TRAFFIC IMPACT ASSESSMENT

LANSERIA EXTENSION 81

25 April 2024

Report prepared by:

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TRAFFIC IMPACT ASSESSMENT
PROPOSED TOWNSHIP LANSERIA EXTENSION 81

TABLE OF CONTENTS

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DECLARATION

It is herewith certified that this TRAFFIC IMPACT ASSESSMENT: LANSERIA EXTENSION 81 has been prepared according to the requirements of the South African Traffic Impact and Site Traffic Assessment Manual.

Signed: ……

DATE: 25 April 2024

Name:	Cobus Havenga
Qualification:	Pr Eng, B Eng Civil, Hons Transportation Engineering
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TRAFFIC IMPACT ASSESSMENT
PROPOSED TOWNSHIP LANSERIA EXTENSION 81

1. BACKGROUND

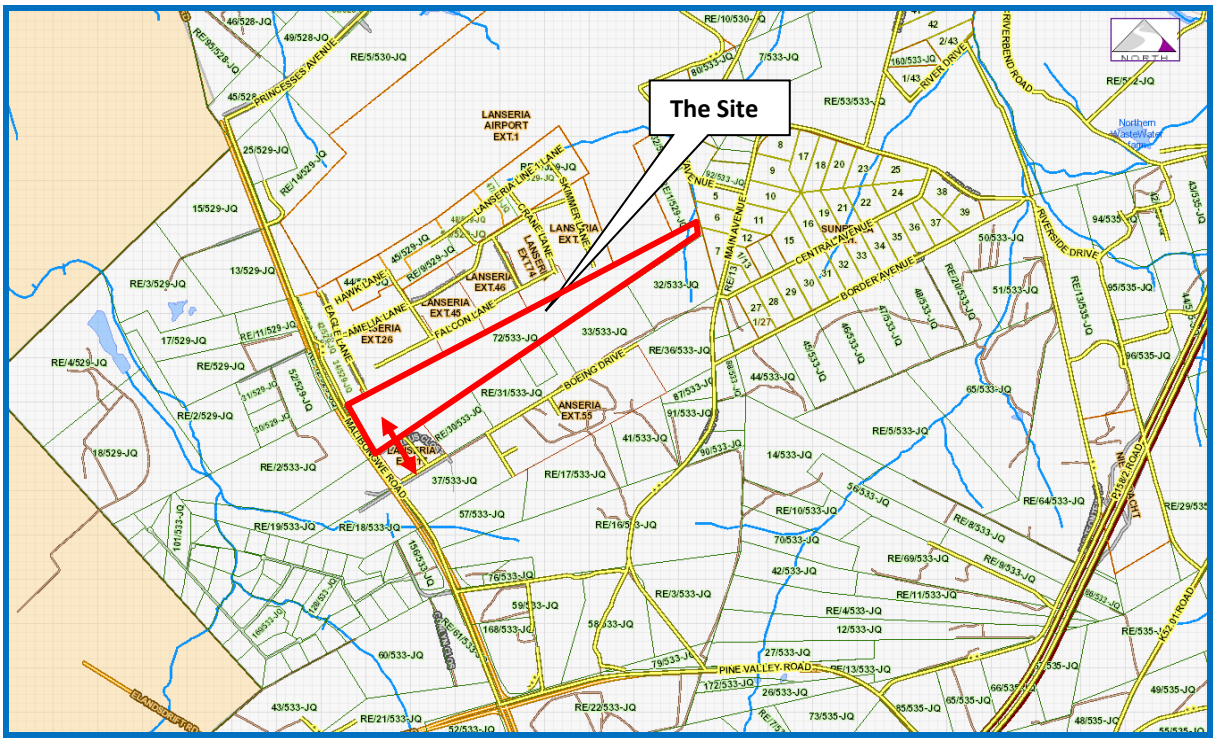
This traffic impact assessment is done in support of the township application on Lanseria Extension 81 situated on a portion of Portion 72 (portion of Portion 2) of the Farm Bultfontein 533 JQ. The total extent of the township is 30.7995ha with 27.031ha available for development. The proposed development controls are:

Zoning "Industrial 1"
FAR: 0.6

The proposed township layout and Conditions of Establishment by Town Planning HUB is presented in Annexure B.

2. SITE LOCATION AND ACCESS

The site is located east of Malibongwe Drive and south of the Lanseria Airport as depicted in Figure 1 and the COJ GIS below.



Site location

There was a previous township application and two of the stands are developed , a section of the access road is also constructed as depicted on the aerial photo below.

Developed stands

A section of the access road to the township was also implemented as depicted in the photos below.

Intersection Boeing Street and township access road

Township access road

Township access road towards Boeing Street

Existing Circle

3. EXISTING TRAFFIC DEMAND

The existing traffic demand at the intersections indicated below was obtained by means of peak period traffic counts on Wednesday, 10 April 2024.

Surveyed intersections

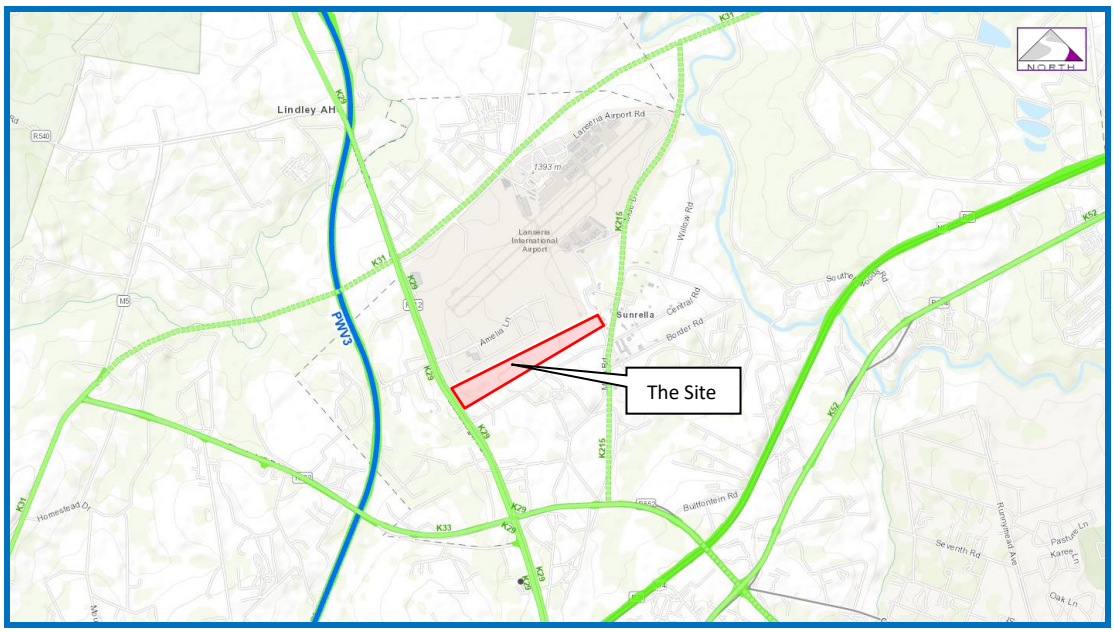
The existing peak hour traffic demand is depicted in Figures 2(a & b). The peak traffic hours are as follows:

Weekday morning peak traffic hour:	07:00 - 08:00
Weekday afternoon peak traffic hour:	16:15 - 17:15

4. FUTURE AND EXISTING ROAD NETWORK

4.1 PROVINCIAL ROAD

The provincial road network is depicted on the extract from the Gauteng RAMS below.



Extract from Gauteng RAMS

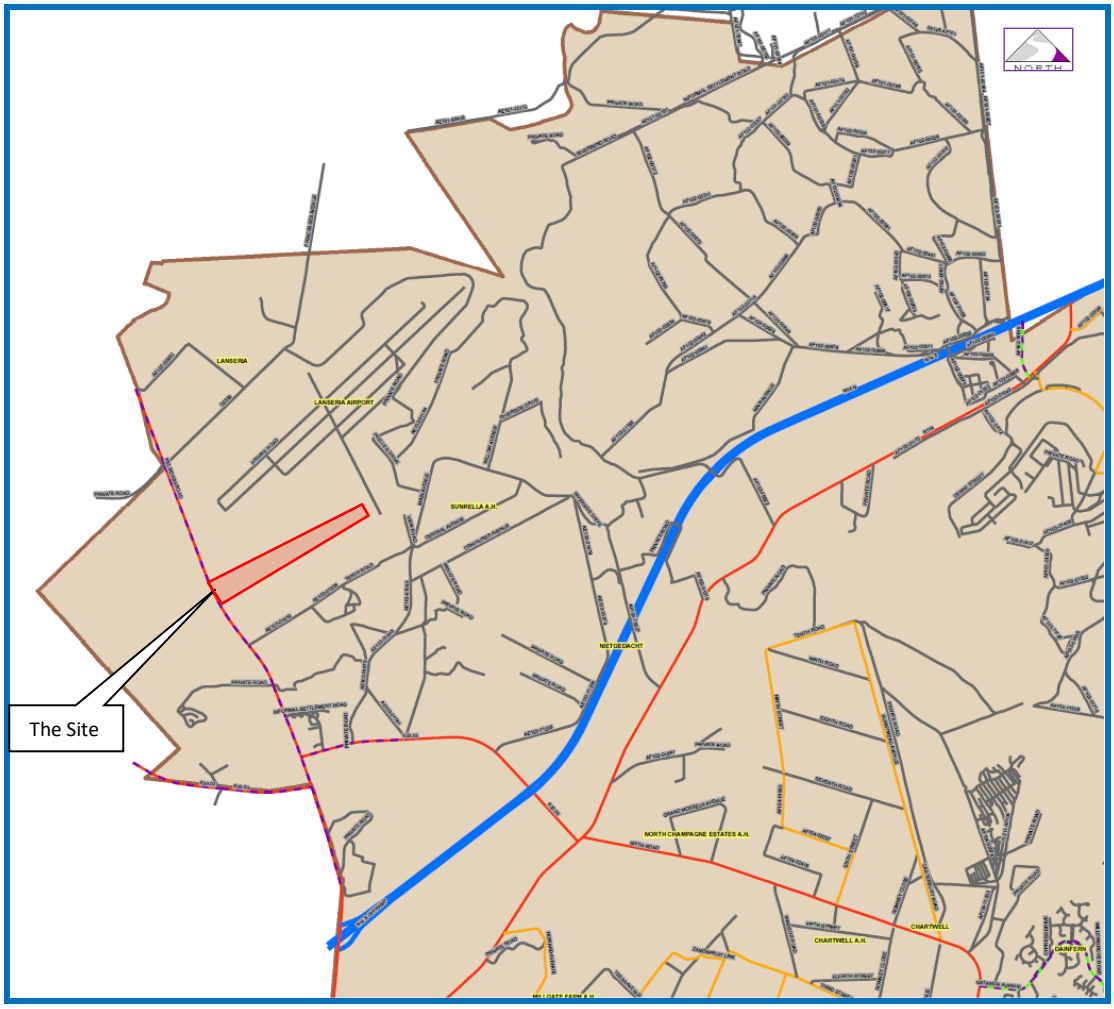
Malibongwe Drive is the K29 and the road is already implemented on the K-route design standard as depicted in the photos below.

Malibongwe Drive towards the north

Malibongwe Drive towards the south

4.2 COJ ROAD MASTER PLAN

The site location is depicted in an extract of the COJ Road Classification map below.



Extract COJ Road Classification

No roads are classified in proximity of the application site. There is no Roads Master Plan available for this area. The only available information is that obtained from the COJ GIS and previous studies, Lanseria Extension 25(2007) and Lanseria Extension 55. In both these studies Boeing Road was indicated with a 25m road reserve.

5. TRIP GENERATION

Traffic counts conducted at a similar development north of and next to the application site indicate the following:

Total number of a.m. peak hour trips	510 (417 in and 93 out)
Total number of p.m. peak hour trips	477 (75 in and 402 out)

Based on an estimated total area of 40ha and a FSR of 0.5 (the total area includes some roads) the estimated total floor area already provided is 200 000m^2.

The weekday morning and afternoon peak hour trip generation are presented in Table 1.

Peak hour	Floor area	Trip generation rate/100m²	Directional Split (in/out)	Total number of trips	New Trips In	New Trips Out
Industrial						
Morning peak hour (a.m.)	200 000	0.255	82:18	510	417	93
Afternoon peak hour (p.m.)	200 000	0.24	16:84	477	75	402

Table 1: Weekday peak hour trip generation

The trip generation rates obtained from the document South African Trip Data Manual [(1)] will be applied. Based on the township layout the total area is 27.03ha and the FAR 0.6, this will allow a total floor area of 162 180m^2.

The following land uses will be allowed in terms of the SA Trip Data Manual[(1)]: Industrial Park, Light Manufacturing, Warehousing and Mini Warehousing.

Over estimating the trip generation is a concern and the following assumption will be made for trip generation purposes:

Industrial	30% of total FAR
Light Manufacturing	30% of total FAR
Warehousing	30% of total FAR
Mini-warehousing	10% of total FAR

The expected weekday morning and afternoon peak hour trip generation are presented in Table 2.

Peak hour	Floor area	Trip generation rate/100m²	Directional Split (in/out)	Total number of trips	New Trips In	New Trips Out
Industrial						
Morning peak hour (a.m.)	48 654	0.80	70:30	389	272	117
Afternoon peak hour (p.m.)	48 654	0.80	25:75	389	97	292
Light Manufacturing						
Morning peak hour (a.m.)	48 654	0.60	80:20	292	234	58
Afternoon peak hour (p.m.)	48 654	0.60	20:80	292	58	234
Warehouse and distribution						
Morning peak hour (a.m.)	48 654	0.50	60:40	243	146	97
Afternoon peak hour (p.m.)	48 654	0.50	45:55	243	109	134
Mini Warehousing						
Morning peak hour (a.m.)	16 218	0.15	60:40	24	14	10
Afternoon peak hour (p.m.)	16 218	0.15	50:50	24	12	12
Total						
Morning peak hour (a.m.)	162 180	0.58	70:30	948	666	282
Afternoon peak hour (p.m.)	162 180	0.58	29:71	948	276	672

Table 2: Expected weekday peak hour trip generation

Two stands are already developed and the trips are already on the road network.

- Erf 956 with GLA of 7 695m^2
- Erf 974 with GLA of 8 092m^2

Total: 15 787m^2

The expected new weekday morning and afternoon peak hour trips are presented in Table 3.

Peak hour	Floor area	Trip generation rate/100m²	Directional Split (in/out)	Total number of trips	New Trips In	New Trips Out
Morning peak hour (a.m.)	146 393	0.58	70:30	849	594	255
Afternoon peak hour (p.m.)	146 393	0.58	29:71	849	246	603

Table 3: Expected weekday peak hour trip generation

These will all be new trips.

6. TRIP ASSIGNMENT

The expected weekday morning and afternoon peak hour trip assignment are depicted in Figures 3(a & b).

7. BACKGROUND TRAFFIC GROWTH AND LATENT RIGHTS

A number of traffic studies have been done in the area; most are however older than 5 years. The weekday morning and afternoon peak hour traffic demand from the following development will be used to determine a background traffic growth:

- Lanseria Extension 55 [(2)]

The annual growth rates recorded (based on trend lines) at the three intersections in this area are depicted in Table 4.

	Year		Annual Growth (%)
	2013	2024	
R512 and Ashenti Rd			
Morning peak hour	1538	1649	0.64
Afternoon peak hour	1901	1642	-1.32
R512 and Boeing Rd			
Morning peak hour	1620	1979	1.84
Afternoon peak hour	1765	1996	1.12
R512 and R552			
Morning peak hour	1698	2655	4.15
Afternoon peak hour	2268	2554	1.09

Table 4: Recorded annual growth rates

An annual growth rate of 2.5% will be applied for the purpose of this study to allow for background traffic growth and some latent rights on the neighbouring development for undeveloped phases.

8. CAPACITY ANALYSIS

PTV Vistro 2020[(3)] software package was used to simulate the operating conditions of the existing major intersections in the vicinity of the proposed development. The following scenarios were adopted for the purposes of this investigation:

Scenario 1: Existing (2024) weekday a.m. and p.m. peak hour traffic demand (Figure 2)
Scenario 2: Expected (2029) weekday a.m. and p.m. peak hour traffic demand with background traffic growth (Figure 4)
Scenario 3: Expected (2024) weekday a.m. and p.m. peak hour traffic demand with the traffic generated by the proposed development added (Figure 5)
Scenario 4: Expected (2029) weekday a.m. and p.m. peak hour traffic demand with background traffic growth, and the traffic generated by the proposed development added (Figure 6)

Peak hour factors (PHF) used in the capacity analyses are the real ones (calculated from the traffic counts).

The operation of priority-controlled intersections is acceptable when the following conditions are met for each individual turning movement:

Period	Maximum Volume/Capacity	Minimum Level of service (TRB 2004)
Normal 15-minute peak	85%	D

Table 5: Performance measures for priority-controlled intersections

For signalised intersections the following will apply:

Period	Maximum Volume/Capacity	
	Left-turn/through	Right-turn
Normal 15-minute peak	90%	95%

Table 6: Performance measures for signalised intersections

Where these conditions cannot be met, the conditions are acceptable when the following conditions are met on each approach:

Period	Maximum Volume/Capacity		Minimum Level of service (TRB 2004)	
	LT & ST	RT	LT & ST	RT
Normal 15-minute peak	95%	100%	D	E

L – Left-turn, T – Through, R – Right-turn

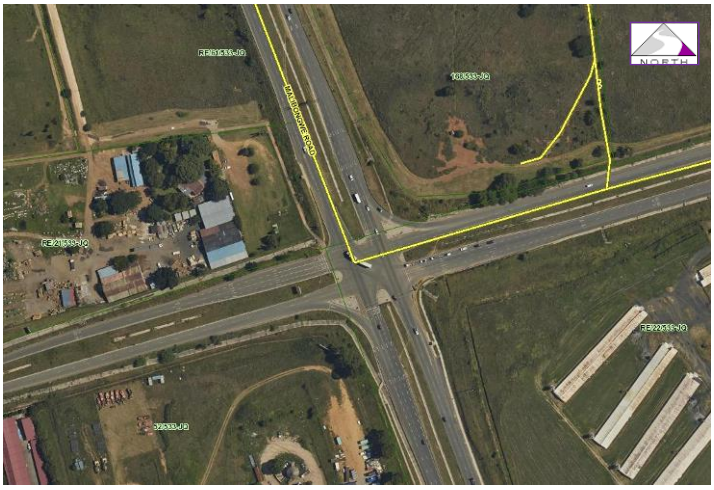
Table 7: Performance measures for signalised intersections

The results of the capacity analyses for each intersection are presented below.

8.1 INTERSECTION: R512 (MALIBONGWE) AND R552 (PINEVALLEY)

8.1.1 SCENARIO 1

This was a signalised intersection but it is now operating as an all-way stop.



The intersection cannot operate at acceptable levels of service during both peak hours and the signalisation is reinstated.

8.1.1.1 Scenario 1 a.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	48	1022	337	287	411	26	58	65	60	131	42	369
X, volume / capacity	0,06	0,57	0,65	0,36	0,23	0,10	0,09	0,04	0,10	0,20	0,03	0,61
d, Delay for Lane Group [s/veh]	10,22	14,77	26,58	13,10	11,28	21,32	13,96	13,49	15,74	15,05	13,39	24,95
Lane Group LOS	B	B	C	B	B	C	B	B	B	B	B	C
50th-Percentile Queue Length [veh/ln]	0,37	5,13	5,12	2,65	1,66	0,35	0,56	0,29	0,62	1,32	0,19	5,29
50th-Percentile Queue Length [m/ln]	2,85	39,05	38,98	20,21	12,62	2,64	4,23	2,19	4,75	10,08	1,42	40,34
d_M, Delay for Movement [s/veh]	10,22	14,77	26,58	13,10	11,28	21,32	13,96	13,49	15,74	15,05	13,39	24,95
Movement LOS	B	B	C	B	B	C	B	B	B	B	B	C
d_A, Approach Delay [s/veh]	17,44			12,36			14,38			21,66		
Approach LOS	B			B			B			C		
d_I, Intersection Delay [s/veh]	16,76											
Intersection LOS	B											
Intersection V/C	0,570											

8.1.1.2 Scenario 1 p.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	70	469	135	333	978	53	23	33	59	224	63	277
X, volume / capacity	0,09	0,26	0,49	0,42	0,55	0,11	0,04	0,02	0,10	0,35	0,04	0,44
d, Delay for Lane Group [s/veh]	10,44	11,55	31,02	13,93	14,51	15,27	13,50	13,35	15,92	16,79	13,49	20,59
Lane Group LOS	B	B	C	B	B	B	B	B	B	B	B	C
50th-Percentile Queue Length [veh/ln]	0,56	1,95	2,33	3,24	4,89	0,56	0,22	0,15	0,62	2,47	0,28	3,52
50th-Percentile Queue Length [m/ln]	4,25	14,87	17,77	24,73	37,26	4,26	1,68	1,12	4,70	18,82	2,16	26,79
d_M, Delay for Movement [s/veh]	10,44	11,55	31,02	13,93	14,51	15,27	13,50	13,35	15,92	16,79	13,49	20,59
Movement LOS	B	B	C	B	B	B	B	B	B	B	B	C
d_A, Approach Delay [s/veh]	15,34			14,40			14,69			18,29		
Approach LOS	B			B			B			B		
d_I, Intersection Delay [s/veh]	15,45											
Intersection LOS	B											
Intersection V/C	0,449											

Note:

With signalisation the intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.1.2 Scenario 2

The intersection layout and signalisation remain the same as in Scenario 1.

8.1.2.1 Scenario 2 a.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	55	1156	337	287	465	29	66	65	68	131	42	369
X, volume / capacity	0,07	0,64	0,69	0,36	0,26	0,13	0,10	0,04	0,11	0,20	0,03	0,61
d, Delay for Lane Group [s/veh]	10,28	15,96	29,33	13,10	11,51	24,07	14,06	13,49	15,87	15,05	13,39	24,95
Lane Group LOS	B	B	C	B	B	C	B	B	B	B	B	C
50th-Percentile Queue Length [veh/ln]	0,43	6,15	5,46	2,65	1,91	0,43	0,63	0,29	0,70	1,32	0,19	5,29
50th-Percentile Queue Length [m/ln]	3,25	46,87	41,59	20,21	14,52	3,24	4,80	2,19	5,37	10,08	1,42	40,34
d_M, Delay for Movement [s/veh]	10,28	15,96	29,33	13,10	11,51	24,07	14,06	13,49	15,87	15,05	13,39	24,95
Movement LOS	B	B	C	B	B	C	B	B	B	B	B	C
d_A, Approach Delay [s/veh]	18,67			12,56			14,50			21,66		
Approach LOS	B			B			B			C		
d_I, Intersection Delay [s/veh]	17,37											
Intersection LOS	B											
Intersection V/C	0,585											

8.1.2.2 Scenario 2 p.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	80	531	135	333	1106	61	27	33	66	224	63	277
X, volume / capacity	0,10	0,30	0,57	0,42	0,62	0,14	0,04	0,02	0,11	0,35	0,04	0,44
d, Delay for Lane Group [s/veh]	10,53	11,84	38,00	13,93	15,60	16,15	13,54	13,35	16,05	16,79	13,49	20,59
Lane Group LOS	B	B	D	B	B	B	B	B	B	B	B	C
50th-Percentile Queue Length [veh/ln]	0,64	2,25	2,68	3,24	5,85	0,66	0,25	0,15	0,70	2,47	0,28	3,52
50th-Percentile Queue Length [m/ln]	4,86	17,17	20,39	24,73	44,58	5,06	1,92	1,12	5,33	18,82	2,16	26,79
d_M, Delay for Movement [s/veh]	10,53	11,84	38,00	13,93	15,60	16,15	13,54	13,35	16,05	16,79	13,49	20,59
Movement LOS	B	B	D	B	B	B	B	B	B	B	B	C
d_A, Approach Delay [s/veh]	16,44			15,25			14,81			18,29		
Approach LOS	B			B			B			B		
d_I, Intersection Delay [s/veh]	16,12											
Intersection LOS	B											
Intersection V/C	0,483											

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.1.3 SCENARIO 3

The intersection layout and signalisation remain the same as in Scenario 1.

8.1.3.1 Scenario 3 a.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	48	1182	337	356	477	72	167	65	60	131	42	529
X, volume / capacity	0,06	0,66	0,70	0,44	0,27	0,32	0,25	0,04	0,10	0,20	0,03	0,87
d, Delay for Lane Group [s/veh]	10,22	16,23	30,09	14,28	11,57	29,53	15,64	13,49	15,74	15,05	13,39	43,02
Lane Group LOS	B	B	C	B	B	C	B	B	B	B	B	D
50th-Percentile Queue Length [veh/ln]	0,37	6,36	5,55	3,49	1,97	1,21	1,73	0,29	0,62	1,32	0,19	10,70
50th-Percentile Queue Length [m/ln]	2,85	48,50	42,29	26,61	14,99	9,19	13,16	2,19	4,75	10,08	1,42	81,56
d_M, Delay for Movement [s/veh]	10,22	16,23	30,09	14,28	11,57	29,53	15,64	13,49	15,74	15,05	13,39	43,02
Movement LOS	B	B	C	B	B	C	B	B	B	B	B	D
d_A, Approach Delay [s/veh]	19,02			14,06			15,19			36,02		
Approach LOS	B			B			B			D		
d_I, Intersection Delay [s/veh]	20,85											
Intersection LOS	C											
Intersection V/C	0,700											

8.1.3.2 Scenario 3 p.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	70	535	135	494	1138	163	68	33	59	224	63	343
X, volume / capacity	0,11	0,37	0,28	0,76	0,78	0,23	0,13	0,03	0,12	0,42	0,05	0,66
d, Delay for Lane Group [s/veh]	14,14	16,15	12,62	27,81	23,58	9,26	17,68	16,65	19,74	21,64	16,83	30,87
Lane Group LOS	B	B	B	C	C	A	B	B	B	C	B	C
50th-Percentile Queue Length [veh/ln]	0,68	2,80	1,01	7,50	7,83	1,16	0,77	0,17	0,71	2,91	0,33	5,64
50th-Percentile Queue Length [m/ln]	5,22	21,34	7,71	57,11	59,65	8,81	5,87	1,30	5,41	22,18	2,50	43,01
d_M, Delay for Movement [s/veh]	14,14	16,15	12,62	27,81	23,58	9,26	17,68	16,65	19,74	21,64	16,83	30,87

Movement LOS	B	B	B	C	C	A	B	B	B	C	B	C
d_A, Approach Delay [s/veh]	15,32			23,45			18,22			26,18		
Approach LOS	B			C			B			C		
d_I, Intersection Delay [s/veh]	21,90											
Intersection LOS	C											
Intersection V/C	0,587											

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.1.4 SCENARIO 4

The intersection layout and signalisation remain the same as in Scenario 1.

8.1.4.1 Scenario 4 a.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	55	1318	382	395	532	75	174	73	69	148	47	578
X, volume / capacity	0,07	0,73	0,84	0,49	0,30	0,40	0,27	0,05	0,11	0,23	0,03	0,96
d, Delay for Lane Group [s/veh]	10,28	17,89	44,20	15,06	11,82	35,58	15,78	13,53	15,94	15,33	13,42	70,83
Lane Group LOS	B	B	D	B	B	D	B	B	B	B	B	E
50th-Percentile Queue Length [veh/ln]	0,43	7,61	8,06	4,01	2,23	1,43	1,82	0,33	0,72	1,52	0,21	16,10
50th-Percentile Queue Length [m/ln]	3,25	57,99	61,38	30,59	17,01	10,92	13,83	2,49	5,47	11,55	1,60	122,66
d_M, Delay for Movement [s/veh]	10,28	17,89	44,20	15,06	11,82	35,58	15,78	13,53	15,94	15,33	13,42	70,83
Movement LOS	B	B	D	B	B	D	B	B	B	B	B	E
d_A, Approach Delay [s/veh]	23,37			14,88			15,29			56,68		
Approach LOS	C			B			B			E		
d_I, Intersection Delay [s/veh]	27,20											
Intersection LOS	C											
Intersection V/C	0,800											

8.1.4.2 Scenario 4 p.m.

Name	R512			R512			R552			R552		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	80	598	153	538	1269	170	71	37	66	254	71	380
X, volume / capacity	0,11	0,35	0,34	0,71	0,75	0,25	0,15	0,03	0,15	0,53	0,07	0,81

d, Delay for Lane Group [s/veh]	13,00	14,99	14,06	23,90	21,55	8,92	21,89	20,57	24,42	28,27	20,82	46,92
Lane Group LOS	B	B	B	C	C	A	C	C	C	C	C	D
50th-Percentile Queue Length [veh/ln]	0,79	3,25	1,24	8,16	9,13	1,27	0,99	0,24	0,98	4,19	0,46	8,66
50th-Percentile Queue Length [m/ln]	6,05	24,79	9,45	62,14	69,56	9,67	7,56	1,81	7,50	31,97	3,50	66,02
d_M, Delay for Movement [s/veh]	13,00	14,99	14,06	23,90	21,55	8,92	21,89	20,57	24,42	28,27	20,82	46,92
Movement LOS	B	B	B	C	C	A	C	C	C	C	C	D
d_A, Approach Delay [s/veh]	14,63			21,10			22,56			37,56		
Approach LOS	B			C			C			D		
d_I, Intersection Delay [s/veh]	22,86											
Intersection LOS	C											
Intersection V/C	0,645											

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.2 INTERSECTION: R512 (MALIBONGWE) AND FALCON CLOSE/REFILWE

8.2.1 SCENARIO 1

This is a two-way stop-controlled intersection with stop control on the eastern and western approaches, Falcon Close and Refilwe.

The intersection cannot operate at acceptable levels of service during both peak hours and the signalisation is reinstated. The low traffic volumes on the Falcon Close and Refilwe approaches however might not make the queue lenght warrant for signalisation.

8.2.1.1 Scenario 1 a.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right

Total Analysis Volume [veh/h]	17	1469	28	2	689	1	2	0	22	18	0	4
X, volume / capacity	0,01	0,51	0,04	0,00	0,24	0,00	0,07			0,06		
d, Delay for Lane Group [s/veh]	3,53	6,23	6,09	3,48	4,42	9,65	32,13			32,03		
Lane Group LOS	A	A	A	A	A	A	C			C		
50th-Percentile Queue Length [veh/ln]	0,07	4,46	0,18	0,01	1,58	0,01	0,44			0,40		
50th-Percentile Queue Length [m/ln]	0,52	34,00	1,36	0,07	12,06	0,08	3,34			3,03		
d_M, Delay for Movement [s/veh]	3,53	6,23	6,09	3,48	4,42	9,65	32,13	32,13	32,13	32,03	32,03	32,03
Movement LOS	A	A	A	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	6,20			4,42			32,13			32,03		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	6,19											
Intersection LOS	A											
Intersection V/C	0,384											

8.2.1.2 Scenario 1 p.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	23	738	17	2	1309	6	2	2	28	27	0	4
X, volume / capacity	0,02	0,26	0,04	0,00	0,46	0,01	0,09			0,09		
d, Delay for Lane Group [s/veh]	3,55	4,52	9,16	3,48	5,80	6,03	32,45			32,37		
Lane Group LOS	A	A	A	A	A	A	C			C		
50th-Percentile Queue Length [veh/ln]	0,10	1,75	0,15	0,01	3,79	0,04	0,58			0,56		
50th-Percentile Queue Length [m/ln]	0,73	13,30	1,12	0,07	28,91	0,27	4,44			4,27		
d_M, Delay for Movement [s/veh]	3,55	4,52	9,16	3,48	5,80	6,03	32,45	32,45	32,45	32,37	32,37	32,37
Movement LOS	A	A	A	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	4,59			5,79			32,45			32,37		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	6,14											
Intersection LOS	A											
Intersection V/C	0,353											

Note:

With the traffic signal the intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.2.2 Scenario 2

The intersection layout and signalisation remain the same as in Scenario 1.

8.2.2.1 Scenario 2 a.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	19	1662	31	2	780	1	2	0	26	20	0	6
X, volume / capacity	0,01	0,58	0,05	0,00	0,27	0,00	0,08			0,07		
d, Delay for Lane Group [s/veh]	3,53	6,91	6,49	3,48	4,58	11,25	32,29			32,15		
Lane Group LOS	A	A	A	A	A	B	C			C		
50th-Percentile Queue Length [veh/ln]	0,08	5,49	0,21	0,01	1,84	0,01	0,50			0,46		
50th-Percentile Queue Length [m/ln]	0,59	41,84	1,60	0,07	14,06	0,09	3,81			3,49		
d_M, Delay for Movement [s/veh]	3,53	6,91	6,49	3,48	4,58	11,25	32,29	32,29	32,29	32,15	32,15	32,15
Movement LOS	A	A	A	A	A	B	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	6,87			4,58			32,29			32,15		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	6,70											
Intersection LOS	A											
Intersection V/C	0,435											

8.2.2.2 Scenario 2 p.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	27	834	19	2	1481	7	2	2	31	30	0	6
X, volume / capacity	0,02	0,29	0,06	0,00	0,52	0,01	0,10			0,10		
d, Delay for Lane Group [s/veh]	3,56	4,70	10,62	3,48	6,32	6,41	32,64			32,54		
Lane Group LOS	A	A	B	A	A	A	C			C		
50th-Percentile Queue Length [veh/ln]	0,11	2,04	0,19	0,01	4,61	0,05	0,65			0,64		
50th-Percentile Queue Length [m/ln]	0,84	15,53	1,42	0,07	35,10	0,34	4,92			4,90		
d_M, Delay for Movement [s/veh]	3,56	4,70	10,62	3,48	6,32	6,41	32,64	32,64	32,64	32,54	32,54	32,54
Movement LOS	A	A	B	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	4,79			6,32			32,64			32,54		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	6,53											
Intersection LOS	A											
Intersection V/C	0,399											

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.2.3 Scenario 3

The intersection layout and signalisation remain the same as in Scenario 1.

8.2.3.1 Scenario 3 a.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	17	1917	28	17	879	10	22	0	22	18	0	38
X, volume / capacity	0,01	0,67	0,05	0,01	0,31	0,04	0,13			0,16		
d, Delay for Lane Group [s/veh]	3,53	8,09	6,88	3,53	4,76	14,84	32,80			33,27		
Lane Group LOS	A	A	A	A	A	B	C			C		
50th-Percentile Queue Length [veh/ln]	0,07	7,17	0,20	0,07	2,15	0,13	0,81			1,02		
50th-Percentile Queue Length [m/ln]	0,52	54,64	1,50	0,52	16,36	0,96	6,15			7,77		
d_M, Delay for Movement [s/veh]	3,53	8,09	6,88	3,53	4,76	14,84	32,80	32,80	32,80	33,27	33,27	33,27
Movement LOS	A	A	A	A	A	B	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	8,03			4,85			32,80			33,27		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	7,91											
Intersection LOS	A											
Intersection V/C	0,515											

8.2.3.2 Scenario 3 p.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	23	922	17	36	1759	26	10	2	28	27	0	18
X, volume / capacity	0,02	0,32	0,06	0,03	0,62	0,05	0,11			0,13		
d, Delay for Lane Group [s/veh]	3,55	4,87	13,49	3,59	7,41	7,09	32,65			32,84		
Lane Group LOS	A	A	B	A	A	A	C			C		
Critical Lane Group	No	No	No	No	Yes	No	No			Yes		
50th-Percentile Queue Length [veh/ln]	0,10	2,32	0,20	0,15	6,21	0,19	0,72			0,81		
50th-Percentile Queue Length [m/ln]	0,73	17,68	1,49	1,12	47,31	1,41	5,52			6,16		
d_M, Delay for Movement [s/veh]	3,55	4,87	13,49	3,59	7,41	7,09	32,65	32,65	32,65	32,84	32,84	32,84
Movement LOS	A	A	B	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	4,99			7,33			32,65			32,84		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	7,29											
Intersection LOS	A											

Intersection V/C	0,472

8.2.4 Scenario 4

The intersection layout and signalisation remain the same as in Scenario 1.

8.2.4.1 Scenario 4 a.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	19	2113	31	17	971	10	22	0	26	20	0	39
X, volume / capacity	0,01	0,73	0,06	0,01	0,34	0,05	0,13			0,17		
d, Delay for Lane Group [s/veh]	3,53	9,33	7,38	3,53	4,95	18,18	32,93			33,40		
Lane Group LOS	A	A	A	A	A	B	C			C		
50th-Percentile Queue Length [veh/ln]	0,08	8,82	0,23	0,07	2,45	0,14	0,87			1,08		
50th-Percentile Queue Length [m/ln]	0,59	67,20	1,77	0,52	18,64	1,10	6,63			8,25		
d_M, Delay for Movement [s/veh]	3,53	9,33	7,38	3,53	4,95	18,18	32,93	32,93	32,93	33,40	33,40	33,40
Movement LOS	A	A	A	A	A	B	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	9,25			5,06			32,93			33,40		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	8,76											
Intersection LOS	A											
Intersection V/C	0,566											

8.2.4.2 Scenario 4 p.m.

Name	R512			R512			Falcon Close			Refilwe		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	27	1021	19	36	1934	27	10	2	31	30	0	19
X, volume / capacity	0,02	0,36	0,09	0,03	0,68	0,05	0,13			0,14		
d, Delay for Lane Group [s/veh]	3,56	5,08	16,30	3,59	8,31	7,62	32,82			33,01		
Lane Group LOS	A	A	B	A	A	A	C			C		
50th-Percentile Queue Length [veh/ln]	0,11	2,66	0,25	0,15	7,47	0,20	0,79			0,89		
50th-Percentile Queue Length [m/ln]	0,84	20,25	1,92	1,12	56,93	1,56	6,01			6,80		
d_M, Delay for Movement [s/veh]	3,56	5,08	16,30	3,59	8,31	7,62	32,82	32,82	32,82	33,01	33,01	33,01
Movement LOS	A	A	B	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	5,24			8,21			32,82			33,01		
Approach LOS	A			A			C			C		
d_I, Intersection Delay [s/veh]	7,93											

Intersection LOS	A
Intersection V/C	0,519

8.3 INTERSECTION: R512 (MALIBONGWE) AND BOEING STREET

8.3.1 SCENARIO 1

This is a two-way stop-controlled intersection with stop control on the eastern and western approaches, Boeing Street.

The intersection cannot operate at acceptable levels of service during both peak hours and the signalisation is reinstated. The low traffic volumes on the Boeing Street might however not make the queue lenght warrant for signalisation.

8.3.1.1 Scenario 1 a.m.

Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	1406	47	2	696	0	0	0	0	26	0	22
X, volume / capacity	0,00	0,49	0,07	0,00	0,24	0,00	0,00			0,16		
d, Delay for Lane Group [s/veh]	0,00	4,68	4,96	2,58	3,35	0,00	0,00			28,49		
Lane Group LOS	A	A	A	A	A	A	A			C		
50th-Percentile Queue Length [veh/ln]	0,00	2,59	0,22	0,01	0,99	0,00	0,00			0,71		
50th-Percentile Queue Length [m/ln]	0,00	19,76	1,66	0,04	7,54	0,00	0,00			5,43		
d_M, Delay for Movement [s/veh]	0,00	4,68	4,96	2,58	3,35	0,00	0,00	0,00	0,00	28,49	28,49	28,49
Movement LOS	A	A	A	A	A	A	A	A	A	C	C	C
d_A, Approach Delay [s/veh]	4,68			3,35			0,00			28,49		
Approach LOS	A			A			A			C		
d_I, Intersection Delay [s/veh]	4,78											
Intersection LOS	A											
Intersection V/C	0,384											

8.3.1.2 Scenario 1 p.m.

Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	747	21	7	1338	0	0	0	0	56	0	22
X, volume / capacity	0,00	0,26	0,05	0,01	0,47	0,00	0,00			0,26		
d, Delay for Lane Group [s/veh]	0,00	3,44	7,42	2,60	4,55	0,00	0,00			30,17		
Lane Group LOS	A	A	A	A	A	A	A			C		
50th-Percentile Queue Length [veh/ln]	0,00	1,10	0,14	0,02	2,44	0,00	0,00			1,22		
50th-Percentile Queue Length [m/ln]	0,00	8,35	1,08	0,13	18,61	0,00	0,00			9,31		
d_M, Delay for Movement [s/veh]	0,00	3,44	7,42	2,60	4,55	0,00	0,00	0,00	0,00	30,17	30,17	30,17
Movement LOS	A	A	A	A	A	A	A	A	A	C	C	C
d_A, Approach Delay [s/veh]	3,55			4,54			0,00			30,17		
Approach LOS	A			A			A			C		
d_I, Intersection Delay [s/veh]	5,10											
Intersection LOS	A											
Intersection V/C	0,388											

Note:

With signalisation the intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.3.2 Scenario 2

The intersection layout and signalisation remain the same as in Scenario 1.

8.3.2.1 Scenario 2 a.m.

Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	1590	47	2	787	0	0	0	0	26	0	22
X, volume / capacity	0,00	0,55	0,07	0,00	0,27	0,00	0,00			0,16		
d, Delay for Lane Group [s/veh]	0,00	5,19	5,27	2,58	3,48	0,00	0,00			28,49		
Lane Group LOS	A	A	A	A	A	A	A			C		
50th-Percentile Queue Length [veh/ln]	0,00	3,18	0,23	0,01	1,15	0,00	0,00			0,71		
50th-Percentile Queue Length [m/ln]	0,00	24,24	1,75	0,04	8,79	0,00	0,00			5,43		
d_M, Delay for Movement [s/veh]	0,00	5,19	5,27	2,58	3,48	0,00	0,00	0,00	0,00	28,49	28,49	28,49
Movement LOS	A	A	A	A	A	A	A	A	A	C	C	C
d_A, Approach Delay [s/veh]	5,19			3,48			0,00			28,49		

Approach LOS	A	A	A	C
d_I, Intersection Delay [s/veh]	5,09			
Intersection LOS	A			
Intersection V/C	0,431			

8.3.2.2 Scenario 2 p.m.

Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	845	21	7	1514	0	0	0	0	56	0	22
X, volume / capacity	0,00	0,30	0,06	0,01	0,53	0,00	0,00			0,26		
d, Delay for Lane Group [s/veh]	0,00	3,59	8,59	2,60	5,01	0,00	0,00			30,17		
Lane Group LOS	A	A	A	A	A	A	A			C		
50th-Percentile Queue Length [veh/ln]	0,00	1,28	0,16	0,02	2,98	0,00	0,00			1,22		
50th-Percentile Queue Length [m/ln]	0,00	9,76	1,21	0,13	22,73	0,00	0,00			9,31		
d_M, Delay for Movement [s/veh]	0,00	3,59	8,59	2,60	5,01	0,00	0,00	0,00	0,00	30,17	30,17	30,17
Movement LOS	A	A	A	A	A	A	A	A	A	C	C	C
d_A, Approach Delay [s/veh]	3,71			5,00			0,00			30,17		
Approach LOS	A			A			A			C		
d_I, Intersection Delay [s/veh]	5,34											
Intersection LOS	A											
Intersection V/C	0,433											

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.3.3 Scenario 3

There is an existing access to a filling station located between the R512 and Airbus Lane that affects the length of the turning lanes and tapers. As result the intersection is upgraded with the following additional lanes as depicted in Figure 7:

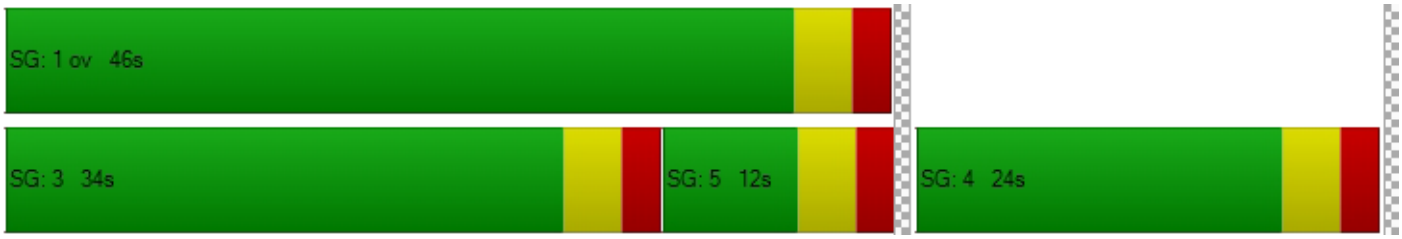
- Additional 90m right-turn lane on R512 southern approach (allowing double right-turn lanes onto Boeing Street);
- Two lanes in both directions along Boeing Street up to Airbus Lane;
- Addition 60m right-turn land on Boeing Street eastern approach;
- Left-slip lane on R512 northern approach; and
- Traffic signal

8.3.3.1 Scenario 3 a.m.

Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	1406	543	167	696	0	0	0	0	237	0	94
X, volume / capacity	0,00	0,59	0,50	0,37	0,69	0,00	0,00			0,25	0,25	0,19
d, Delay for Lane Group [s/veh]	0,00	9,94	22,61	23,91	27,74	0,00	0,00			21,30	21,30	22,30
Lane Group LOS	A	A	C	C	C	A	A			C	C	C
50th-Percentile Queue Length [veh/ln]	0,00	5,18	3,38	2,21	4,94	0,00	0,00			1,45	1,45	1,19
50th-Percentile Queue Length [m/ln]	0,00	39,45	25,77	16,81	37,62	0,00	0,00			11,07	11,07	9,06
d_M, Delay for Movement [s/veh]	0,00	9,94	22,61	23,91	27,74	0,00	0,00	0,00	0,00	21,30	21,30	22,30
Movement LOS	A	A	C	C	C	A	A	A	A	C	C	C
d_A, Approach Delay [s/veh]	13,47			27,00			0,00			21,58		
Approach LOS	B			C			A			C		
d_I, Intersection Delay [s/veh]	18,04											
Intersection LOS	B											
Intersection V/C	0,424											

8.3.3.2 Scenario 3 p.m.

Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	747	224	75	1338	0	0	0	0	554	0	187
X, volume / capacity	0,00	0,33	0,28	0,10	0,83	0,00	0,00			0,59	0,59	0,38
d, Delay for Lane Group [s/veh]	0,00	7,85	22,94	12,86	24,11	0,00	0,00			27,99	27,99	25,30
Lane Group LOS	A	A	C	B	C	A	A			C	C	C
50th-Percentile Queue Length [veh/ln]	0,00	2,30	0,66	0,66	9,08	0,00	0,00			4,08	4,08	2,60
50th-Percentile Queue Length [m/ln]	0,00	17,50	5,00	5,05	69,17	0,00	0,00			31,12	31,12	19,78
d_M, Delay for Movement [s/veh]	0,00	7,85	22,94	12,86	24,11	0,00	0,00	0,00	0,00	27,99	27,99	25,30
Movement LOS	A	A	C	B	C	A	A	A	A	C	C	C
d_A, Approach Delay [s/veh]	11,33			23,52			0,00			27,31		
Approach LOS	B			C			A			C		
d_I, Intersection Delay [s/veh]	20,63											
Intersection LOS	C											
Intersection V/C	0,519											



Note:

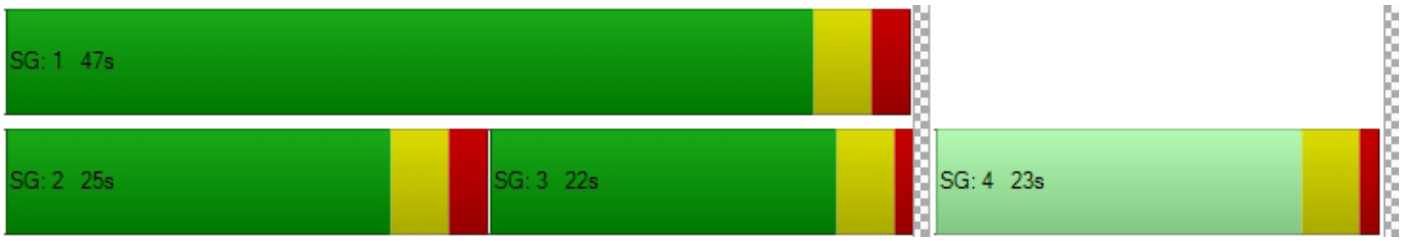
With the upgrades the intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.3.4 Scenario 4

The intersection layout proposed in Scenario 3 remains.

8.3.4.1 Scenario 4 a.m.

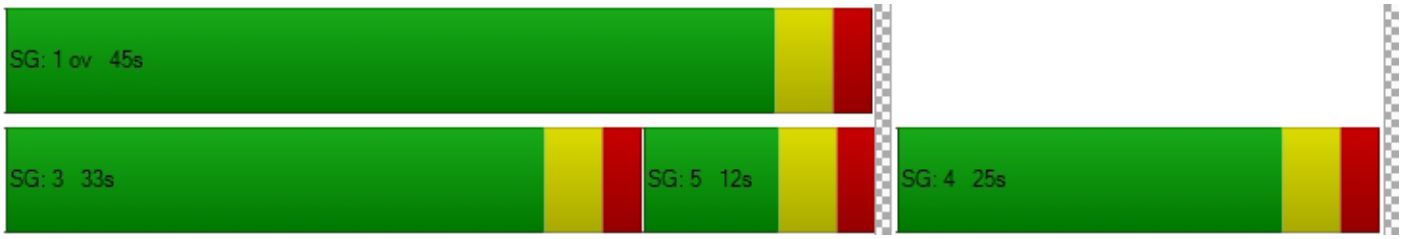
Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	1594	543	167	789	0	0	0	0	237	0	94
X, volume / capacity	0,00	0,67	0,88	0,37	0,78	0,00	0,00			0,24	0,24	0,83
d, Delay for Lane Group [s/veh]	0,00	11,15	44,52	23,91	30,97	0,00	0,00			20,37	20,37	103,35
Lane Group LOS	A	B	D	C	C	A	A			C	C	F
50th-Percentile Queue Length [veh/ln]	0,00	6,41	5,50	2,21	6,00	0,00	0,00			1,41	1,41	3,36
50th-Percentile Queue Length [m/ln]	0,00	48,87	41,89	16,81	45,68	0,00	0,00			10,75	10,75	25,61
d_M, Delay for Movement [s/veh]	0,00	11,15	44,52	23,91	30,97	0,00	0,00	0,00	0,00	20,37	20,37	103,35
Movement LOS	A	B	D	C	C	A	A	A	A	C	C	F
d_A, Approach Delay [s/veh]	19,63			29,74			0,00			44,04		
Approach LOS	B			C			A			D		
d_I, Intersection Delay [s/veh]	24,81											
Intersection LOS	C											
Intersection V/C	0,429											



8.3.4.2 Scenario 4 p.m.

Name	R512			R512			Boeing			Boeing		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	847	224	75	1518	0	0	0	0	554	0	187
X, volume / capacity	0,00	0,38	0,29	0,11	0,97	0,00	0,00			0,56	0,56	0,36
d, Delay for Lane Group [s/veh]	0,00	8,76	23,48	13,51	49,60	0,00	0,00			26,21	26,21	24,17

Lane Group LOS	A	A	C	B	D	A	A			C	C	C
50th-Percentile Queue Length [veh/ln]	0,00	2,84	0,69	0,68	15,64	0,00	0,00			3,92	3,92	2,52
50th-Percentile Queue Length [m/ln]	0,00	21,62	5,30	5,21	119,17	0,00	0,00			29,89	29,89	19,21
d_M, Delay for Movement [s/veh]	0,00	8,76	23,48	13,51	49,60	0,00	0,00	0,00	0,00	26,21	26,21	24,17
Movement LOS	A	A	C	B	D	A	A	A	A	C	C	C
d_A, Approach Delay [s/veh]	11,84			47,91			0,00			25,70		
Approach LOS	B			D			A			C		
d_I, Intersection Delay [s/veh]	31,72											
Intersection LOS	C											
Intersection V/C	0,578											



Note:

The intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.4 INTERSECTION: R512 (MALIBONGWE) AND AMELIA LANE

8.4.1 SCENARIO 1

This is a two-way stop-controlled intersection with stop control on the eastern and western approaches, Amelia Lane.

The intersection cannot operate at acceptable levels of service during both peak hours and the signalisation is reinstated.

8.4.1.1 Scenario 1 a.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	9	855	417	30	535	0	4	1	3	72	0	28
X, volume / capacity	0,01	0,40	0,76	0,03	0,25	0,00	0,01			0,14		0,05
d, Delay for Lane Group [s/veh]	6,92	9,46	29,02	7,05	8,29	0,00	17,28			18,53		17,59
Lane Group LOS	A	A	C	A	A	A	B			B		B
50th-Percentile Queue Length [veh/ln]	0,05	3,10	6,79	0,18	1,74	0,00	0,09			0,83		0,31
50th-Percentile Queue Length [m/ln]	0,39	23,64	51,76	1,37	13,28	0,00	0,71			6,34		2,35
d_M, Delay for Movement [s/veh]	6,92	9,46	29,02	7,05	8,29	0,00	17,28	17,28	17,28	18,53	17,59	17,59
Movement LOS	A	A	C	A	A	A	B	B	B	B	B	B
d_A, Approach Delay [s/veh]	15,82			8,23			17,28			18,27		
Approach LOS	B			A			B			B		
d_I, Intersection Delay [s/veh]	13,75											
Intersection LOS	B											
Intersection V/C	0,475											

8.4.1.2 Scenario 1 p.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	3	653	77	4	908	0	0	1	7	414	2	25
X, volume / capacity	0,00	0,30	0,19	0,00	0,42	0,00	0,01			0,79		0,05
d, Delay for Lane Group [s/veh]	6,88	8,64	15,55	6,89	9,60	0,00	17,31			36,56		17,56
Critical Lane Group	No	No	No	No	Yes	No	No			Yes		No
50th-Percentile Queue Length [veh/ln]	0,02	2,15	0,82	0,03	3,26	0,00	0,08			7,16		0,30
50th-Percentile Queue Length [m/ln]	0,14	16,39	6,22	0,19	24,86	0,00	0,63			54,57		2,26
d_M, Delay for Movement [s/veh]	6,88	8,64	15,55	6,89	9,60	0,00	17,31	17,31	17,31	36,56	17,56	17,56
Movement LOS	A	A	B	A	A	A	B	B	B	D	B	B
d_A, Approach Delay [s/veh]	9,35			9,59			17,31			35,37		
Approach LOS	A			A			B			D		
d_I, Intersection Delay [s/veh]	14,97											
Intersection LOS	B											
Intersection V/C	0,471											

Note:

With signalisation the intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.4.2 Scenario 2

The intersection layout and signalisation remain the same as in Scenario 1.

8.4.2.1 Scenario 2 a.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	10	967	472	34	605	0	5	1	3	82	0	31
X, volume / capacity	0,01	0,45	0,92	0,04	0,28	0,00	0,02			0,16		0,05
d, Delay for Lane Group [s/veh]	6,92	9,95	55,78	7,08	8,52	0,00	17,30			18,74		17,64
Lane Group LOS	A	A	E	A	A	A	B			B		B
50th-Percentile Queue Length [veh/ln]	0,06	3,66	11,77	0,21	2,02	0,00	0,11			0,95		0,35
50th-Percentile Queue Length [m/ln]	0,43	27,87	89,67	1,57	15,36	0,00	0,80			7,25		2,63
d_M, Delay for Movement [s/veh]	6,92	9,95	55,78	7,08	8,52	0,00	17,30	17,30	17,30	18,74	17,64	17,64
Movement LOS	A	A	E	A	A	A	B	B	B	B	B	B
d_A, Approach Delay [s/veh]	24,87			8,44			17,30			18,43		
Approach LOS	C			A			B			B		
d_I, Intersection Delay [s/veh]	19,75											
Intersection LOS	B											
Intersection V/C	0,568											

8.4.2.2 Scenario 2 p.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	3	738	87	5	1027	0	0	1	8	469	2	29
X, volume / capacity	0,00	0,34	0,24	0,01	0,47	0,00	0,02			0,90		0,05
d, Delay for Lane Group [s/veh]	6,88	8,94	17,81	6,90	10,14	0,00	17,33			52,55		17,61
Lane Group LOS	A	A	B	A	B	A	B			D		B
50th-Percentile Queue Length [veh/ln]	0,02	2,50	1,01	0,03	3,86	0,00	0,09			10,11		0,33
50th-Percentile Queue Length [m/ln]	0,14	19,07	7,73	0,24	29,41	0,00	0,72			77,01		2,53
d_M, Delay for Movement [s/veh]	6,88	8,94	17,81	6,90	10,14	0,00	17,33	17,33	17,33	52,55	17,61	17,61
Movement LOS	A	A	B	A	B	A	B	B	B	D	B	B
d_A, Approach Delay [s/veh]	9,86			10,12			17,33			50,40		
Approach LOS	A			B			B			D		
d_I, Intersection Delay [s/veh]	18,55											
Intersection LOS	B											
Intersection V/C	0,533											

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.4.3 Scenario 3

The intersection layout and signalisation remain the same as in Scenario 1.

8.4.3.1 Scenario 3 a.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	9	916	426	30	675	0	4	1	3	91	0	28
X, volume / capacity	0,01	0,37	0,73	0,03	0,27	0,00	0,02			0,27		0,07
d, Delay for Lane Group [s/veh]	4,15	5,86	22,55	4,24	5,28	0,00	22,60			25,75		23,07
Lane Group LOS	A	A	C	A	A	A	C			C		C
50th-Percentile Queue Length [veh/ln]	0,03	2,26	5,87	0,12	1,54	0,00	0,11			1,32		0,37
50th-Percentile Queue Length [m/ln]	0,26	17,26	44,77	0,93	11,70	0,00	0,86			10,07		2,82
d_M, Delay for Movement [s/veh]	4,15	5,86	22,55	4,24	5,28	0,00	22,60	22,60	22,60	25,75	23,07	23,07
Movement LOS	A	A	C	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	11,11			5,24			22,60			25,13		
Approach LOS	B			A			C			C		
d_I, Intersection Delay [s/veh]	10,03											
Intersection LOS	B											
Intersection V/C	0,552											

8.4.3.2 Scenario 3 p.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	3	798	97	4	968	0	0	1	7	422	2	25
X, volume / capacity	0,00	0,36	0,25	0,00	0,43	0,00	0,02			0,85		0,05
d, Delay for Lane Group [s/veh]	6,45	8,58	16,27	6,45	9,24	0,00	18,03			44,33		18,29
Lane Group LOS	A	A	B	A	A	A	B			D		B
50th-Percentile Queue Length [veh/ln]	0,02	2,63	1,06	0,02	3,39	0,00	0,08			8,19		0,30
50th-Percentile Queue Length [m/ln]	0,14	20,02	8,09	0,18	25,80	0,00	0,65			62,39		2,32
d_M, Delay for Movement [s/veh]	6,45	8,58	16,27	6,45	9,24	0,00	18,03	18,03	18,03	44,33	18,29	18,29
Movement LOS	A	A	B	A	A	A	B	B	B	D	B	B
d_A, Approach Delay [s/veh]	9,40			9,22			18,03			42,74		

Approach LOS	A	A	B	D
d_I, Intersection Delay [s/veh]	15,79			
Intersection LOS	B			
Intersection V/C	0,491			

Note:

The intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.4.4 Scenario 4

The intersection layout and signalisation remain the same as in Scenario 1.

8.4.4.1 Scenario 4 a.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	10	1031	482	34	747	0	5	1	3	101	0	31
X, volume / capacity	0,01	0,41	0,88	0,03	0,30	0,00	0,02			0,30		0,07
d, Delay for Lane Group [s/veh]	4,15	6,18	40,84	4,25	5,45	0,00	22,63			26,21		23,16
Lane Group LOS	A	A	D	A	A	A	C			C		C
50th-Percentile Queue Length [veh/ln]	0,04	2,66	9,96	0,14	1,74	0,00	0,13			1,48		0,41
50th-Percentile Queue Length [m/ln]	0,29	20,27	75,89	1,06	13,27	0,00	0,96			11,25		3,15
d_M, Delay for Movement [s/veh]	4,15	6,18	40,84	4,25	5,45	0,00	22,63	22,63	22,63	26,21	23,16	23,16
Movement LOS	A	A	D	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	17,13			5,39			22,63			25,49		
Approach LOS	B			A			C			C		
d_I, Intersection Delay [s/veh]	13,85											
Intersection LOS	B											
Intersection V/C	0,659											

8.4.4.2 Scenario 4 p.m.

Name	R512			R512			Amelia			Amelia		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	3	886	107	5	1090	0	0	1	8	478	2	29
X, volume / capacity	0,00	0,43	0,34	0,01	0,53	0,00	0,02			0,84		0,05
d, Delay for Lane Group [s/veh]	7,80	10,79	23,05	7,82	11,88	0,00	15,94			38,47		16,19
Lane Group LOS	A	B	C	A	B	A	B			D		B

50th-Percentile Queue Length [veh/ln]	0,02	3,46	1,48	0,03	4,61	0,00	0,09			8,52		0,31
50th-Percentile Queue Length [m/ln]	0,16	26,40	11,27	0,26	35,10	0,00	0,68			64,89		2,40
d_M, Delay for Movement [s/veh]	7,80	10,79	23,05	7,82	11,88	0,00	15,94	15,94	15,94	38,47	16,19	16,19
Movement LOS	A	B	C	A	B	A	B	B	B	D	B	B
d_A, Approach Delay [s/veh]	12,09			11,86			15,94			37,12		
Approach LOS	B			B			B			D		
d_I, Intersection Delay [s/veh]	16,89											
Intersection LOS	B											
Intersection V/C	0,554											

Note:

The intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.5 INTERSECTION: R512 (MALIBONGWE) AND ASHENTI ROAD/PRINCESS AVENUE

8.5.1 SCENARIO 1

This is an all-way stop controlled intersection.

The intersection cannot operate at acceptable levels of service during both peak hours and signalisation is proposed.

8.5.1.1 Scenario 1 a.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	1	363	605	61	338	0	1	0	0	350	0	35
X, volume / capacity	0,00	0,14	0,76	0,05	0,13	0,00	0,00			0,63	0,04	0,05

d, Delay for Lane Group [s/veh]	3,78	4,31	19,00	4,02	4,27	0,00	23,24			32,18	23,63	25,49
Lane Group LOS	A	A	B	A	A	A	C			C	C	C
50th-Percentile Queue Length [veh/ln]	0,00	0,70	7,34	0,24	0,65	0,00	0,01			2,84	0,24	0,25
50th-Percentile Queue Length [m/ln]	0,03	5,36	55,91	1,79	4,96	0,00	0,11			21,64	1,82	1,92
d_M, Delay for Movement [s/veh]	3,78	4,31	19,00	4,02	4,27	0,00	23,24	23,24	23,24	32,18	23,63	24,56
Movement LOS	A	A	B	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	13,48			4,23			23,24			31,49		
Approach LOS	B			A			C			C		
d_I, Intersection Delay [s/veh]	15,34											
Intersection LOS	B											
Intersection V/C	0,656											

8.5.1.2 Scenario 1 p.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	383	328	44	332	3	1	0	2	537	1	84
X, volume / capacity	0,00	0,18	0,48	0,05	0,15	0,00	0,01			0,63	0,09	0,09
d, Delay for Lane Group [s/veh]	0,00	7,35	14,89	6,69	7,21	8,99	17,97			25,60	18,87	23,25
Lane Group LOS	A	A	B	A	A	A	B			C	B	C
50th-Percentile Queue Length [veh/ln]	0,00	1,15	3,42	0,25	0,98	0,02	0,04			3,81	0,58	0,48
50th-Percentile Queue Length [m/ln]	0,00	8,73	26,06	1,93	7,45	0,18	0,28			29,06	4,43	3,67
d_M, Delay for Movement [s/veh]	0,00	7,35	14,89	6,69	7,21	8,99	17,97	17,97	17,97	25,60	18,87	20,74
Movement LOS	A	A	B	A	A	A	B	B	B	C	B	C
d_A, Approach Delay [s/veh]	10,83			7,17			17,97			24,93		
Approach LOS	B			A			B			C		
d_I, Intersection Delay [s/veh]	15,15											
Intersection LOS	B											
Intersection V/C	0,470											

Note:

With signalisation the intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.5.2 Scenario 2

The intersection layout and signalisation remain the same as in Scenario 1.

8.5.2.1 Scenario 2 a.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	1	411	605	61	383	0	1	0	0	350	0	35
X, volume / capacity	0,00	0,16	0,79	0,05	0,15	0,00	0,00			0,63	0,04	0,05
d, Delay for Lane Group [s/veh]	3,78	4,39	21,60	4,02	4,34	0,00	23,24			32,18	23,63	25,49
Lane Group LOS	A	A	C	A	A	A	C			C	C	C
50th-Percentile Queue Length [veh/ln]	0,00	0,81	8,02	0,24	0,75	0,00	0,01			2,84	0,24	0,25
50th-Percentile Queue Length [m/ln]	0,03	6,15	61,14	1,79	5,69	0,00	0,11			21,64	1,82	1,92
d_M, Delay for Movement [s/veh]	3,78	4,39	21,60	4,02	4,34	0,00	23,24	23,24	23,24	32,18	23,63	24,56
Movement LOS	A	A	C	A	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	14,63			4,30			23,24			31,49		
Approach LOS	B			A			C			C		
d_I, Intersection Delay [s/veh]	15,67											
Intersection LOS	B											
Intersection V/C	0,677											

8.5.2.2 Scenario 2 p.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	433	328	44	376	3	1	0	2	537	1	84
X, volume / capacity	0,00	0,19	0,48	0,04	0,17	0,00	0,01			0,70	0,10	0,09
d, Delay for Lane Group [s/veh]	0,00	6,53	13,76	5,83	6,39	8,12	19,44			29,35	20,49	25,10
Lane Group LOS	A	A	B	A	A	A	B			C	C	C
50th-Percentile Queue Length [veh/ln]	0,00	1,18	3,24	0,23	1,01	0,02	0,04			4,14	0,63	0,49
50th-Percentile Queue Length [m/ln]	0,00	9,02	24,67	1,74	7,69	0,17	0,29			31,55	4,78	3,75
d_M, Delay for Movement [s/veh]	0,00	6,53	13,76	5,83	6,39	8,12	19,44	19,44	19,44	29,35	20,49	22,39
Movement LOS	A	A	B	A	A	A	B	B	B	C	C	C
d_A, Approach Delay [s/veh]	9,64			6,34			19,44			28,39		
Approach LOS	A			A			B			C		
d_I, Intersection Delay [s/veh]	15,34											
Intersection LOS	B											
Intersection V/C	0,481											

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.5.3 Scenario 3

The intersection layout and signalisation remain the same as in Scenario 1.

8.5.3.1 Scenario 3 a.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	1	396	633	61	414	0	1	0	0	413	0	35
X, volume / capacity	0,00	0,16	0,85	0,05	0,16	0,00	0,00			0,75	0,04	0,05
d, Delay for Lane Group [s/veh]	3,78	4,36	27,77	4,02	4,39	0,00	23,24			36,85	23,63	25,49
Lane Group LOS	A	A	C	A	A	A	C			D	C	C
50th-Percentile Queue Length [veh/ln]	0,00	0,77	9,93	0,24	0,81	0,00	0,01			3,63	0,24	0,25
50th-Percentile Queue Length [m/ln]	0,03	5,90	75,63	1,79	6,21	0,00	0,11			27,68	1,82	1,92
d_M, Delay for Movement [s/veh]	3,78	4,36	27,77	4,02	4,39	0,00	23,24	23,24	23,24	36,85	23,63	24,56
Movement LOS	A	A	C	A	A	A	C	C	C	D	C	C
d_A, Approach Delay [s/veh]	18,75			4,34			23,24			35,89		
Approach LOS	B			A			C			D		
d_I, Intersection Delay [s/veh]	19,18											
Intersection LOS	B											
Intersection V/C	0,739											

8.5.3.2 Scenario 3 p.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	460	391	44	364	3	1	0	2	564	1	84
X, volume / capacity	0,00	0,20	0,57	0,04	0,16	0,01	0,01			0,74	0,10	0,09
d, Delay for Lane Group [s/veh]	0,00	6,59	15,67	5,83	6,36	8,24	19,44			30,66	20,49	25,10
Lane Group LOS	A	A	B	A	A	A	B			C	C	C
50th-Percentile Queue Length [veh/ln]	0,00	1,27	4,24	0,23	0,97	0,02	0,04			4,46	0,63	0,49
50th-Percentile Queue Length [m/ln]	0,00	9,66	32,29	1,74	7,42	0,17	0,29			34,01	4,78	3,75
d_M, Delay for Movement [s/veh]	0,00	6,59	15,67	5,83	6,36	8,24	19,44	19,44	19,44	30,66	20,49	22,39
Movement LOS	A	A	B	A	A	A	B	B	B	C	C	C
d_A, Approach Delay [s/veh]	10,77			6,32			19,44			29,58		
Approach LOS	B			A			B			C		
d_I, Intersection Delay [s/veh]	16,20											
Intersection LOS	B											
Intersection V/C	0,545											

Note:

The intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.5.4 Scenario 4

The intersection layout and signalisation remain the same as in Scenario 1.

8.5.4.1 Scenario 4 a.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	1	445	714	69	460	0	1	0	0	460	0	39
X, volume / capacity	0,00	0,18	1,00	0,06	0,18	0,00	0,00			0,83	0,05	0,06
d, Delay for Lane Group [s/veh]	3,78	4,44	85,86	4,05	4,47	0,00	23,24			43,48	23,69	25,56
Lane Group LOS	A	A	F	A	A	A	C			D	C	C
50th-Percentile Queue Length [veh/ln]	0,00	0,88	23,91	0,27	0,92	0,00	0,01			4,47	0,27	0,28
50th-Percentile Queue Length [m/ln]	0,03	6,73	182,17	2,06	6,99	0,00	0,11			34,04	2,04	2,16
d_M, Delay for Movement [s/veh]	3,78	4,44	85,86	4,05	4,47	0,00	23,24	23,24	23,24	43,48	23,69	24,62
Movement LOS	A	A	F	A	A	A	C	C	C	D	C	C
d_A, Approach Delay [s/veh]	54,56			4,42			23,24			42,00		
Approach LOS	D			A			C			D		
d_I, Intersection Delay [s/veh]	39,57											
Intersection LOS	D											
Intersection V/C	0,859											

8.5.4.2 Scenario 4 p.m.

Name	R512			R512			Ashenti			Ashenti		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Total Analysis Volume [veh/h]	0	511	435	49	409	3	1	0	2	636	1	96
X, volume / capacity	0,00	0,23	0,66	0,05	0,18	0,01	0,01			0,83	0,12	0,11
d, Delay for Lane Group [s/veh]	0,00	6,72	18,99	5,86	6,47	8,49	19,46			36,28	20,69	25,55
Lane Group LOS	A	A	B	A	A	A	B			D	C	C
50th-Percentile Queue Length [veh/ln]	0,00	1,43	5,39	0,26	1,11	0,02	0,04			5,57	0,73	0,56
50th-Percentile Queue Length [m/ln]	0,00	10,90	41,04	1,96	8,45	0,17	0,29			42,43	5,54	4,25
d_M, Delay for Movement [s/veh]	0,00	6,72	18,99	5,86	6,47	8,49	19,46	19,46	19,46	36,28	20,69	22,66
Movement LOS	A	A	B	A	A	A	B	B	B	D	C	C

d_A, Approach Delay [s/veh]	12,37	6,42	19,46	34,48
Approach LOS	B	A	B	C
d_I, Intersection Delay [s/veh]	18,66			
Intersection LOS	B			
Intersection V/C	0,624			

Note:

The intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.6 INTERSECTION: BOEING STREET AND AIRBUS CLOSE

8.6.1 SCENARIO 1

This is a two-way stop-controlled intersection with stop control on the northern approach, Airbus Close.

8.6.1.1 Scenario 1 a.m.

Name	Airbus		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	38	42	0	2	0
V/C, Movement V/C Ratio	0,00	0,04	0,00	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	8,55	8,77	0,00	0,00	0,00	7,30
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,12	0,12	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	0,91	0,91	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	8,77		0,00		0,00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	4,06					
Intersection LOS	A					

8.6.1.2 Scenario 1 p.m.

Name	Airbus		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	67	24	2	1	0
V/C, Movement V/C Ratio	0,00	0,07	0,00	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	8,63	8,84	0,00	0,00	0,00	7,27
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,21	0,21	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	1,63	1,63	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	8,84		0,00		0,00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	6,30					
Intersection LOS	A					

Note:

The intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.6.2 Scenario 2

The intersection layout and signalisation remain the same as in Scenario 1.

8.6.2.1 Scenario 2 a.m.

Name	Airbus		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	38	42	0	2	0
V/C, Movement V/C Ratio	0,00	0,04	0,00	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	8,55	8,77	0,00	0,00	0,00	7,30
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,12	0,12	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	0,91	0,91	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	8,77		0,00		0,00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	4,06					
Intersection LOS	A					

8.6.2.2 Scenario 2 p.m.

Name	Airbus		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	67	24	2	1	0
V/C, Movement V/C Ratio	0,00	0,07	0,00	0,00	0,00	0,00

d_M, Delay for Movement [s/veh]	8,63	8,84	0,00	0,00	0,00	7,27
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,21	0,21	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	1,63	1,63	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	8,84		0,00		0,00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	6,30					
Intersection LOS	A					

Note:

The intersection and the individual movements on each approach continue to operate at acceptable levels of service during both peak hours.

8.6.3 Scenario 3

There is an existing access to a filling station located between the R512 and Airbus Close that affects the length of the turning lanes and tapers. As result the intersection is upgraded with the following additional lanes as depicted in Figure 7:

- Two lanes in both directions along Boeing Street towards the R512; and
- Left-slip lane on Boeing Street, eastern approach.

8.6.3.1 Scenario 3 a.m.

Name	Access Road		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	293	637	0	2	0
V/C, Movement V/C Ratio	0,00	0,29	0,01	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	9,74	9,94	0,00	0,00	0,00	7,22
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1,20	1,20	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	9,17	9,17	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	9,94		0,00		0,00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3,13					
Intersection LOS	A					

8.6.3.2 Scenario 3 p.m.

Name	Access Road		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	670	271	2	1	0
V/C, Movement V/C Ratio	0,00	0,66	0,00	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	15,03	15,24	0,00	0,00	0,00	7,22
Movement LOS	C	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	5,58	5,58	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	42,51	42,51	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	15,24		0,00		0,00	

Approach LOS	C	A	A
d_I, Intersection Delay [s/veh]	10,82		
Intersection LOS	C		

Note:

With the upgrades the intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

8.6.4 Scenario 4

The intersection layout proposed in Scenario 3 remains.

8.6.4.1 Scenario 4 a.m.

Name	Access Road		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	293	637	0	2	0
V/C, Movement V/C Ratio	0,00	0,29	0,01	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	9,74	9,94	0,00	0,00	0,00	7,22
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1,20	1,20	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	9,17	9,17	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	9,94		0,00		0,00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3,13					
Intersection LOS	A					

8.6.4.2 Scenario 4 p.m.

Name	Airbus		Boeing		Boeing	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Total Analysis Volume [veh/h]	0	670	271	2	1	0
V/C, Movement V/C Ratio	0,00	0,66	0,00	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	15,03	15,24	0,00	0,00	0,00	7,22
Movement LOS	C	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	5,58	5,58	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	42,51	42,51	0,00	0,00	0,00	0,00
d_A, Approach Delay [s/veh]	15,24		0,00		0,00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	10,82					
Intersection LOS	C					

Note:

The intersection and the individual movements on each approach to the intersection operate at acceptable levels of service during both peak hours.

11. PUBLIC TRANSPORT

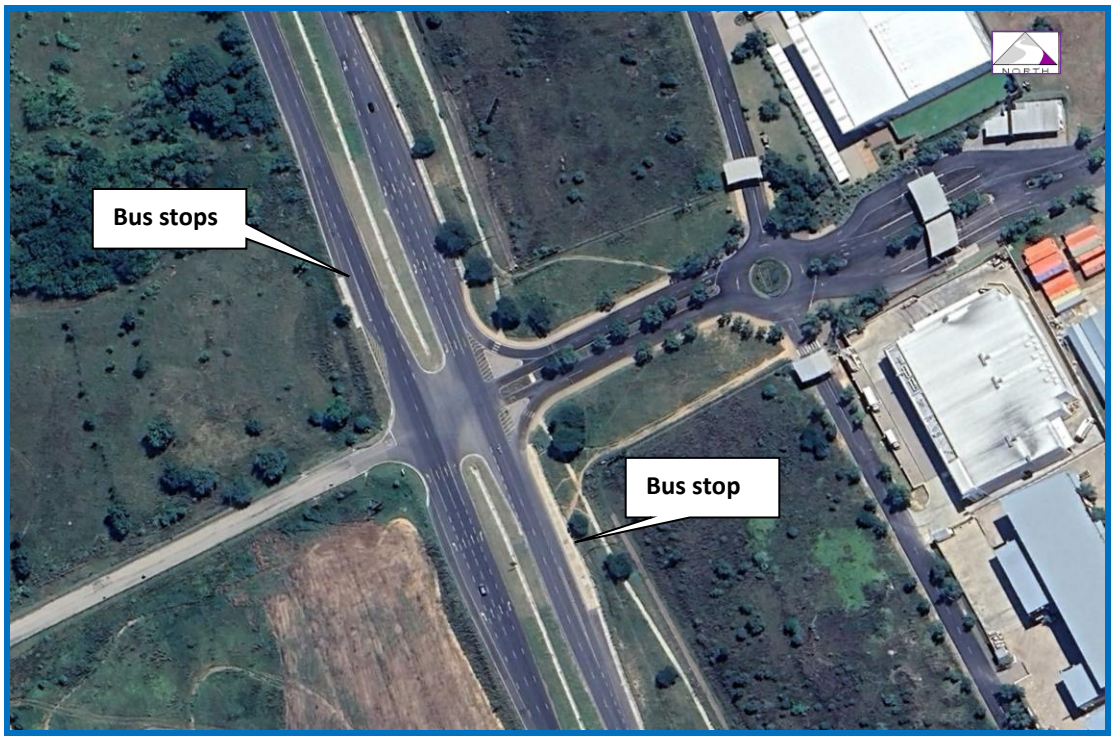
11.1 GAUTRAIN

Not operating in the area.

11.2 BUS AND MINI-BUS SERVICES

Bus services and minibus services were observed operating along the R512/Malibongwe Drive. There are existing facilities along Malibongwe Drive at the intersection with Amelia Lane and at the intersection with Ashenti Street.

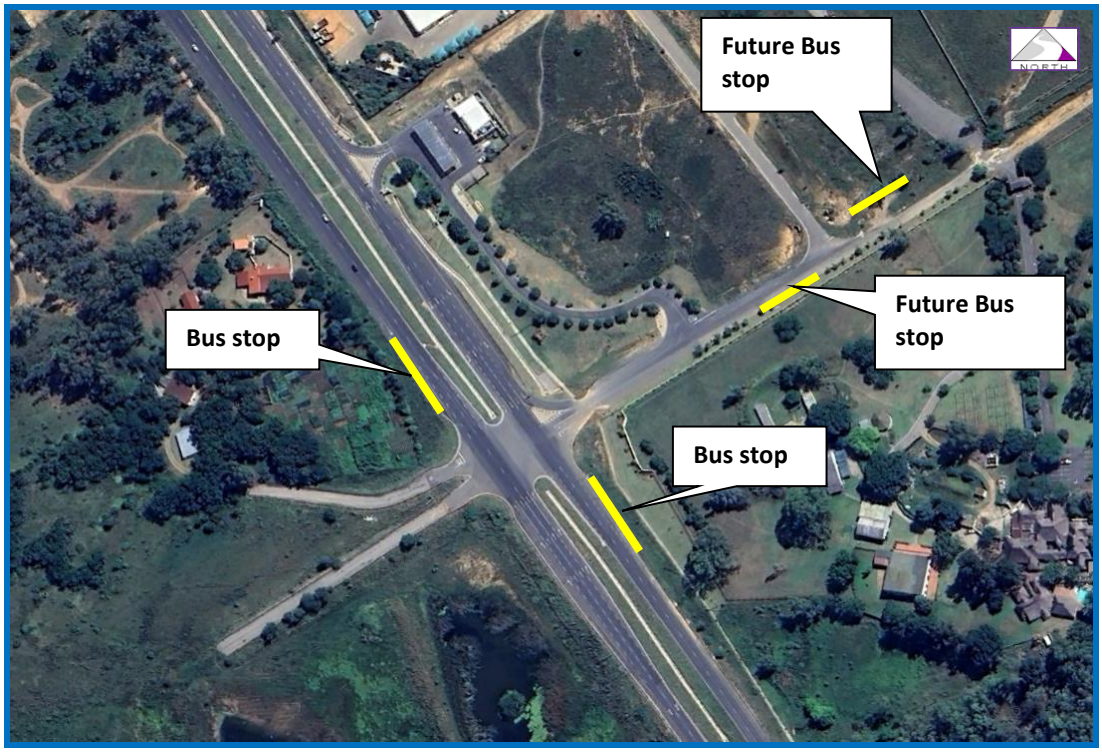
The existing facilities at the intersection with Amelia Lane is depicted on the aerial photo below.



Existing facilities along R512/Malibonge Drive

These facilities are located well beyond an acceptable walking distance from the proposed township, ±1.6km from the middle of the township. Facilities are therefore proposed at the intersection of the R512 and Boeing Street, the walking distance is ±850m.

As development takes place in the area and Boeing Street is extended, facilities should be implemented at the intersection of Boeing Street and Airbus Close.



Proposed and future facilities

The public transport demand from this development can be accommodated with these facilities. As development takes place and the road network develops it is expected that public transport service providers will increase services in the area.

11.4 PEDESTRIANS

There are no sidewalks along Airbus Close , Boeing Street or the R512. The provision of sidewalks along Boeing Street between Airbus Close and the R512 are proposed (see Figure 7).

12. ROAD UPGRADES

Based on Scenario 3 the following upgrades are required to accommodate the expected traffic demand from the proposed township.

8.1 INTERSECTION: R512 (MALIBONGWE) AND R552 (PINEVALLEY)

All-way stop upgraded to signalised intersection.

This was a signalised intersection, parts of it is still visible on site.

8.2 INTERSECTION: R512(MALIBONGWE) AND FALCON CLOSE/REFILWE

All-way stop upgraded to signalised intersection, subject to a signal warrant.

8.3 INTERSECTION: R512(MALIBONGWE) AND BOEING STREET

The intersection is upgraded to accommodate the access to the township with the following additional lanes as depicted in Figure 7:

- Additional 90m right-turn lane on R512 southern approach (allowing double right-turn lanes onto Boeing Street);
- Two lanes in both directions along Boeing Street up to township access;
- Addition 60m right-turn land on Boeing Street eastern approach;

- Left-slip lane on R512 northern approach;
- Bus/taxi stops along Malibongwe Drive on both sides of the intersection; and
- Traffic signal

8.4 INTERSECTION: R512 (MALIBONGWE) AND AMELIA LANE

Two-way stop upgraded to signalised intersection.

8.5 INTERSECTION: R512 (MALIBONGWE) AND ASHENTI ROAD/PRINCESS AVENUE

All-way stop upgraded to signalised intersection.

8.6 INTERSECTION: BOEING STREET AND AIRBUS CLOSE

There is an existing access to a filling station located between the R512 and Airbus Close that affects the length of the turning lanes and tapers. As result the intersection is upgraded with the following additional lanes as depicted in Figure 7:

- Two lanes in both directions along Boeing Street towards the R512;
- Left-slip lane on Boeing Street eastern approach.
- Additional 45m shared through- and right-turn lane on Boeing Street eastern approach (future right-turn lane)

13. CONCLUSION AND RECOMMENDATION

This traffic impact assessment was done in support of the township application on Lanseria Extension 81 situated on a portion of Portion 72 (portion of Portion 2) of the Farm Bultfontein 533 JQ. The total extent of the township is 30.7995ha with 27.031ha available for development. The proposed development controls are:

Zoning "Industrial 1"
FAR: 0.6

Traffic counts conducted at a similar development north of and next to the application site indicate the following:

Total number of a.m. peak hour trips 510 (417 in and 93 out)
Total number of p.m. peak hour trips 477 (75 in and 402 out)

Based on an estimated total area of 40ha and a FSR of 0.5 (the total area includes some roads) the estimated total floor area already provided is 200 000m^2.

The weekday morning and afternoon peak hour trip generation are presented in Table 1.

Peak hour	Floor area	Trip generation rate/100m^2	Directional Split (in/out)	Total number of trips	New Trips In	New Trips Out
Industrial						
Morning peak hour (a.m.)	200 000	0.255	82:18	510	417	93
Afternoon peak hour (p.m.)	200 000	0.24	16:84	477	75	402

Table 1: Weekday peak hour trip generation

The trip generation rates obtained from the document South African Trip Data Manual [(1)] was applied. The development controls will allow a total floor area of 162 180m^2.

The following land uses will be allowed in terms of the SA Trip Data Manual[(1)]: Industrial Park, Light manufacturing, Warehousing and Mini Warehousing.

Over estimating the trip generation is a concern and the following assumption was made for trip generation purposes:

Industrial	30% of total FAR
Light Manufacturing	30% of total FAR
Warehousing	30% of total FAR
Mini-warehousing	10% of total FAR

The expected weekday morning and afternoon peak hour trip generation are presented in Table 2.

Peak hour	Floor area	Trip generation rate/100m²	Directional Split (in/out)	Total number of trips	New Trips In	New Trips Out
Industrial						
Morning peak hour (a.m.)	48 654	0.80	70:30	389	272	117
Afternoon peak hour (p.m.)	48 654	0.80	25:75	389	97	292
Light Manufacturing						
Morning peak hour (a.m.)	48 654	0.60	80:20	292	234	58
Afternoon peak hour (p.m.)	48 654	0.60	20:80	292	58	234
Warehouse and distribution						
Morning peak hour (a.m.)	48 654	0.50	60:40	243	146	97
Afternoon peak hour (p.m.)	48 654	0.50	45:55	243	109	134
Mini Warehousing						
Morning peak hour (a.m.)	16 218	0.15	60:40	24	14	10
Afternoon peak hour (p.m.)	16 218	0.15	50:50	24	12	12
Total						
Morning peak hour (a.m.)	162 180	0.58	70:30	948	666	282
Afternoon peak hour (p.m.)	162 180	0.58	29:71	948	276	672

Table 2: Expected weekday peak hour trip generation

Two stands are already developed and the trips are already on the road network.

- Erf 956 with GLA of 7 695m²
- Erf 974 with GLA of 8 092m²

Total: 15 787m²

The expected new weekday morning and afternoon peak hour trips are presented in Table 3.

Peak hour	Floor area	Trip generation rate/100m²	Directional Split (in/out)	Total number of trips	New Trips In	New Trips Out
Morning peak hour (a.m.)	146 393	0.58	70:30	849	594	255
Afternoon peak hour (p.m.)	146 393	0.58	29:71	849	246	603

Table 3: Expected weekday peak hour trip generation

The results of the capacity analysis indicate that traffic control upgrades are already required at all the intersections analysed along the R512/Malibongwe Drive. With the expected traffic demand from the development road upgrades are required at two intersections.

This application can be supported from a traffic flow point of view. It is further recommended that:

13.1 Access is obtained off Airbus Close as depicted in the township layout and in Figure 7.

13.2 The following road upgrades are implemented:

13.2.1 Intersection: R512 (Malibongwe) and R552 (Pinevalley)

All-way stop upgraded to signalised intersection.

13.2.1 Intersection: R512(Malibongwe) and Falcon Close/Refilwe

All-way stop upgraded to signalised intersection, subject to a signal warrant.

13.2.3 Intersection: R512 (Malibongwe) and Boeing Street

The intersection is upgraded as depicted in Figure 7:

- Additional 90m right-turn lane on R512 southern approach (allowing double right-turn lanes onto Boeing Street);
- Two lanes in both directions along Boeing Street up to Airbus Close;
- Additional right-turn lane, maximum that can be fitted on Boeing Street eastern approach;
- Left-slip lane on R512 northern approach;
- Bus/taxi stops along Malibongwe Drive on both sides of the intersection; and
- Traffic signal

13.2.4 Intersection: R512 (Malibongwe) and Amelia Lane

Two-way stop upgraded to signalised intersection.

13.2.5 Intersection: R512 (Malibongwe) and Ashenti Road/Princess Avenue

All-way stop upgraded to signalised intersection.

13.2.6 Intersection: Boeing Street and Airbus Close

The intersection is upgraded to accommodate the access to the township with the following additional lanes as depicted in Figure 7:

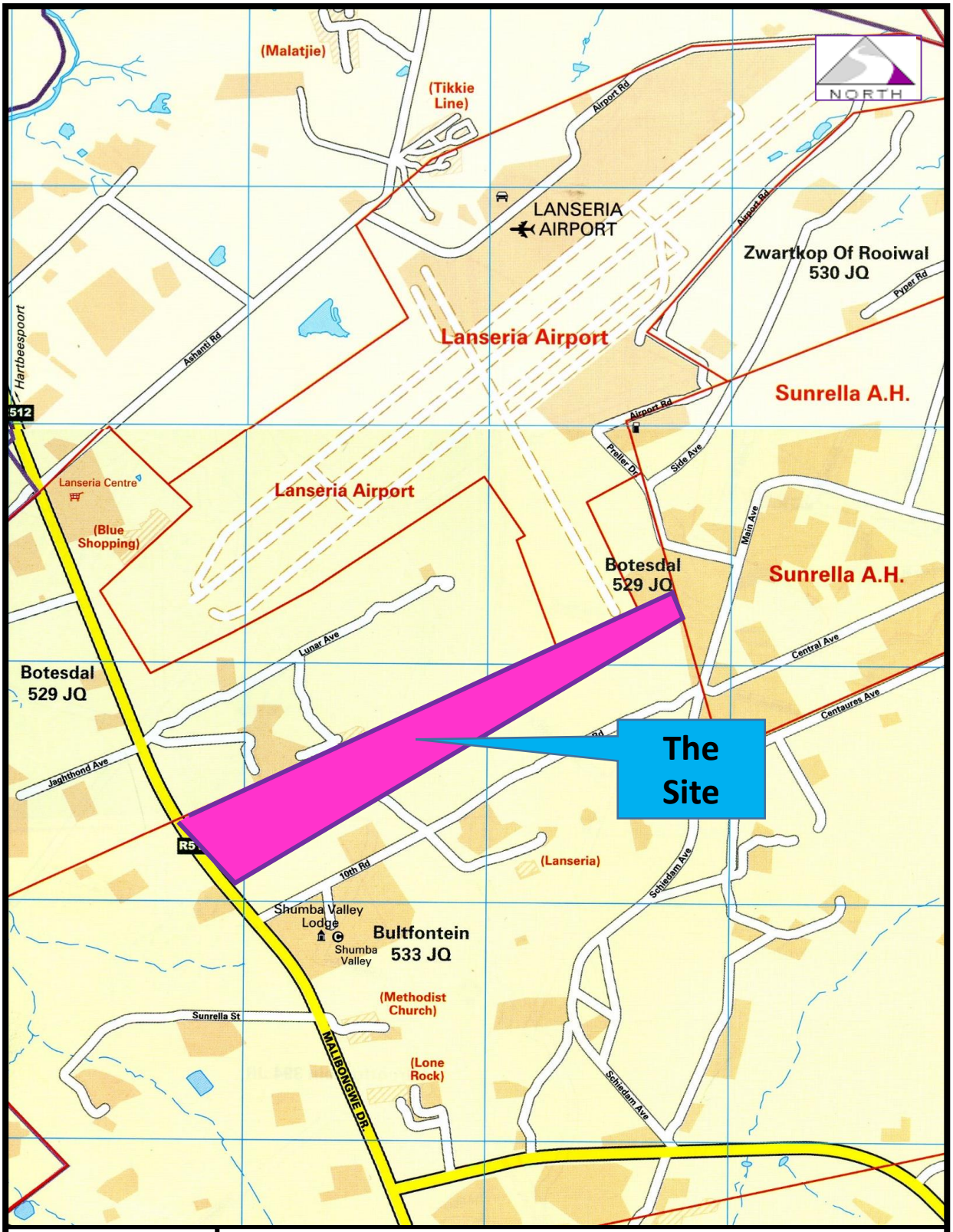
- Two lanes in both directions along Boeing Street towards the R512;
- Left slip lane on Boeing Street eastern approach; and
- Additional 45m shared through- and right-turn lane on Boeing Street eastern approach (future right-turn lane)

13.3 The developer implements sidewalks next to Boeing Street, between Airbus Close and the R512 (see Figure 7).

14. REFERENCES

(1) COTO, TMH 17 Volume 1, South African Trip Data Manual, Version 2.0, March 2018.
(2) Corli Havenga Transportation Engineers, Traffic Impact Study, Lanseria Extension 55, 18 February 2013.
(3) PTV Group, PTV Vistro 2020-08, PTV AG. Haid-und-Neu-Str. 15, D-76131 Karlsruhe, Deutschland.

ANNEXURE A



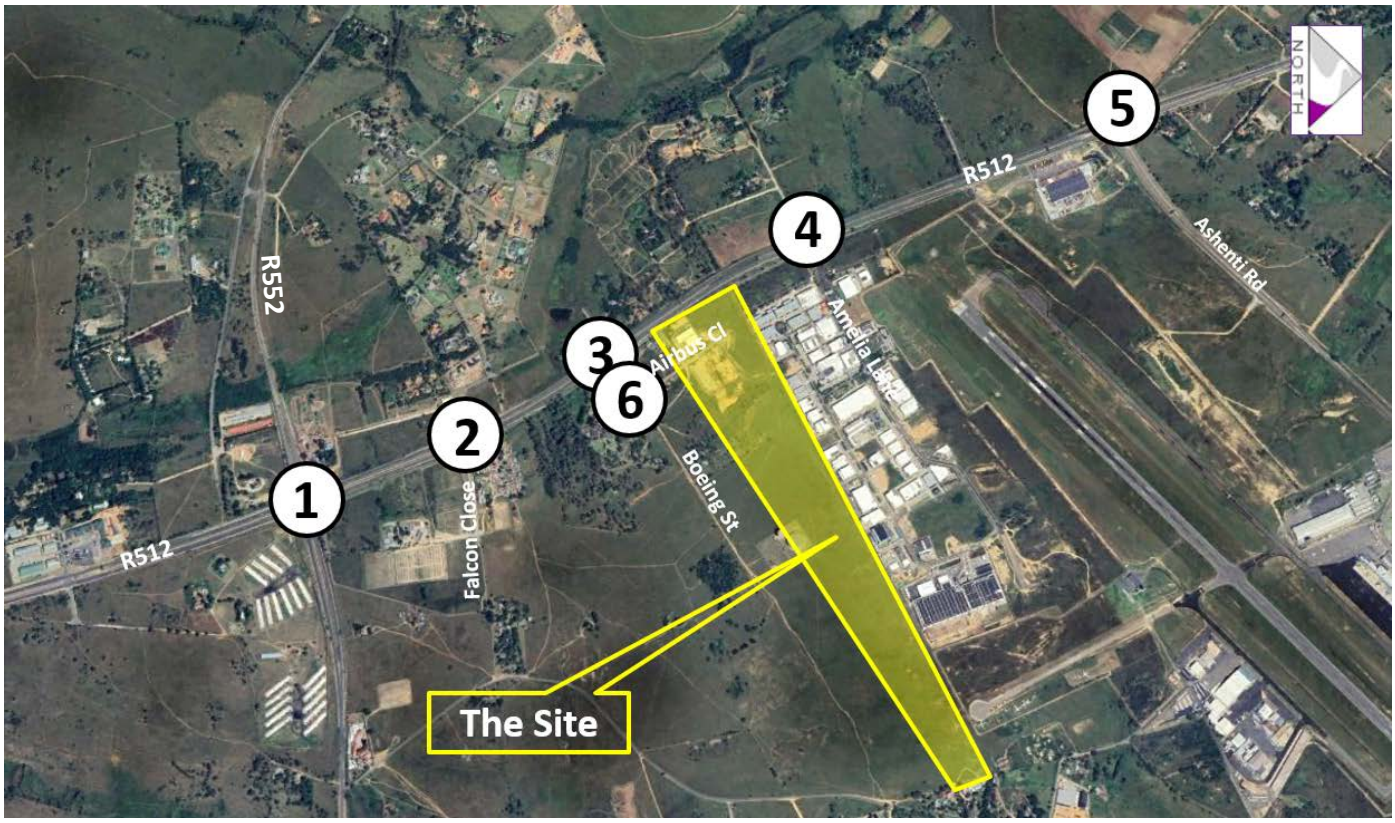
CORLI HAVENGA
VERVOER INGENIEURS
TRANSPORTATION ENGINEERS

TRAFFIC IMPACT ASSESSMENT
LANSERIA EXTENSION 81

FIGURE 1: SITE LOCATION PLAN

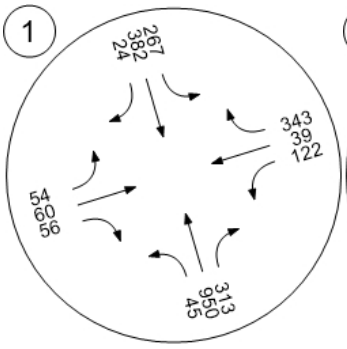
SCALE: N/A	PP21918

Traffic Volume - Base Volume

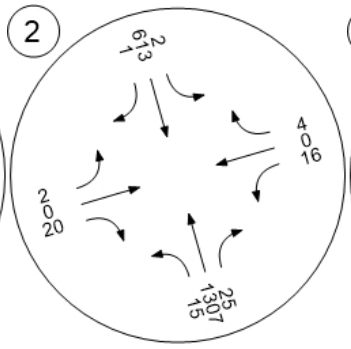


Existing A.m. Peak Hour Traffic Demand:

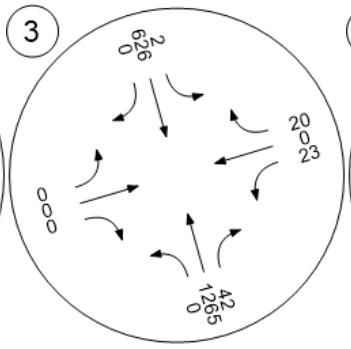
R512 and R552



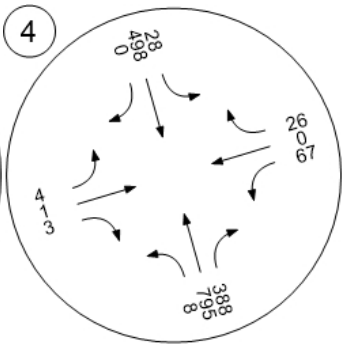
R512 and Falcon Close



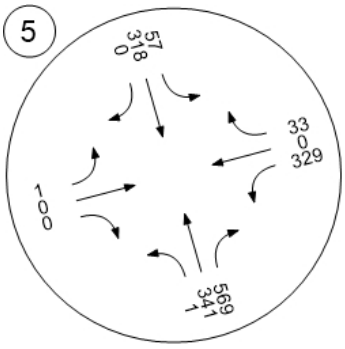
R512 and Boeing



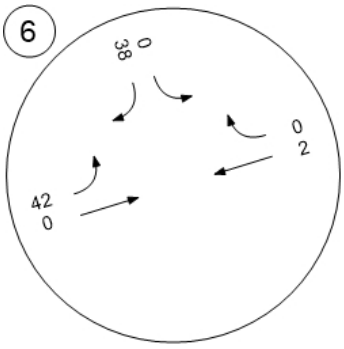
R512 and Amelia



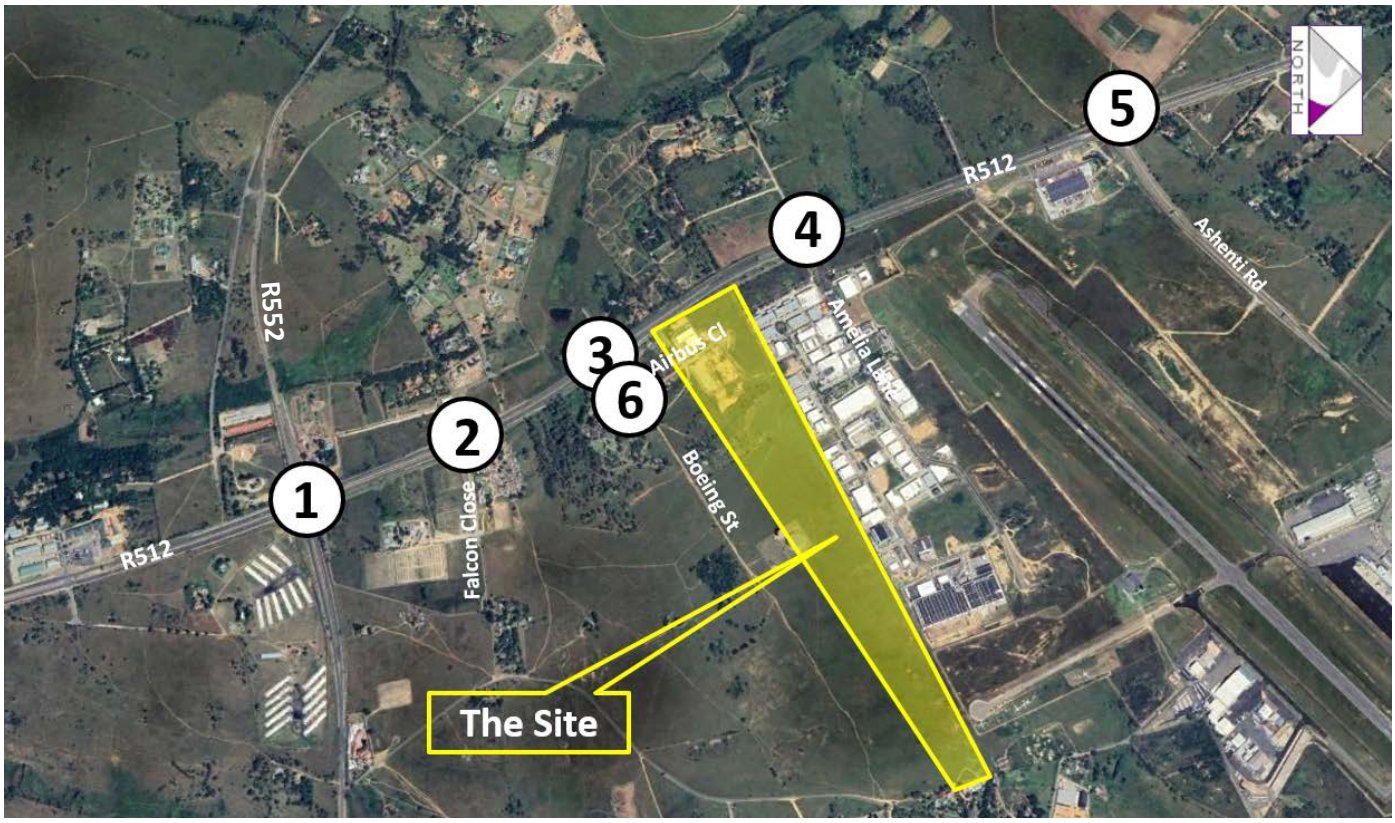
R512 and Ashenti



Boeing and Airbus Close

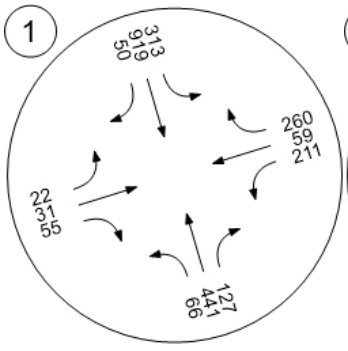


Traffic Volume - Base Volume

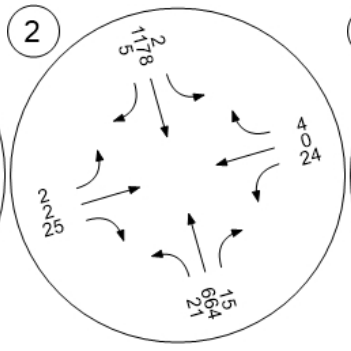


Existing P.m. Peak Hour Traffic Demand:

R512 and R552



R512 and Falcon Close



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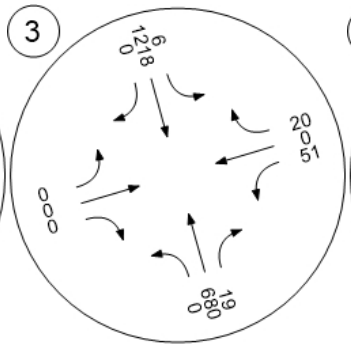
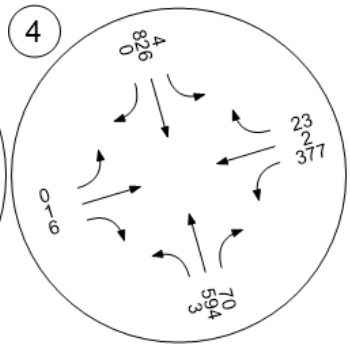
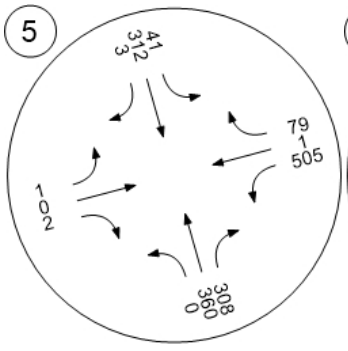


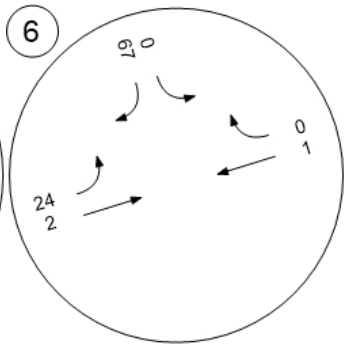
R512 and Amelia



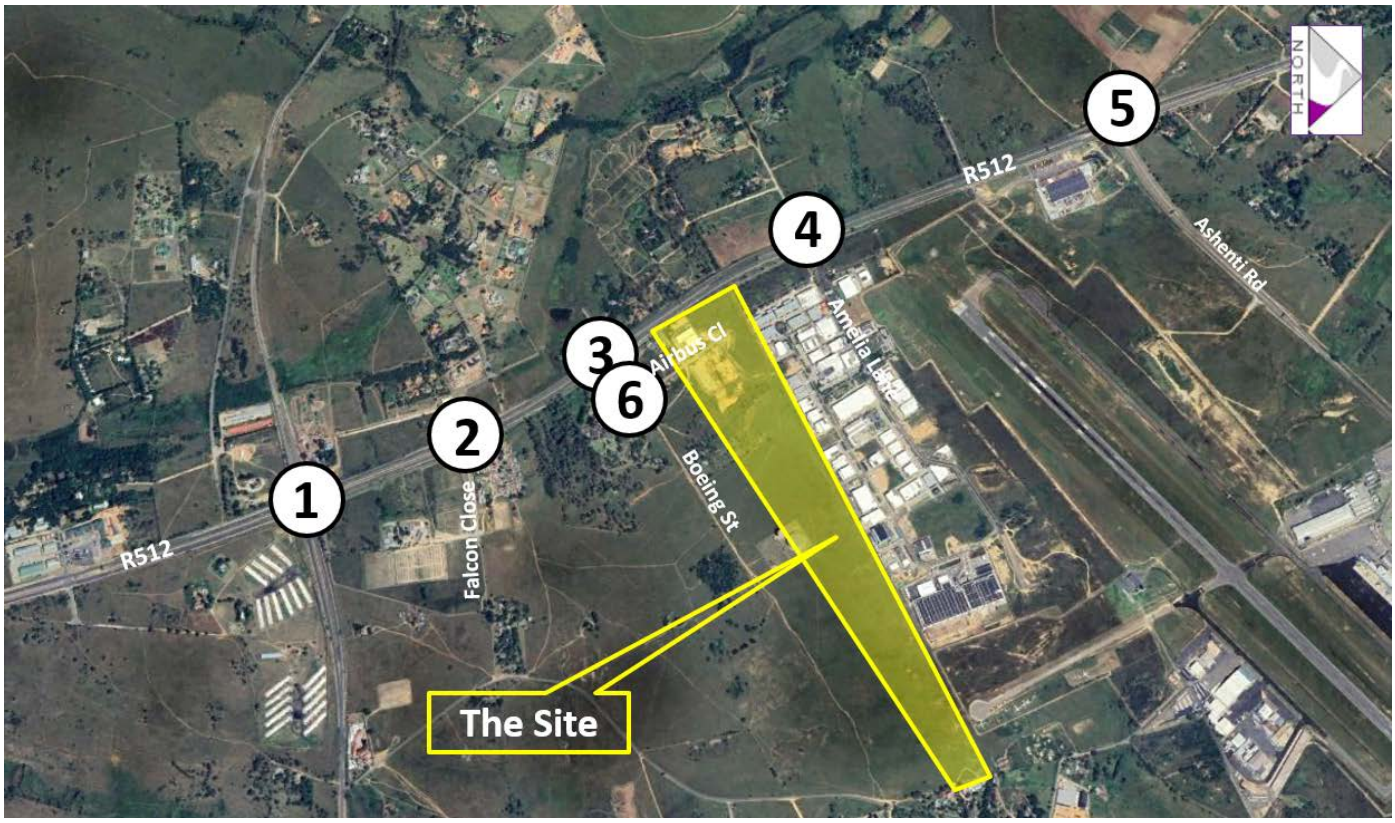
R512 and Ashenti



Boeing and Airbus Close

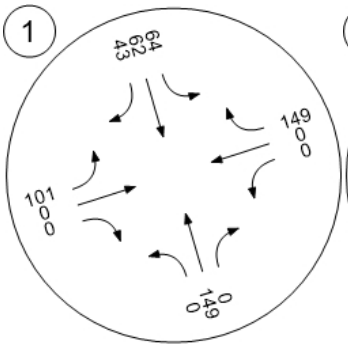


Traffic Volume - Net New Site Trips

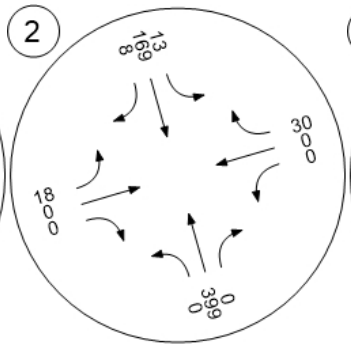


Expected A.m. Peak Hour Traffic Demand:

R512 and R552



R512 and Falcon Close



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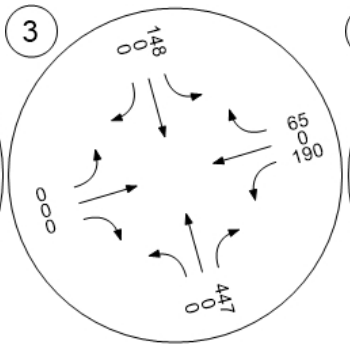

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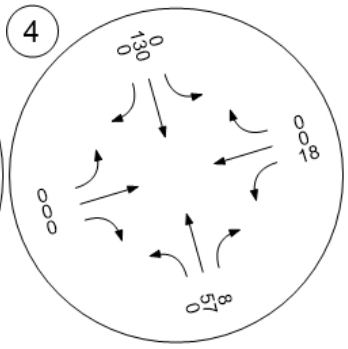

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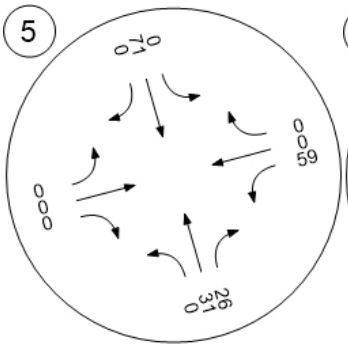
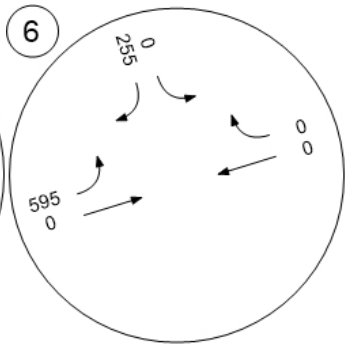
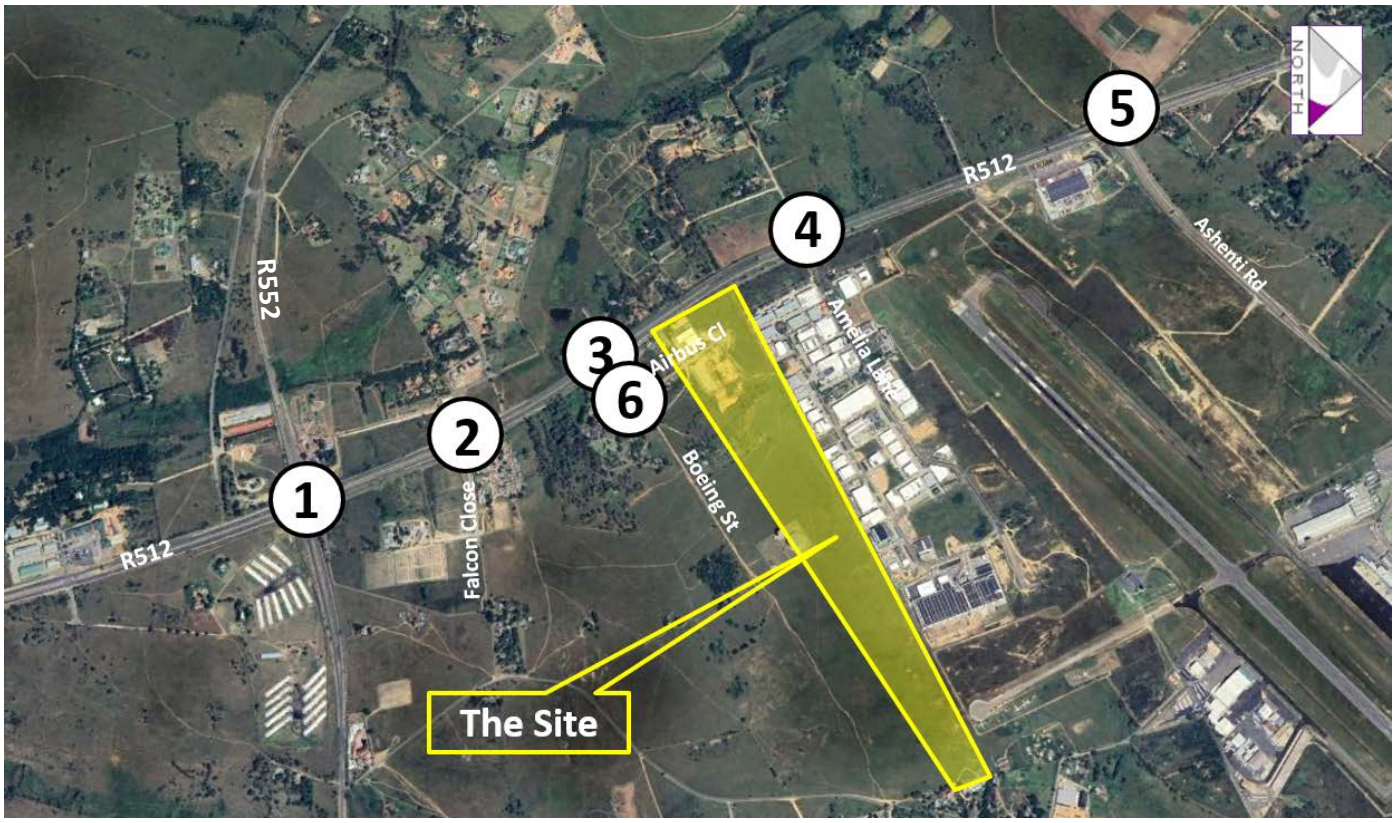


Boeing and Airbus Close

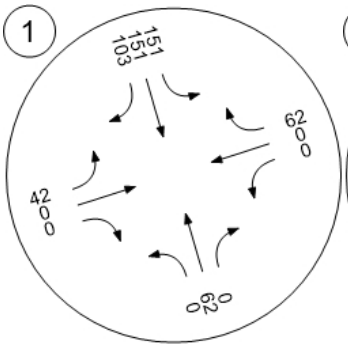


Traffic Volume - Net New Site Trips

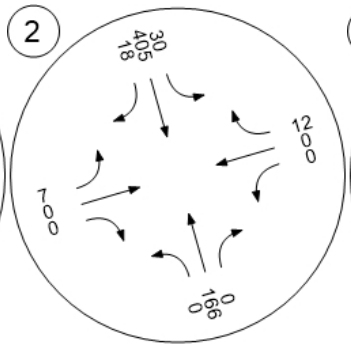


Expected P.m. Peak Hour Traffic Demand:

R512 and R552



R512 and Falcon Close



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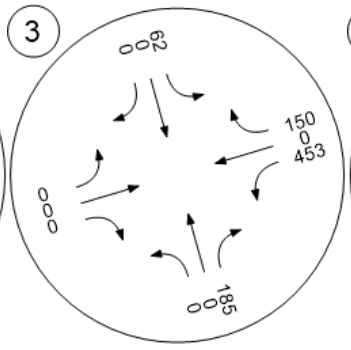

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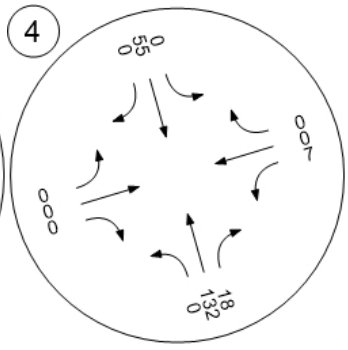

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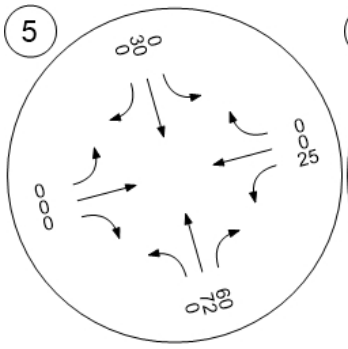
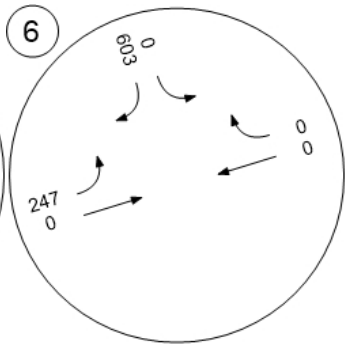
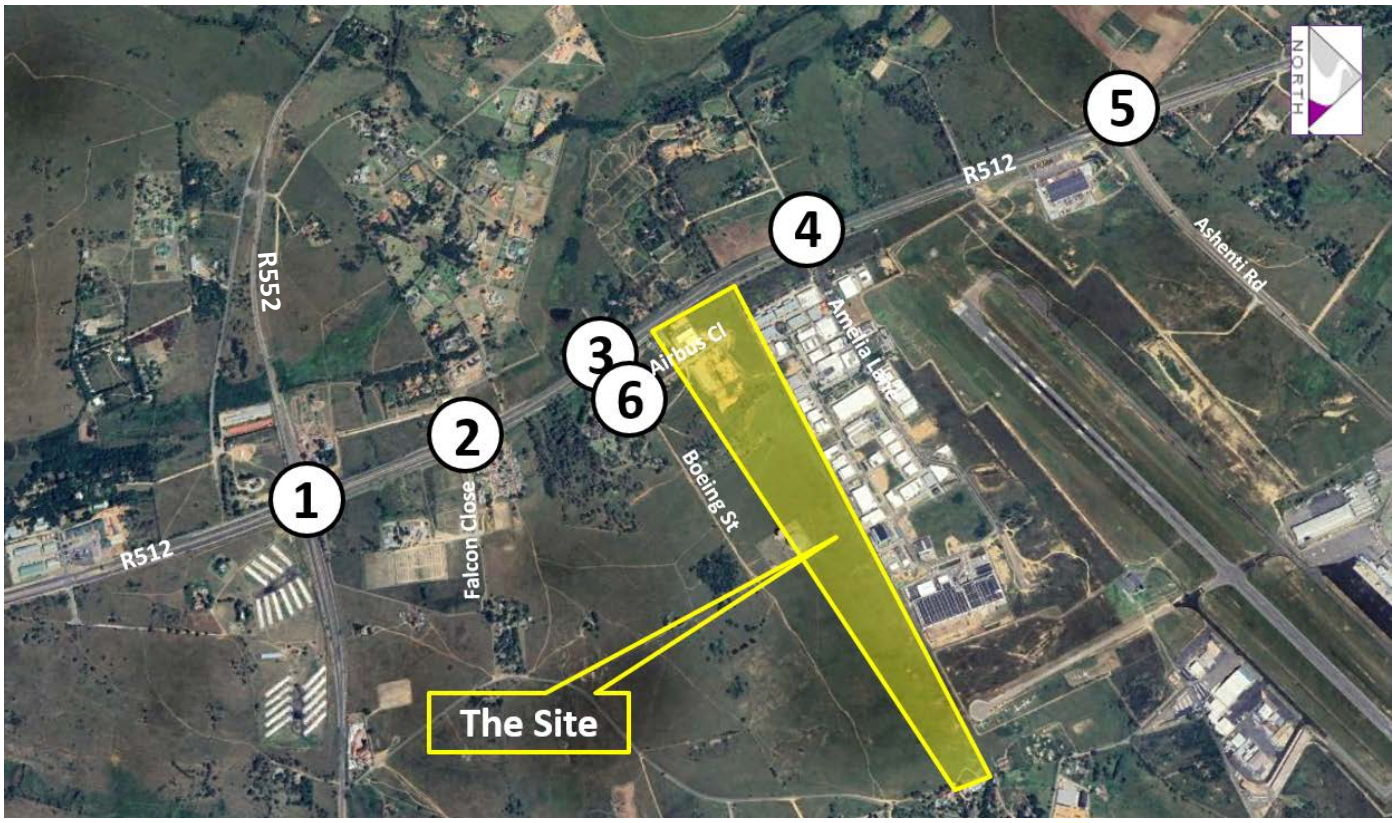


Boeing and Airbus Close

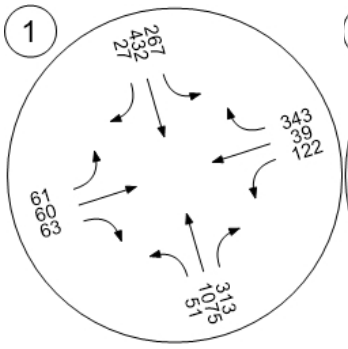


Traffic Volume - Future Total Volume

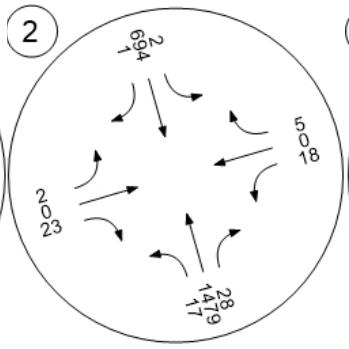


Expected A.m. Peak Hour Traffic Demand:

R512 and R552



R512 and Falcon Close



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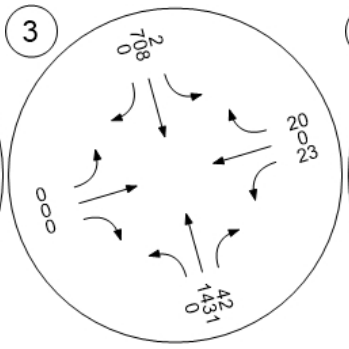

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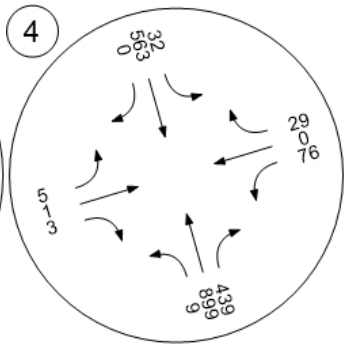

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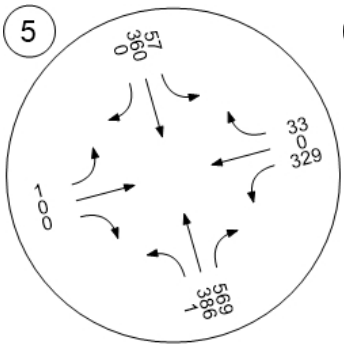
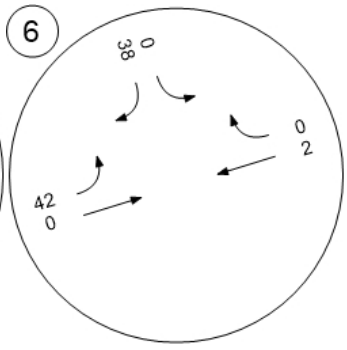
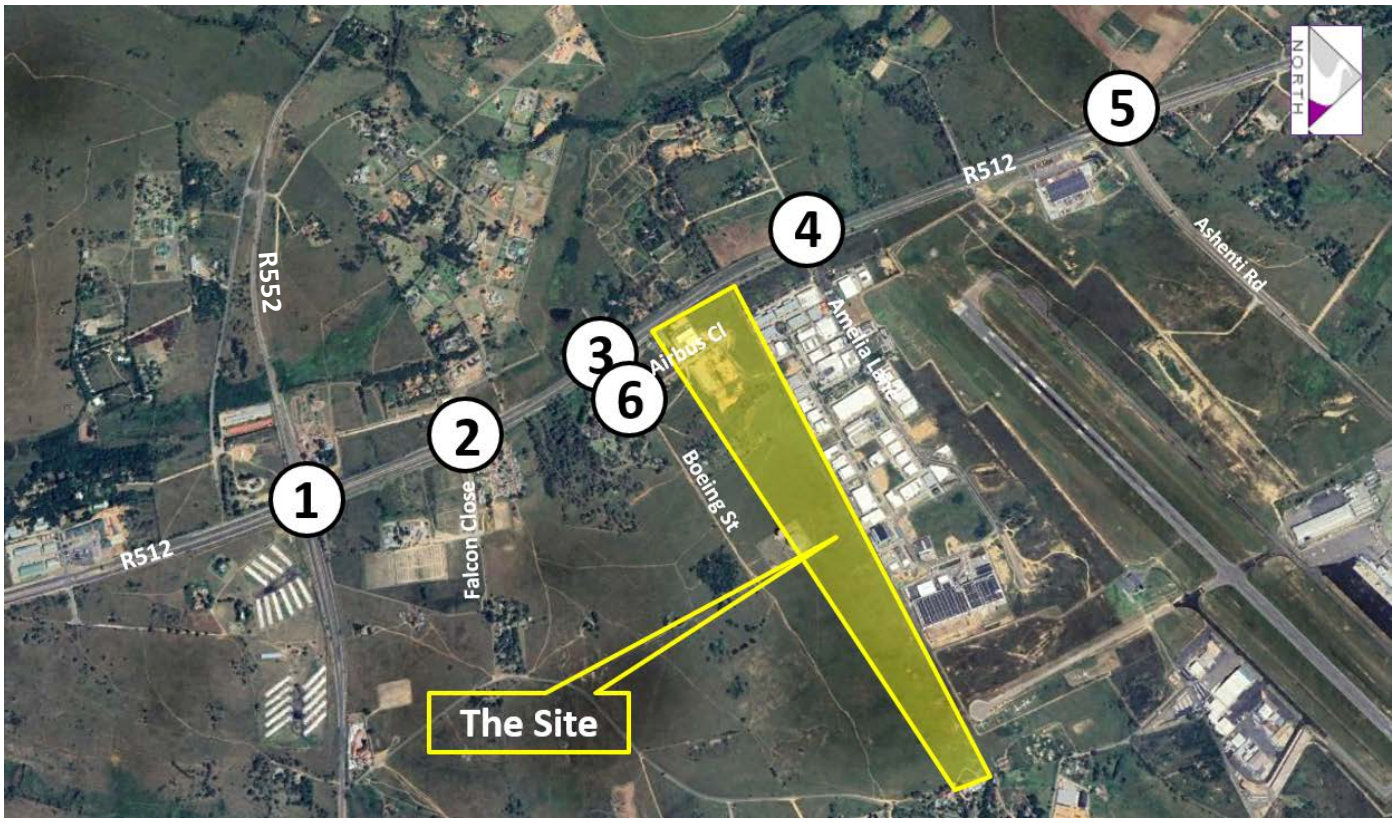


Boeing and Airbus Close

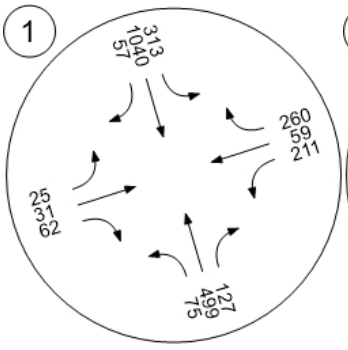


Traffic Volume - Future Total Volume

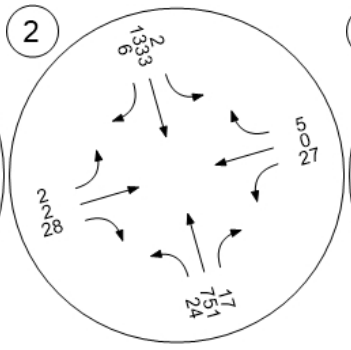


Expected P.m. Peak Hour Traffic Demand:

R512 and R552



R512 and Falcon Close



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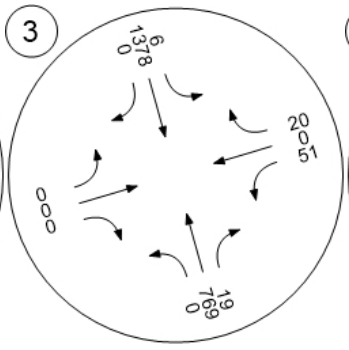

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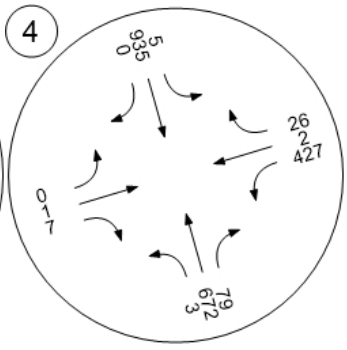

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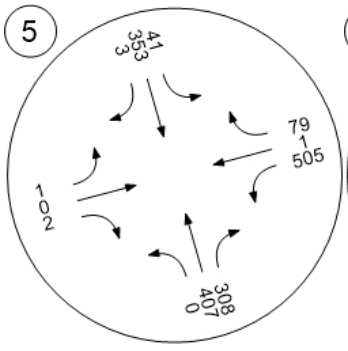
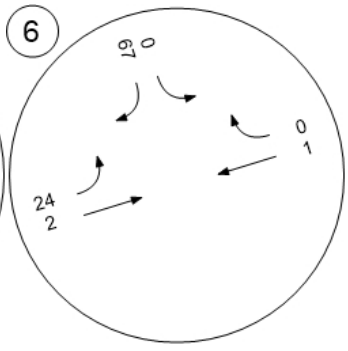
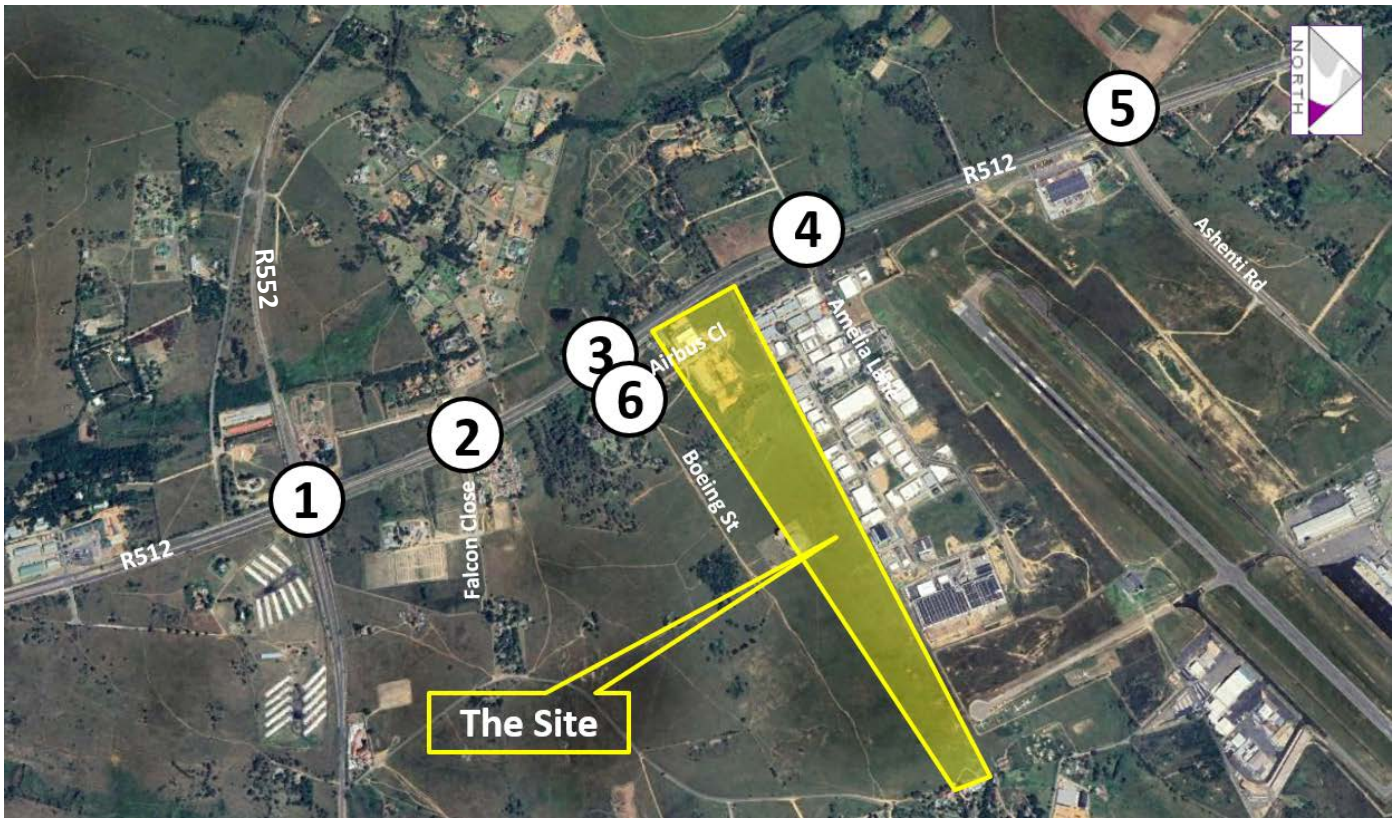


Boeing and Airbus Close

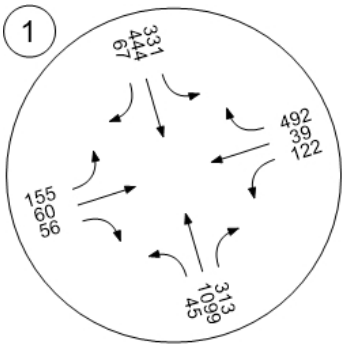


Traffic Volume - Future Total Volume

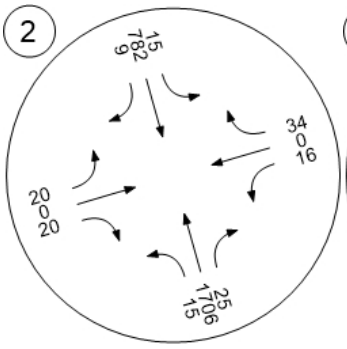


Expected A.m. Peak Hour Traffic Demand:

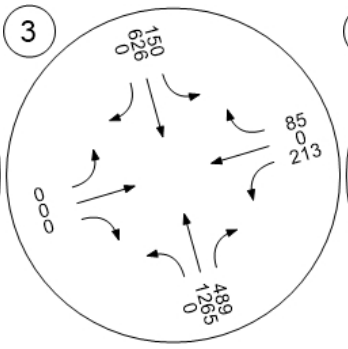
R512 and R552



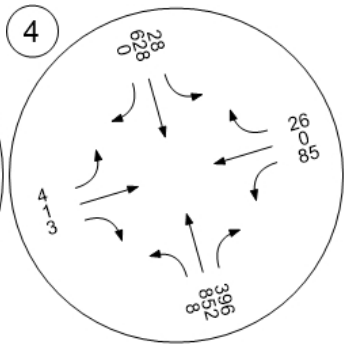
R512 and Falcon Close



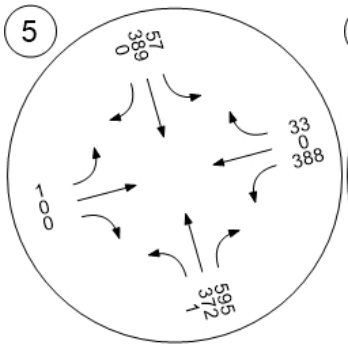
R512 and Boeing



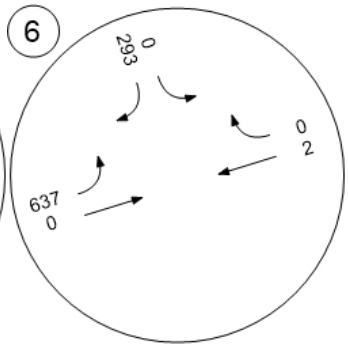
R512 and Amelia



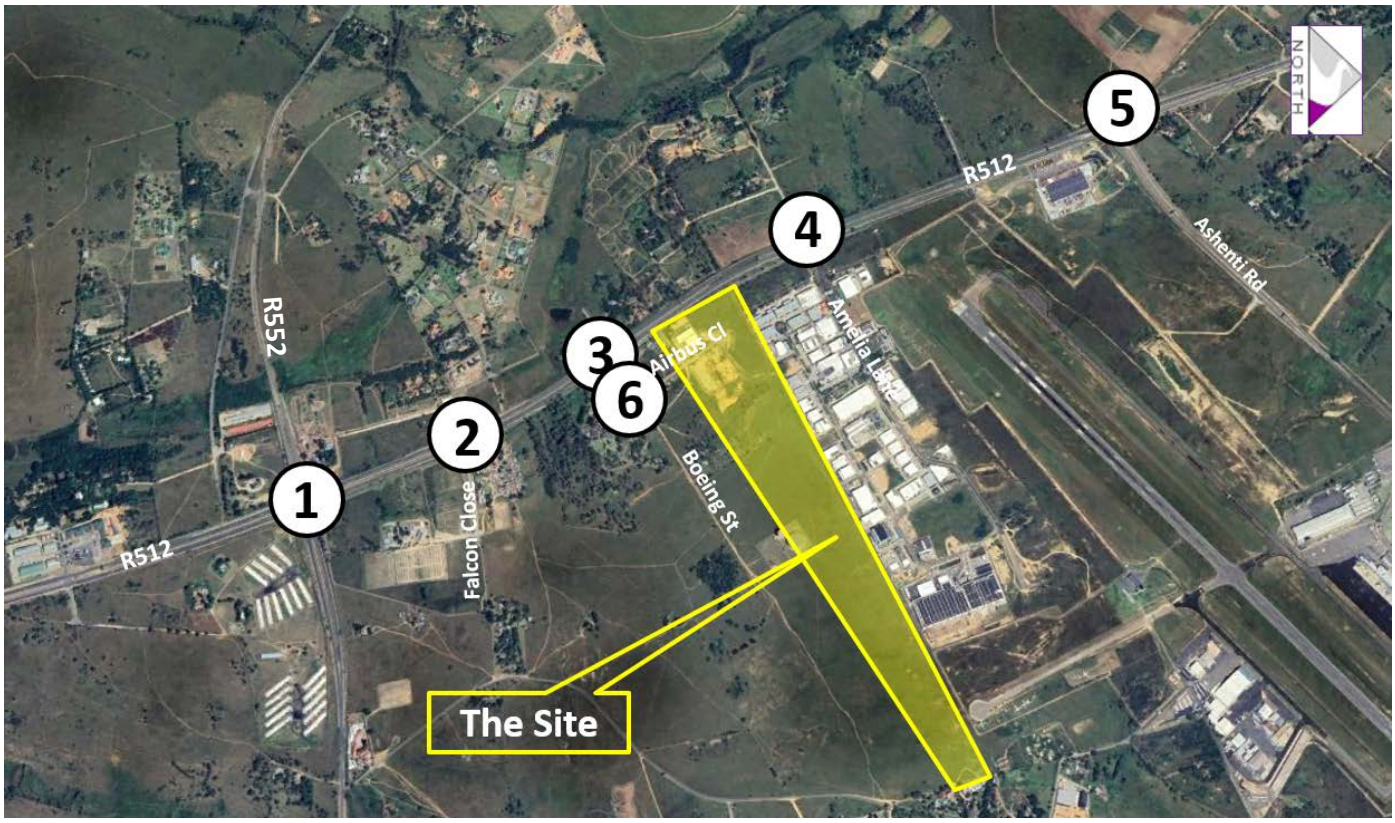
R512 and Ashenti



Boeing and Airbus Close

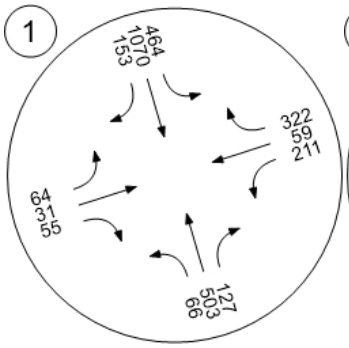


Traffic Volume - Future Total Volume

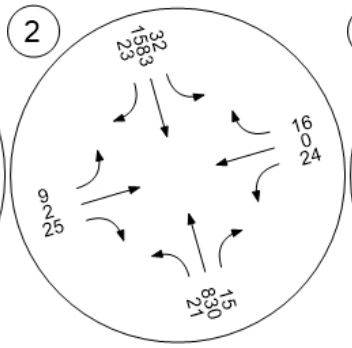


Expected P.m. Peak Hour Traffic Demand:

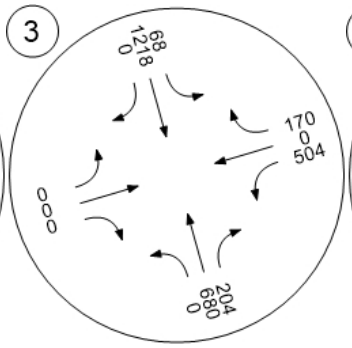
R512 and R552



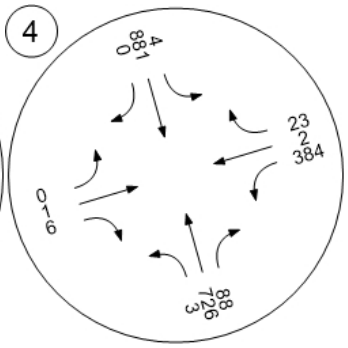
R512 and Falcon Close



R512 and Boeing



R512 and Amelia



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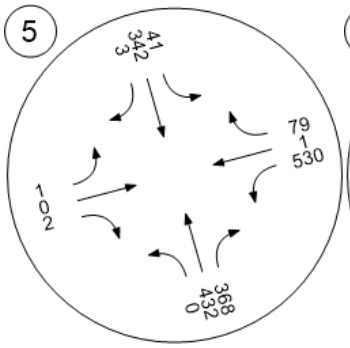
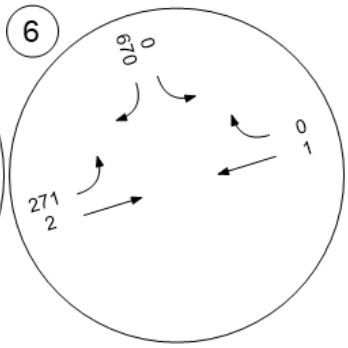
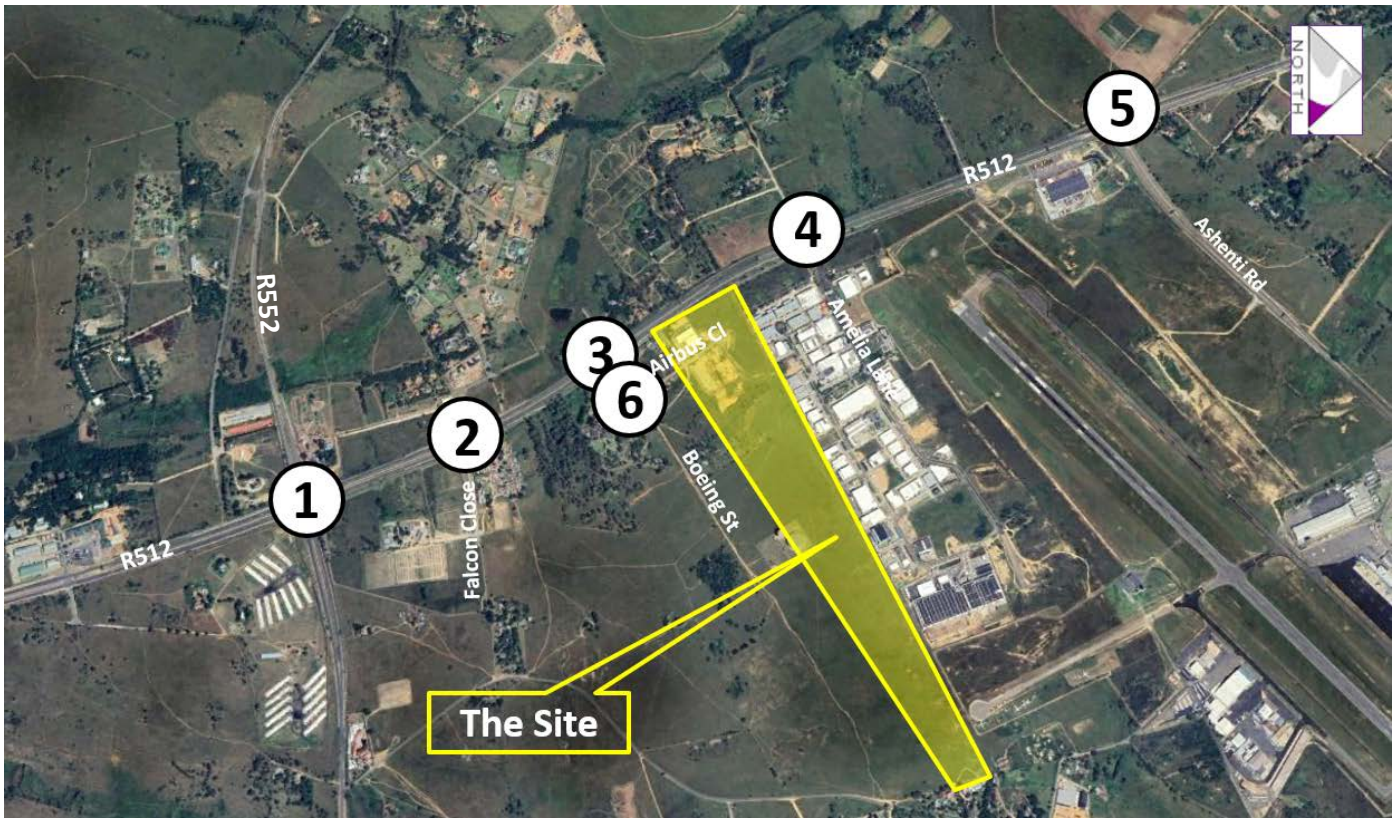


Boeing and Airbus Close

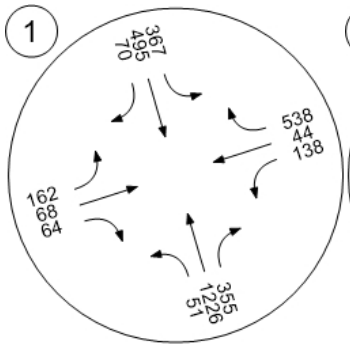


Traffic Volume - Future Total Volume

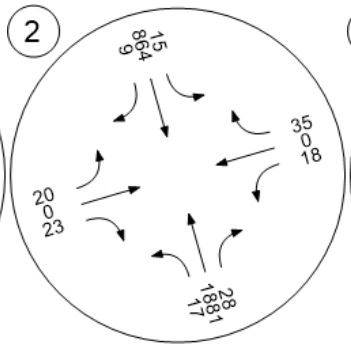


Expected A.m. Peak Hour Traffic Demand:

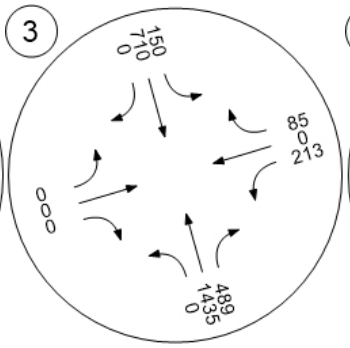
R512 and R552



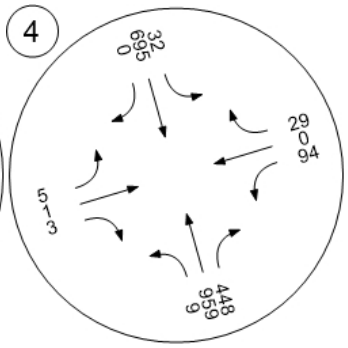
R512 and Falcon Close



R512 and Boeing



R512 and Amelia



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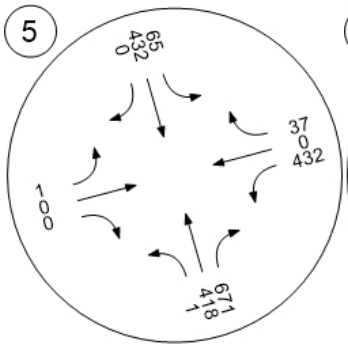
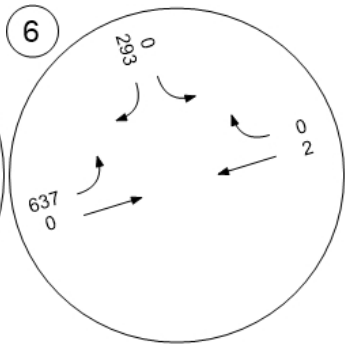
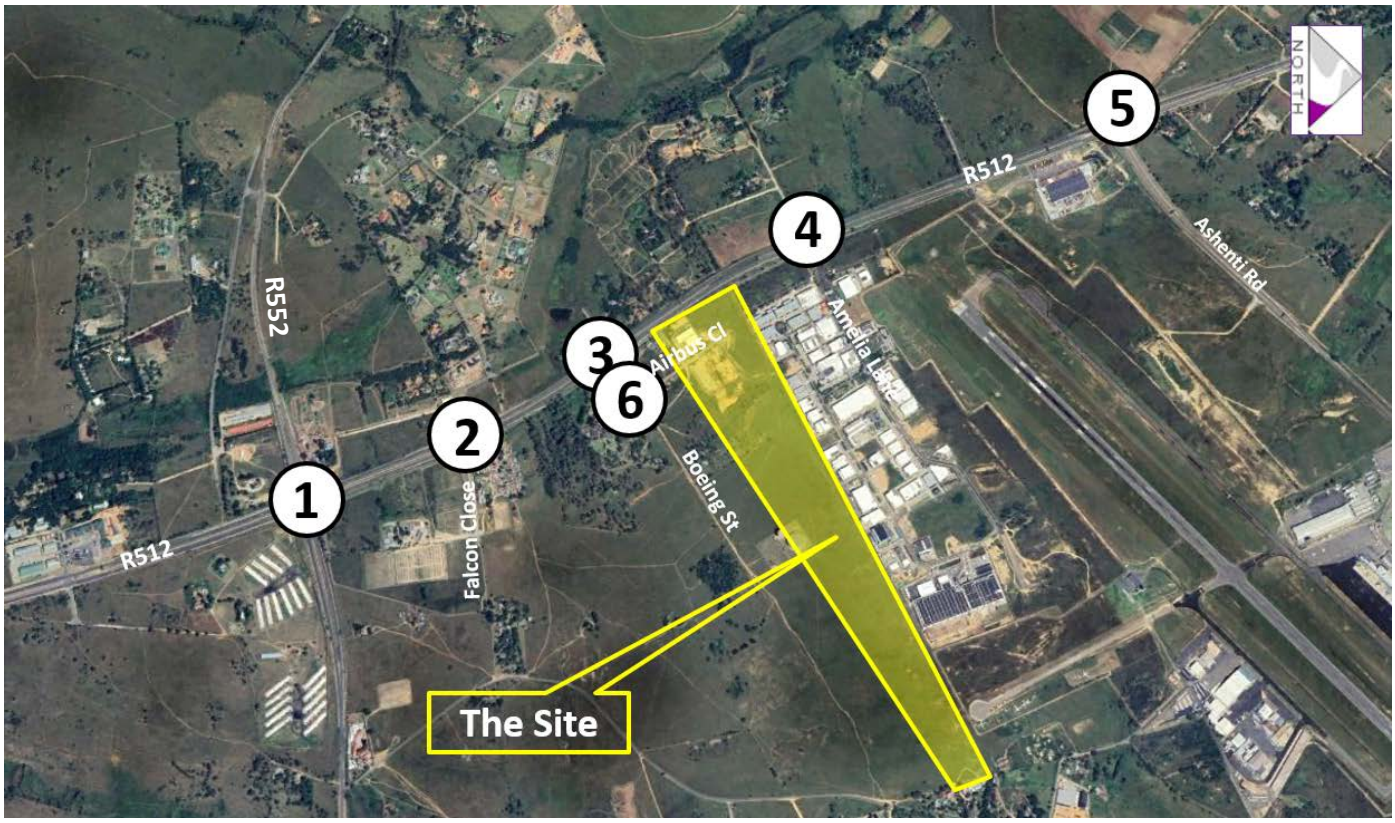


Boeing and Airbus Close

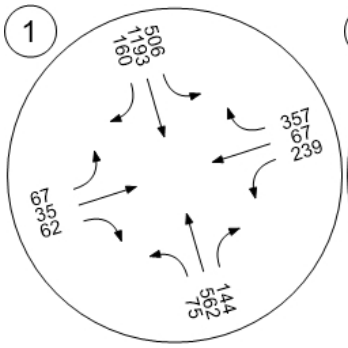


Traffic Volume - Future Total Volume



Expected P.m. Peak Hour Traffic Demand:

R512 and R552



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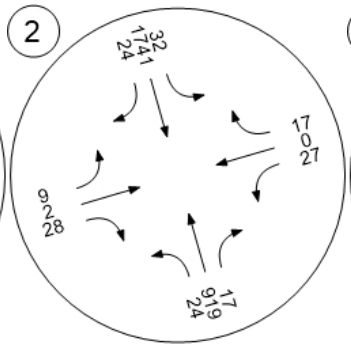

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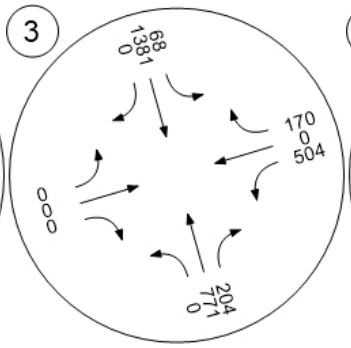

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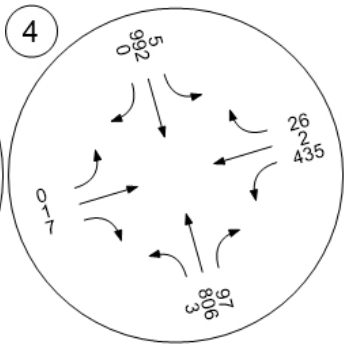

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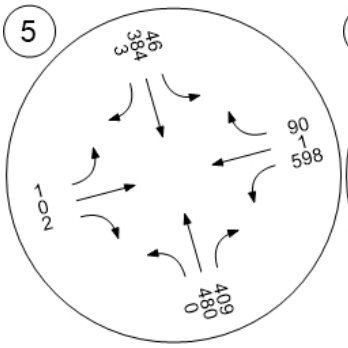
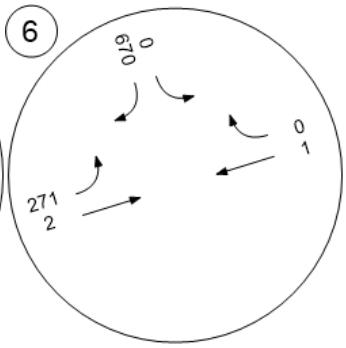


Boeing and Airbus Close



CORLI HAVENGA TRANSPORTATION ENGINEERS PO BOX 133 SERENGETI ESTATES 1642 CELL: 083 284 2860 CELL: 083 458 0066 EMAIL: traffic@chavenga.co.za	CLIENT: **TOWN PLANNING HUB**	PROJECT: **TRAFFIC IMPACT ASSESSMENT LANSERIA EXTENSION 81**	TITLE: **CONCEPTUAL INTERSECTION LAYOUT R512 AND BOEING & BOEING AND AIRBUS**	SCALE **NA**	FIGURE **7**

ANNEXURE B

LOCALITY PLAN

SCALE 1 : 50 000

NOTES:

1. The township boundaries are indicated by points ABCDEFGHJA.
2. **All areas and distances are estimates, subject to final survey for General Plan purposes.**
3. Erven 938 - 940, 946, 947, 950 and 953 are affected by existing and proposed servitude areas for municipal purposes as indicated.
4. Erf 952 is affected by a proposed right of way servitude as indicated and described.
5. Erf 950 is subject to a proposed access servitude 6m wide as indicatedand described.

VOORGESTELDE DORP: **LANSERIA EXT 81**
PROPOSED TOWNSHIP:
GELEE OP: **PORTION OF PORTION 72**
SITUATED ON: **(PTN OF PTN 2)**
VAN DIE PLAAS:
OF THE FARM: **BULTFONTEIN 533 - JQ**
PLAASLIKE BESTUUR: **CITY OF JOHANNESBURG**
LOCAL AUTHORITY: **METROPOLITAN MUNICIPALITY**

LAND USE TABLE

USE	AREA	OF TOWNSHIP	AMOUNT OF ERVEN	ERF NUMBERS
" INDUSTRIAL 1"	27.0313ha	88%	21	954 - 974
ROAD	3.7682ha	12%		
TOTAL	30.7995ha	100%	21	954 - 974

SIZE OF ERVEN

USE	MINIMUM	RULING

STREETS

MINIMUM HELLING: / MINIMUM GRADIENT: N / A
MAKSIMUM HELLING: / MAXIMUM GRADIENT: N / A
TOTALE LENGTE: / TOTAL LENGHT: N / A

PB VEW: / LA VEW: CPD/LSAX81/1
SKAAL: / SCALE: 1:7000 on A3

DATE	AMENDMENT	DATE	AMENDMENT
04/2024	1//SUBMISSION		

KONTOERINTERVAL: / CONTOUR INTERVAL: 2m
DATUM G.H.S.S. (TRIG): / DATE A.H.S.L. (TRIG): WG 29
KONTOER OPMETING DEUR: / CONTOUR SURVEY BY: City of Johannesburg GeoLIS export
ONTWERP DEUR: / DESIGNED BY: A. COERTZE
APPLIKANT: / APPLICANT: B.E. FLETCHER

IT IS HEREBY CERTIFIED THAT THE PROPERTIES SHOWN ON THIS DRAWING IS NOT AFFECTED BY FLOODWATER 1:50 AND 1:100 YEAR RECURRENCE INTERVAL EVENT DETERMINED IN ACCORDANCE WITH SECTION 144 OF THE NATIONAL WATER ACT (ACT 36 OF 1998).

NAME & PR. ENG. REG NO. _____ DATE _____

THE TOWN PLANNING HUB cc
changing landscapes

TN

0m 150m 300m 600m 1km

STATEMENT OF THE CONDITIONS UNDER WHICH THE APPLICATION MADE BY CORPCLO 1482 (PTY) LTD (REGISTRATION NUMBER 2002/030437/07) (HEREINAFTER REFERRED TO AS THE TOWNSHIP OWNER) IN TERMS OF THE PROVISIONS OF PART 3 OF CHAPTER 5 OF THE CITY OF JOHANNESBURG MUNICIPAL PLANNING BY-LAW, 2016 (HEREINAFTER REFERRED TO AS THE BY-LAW), FOR PERMISSION TO ESTABLISH A TOWNSHIP ON A PORTION OF PORTION 72 (A PORTION OF PORTION 2) OF THE FARM BULTFONTEIN 533-JQ, GAUTENG PROVINCE, HAS BEEN APPROVED.

1. CONDITIONS TO BE COMPLIED WITH PRIOR TO THE OPENING OF THE TOWNSHIP REGISTER AND THE DECLARATION OF THE TOWNSHIP AS AN APPROVED TOWNSHIP.

(1) CANCELLATION OF EXISTING CONDITIONS OF TITLE

The township owner shall at its own costs, cause the following restrictive conditions and/or servitudes to be cancelled or the township area to be freed there from: None

(2) GENERAL

(a) The township owner shall, prior to approval of the General Plan, make arrangements with Corporate Geo-Informatics (CGIS) for the allocation of a street name to the public road (or street names to the public roads) in the township (to be indicated on the layout plan so that it forms part of the General Plan).

(b) The local authority shall, after approval of the General Plan, make arrangements with Corporate Geo-Informatics (CGIS) for the allocation of street numbers to the newly created erven in the township.

(c) A satisfactory geo-technical report (in triplicate) shall be submitted to the local authority and the Amendment Scheme shall not be considered/approved by the local authority until such time as the comments on the said report, have been obtained and included in the mentioned Amendment Scheme.

(d) The township owner shall submit acceptable proof that all outline scheme reports have been submitted to the Municipal Entities (Johannesburg Water and Johannesburg Roads Agency).

(e) Authorisation/exemption to establish the township in terms of the National Environmental Management Act (No 107 of 1998) shall be obtained from the Department of Agriculture and Rural Development and shall be submitted to the local authority.

(f) The comments of the South African National Roads Agency Limited on the establishment of the township, shall be obtained and shall be submitted to the local authority.

(g) The comments of the Department: Mineral Resources on the establishment of the township, shall be obtained and shall be submitted to the local authority.

(h) The comments of the Department of Roads and Transport (Gauteng Provincial Government) on the establishment of the township, shall be obtained and shall be submitted to the local authority.

(i) The township owner shall obtain and submit a certificate from City Power Johannesburg that electricity supply to the township, is available. Provided that if supply is not available and the township has been approved by the local authority 5 years or more than 5 years ago, a letter from City Power shall be submitted confirming that supply is not available.

(j) The township owner shall, after approval of the General Plan of the township, submit the relevant Amendment Scheme to the local authority for approval, in order that it can be published simultaneously with the declaration of the township as an approved township.

(k) The township owner shall comply with the provisions of sections 28(5), (9), (10) and (11) of the By-Law.

2. CONDITIONS OF ESTABLISHMENT

(1) NAME

The name of the township is **Lanseria Extension 81**.

(2) DESIGN

The township consists of erven and roads as indicated on layout plan CPD/LSAX81/1.

(3) DESIGN AND PROVISION OF ENGINEERING SERVICES IN AND FOR THE TOWNSHIP

The township owner shall, to the satisfaction of the local authority, make the necessary arrangements for the design and provision of all engineering services of which the local authority is the supplier.

(4) ELECTRICITY

The local authority is not the bulk supplier of electricity to or in the township. The township owner shall in terms of Chapter 6 Part 1 of the By-law make the necessary arrangements with ESKOM, the licensed supplier of electricity for the provision of electricity.

(5) GAUTENG PROVINCIAL GOVERNMENT (DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT)

Should the development of the township not been commenced with before ……. the application to establish the township, shall be resubmitted to the Department of Agriculture and Rural Development for exemption/authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998), as amended.

(6) GAUTENG PROVINCIAL GOVERNMENT (DEPARTMENT OF ROADS AND TRANSPORT)

(a) Should the development of the township not be completed before ….. the application to establish the township, shall be resubmitted to the Department of Roads and Transport for reconsideration.

(b) If however, before the expiry date mentioned in (a) above, circumstances change in such a manner that roads and/or PWV routes under the control of the said Department are affected by the proposed layout of the township, the township owner shall resubmit the application for the purpose of fulfilment of the requirements of the controlling authority in terms of the provisions of Section 48 of the Gauteng Transport Infrastructure Act, 2001 (Act 8 of 2001).

(c) The township owner shall comply with the conditions of the Department as set out in the Department's letter dated ……...

(7) NATIONAL GOVERNMENT (DEPARTMENT: MINERAL RESOURCES)

Should the development of the township not been completed before …….. the application to establish the township, shall be resubmitted to the Department: Mineral Resources for reconsideration.

(8) ACCESS

Access to or egress from the township shall be provided to the satisfaction of the local authority and/or Johannesburg Roads Agency (Pty) Ltd and/or the Department of Roads and Transport.

(9) ACCEPTANCE AND DISPOSAL OF STORMWATER DRAINAGE

The township owner shall arrange for the stormwater drainage of the township to fit in with that of the adjacent road/roads and all stormwater running off or being diverted from the road/roads shall be received and disposed of.

(10) REFUSE REMOVAL

The township owner shall provide sufficient refuse collection points in the township and shall make arrangements to the satisfaction of the local authority for the removal of all refuse.

(11) REMOVAL OR REPLACEMENT OF EXISTING SERVICES

If, by reason of the establishment of the township, it should be necessary to remove or replace any existing municipal, TELKOM and/or ESKOM services, the cost of such removal or replacement shall be borne by the township owner.

(12) DEMOLITION OF BUILDINGS AND STRUCTURES

The township owner shall at its own costs cause all existing buildings and structures situated within the building line reserves, side spaces or over common boundaries to be demolished to the satisfaction of the local authority, when requested thereto by the local authority.

(13) OBLIGATIONS WITH REGARD TO THE CONSTRUCTION AND INSTALLATION OF ENGINEERING SERVICES AND RESTRICTIONS REGARDING THE TRANSFER OF ERVEN

(a) The township owner shall, after compliance with clause 2.(3) above, at its own costs and to the satisfaction of the local authority, construct and install all engineering services including the internal roads and the stormwater reticulation, within the boundaries of the township. Erven and/or units in the township may not be transferred into the name of a purchaser, prior to the local authority certifying to the Registrar of Deeds that these engineering services had been constructed and installed.

(b) The township owner shall fulfil its obligations in respect of the installation of electricity, water and sanitary services as well as the construction of roads and stormwater drainage and the installation of systems therefor, as agreed between the township owner and the local authority in terms of clause 2.(3) above. Erven and/or units in the township, may not be transferred into the name of a purchaser, prior to the local authority certifying to the Registrar of Deeds that sufficient guarantees/cash contributions in respect of the engineering services have been submitted or paid to the said local authority.

(14) OBLIGATIONS WITH REGARD TO THE PROTECTION OF ENGINEERING SERVICES

The township owner shall, at its costs and to the satisfaction of the local authority, survey and register all servitudes required to protect the constructed/installed services. Erven and/or units in the township may not be or transferred into the name of a purchaser, prior to the local authority certifying to the Registrar of Deeds that these engineering services had been or will be protected to the satisfaction of the local authority.

3. DISPOSAL OF EXISTING CONDITIONS OF TITLE.

All erven shall be made subject to existing conditions and servitudes, if any:-

A. Excluding the following conditions (a), (b), (c) and (d) in Deed of Transfer Nr. 24878/2012, which do not affect the township due to locality:

(a) Die eienaar van Gedeelte 4 van gedeelte B gehou onder Akte van Verdelingstransport Nr.7227/1940 gedateer 15 Mei 1940, en die eienaar van die Resterende gedeelte

hieronder gehou sal geregtig wees tot al die water uit al die fonteine, geleë op gedeelte 3, gehou onder Akte van Verdelingstransport Nr.7227/1940, en die dam geleë op gedeelte 4 deur middel van die watervoor lopende van voormelde fonteine en dam oor genoemde gedeeltes 3, 4 en gedeelte 5 gehou onder Akte van Verdelingstransport Nr.7228/1940 tot die resterende gedeelte, en wel in die volgende volgorde:

Gedeelte 4, sewe agtereenvolgende dae en die Resterende gedeelte vir sewe agtereenvolgende dae, met dien verstande dat die eienaar van gedeelte 3, die reg het tot gebruik van drink water wat uit die boonste fontein vloei, geleë op voormeld Gedeelte 3, en is die eienaar van voormeld gedeelte 3 verder geregtig tot suiping van 30 (dertig) stuks diere uit die water wat uit voormelde boonste fontein ontstaan.

Voormelde regte word egter verleen op voorwaarde dat die bestaande twee damme wat op voormelde gedeelte 3 geleë tot niet gedaan en vernietig word. Die eienaar van voormelde gedeelte 3 sal geregtig wees 'n holte te maak vir die suiping van die diere voormeld.

Verder sal die genoemde eienare die reg hê om verbeterings te maak aan genoemde dam en fonteine, en dieselwe af te kamp op die mees gerieflike en minst skadelike manier vir die eienaar op wie se gedeelte sodanige dam of fontein geleë is.

(b) Die eienare van voorrmelde Gedeelte 4 en die genoemde Resterende Gedeelte sal die reg het om verbeterings te maak aan voormelde fonteine op gedeelte 3 en dam op gedeelte 4 en hulle sal persoonlik verantwoordelik wees vir die onderhoud, reparasies en skoonmaak van voormelde dam, watervore en fonteine en word vir daardie doel die nodige reg van toegang oor en weer deur die ander gedeeltes gegee.

(c) Die bestaande watervore wat oor die verskillende gedeeltes loop sal vry en onbelemmerd na ieder gedeelte toegelaat word.

(d) Gedeeltes 3, 4, 5 en die Resterende gedeelte sal oor en weer geregtig wees en onderworpe wees aan 'n Serwituut van water passaat.

B. Excluding the following condition (e) and (f) in Deed of Transfer Nr. 24878/2012, which should not be carried over to the erven in the township due to township establishment:

(e) Die bestaande paaie sal onbelemmerd bly en wees.

(f) The Minister of Tranport has in terms of Section 11(1)(b) of the Gauteng Transport INfrastructure Act, 2001 (Act No. 8 of 2001) proclaimed K29 a Provincial Road.

C. Including the following endorsement on page 5 of Deed of Transfer Nr. 24878/2012, which shall be made applicable to Erven 954, 955 and 956 in the township only:

By virtue of registration of a Notarial deed of servitude K 14 05540S dated 27 august 2014

The within mentioned property is subject to a perpetual servitude for municipal purposes over the property in favour of the city of Johannesburg metropolitan municipality, servitude representing 771 square meters of land and indicated by figure A B C D E F G H A on servitude diagram SG 10272013

AS IT WILL FULLY APPEAR ON THE ABOVE MENTIONED NOTARIAL DEED OF SERVITUDE

4. CONDITIONS OF TITLE

(A) Conditions of Title imposed by the local authority in terms of the provisions of Chapter 5 Part 3 of the By-Law

(1) ALL ERVEN

(a) The erven lie in an area where soil conditions that can affect and damage buildings and structures. Building plans submitted to the local authority for consideration shall indicate measures to be taken, to limit possible damage to buildings and structures as a result of detrimental foundation conditions. These measures shall be in accordance with the recommendation contained in the Geo-technical report for the township, unless it is proved to the local authority that such measures are unnecessary or that the same purpose can be achieved by other more effective means. The NHBRC coding for foundation is classified as _ .

(2) ALL ERVEN

(a) Each erf is subject to a servitude, 2m wide, in favour of the local authority, for sewerage and other municipal purposes, along any two boundaries other than a street boundary and in the case of a panhandle erf, an additional servitude for municipal purposes 2m wide across the access portion of the erf, if and when required by the local authority: Provided that the local authority may dispense with any such servitude.

(b) No building or other structure shall be erected within the aforesaid servitude area and no large rooted trees shall be planted within the area of such servitude or within 2m thereof.

(c) The local authority shall be entitled to deposit temporarily on the land adjoining the aforesaid servitude such material as may be excavated by it during the process of the construction, maintenance or removal of such sewerage mains and other works as it, in its discretion may deem necessary and shall further be entitled to reasonable access to the said land for the aforesaid purpose subject to any damage done during the process of the construction, maintenance or removal of such sewerage mains and other works being made good by the local authority.

(3) ALL ERVEN

(a) The erven shall not be transferred without the written consent of the local authority first having been obtained and the local authority shall have an absolute discretion to withhold such consent, unless the transferee accepts the following condition: The local authority had limited the electricity supply to the erven to ……. kVA and should the registered owners of the erven exceed the supply or should an application to exceed such supply be submitted to the local authority, additional electrical contributions as determined by the local authority, shall become due and payable by such owner/s to the local authority.

(4) ERVEN 962 AND 969

The erven are subject to a 2m wide servitude for water services in favour of the local authority, along the eastern boundary as indicated on layout plan CPD/LSA X81/1.

(5) ERVEN 963 AND 966

The erven are subject to a 2m wide servitude for water services in favour of the local authority, along the northern boundary as indicated on layout plan CPD/LSA X81/1.

(6) ERF 968

The erf is subject to a 20m wide servitude for future access purposes, along the eastern boundary as indicated on layout plan CPD/LSA X81/1.

(7) ERF 966

Erf 966 is subject to a 6m wide Right of Way Servitude in favour of the Remainder of Portion 72 (a portion of Portion 2) of the farm Bultfontein 533JQ, along the northern boundary as indicated on layout plan CPD/LSA X81/1.

5. CONDITIONS TO BE INCORPORATED IN THE TOWN PLANNING SCHEME IN TERMS OF SECTION 54 OF THE BY-LAW, IN ADDITION TO THE PROVISIONS OF THE CITY OF JOHANNESBURG LAND USE SCHEME, 2018.

(1) ERVEN 954 - 974

COLUMN 1:	USE ZONE "Industrial 1"
COLUMN 2:	DESCRIPTION OF PORTION OF LAND Erven 954 – 974, Lanseria Extension 81
COLUMN 3:	PRIMARY RIGHTS As per Scheme
COLUMN 4:	USES WITH CONSENT (LAND USE TABLE 2) As per Scheme
COLUMN 5:	USES NOT PERMITTED (LAND USE TALBE 2) As per Scheme
COLUMN 6:	WIDTH OF SERVITUDE AREA -
COLUMN 7:	STOREYS OR HEIGHT IN METERS 25m (3 storeys)
COLUMN 8:	COVERAGE 60%
COLUMN 9:	F.A.R OR FLOOR AREA 0.6
COLUMN 10:	PARKING PROVISION As per Scheme
COLUMN 11:	DENSITY Not applicable
COLUMN 12:	BUILDING LINE PROVISION As per Scheme
COLUMN 13:	GENERAL PROVISIONS 1. A Site Development Plan to the satisfaction of the council, shall be submitted for evaluation and approval prior to the submission of building plans and/or the development of the erf.
COLUMN 14:	AMENDMENT SCHEME NUMBER