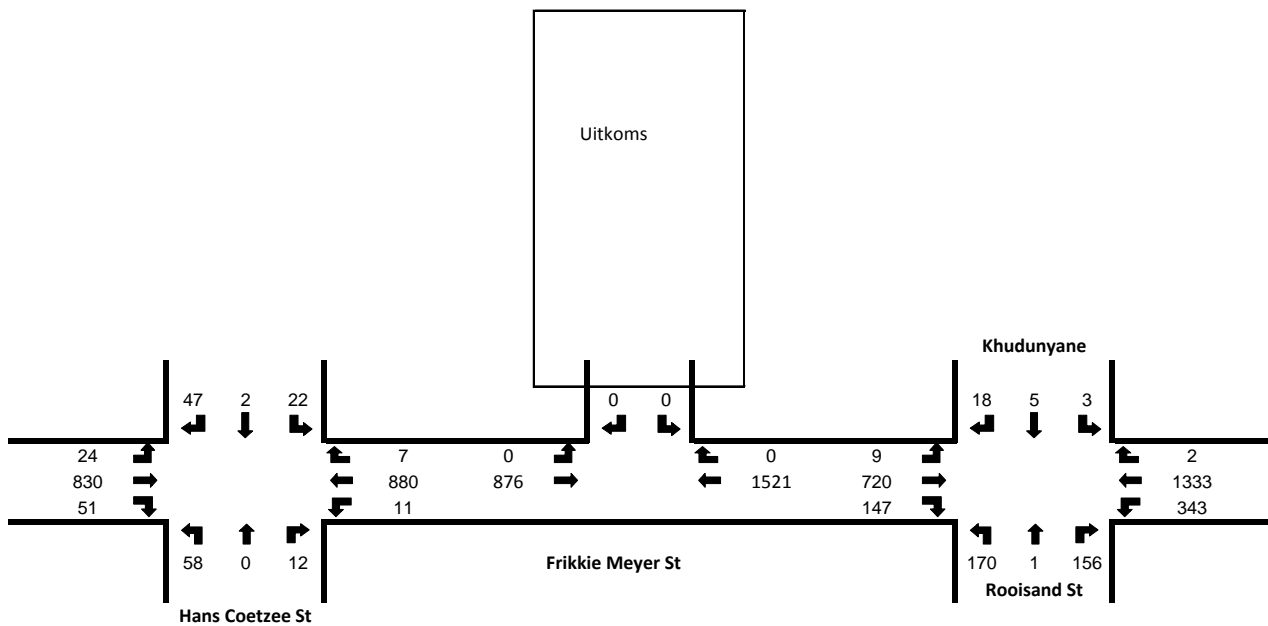


Figure 5.1b: 2015 AM Background Peak (including latent rights)

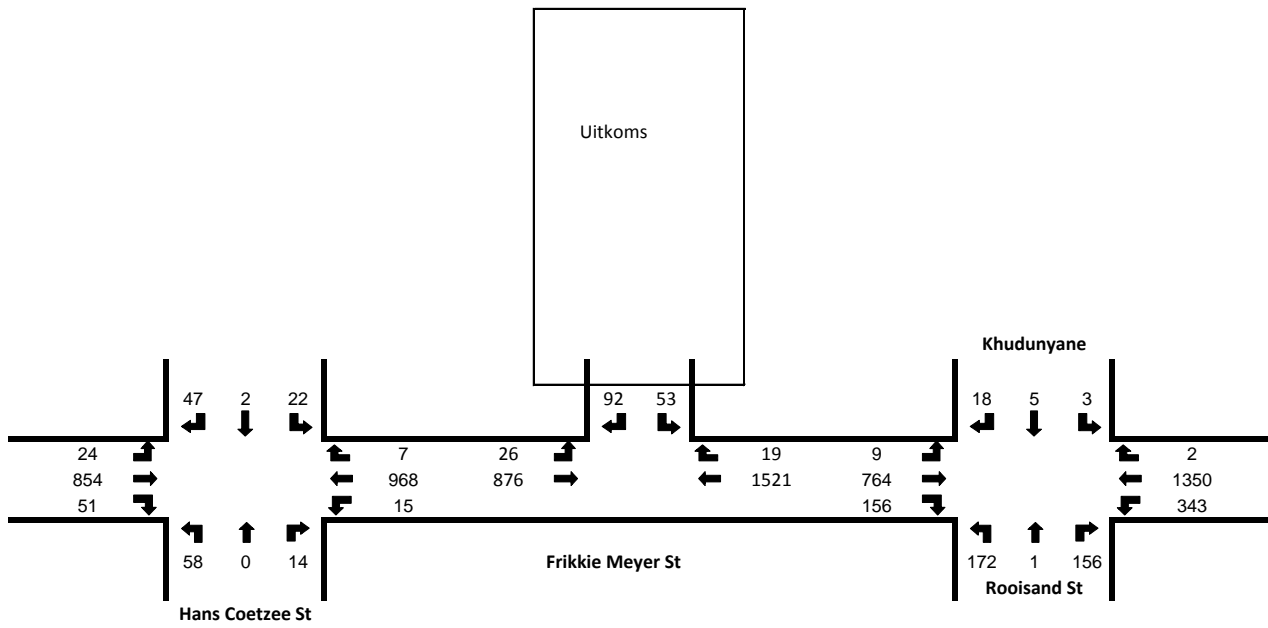


Figure 5.2: 2015 AM Background Peak with full development

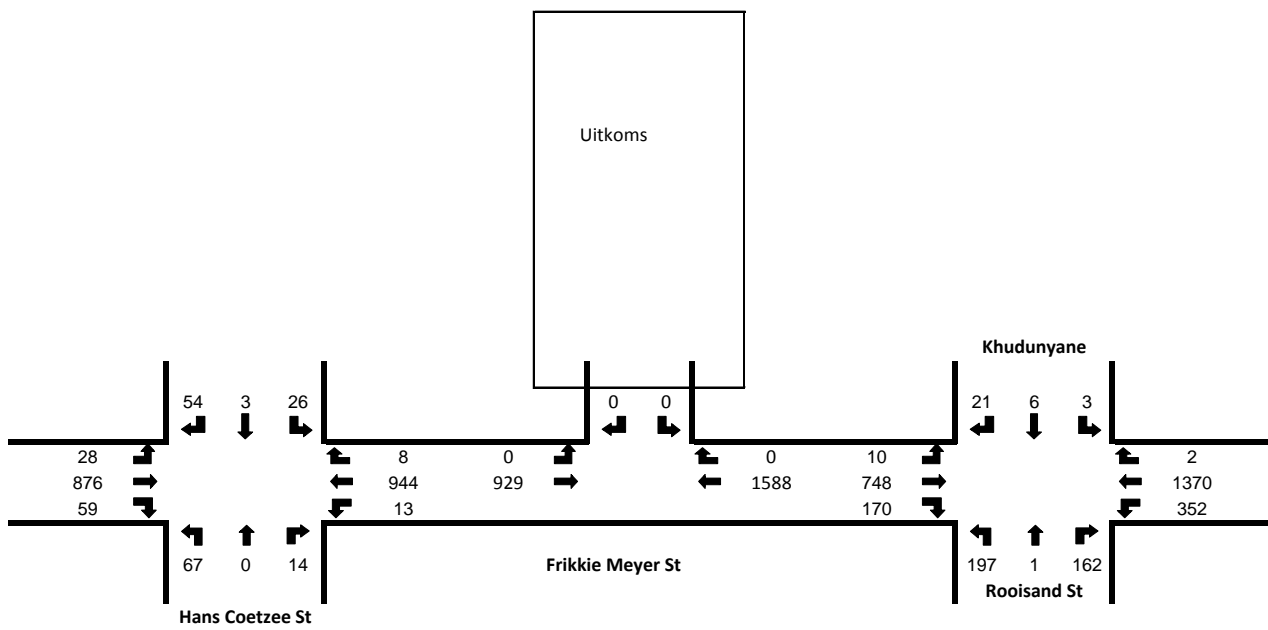


Figure 5.3: 2020 AM Background Peak (including latent rights)

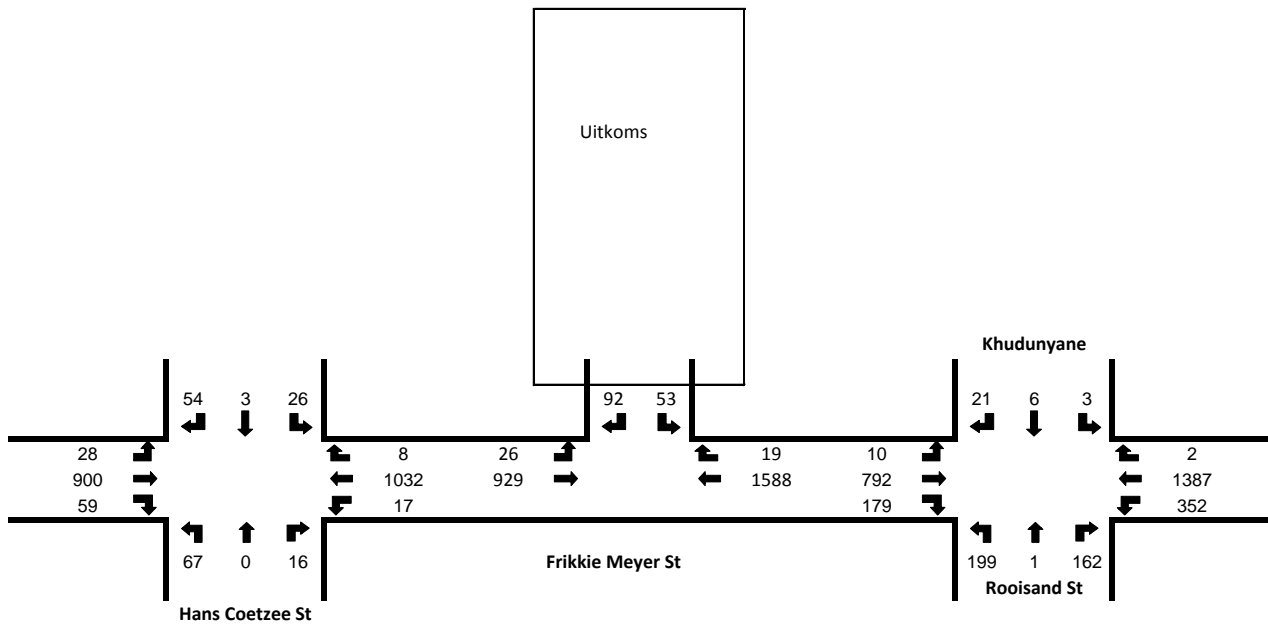


Figure 5.4: 2020 AM Background Peak with development

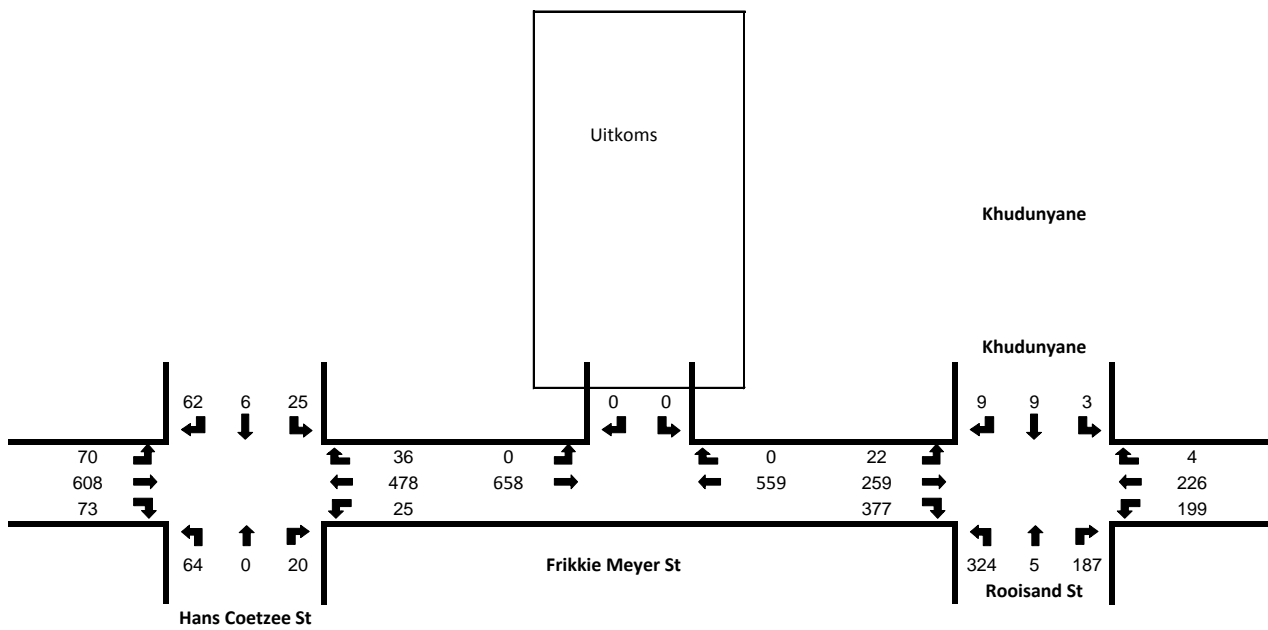


Figure 5.5a: 2015 PM Peak Volumes

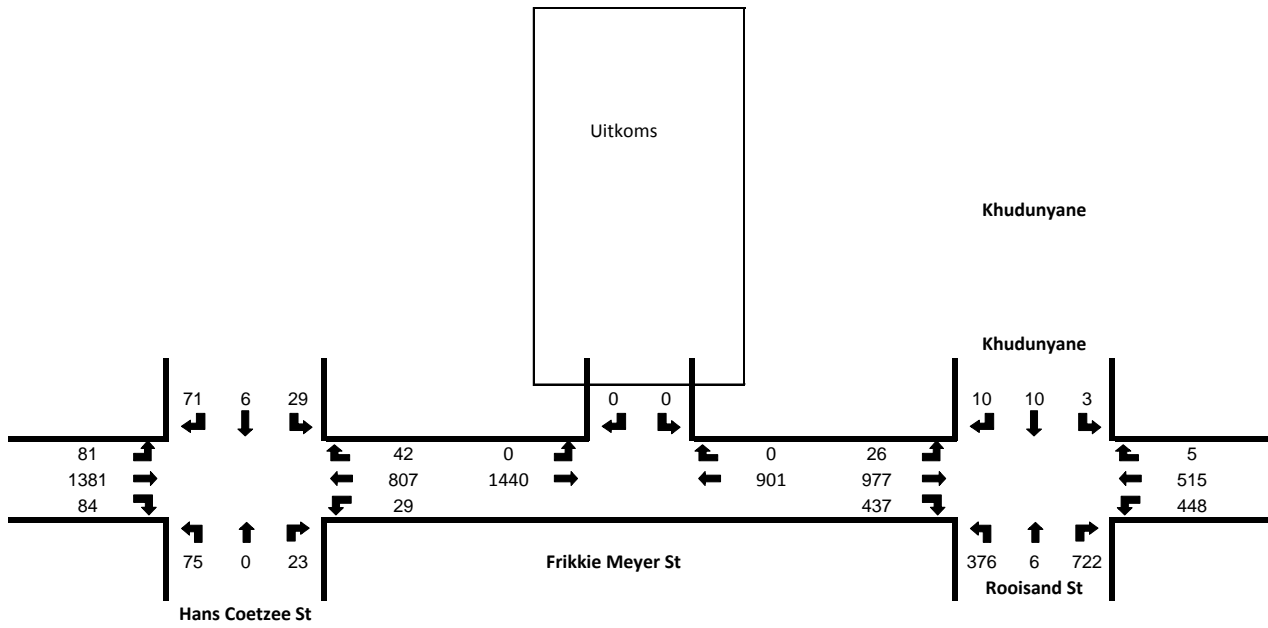


Figure 5.7: 2020 PM Background Peak (including latent rights)

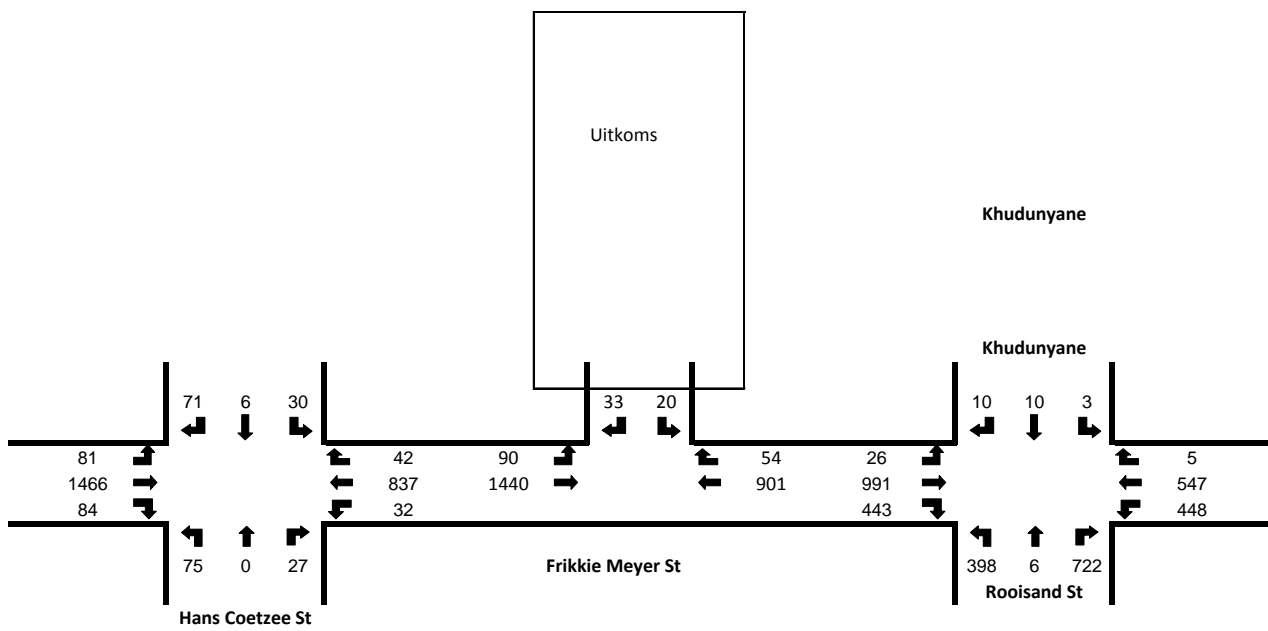


Figure 5.8: 2020 PM Background Peak with development

6 CAPACITY ANALYSIS

Capacity analyses were performed by means of the SIDRA program. The tables below show the Levels of Service of the different traffic movements. Levels of Service (LOS) give an indication of operational characteristics in a traffic stream and their perception by motorists and passengers. Levels of service A to D are usually assumed to be acceptable, with LOS E regarded as the maximum flow rate, or capacity of the facility.

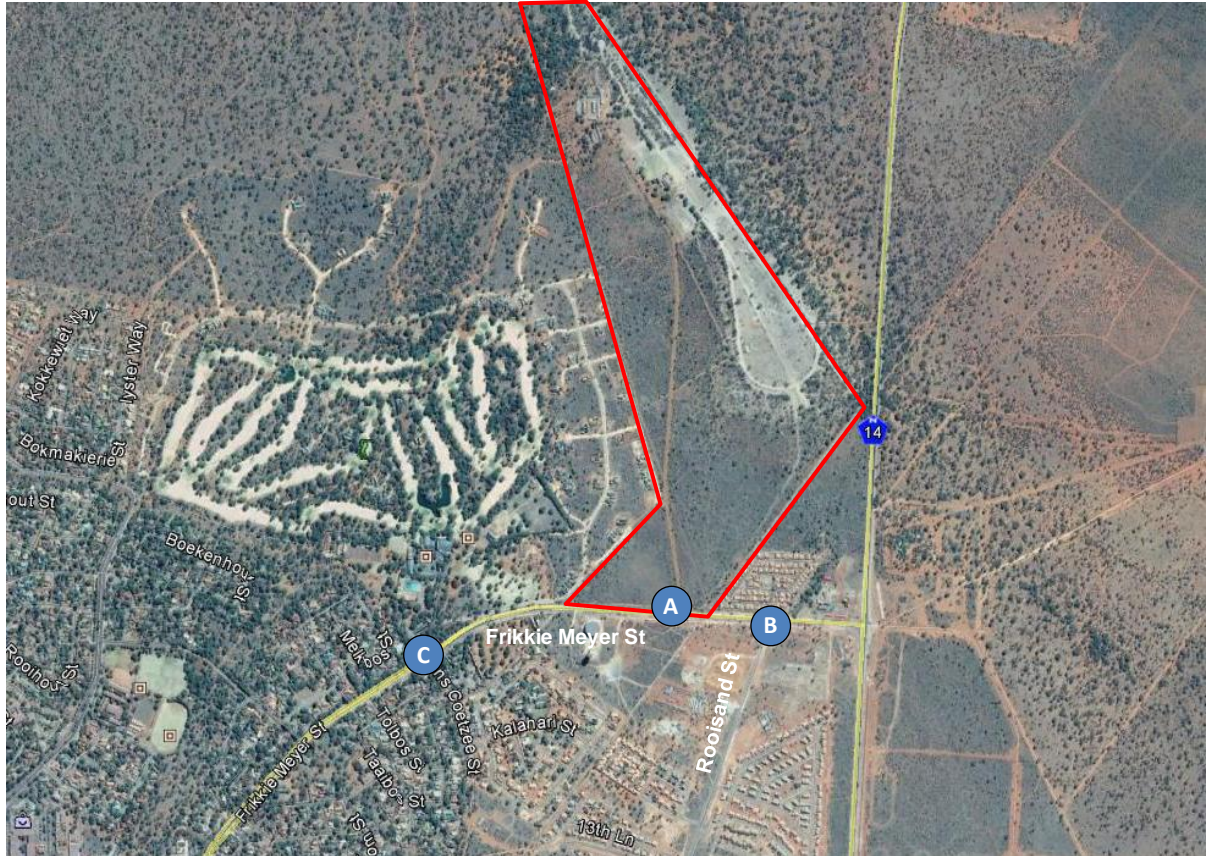
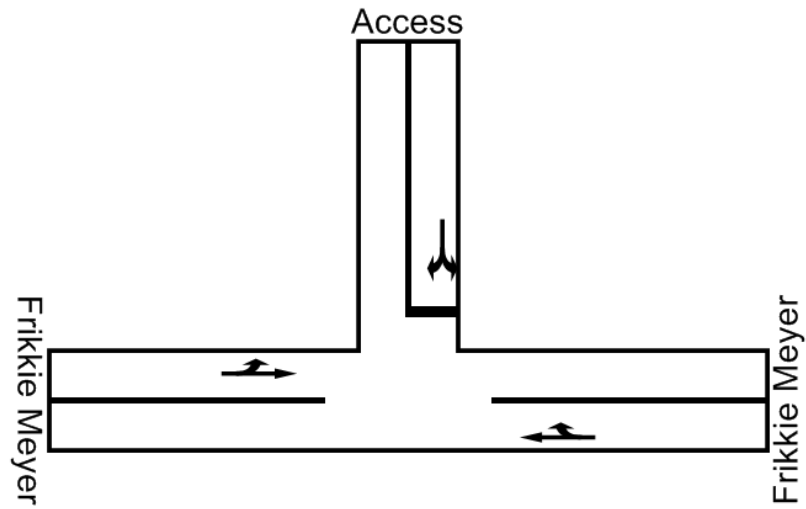


Figure 1.3: Intersections Analysed

- a) **Intersection A:** Access from Frikkie Meyer Street
- b) **Intersection B:** Rooisand Street / Frikkie Meyer Street Intersection
- c) **Intersection C:** Hans Coetzee Street / Frikkie Meyer Street Intersection

6.1 Intersection A: Access from Frikkie Meyer Street

The current layout is as shown below:



Current Layout



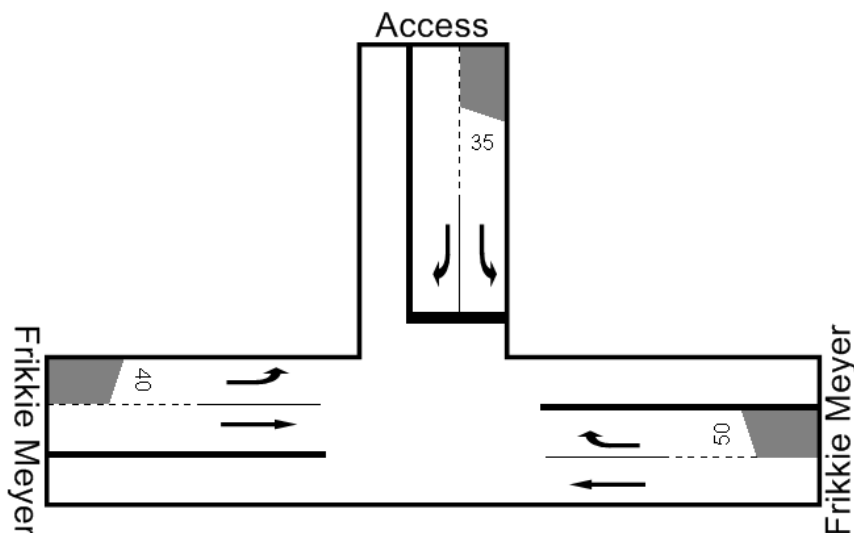
Photo 2: Intersection as seen from Frikkie Meyer Street

Levels of service at this intersection will be as follows:

Intersection: Access from Frikkie Meyer		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
1b	2015 AM Background Peak	F		F		F	F				A	A	
5b	2015 PM Background Peak	F		F		F	F				A	A	

The intersection is therefore expected to experience capacity problems with the latent rights; even before implementation of the development under consideration. The situation could be acceptable if only side road traffic is expected to experience capacity problems based on the principle contained in the Manual for Traffic Impact Studies, namely "It may, however be acceptable if individual movements are operating at LOS E or even F, if the traffic volumes affected are low" The fact that through traffic will experience capacity problems is however not acceptable and turning lanes should as a minimum be provided. Not only will this improve capacity, but will also improve road safety.

The recommended priority controlled intersection is as follows:



Recommended Layout

This will result in the following levels of service for the worst case scenarios.

Intersection: Access from Frikkie Meyer		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
4	2020 AM Peak with Development	C		F		A	C				A	A	
8	2020 PM Peak with Development	F		F		A	D				A	A	

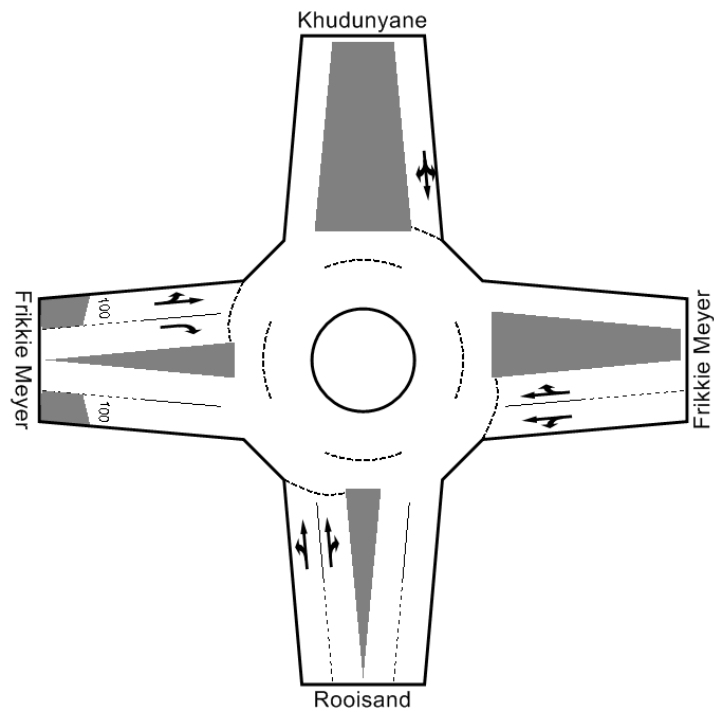
Although levels of service will not be acceptable for all movements, this is acceptable based on the mentioned principle. The intersection will not qualify for all way stop control or signalisation (traffic lights).

Provision of turning lanes will have a significant impact on queue lengths as shown below.

Intersection A		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
95th Percentile Queues (Vehicles)													
4	2020 AM Peak Hour with development	72.0		72.0		72.1	72.1				0.0	0.0	
4a	2020 AM Peak Hour with development (upgraded)	0.9		32.4		0.0	0.2				0.0	0.0	
8	2020 PM Peak Hour with development	17.1		17.1		267.1	267.1				0.0	0.0	
8a	2020 PM Peak Hour with development (upgraded)	1.0		6.8		0.0	2.3				0.0	0.0	

6.2 Intersection B: Rooisand Street / Frikkie Meyer Street Intersection

The recently established traffic circle is shown below:



Current Layout

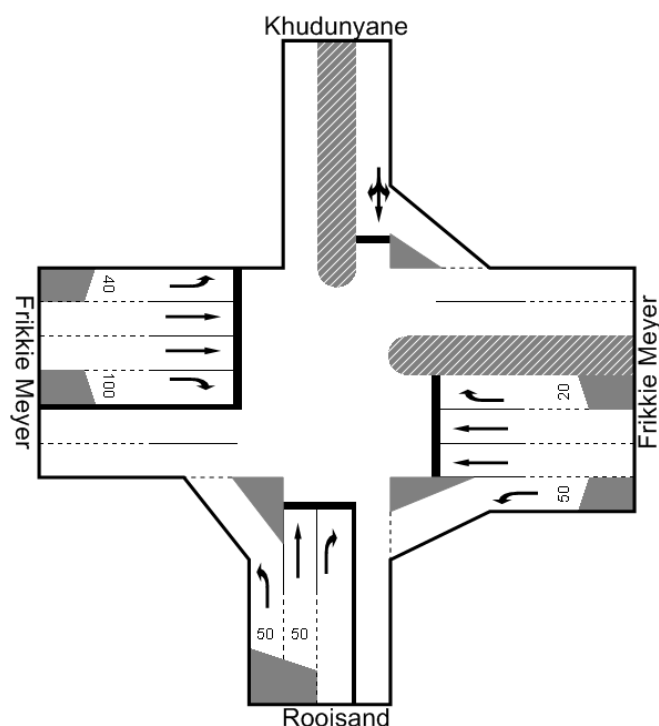


Photo 3: Intersection as seen from the west

Levels of service at this intersection will be as follows:

Intersection: Roosand / Frikkie Meyer		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
1	2015 AM Peak Volumes	A	A	B	A	A	B	A	A	B	A	A	B
1b	2015 AM Background Peak	A	A	B	A	A	B	B	B	B	A	A	B
5a	2015 PM Peak Volumes	A	A	B	A	A	B	A	A	B	A	A	B
5b	2015 PM Background Peak	C	C	C	A	A	B	B	B	B	E	E	E
8	2020 PM Peak with Development	D	D	D	A	A	B	B	B	C	F	F	F

As shown, the traffic circle is currently operating acceptably, but will experience capacity problems during the afternoon peak with the latent rights, irrespective of whether the development under consideration is implemented or not. The Traffic Impact Study for the Roosand Square Shopping Centre on Erven 9687 to 9693 (2189, 12190 and 12191) recommended that the intersection should be signalised as shown below. Unfortunately this layout was not implemented.



Required Upgraded Signalised Layout

Worst-case levels of service with this layout will be as follows:

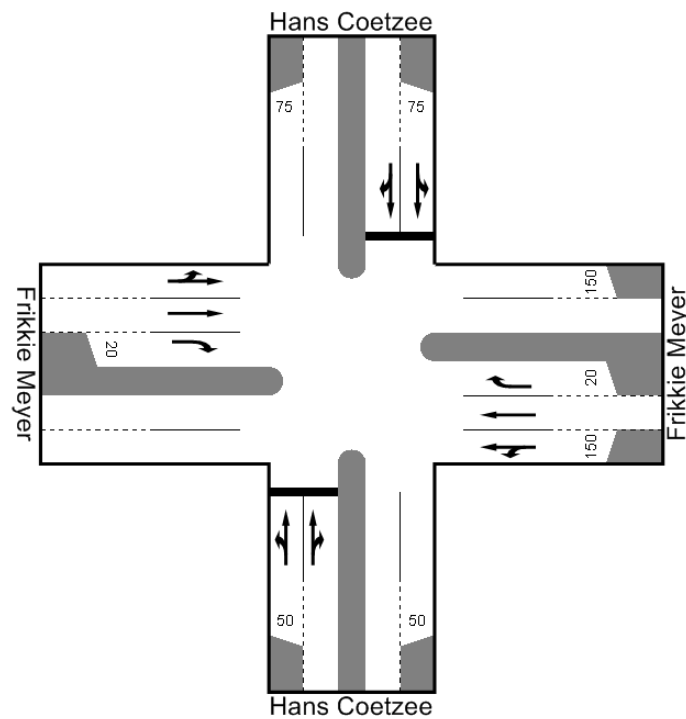
Roosand / Frikkie Meyer		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
8	2020 PM Peak with Development	B	A	B	A	B	C	A	C	D	B	B	D

6.3 Intersection C: Hans Coetzee Street / Frikkie Meyer Street Intersection

The current layout is shown below.



Photo 4: Intersection as seen from the south



Current Layout

Levels of service at this intersection will be as follows.

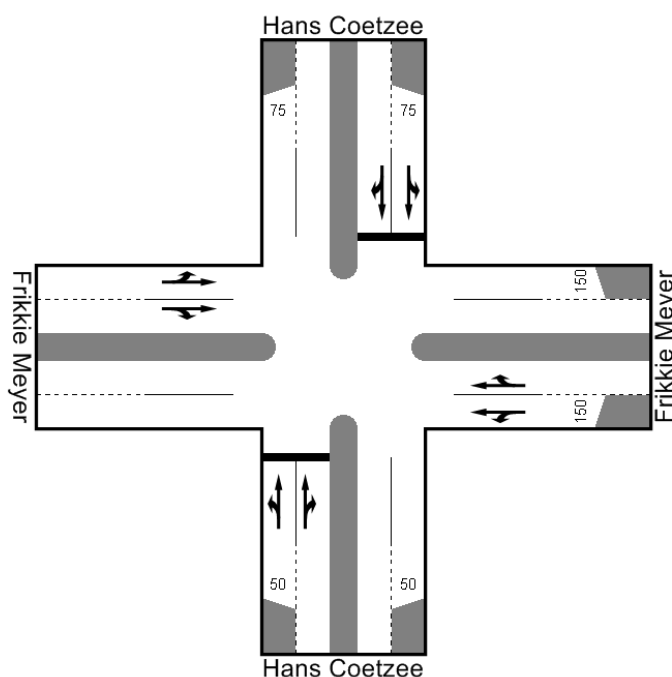
Intersection: Hans Coetzee / Frikkie Meyer		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
1a	2015 AM Peak Volumes	B	B	C	A	A	A	B	C	C	A	A	B
1b	2015 AM Background Peak	D	D	F	A	A	C	C	F	F	A	A	C
2	2015 AM Peak with Development	D	D	F	A	A	C	C	F	F	A	A	C
3	2020 AM Background Peak	F	F	F	A	A	C	D	F	F	A	A	D
4	2020 AM Peak with Development	F	F	F	A	A	C	D	F	F	A	A	D
5a	2015 PM Peak Volumes	C	C	D	A	A	B	B	D	D	A	A	B
5b	2015 PM Background Peak	F	F	F	A	A	F	C	D	F	A	A	C
6	2015 PM Peak with Development	F	F	F	A	A	F	C	D	F	A	A	C
7	2020 PM Background Peak	F	F	F	A	A	F	D	E	F	A	A	D
8	2020 PM Peak with Development	F	F	F	A	A	F	D	E	F	A	A	D

Current levels of service are still acceptable, but levels of service will be problematic with latent rights. The intersection will not qualify for signalisation and it is not possible to implement all way stop control at this intersection due to the following principles as contained in the South African Road Traffic Signs Manual (SARTSM). The manual prescribes the conditions under which all-way stop control is allowable, namely:

- All-way stop control should not be implemented on a trunk road or major arterial road
- It should not be implemented on a public passenger transport route
- The traffic flow on one road should not exceed the traffic flow on the other road by more than 20% of the total traffic through the junction.
- It should not be implemented if any approach road to the junction has more than one lane for traffic.

It is not really possible to significantly upgrade the priority controlled intersection. This could however be acceptable based on the principle that it may be acceptable if individual movements are operating at LOS E or even F, if the traffic volumes affected are low.

The only improvement that can be considered is provision of right turning lanes on Frikkie Meyer Street as shown below.



Possible Improved Layout

This will slightly improve levels of service as follows for the worst case scenarios.

Intersection: Hans Coetzee / Frikkie Meyer		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
4	2020 AM Peak with Development	F	F	F	A	A	C	D	F	F	A	A	C
8	2020 PM Peak with Development	F	F	F	A	A	F	D	E	F	A	A	C

Queues will however be more significantly improved as follows:

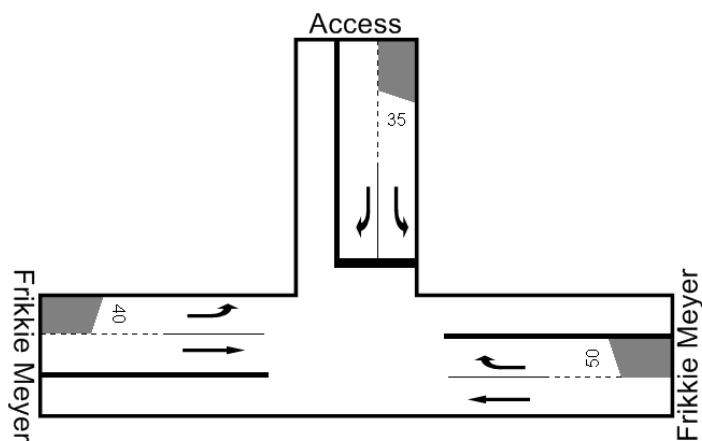
Intersection C		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
95th Percentile Queues (Vehicles)													
4	2020 AM Peak Hour with development	0.4	0.4	2.7	0.0	3.3	3.3	0.6	0.8	0.8	0.0	2.7	2.7
4a	2020 AM Peak Hour with development (upgraded)	0.4	0.4	2.7	0.0	0.0	0.0	0.6	0.8	0.8	0.0	0.0	0.0
8	2020 PM Peak Hour with development	0.7	8.2	8.2	0.0	1.3	1.3	0.4	0.4	2.0	0.0	5.2	5.2
8a	2020 PM Peak Hour with development (upgraded)	0.8	0.8	6.8	0.0	0.0	0.0	0.6	0.6	2.0	0.0	0.0	0.3

6.4 Summary

The findings of the Capacity Analysis can be summarised as follows.

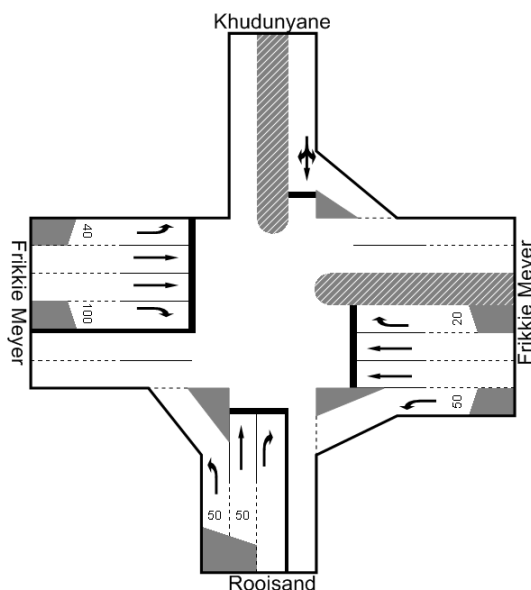
a) Intersection A: Access from Frikkie Meyer Street

The current access to the Kathu Equestrian Club will have to be upgraded with turning lanes as follows:



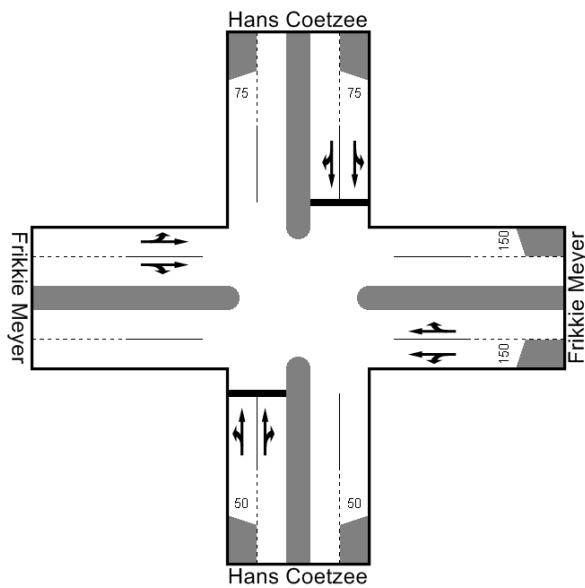
b) Intersection B: Rooisand Street / Frikkie Meyer Street Intersection

The relatively recently constructed traffic circle is operating at acceptable levels of service, but is expected to experience capacity problems with the development of latent rights. The traffic circle was therefore a relatively short term solution and the Traffic Impact Study for the Rooisand Square Shopping Centre on Erven 9687 to 9693 (2189, 12190 and 12191) recommended that the intersection should be signalised but this was unfortunately not implemented. Depending on the rate of development of latent rights (or traffic growth), it is expected that the intersection will in due time have to be signalised as follows



c) Intersection C: Hans Coetzee Street / Frikkie Meyer Street Intersection

Although capacity problems can be expected with development of latent rights, all-way stop control is not warranted according to the South African Road Traffic Signs Manual and the intersection will not warrant signalisation. An improvement that should be considered is provision of right turning lanes on Frikkie Meyer Street as this will increase capacity and improve road safety.



d) Other

Note must be taken of the recommendation of the Traffic Impact Study for the Rooisand Square, namely "Due to the expected high trip generation of the Bestwood Estate Frikkie Meyer Street needs to be upgraded to a four-lane road."

7 OTHER ASPECTS

7.1 Trip Generation during Construction

Due to the phasing of the development there will be periods when there will be a combination of construction - and operational trips, but considering the slow construction rate, it is believed that the worst case scenario will be when the development is fully implemented as analysed in Chapter 6 and no combination of trips is expected to exceed the full trip generation as analysed.

During construction heavy vehicle volumes will be relatively higher than during the operational stages but due to the limited size of the development it is not expected that any community will be significantly affected by heavy vehicle operations during construction.

7.2 Public Transport Operations

As the area will not be a low vehicle ownership area, limited public transport operations can be expected and no specific provision has to be made for this mode of transport.

7.3 Pedestrian Activities

During traffic counting limited pedestrian activity was observed. As a medium to higher income development no significant pedestrian activity outside the development area is expected. It is however advisable that should Frikkie Meyer Street be upgraded to a four-lane road, the road be upgraded to a proper urban street with sidewalks (street lights are already provided)

7.4 Access Road

The current access road to the Equestrian Club is a (good condition) gravel road as shown below.



Photo 5: Current access road

The road does not have to be upgraded from a capacity point of view, but due to potential dust, the road should preferably be upgraded to a paved road, ideally with shoulders that will facilitate pedestrians.

8. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be made from the study:

- a) The development could potentially generate 197 new trips during both the morning and afternoon peaks.
- b) The development will not have a noticeable impact on any of the analysed intersections, but with normal traffic growth, and especially the trip generation of latent rights, which are expected to be developed, but are not yet developed, some improvements are required at the relevant intersections.

Based on the conclusions it is recommended that the development be approved from a traffic point of view.

9. REFERENCES

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