

# TRAFFIC IMPACT STUDY

TOWNSHIP ESTABLISHMENT FOR PROPOSED TOWNSHIP TO BE SITUATED ON THE REMAINDER OF PORTION 8 OF THE FARM BOSCHHOEK 103 JQ IN RUSTENBURG LOCAL MUNICIPALITY

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Rev 00

16<sup>th</sup> November 2020



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## DOCUMENT CONTROL SHEET

<b>Project Title</b>	TOWNSHIP ESTABLISHMENT FOR PROPOSED TOWNSHIP TO BE SITUATED ON THE REMAINDER OF PORTION 8 OF THE FARM BOSCHOEK 103 JQ IN RUSTENBURG LOCAL MUNICIPALITY
<b>Report Title</b>	TRAFFIC STUDY REPORT
<b>Reference</b>	
<b>Date</b>	16 NOVEMBER 2020

### RECORD OF REVISIONS AND AMENDMENTS

Date	Section	Title	Revision No.

### QUALITY CONTROL

Prepared By	Designation	Signature	Date
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Issued By	Designation	Signature	Date
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## DECLARATION

I certify that this TRAFFIC IMPACT STUDY – **BOESHOK FARM IN RUSTERNBURG LOCAL MUNICIPALITY** was prepared by me according to the requirements of the South African Traffic and Site Traffic Assessment Manual and I have experience and training in the field of traffic and transportation engineering.

Signed.....

Date: 16 November 2020

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## 1. INTRODUCTION

### 1.1. Background

Abidia Civil/Structural Engineers was appointed by Nkanivo Development Consultants in October 2020 to conduct a traffic impact assessment for Township Establishment for proposed Remainder of Portion 8 of the Farm Boschoek 103 JQ in Rustenburg Local Municipality, within the Bojanala Platinum District Municipality in the North West Province.

There is an informal settlement on the proposed property and 540 stands have been proposed by the Town Planners for the development – in which 530 stands are residential.

Abidia Civil/Structural Engineers conducted traffic assessment at three traffic intersections as follows:

- Intersection A – R565 & Unknown Gravel A (25°29'39.05"S, 27° 5'10.90"E),
- Intersection B – R565 & Thaba Chweu Bricks (25°29'51.88"S, 27° 5'19.73"E), and
- Intersection C – R565 & Unknown Gravel C (25°30'4.42"S, 27° 5'29.38"E), for a two-day manual count (Friday 16<sup>th</sup> October and Saturday 17<sup>th</sup> October 2020)

### 1.2. Objectives of the Traffic Impact Assessment

The objectives of the Assessment report are as follows:

- To determine the impact that the additional traffic generated by the proposed development will have on the existing and future road network (if applicable);
- To propose measures (if applicable) that could be put in place to accommodate the impact that the proposed development will have on the existing traffic and road conditions;
- To determine suitable access regimes for the proposed development; and
- To provide sufficient information for the approval of the proposed development.

### 1.3. Report Structure

The remainder of the report is structured as follows:

- The development details, study area and comments on the site visit are provided in **Chapter 2**;
- Matters pertaining to the existing roadway elements, Public transport and pedestrian matters are discussed in **Chapter 3**;





- The existing traffic conditions and proposed development's traffic are described in **Chapter 4**;
- The capacity analysis of the existing traffic and the impact of the proposed development traffic are detailed in **Chapter 5**;
- The proposed town layout is assessed in terms of access spacing, accommodation of public transport and pedestrians in **Chapter 6**; and
- The TIS conclusions and recommendations are summarised in **Chapter 7**.

#### **1.4. Methodology**

The guidelines as outlined in the TMH 16 Vol 1 – South African traffic Impact and Site Assessment Manual were followed. Guidelines as set by the Rustenburg Local Municipality were not available during this study.

In detail, the methodology followed is outlined below:

- From the two-day manual traffic count conducted at Intersection A, Intersection B and Intersection C on a Friday and Saturday current traffic flow patterns were obtained, affected accesses were noted;
- Based on TMH 17 Vol. 1 – South African Trip Data Manual, trips that will be generated by the development using applicable trip generation rates as specified in the said manual were noted;
- Taking cognisance of the proposed traffic volumes existing routes were assessed against negative impacts in terms of traffic flow;
- Traffic operation, intersection safety and the existing road condition were assessed; and
- Considering the major findings of this study conclusions and recommendations were made.

#### **1.5. Development Controls and Property Particulars**

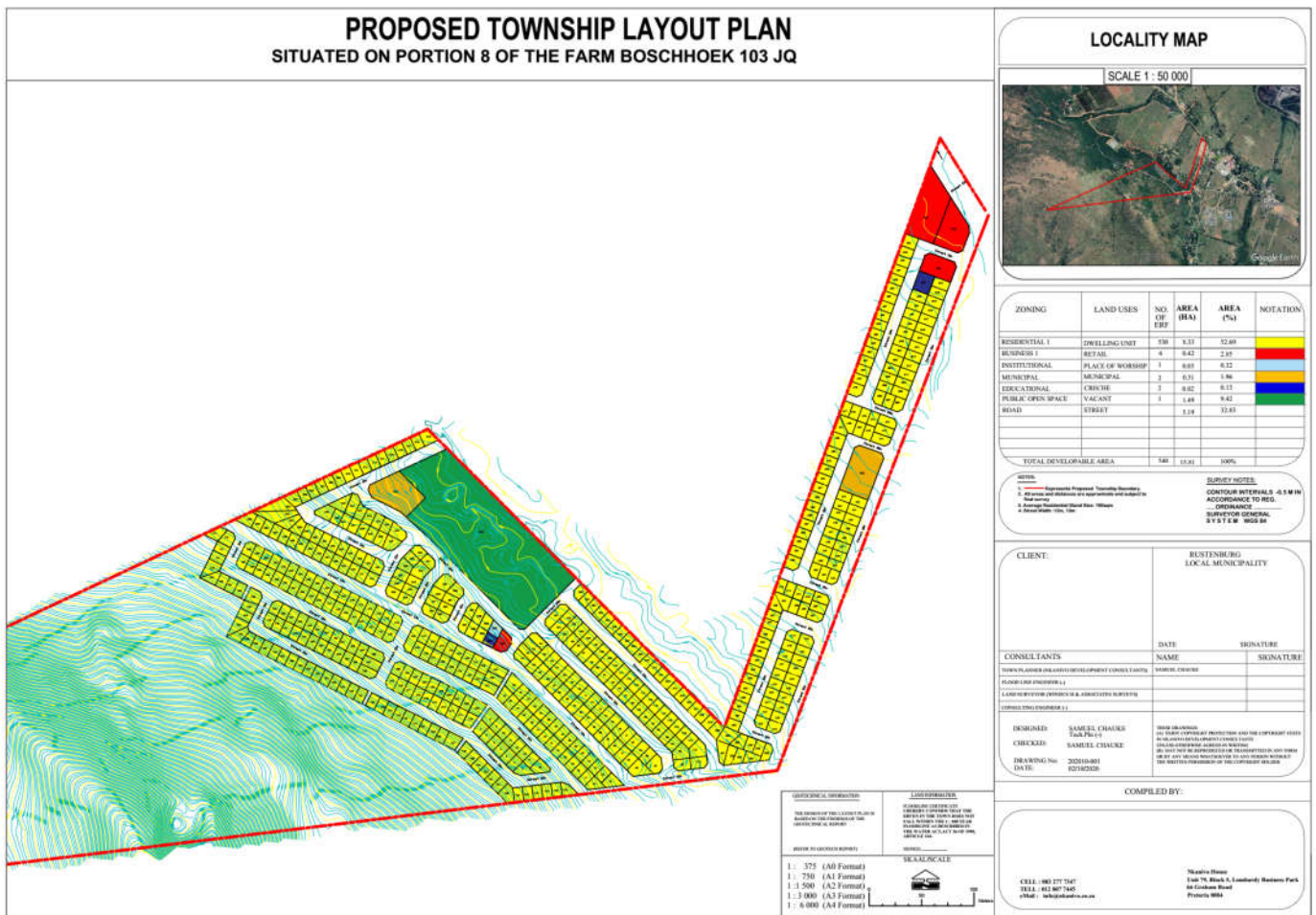
The development is a brownfield development with informal settlements within the site. The details of the rights applied for and respective trip generation rates are shown in Table 1 below. The developments comprise of the development of Portion 8 on Farm Boschoek in Rustenburg Local Municipality. The town layout is shown in Figure 1 below.



**Table 1: Boschoek – Mixed Use Development**

Portion	Land Use	Erven /Units	Adjustment Factors Applied			Land Use Code	Trip Rate		Directional Split (%)			
			Mixed Use Development	Very Low Ownership	Car Trip		Peak hour		AM Peak		PM Peak	
							AM	PM	In	Out	In	Out
8	Residential 1 (low income)	602	Y	YES (70% Adjustment factor)	210	1.0	1.0	0.25	0.75	0.70	0.30	

**PROPOSED TOWNSHIP LAYOUT PLAN**  
**SITUATED ON PORTION 8 OF THE FARM BOSCHHOEK 103 JQ**



**Figure 1: Proposed Township Layout - Boshhoek Farm**

**1.6. Site Visit**

A site visit was conducted to attain a sense of the area in terms of traffic engineering aspects. The objectives of the site visit were:

- To observe the existing traffic operations and pedestrian movement; and
- To reaffirm the geometric layout of the intersections in the study area.

The site visit was undertaken on 16<sup>th</sup>, and 17<sup>th</sup> October 2020 in clear weather conditions. The observations made during the site visit are summarised in the subsequent sections per intersection in the study area.

### 1.6.1. Intersection A – R565 & Unknown Gravel A

The observations made relating to the area in the direct vicinity of the intersection include:

- The R565 falls under jurisdiction of Northwest Province Roads, although intersection A remains under the jurisdiction of the Rustenburg local municipality,
- The locality of the intersection and the surroundings are presented in Figure 2,
- **The intersection is priority controlled with free flow along the R565,**
- Deceleration lanes are not provided to accommodate left turning traffic from the R565 to Unknown Gravel A (Gatz Guest House),
- Dedicated pedestrian crossing is not provided at the intersection,



Figure 2: Geometric Configuration of Intersection A

### 1.6.2. Intersection B – R565 & Thaba Chweu Bricks

The observations made relating to the area in the direct vicinity of the intersection include:

- The R565 falls under jurisdiction of Northwest Province Roads, although intersection A remains under the jurisdiction of the Rustenburg local municipality,
- The locality of the intersection and the surroundings are presented in Figure 3,

- The intersection is priority controlled with free flow along the R565,
- Deceleration lanes are not provided to accommodate left turning traffic from the R565 to unknown gravel road,
- No dedicated pedestrian crossing is provided at the intersection,



**Figure 3: Geometric Configuration of Intersection B**

### **1.6.3. Intersection C – R565 & Unknown Gravel C**

The observations made relating to the area in the direct vicinity of the intersection include:

- The R565 falls under jurisdiction of Northwest Provincial Roads,
- The locality of the intersection and the surroundings are presented in Figure 4,
- The intersection is priority controlled with free flow along the R565,
- Deceleration lanes are provided to accommodate left turning traffic from the R565 to unknown gravel road,
- Dedicated pedestrian crossing is not provided at the intersection,





Figure 4: Geometric Configuration of Intersection C

### 1.7. Study Area

Informal settlement is mushrooming on the proposed site with the main access from intersection B.

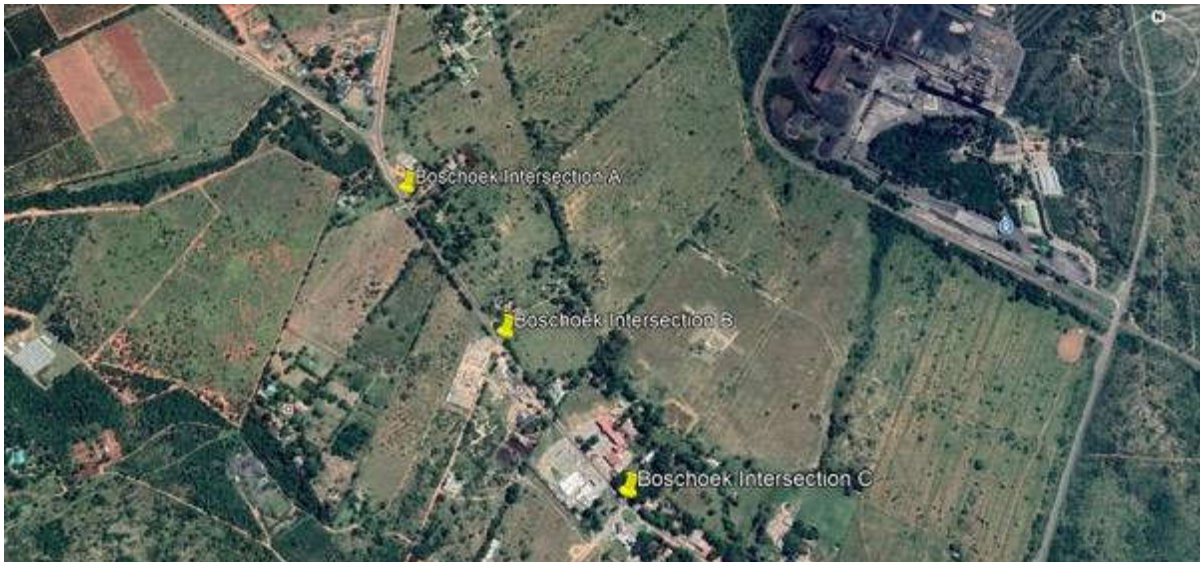





Figure 5: Intersection Overview and Layout

The proposed Boschoek project will be located on a property that is 15.8ha, which is zoned as follows:

-  593 No. Residential 1;
-  3No Business;
-  1 Place of Worship

- ✚ 2No. Creche
- ✚ 2No. Municipal;

Boschoek is predominantly a residential area, with most of commercial activities taking place within Boschoek Town. The provincial road R565 Boschoek town with intersection B being the road serving the proposed Settlement. The Proposed development is currently accessible via road R565 intersection B.

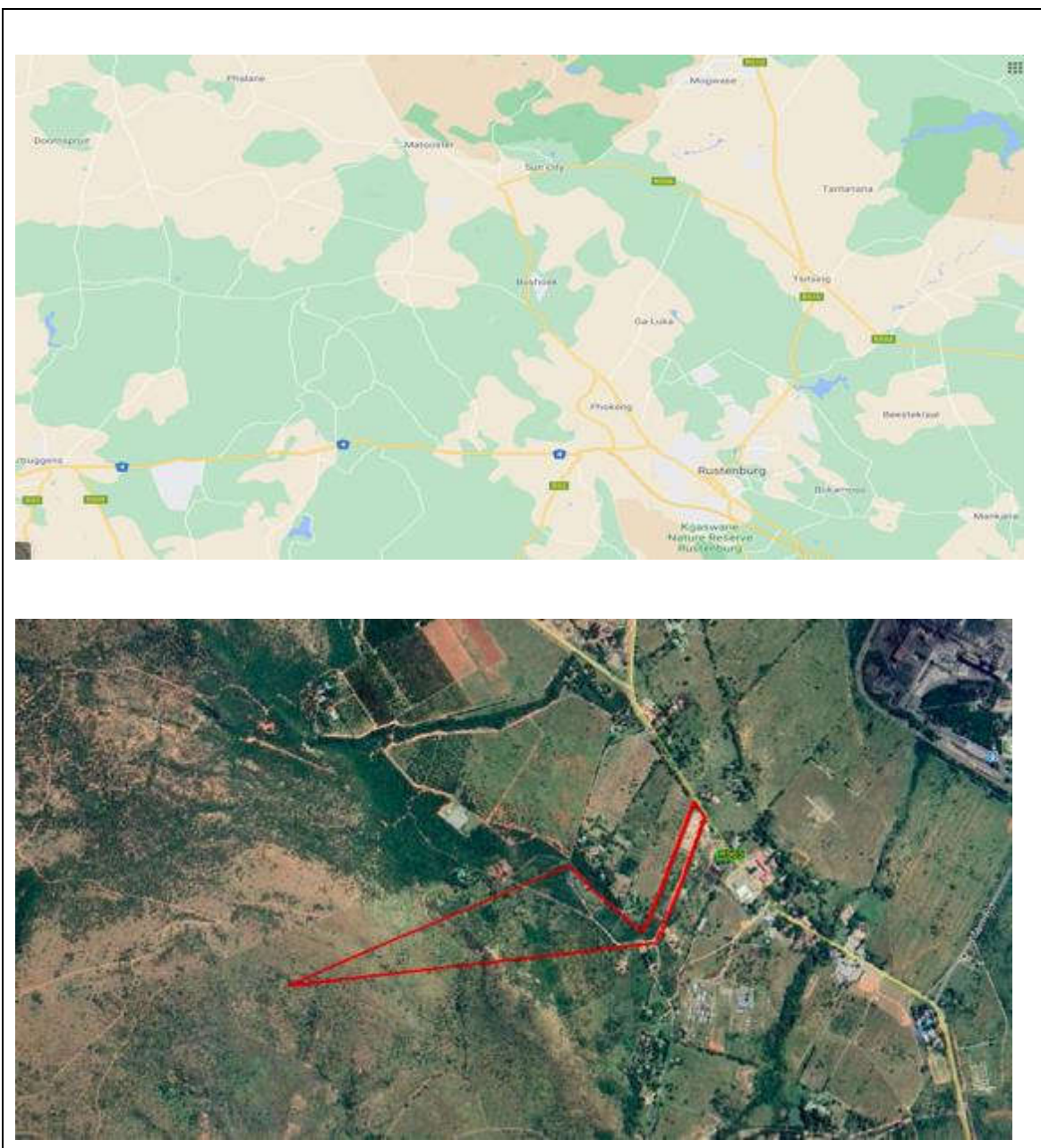


Figure 6– Locality Plan





Investigations conducted were mainly on the route R565 (intersection B) which is the main **arterial** road serving proposed Boschoek farm development and the greater part of Boschoek Communities.

In general, the area is currently being utilised for both residential and commercial purposes, with social amenities around the study area i.e. several Schools in close proximity to Boschoek – Proposed Development.

## 2. EXISTING TRAFFIC AND OPERATION SCENARIO

Traffic counts over the two-day period were conducted along the intersections on R565 on the 16<sup>th</sup> & 17<sup>th</sup> October 2020. The manual counts are attached on Annexure B and Sidra Analysis conducted attached as Annexure C. The traffic count was conducted for one weekday (Friday) and one weekend (Saturday).

Also noticed is the lack of a designated taxi rank, lack of drop-off zones esp. near schools, creches and communal amenities.

Also, to note is the absence of covered public transport facilities along all the roads within Boschoek, and we do recommend that Boschoek covered public transport facilities together with drop off zones as articulated in the planning development layout. Figures 2 to 6 above illustrate the layout of the intersections together with associated facilities.

## 3. TRAFFIC DEMAND

### 3.1. Existing Traffic Condition

The effects of COVID 19 affect the existing traffic condition and we have applied a factor of 1.2 to take care of the lockdown effects. A factor of 1.2 has been adopted since the Boschoek community were on a relaxed mode of lockdown, there was minimum compliance to lockdown effects.

There is a total of **144 veh/hr.** traversing on R565 from Boschoek side and 128veh/hr from Phokeng side with an average traffic flow of **21veh/hr.** on Gravel Rd, on intersection **A.** An average growth rate of 3,5% per annum for urban area is utilised in the general traffic analysis. At intersection B, there is a total of **107 veh/hr.** traversing on R565 from Boschoek side and 118 veh/hr from Phokeng side, with **4veh/hr.** on Unknown Gravel Road adjacent Thaba Chweu Bricks towards the proposed development.

At intersection C, there is a total of **147 veh/hr.** traversing on R565 from Boschoek side and 178 veh/hr from Phokeng side, with **4veh/hr.** on gravel road towards the proposed development.

### 3.2. Existing Road Condition

Intersection A is in fairly good condition, poor marking, especially at the intersections on the road R565.



Figure 7– Intersection A – Road Condition

In terms of cracking, Provincial road R565 is a paved road and can be classified, as low that is  $>0<4\%$ .

The Visual Condition Index categorises the extent of pavement distress with low % indicating high and visible distress and 100% indicating no signs of visual distress and hence road pavement in fair to good condition with  $VCI>75\%$ .

No AADT information obtained from a Permanent counting station within Boschoek, hence only the manual counts attached herein under Annexure B.



Figure 8– Intersection B – Road Condition

Intersection B is in a fair to good condition, with poor road marking for stop signs.



Unknown Road is a gravel road and can be classified, as poor to fair Gravel Visual Index that is 50%-70%, but poor maintenance as the main reason the road has deteriorated.

No AADT information obtained from a Permanent counting station within Boschoek hence the manual count AADT attached here-in under Annexure B below.



**Figure 9 – Intersection C – Road Condition**

Intersection C is in a poor to fair condition, with poor road marking for stop signs.

In terms of cracking, gravel Road can be classified, as low to medium that is <4%, but poor maintenance as the main reason the road has deteriorated.

No AADT information obtained from a Permanent counting station within Boschoek hence the manual count AADT attached here-in under Annexure B below.



**Figure 10 – Intersection C – Road Condition**

### **3.3. Planned Future Roads**

#### **3.3.1. Provincial and National Roads**

During the development of the Traffic Impact Study, Bojanala Platinum District Municipality couldn't give information on the infrastructure projects for the District Municipality.



### 3.3.2. Municipal Roads

Planned new roads in the area will influence the distribution of the trips of the proposed developments and access points to the exiting road network. The development of a road master plan for Rustenburg Local Municipality is a critical project that the Local municipality needs to embark on if there's none in existence. The road master plan could however not be obtained thus the proposed roads indicated as part of the SDP was used as guideline for the development of road hierarchy.

### 3.3.3. Non–Motorised Transport, Disabled and Vulnerable Road Users

Pedestrian movement was observed along the R565 before intersections on R565 (intersections A, B and C). It is highly recommended that raised zebra crossing be adopted as traffic calming measures at all junctions.

## 3.4. Trip Generation

The method used to determine trip generation rates are discussed below.

### 3.4.1. South African Trip Data Manual

Trip generation rates as specified in the TMH17 South African Trip data Manual, the applicable rates for a residential development are shown in the table 2 below.

Table 2 – Trip generation Adjustment factors for a Low Vehicle development

Land Use	Size Units	Percentage reduction for developments in areas with			
		Mixed-use Development	Low vehicle Ownership	Very Low Ownership	Transit nodes or Corridors
<b>100 Industrial</b>					
110 Service Industry	100 sqm GLA	5%	20%	30%	15%
120 Heavy industry/manufacturing	100 sqm GLA	5%	20%	30%	15%
121 Mining	1 Employees	5%	20%	30%	15%
130 Industrial Area (Park)	100 sqm GLA	5%	20%	30%	15%
140 Manufacturing	100 sqm GLA	5%	20%	30%	15%
150 Warehousing and Distribution	100 sqm GLA	5%	20%	30%	15%
151 Mini-Warehousing	100 sqm GLA	5%	20%	30%	15%
<b>200 Residential</b>					
210 Single Dwelling Units	1 D/Unit	10%	40%	70%	15%
220 Apartments and Flats	1 D/Unit	15%	30%	50%	15%
225 Student Apartments and Flats	1 D/Unit	25%	50%	80%	15%
231 Townhouses (Simplexes and Duplexes)	1 D/Unit	15%	30%	50%	15%
232 Multi-Level Townhouses	1 D/Unit	15%	30%	50%	15%
251 Retirement Village	1 D/Unit	5%	50%	80%	15%
254 Old-Age Home	1 D/Unit	5%	50%	80%	15%
260 Recreational Homes	1 D/Unit	10%	20%	30%	15%



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<b>300 Lodging</b>						
310 Hotel, Residential	1 Room	20%	20%	30%	15%	
330 Hotel, Resort	1 Room	20%	20%	30%	15%	
350 Guest House	1 Room	20%	30%	50%	15%	
<b>400 Recreational and Sport</b>						
430 Golf Course	1 Course	5%	0%	0%	0%	
473 Casino	100 sqm GLA	5%	20%	30%	15%	
480 Amusement Park	1 ha	5%	30%	50%	15%	
488 Sport Stadium	1000 Seat	5%	30%	50%	15%	
492 Health and Fitness Centre	100 sqm GLA	15%	20%	30%	15%	
<b>500 Institutional</b>						
520 Public Primary School	1 Student	30%	50%	80%	15%	
530 Public Secondary School	1 Student	30%	50%	80%	15%	
536 Private School	1 Student	30%	50%	80%	15%	
550 University / College	1 Student	20%	40%	60%	15%	
560 Places of Public Worship (Weekend)	1 Seat	10%	50%	80%	15%	
561 Places of Public Worship (Weekday)	1 Seat	10%	50%	80%	15%	
565 Pre-School (Day Care Centre)	1 Student	5%	50%	80%	15%	
566 Cemetery	1 Ha	0%	30%	50%	15%	
<b>600 Medical</b>						
611 Public Hospital	1 Bed	0%	50%	80%	15%	
612 Private Hospital	100 sqm GLA	0%	20%	30%	15%	
620 Nursing Home	1 Bed	0%	50%	80%	15%	
630 Medical Clinic	100 sqm GLA	0%	50%	80%	15%	
<b>700 Office</b>						
710 Offices	100 sqm GLA	20%	20%	30%	15%	
713 Home offices and undertakings	1 House	10%	20%	30%	15%	
720 Medical consulting rooms	100 sqm GLA	10%	30%	50%	15%	
770 Business Centre (Park)	100 sqm GLA	15%	20%	30%	15%	
780 Conference Centre	1 Seat	10%	20%	30%	10%	



**Table 3 – Trip generation Adjustment factors for a Mixed Use development**

Land Use	Size Units	Peak Hour		Trip Gen Adj. Factor (Very Low Vehicle Ownership)	Generated Trips		Adjusted Generated Trips		AM Peak Split		PM Peak Split		AM Peak		PM Peak	
		Trip Rate - AM	Trip Rate - PM		AM Trips	PM Trips	AM Trips	PM Trips	In	Out	In	Out	In	Out	In	Out
210 Single Dwelling Units	1D / unit	1,0	1	70%	593	593	178	178	25%	75%	70%	30%	44	133	125	53
770 Business	100 sqm GLA	0,6	0,6	30%	15	15	11	11	85%	15%	20%	80%	9	2	2	8
520 & 530 Primary & secondary School	1 Student	0,85	0,3	80%	0	0	0	0	50%	50%	50%	50%	0	0	0	0
820 Municipal	100 sqm GLA	1,5	1,5	60%	466,5	466,5	186,6	186,6	85%	15%	20%	80%	158,6	28,0	37,3	149,3
565 Creche (36 students)	1 Student	1	0,8	80%	144	115	29	23	50%	50%	50%	50%	14	14	12	12
561 Church (100 seats per church)	1 Seat	0,05	0,05	60%	5	5	2	2	50%	50%	50%	50%	1	1	1	1
<b>Total</b>							<b>406</b>	<b>400</b>					<b>227</b>	<b>178</b>	<b>176</b>	<b>224</b>

Generated trips are hereby listed in the table above, with generated AM trips being used for analysis.



### **3.5. Traffic Analysis Criteria**

Quantification of the traffic operational conditions has been undertaken using appropriate technology with the results of the analysis for the design peak periods under existing conditions being tabulated below showing the traffic volumes used in the analysis. The criteria for assessment are principally delay and volume to capacity ratio (V/C Ratio). A V/C ratio of say 0.5 would represent 50% spare capacity and a ratio of 1.0 would represent conditions where the road or movement is operating at its maximum capacity (i.e. actual volume equals capacity), hence suggesting an intersection upgrade.

The concept of *levels of service* uses qualitative measures that characterize operational conditions within a traffic stream and their perception by motorists and passengers

Delay is in turn expressed in terms of Level of Service (LOS). Level of service (LOS) is a commonly used traffic engineering criteria for assessing the quality of the traffic conditions on a road and can be applicable to two-way flow or specific single directional movements. Level of Service is a qualitative measure describing operational conditions with a traffic stream and their perception/tolerance by the driver and is stated in terms of a scale from A through F, with A displaying the highest quality and F the lowest, a point at which excessive delays occur. The LOS is dependent on certain average delay thresholds when applied to intersections.

#### **3.5.1. Peak Hours**

Peak Hours were noted to coincide with morning and afternoon peak periods as below:

- 📅 Morning Peak hour: 09:15 - 10:15hrs and
- 📅 Afternoon Peak hours: 15:00 – 16:00hrs, these peak periods will inevitably change during weekends especially from 10:30hrs until 16:00hrs

#### **3.5.2. Peak Hour Factor**

A peak hour factor of 0.95 is utilised for analysis.

#### **3.5.3. Scenarios**

The following years are noted for this study:

- Scenario 0: 2020 which is base year of assessment
- Scenario 1: Five year after assessment year 2025 of which it is assumed that the development would reach 100% completion with full access to public roads.



- Scenario 2: Ten years after assessment. Year 2030 of which it is assumed that the development would be 5 years.
- Scenario 3: 20 years after assessment. Year 2040 of which it is assumed that the development would be 15 years. Recommended geometric upgrades are based on scenario 3, and development traffic has been conducted to highlight the implications of the townships established.

### 3.5.4. Assumptions

Growth rate in background traffic = 3.0% for a low growth rural town

Table 4 – Typical Growth Rates ( Table 1.1 TMH17)

Development Area	Growth rate
Low growth areas	0 - 3%
Average growth areas	3 - 4%
Above average growth areas	4 - 6%
Fast growing areas	6 - 8%
Exceptionally high growth areas	> 8%

Source: City Council of Pretoria (1998)

Traffic volume expansion factor = 1.2 (studies conducted under abnormal conditions- lockdown, factored in Sidra Analysis)

Trip distribution – surrogate method

A ten-year limit is intended for medium term planning, long term planning i.e. 20 years was also analysed.

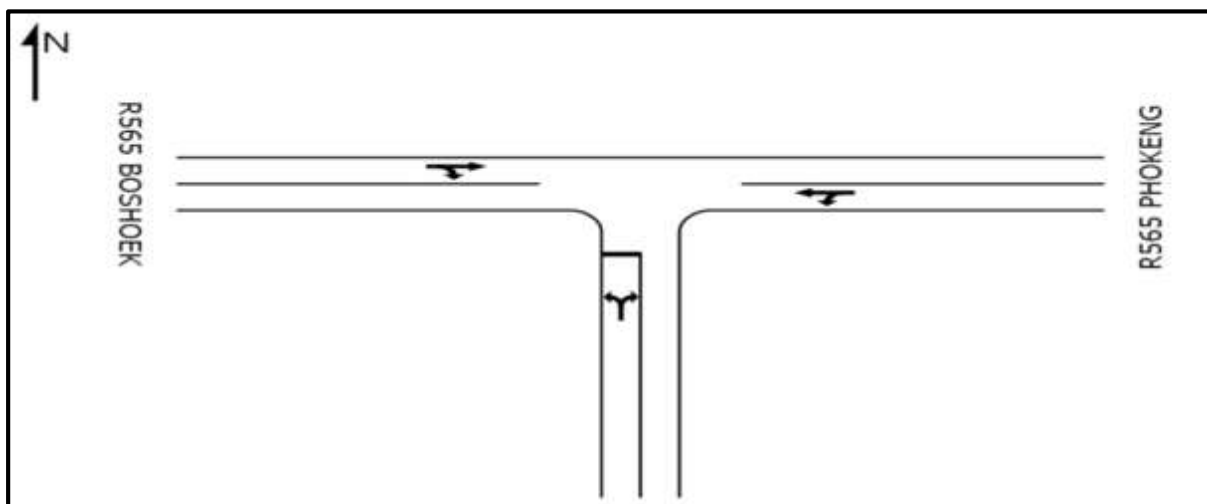


Figure 11– R565 & Gravel Road- Existing intersection A Layout

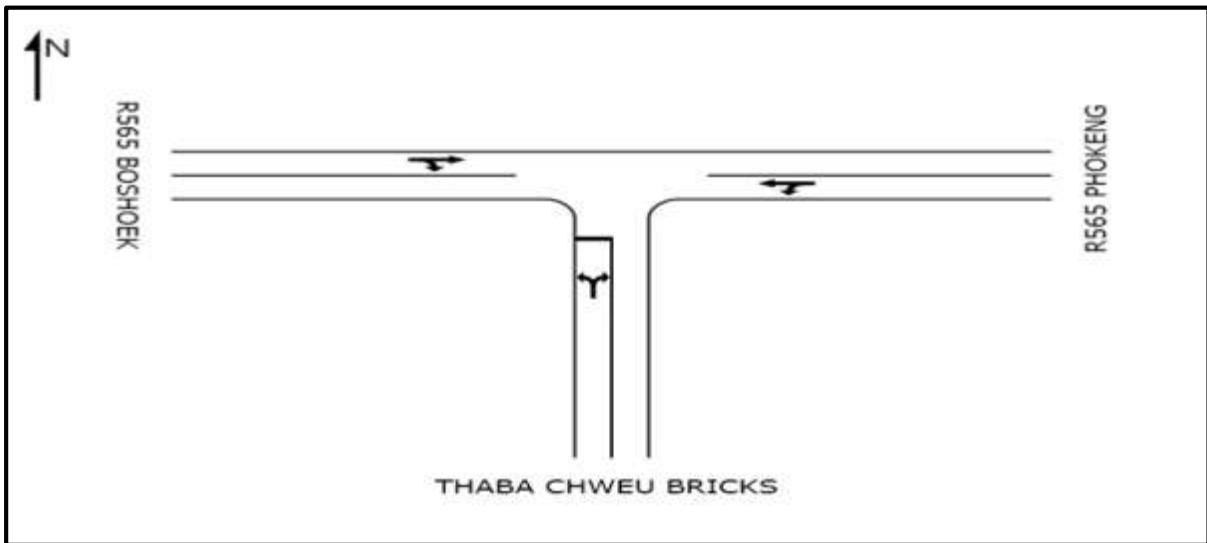


Figure 12– R565 & Unknown Gravel Road Existing intersection B Layout

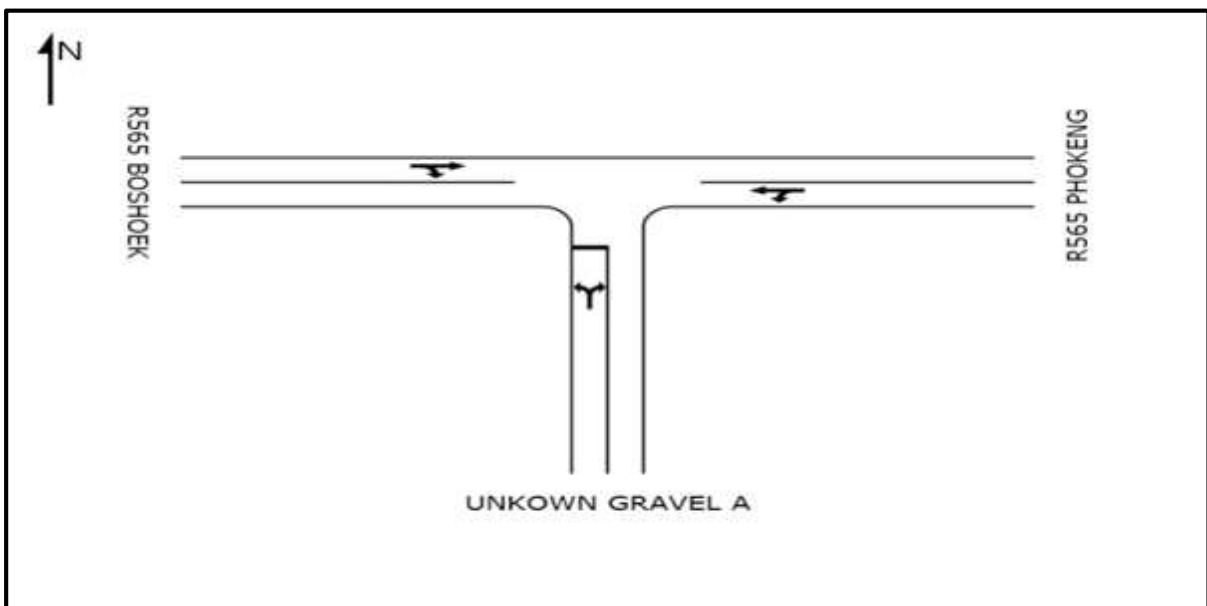


Figure 13– R565 & Unknown Gravel Rd intersection C Layout

It must be noted, specifically for the development, that Intersection B, must be prioritised as the main access and to be upgraded accordingly.

### 3.6. Existing Traffic Counts

The intersections were analysed in their current situation (layout). The results of the analysis of the operational efficiency of the selected intersections are tabulated below.





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**Table 4: Intersection A Movement Summary for existing traffic conditions AM peak.**

<b>MOVEMENT SUMMARY</b>												<b>Site: INTERSECTION A AM PEAK</b>	
												<b>20 YEARS</b>	
R565 & UNKOWN GRAVEL A AM PEAK													
Stop (Two-Way)													
<b>Movement Performance - Vehicles</b>													
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn w/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h		
<b>South: UNKOWN GRAVEL A</b>													
1	L	36	2.0	0.117	14.5	LOS B	0.5	3.9	0.47	0.85	43.7		
3	R	33	2.0	0.117	14.3	LOS B	0.5	3.9	0.47	1.00	43.9		
<b>Approach</b>		69	2.0	0.116	14.4	LOS B	0.5	3.9	0.47	0.92	43.8		
<b>East: R565 PHOKENG</b>													
4	L	32	2.0	0.135	8.2	LOS A	0.0	0.0	0.00	1.01	49.0		
5	T	226	2.0	0.135	0.0	LOS A	0.0	0.0	0.00	0.00	60.0		
<b>Approach</b>		258	2.0	0.135	1.0	LOS A	0.0	0.0	0.00	0.12	58.4		
<b>West: R565 BOSHOEK</b>													
11	T	207	2.0	0.131	1.2	LOS A	1.1	7.9	0.41	0.00	52.5		
12	R	26	2.0	0.132	9.7	LOS A	1.1	7.9	0.41	0.94	49.0		
<b>Approach</b>		234	2.0	0.131	2.2	LOS A	1.1	7.9	0.41	0.11	52.1		
<b>All Vehicles</b>		560	2.0	0.135	3.1	NA	1.1	7.9	0.23	0.21	53.5		
LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.													
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).													
Approach LOS values are based on the worst delay for any vehicle movement.													
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The vehicle load rate is 560veh/hr for the AM peak approach , with 2.0% Heavy Traffic at an average delay of 3.1 sec at 100% lane utilisation culminating to LOS A for R565. However, a delay of 14.4sec at 43.8km/h for Gravel Road, depicts the need for an all stop/signal controlled junction.

**Table 5: Intersection A Movement Summary existing traffic conditions PM peak.**

<b>LANE SUMMARY</b>														<b>Site: INTERSECTION A PM PEAK</b>				
														<b>20 YEARS</b>				
R565 & UNKOWN GRAVEL A PM PEAK																		
Stop (Two-Way)																		
Design Life Analysis (Practical Capacity): Results for 20 years																		
<b>Lane Use and Performance</b>																		
	Demand Flows			Total	HV %	Cap. veh/h	Deg. Satn w/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %		
	L	T	R	veh/h	%	veh/h			sec		veh	m	m					
<b>South: UNKOWN GRAVEL A</b>																		
Lane 1	50	0	49	99	2.0	477	0.207	100	16.5	LOS C	1.0	6.9	500	-	0.0	0.0		
<b>Approach</b>		50	0	49	99	2.0	0.207		16.5	LOS C	1.0	6.9						
<b>East: R565 PHOKENG</b>																		
Lane 1	49	317	0	365	2.0	1912	0.191	100	1.1	LOS A	0.0	0.0	500	-	0.0	0.0		
<b>Approach</b>		49	317	0	365	2.0	0.191		1.1	LOS A	0.0	0.0						
<b>West: R565 BOSHOEK</b>																		
Lane 1	0	209	46	255	2.0	1642	0.155	100	3.5	LOS A	1.4	9.9	500	-	0.0	0.0		
<b>Approach</b>		0	209	46	255	2.0	0.155		3.5	LOS A	1.4	9.9						
<b>Intersection</b>				719	2.0		0.207		4.1	NA	1.4	9.9						
LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.																		
Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).																		
Approach LOS values are based on the worst delay for any lane.																		
The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.																		
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The vehicle load rate is 719veh/hr for the PM peak approach , with 2.0% Heavy Traffic causing an average delay of 16.5sec at 100% lane utilisation culminating to LOS C, on gravel road.



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**Table 6: Intersection B Movement Summary for existing traffic conditions AM peak.**

<b>MOVEMENT SUMMARY</b>												<b>Site: INTERSECTION B AM PEAK 20 YEARS</b>	
R565 & THABA CHWEU BRICKS AM PEAK Stop (Two-Way) Design Life Analysis (Practical Capacity): Results for 20 years													
<b>Movement Performance - Vehicles</b>													
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h		
<b>South: THABA CHWEU BRICKS</b>													
1	L	29	2.0	0.123	16.3	LOS C	0.6	4.0	0.54	0.87	42.3		
3	R	29	2.0	0.123	16.0	LOS C	0.6	4.0	0.54	1.01	42.5		
<b>Approach</b>		59	2.0	0.123	16.1	LOS C	0.6	4.0	0.54	0.94	42.4		
<b>East: R565 PHOKENG</b>													
4	L	29	2.0	0.167	8.2	LOS A	0.0	0.0	0.00	1.03	49.0		
5	T	290	2.0	0.167	0.0	LOS A	0.0	0.0	0.00	0.00	60.0		
<b>Approach</b>		320	2.0	0.167	0.8	LOS A	0.0	0.0	0.00	0.10	58.8		
<b>West: R565 BOSHOEK</b>													
11	T	265	2.0	0.166	1.7	LOS A	1.5	11.0	0.48	0.00	51.4		
12	R	29	2.0	0.167	10.2	LOS B	1.5	11.0	0.48	0.95	49.0		
<b>Approach</b>		295	2.0	0.166	2.5	LOS B	1.5	11.0	0.48	0.10	51.2		
<b>All Vehicles</b>		673	2.0	0.167	2.9	NA	1.5	11.0	0.26	0.17	53.5		
LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements. Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM). Approach LOS values are based on the worst delay for any vehicle movement. The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.													
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The vehicle load rate is 673veh/hr for the AM peak approach , with 2.0% Heavy Traffic causing an average delay of 16.3sec at 100% lane utilisation culminating to LOS C, for Gravel road towards Thaba Chweu Brickyard.

**Table 7: Intersection B Movement Summary for existing traffic conditions PM peak.**

<b>MOVEMENT SUMMARY</b>												<b>Site: INTERSECTION B PM PEAK 20 YEARS</b>	
R565 & THABA CHWEU BRICKS PM PEAK Stop (Two-Way)													
<b>Movement Performance - Vehicles</b>													
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h		
<b>South: THABA CHWEU BRICKS</b>													
1	L	36	2.0	0.124	14.8	LOS B	0.6	4.1	0.48	0.85	43.5		
3	R	35	2.0	0.124	14.6	LOS B	0.6	4.1	0.48	1.01	43.7		
<b>Approach</b>		71	2.0	0.124	14.7	LOS B	0.6	4.1	0.48	0.93	43.6		
<b>East: R565 PHOKENG</b>													
4	L	35	2.0	0.137	8.2	LOS A	0.0	0.0	0.00	1.00	49.0		
5	T	226	2.0	0.136	0.0	LOS A	0.0	0.0	0.00	0.00	60.0		
<b>Approach</b>		261	2.0	0.137	1.1	LOS A	0.0	0.0	0.00	0.13	58.3		
<b>West: R565 BOSHOEK</b>													
11	T	216	2.0	0.142	1.3	LOS A	1.2	8.5	0.41	0.00	52.3		
12	R	33	2.0	0.141	9.8	LOS A	1.2	8.5	0.41	0.93	48.9		
<b>Approach</b>		248	2.0	0.142	2.4	LOS A	1.2	8.5	0.41	0.12	51.9		
<b>All Vehicles</b>		580	2.0	0.142	3.3	NA	1.2	8.5	0.24	0.22	53.3		
LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements. Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM). Approach LOS values are based on the worst delay for any vehicle movement.													
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The vehicle load rate is 580veh/hr for the PM peak approach , with 2.0% Heavy Traffic causing an average delay of 14.7sec at 100% lane utilisation culminating to LOS B for Gravel road approach vehicles.



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**Table 8: Intersection C Movement Summary for existing traffic conditions AM peak.**

<b>MOVEMENT SUMMARY</b>											<b>Site: INTERSECTION C AM PEAK 20 YEARS</b>		
R565 & UNKNOWN GRAVEL C AM PEAK Stop (Two-Way) Design Life Analysis (Practical Capacity): Results for 20 years													
<b>Movement Performance - Vehicles</b>													
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h		
<b>South: UNKNOWN GRAVEL C</b>													
1	L	29	2.0	0.120	16.0	LOS C	0.5	3.9	0.53	0.86	42.5		
3	R	29	2.0	0.120	15.8	LOS C	0.5	3.9	0.53	1.01	42.7		
Approach		59	2.0	0.120	15.9	LOS C	0.5	3.9	0.53	0.94	42.6		
<b>East: R565 PHOKENG</b>													
4	L	3	2.0	0.155	8.2	LOS A	0.0	0.0	0.00	1.08	49.0		
5	T	290	2.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	60.0		
Approach		293	2.0	0.152	0.1	LOS A	0.0	0.0	0.00	0.01	59.9		
<b>West: R565 BOSHOEK</b>													
11	T	265	2.0	0.165	1.5	LOS A	1.5	10.7	0.46	0.00	51.8		
12	R	29	2.0	0.166	10.0	LOS B	1.5	10.7	0.46	0.95	49.1		
Approach		295	2.0	0.165	2.4	LOS B	1.5	10.7	0.46	0.09	51.5		
All Vehicles		647	2.0	0.165	2.6	NA	1.5	10.7	0.26	0.13	53.9		
LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.													
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).													
Approach LOS values are based on the worst delay for any vehicle movement.													
The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.													
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The vehicle load rate is 647veh/hr for the AM peak, with 2.0% Heavy Traffic causing an average delay of 15.9sec culminating to LOS C, on gravel road approach vehicles.

**Table 9: Intersection C Movement Summary for existing traffic conditions PM peak.**

<b>MOVEMENT SUMMARY</b>											<b>Site: INTERSECTION C PM PEAK 20 YEARS</b>		
R565 & UNKNOWN GRAVEL A PM PEAK Stop (Two-Way)													
<b>Movement Performance - Vehicles</b>													
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h		
<b>South: UNKNOWN GRAVEL C</b>													
1	L	21	2.0	0.086	15.9	LOS C	0.4	2.7	0.53	0.86	42.6		
3	R	21	2.0	0.086	15.7	LOS C	0.4	2.7	0.53	1.01	42.8		
Approach		42	2.0	0.086	15.8	LOS C	0.4	2.7	0.53	0.93	42.7		
<b>East: R565 PHOKENG</b>													
4	L	35	2.0	0.170	8.2	LOS A	0.0	0.0	0.00	1.02	49.0		
5	T	292	2.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	60.0		
Approach		326	2.0	0.170	0.9	LOS A	0.0	0.0	0.00	0.11	58.6		
<b>West: R565 BOSHOEK</b>													
11	T	243	2.0	0.159	1.7	LOS A	1.4	10.3	0.48	0.00	51.4		
12	R	34	2.0	0.159	10.2	LOS B	1.4	10.3	0.48	0.94	48.9		
Approach		277	2.0	0.159	2.7	LOS B	1.4	10.3	0.48	0.11	51.1		
All Vehicles		645	2.0	0.170	2.7	NA	1.4	10.3	0.24	0.17	53.9		
LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.													
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).													
Approach LOS values are based on the worst delay for any vehicle movement.													
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The vehicle load rate is 649veh/hr for the PM peak, with 2.0% Heavy Traffic causing an average delay of 15.8sec culminating to LOS C on gravel road approach vehicles.





From the Sidra analysis for the existing traffic, there is need to upgrade the intersections however, there is need to upgrade the road pavement condition as it is in poor to very poor state especially intersection B considered as the main access.

#### 4. FUTURE OPERATING CONDITIONS OF INTERSECTION

These assumptions were adopted:

- A phf factor of 0,95 for capacity analysis
- Queue lengths indicated are actually average lengths.

For signalised intersections the following will apply:

**Table 10: Performance measures for Signalised intersections.**

Period	Maximum Volume/Capacity	Minimum Level of Service
	Left Turn /Through (Straight)	Right Turn
15min Peak	90%	95%

#### 4.1. Traffic Growth

There is no indication of traffic growth outside of the proposed development.

Boshoek seems not to be included in most proposed developments as stated in Figure 17 below. Boshoek has been excluded from ILLIMA Projects, DRDP (District Rural Development Programme) and FPSUs (Farmer Production Support Units) even from RID (Rural Infrastructure Development) but does have CASP and REID (Rural Energy Infrastructure Development). It's not even included in the VTSD (Village Township and Small Dorpies Strategy) projects.

Average Annual growth				
2017-2022	1.66%	1.43%	1.32%	1.32%
<i>Source: IHS Markit Regional eXplorer version 1479</i>				
<p>The population projection of Rustenburg Local Municipality shows an estimated average annual growth rate of 1.7% between 2017 and 2022. The average annual growth rate in the population over the projection period for Bojanala Platinum District Municipality, North-West Province and South Africa is 1.4%, 1.3% and 1.3% respectively and is lower than that the average annual growth in the Rustenburg Local Municipality.</p>				

Whilst traffic growth has been steady in recent years it is likely to continue at this rate in the medium to long-term. For this assessment, Boshhoek falls within average growth areas of less than 3%, and a 3,0% traffic growth over a 20-year horizon (2020 to 2040) has been applied to the existing traffic in line with TMH17-Trip Data Manual.

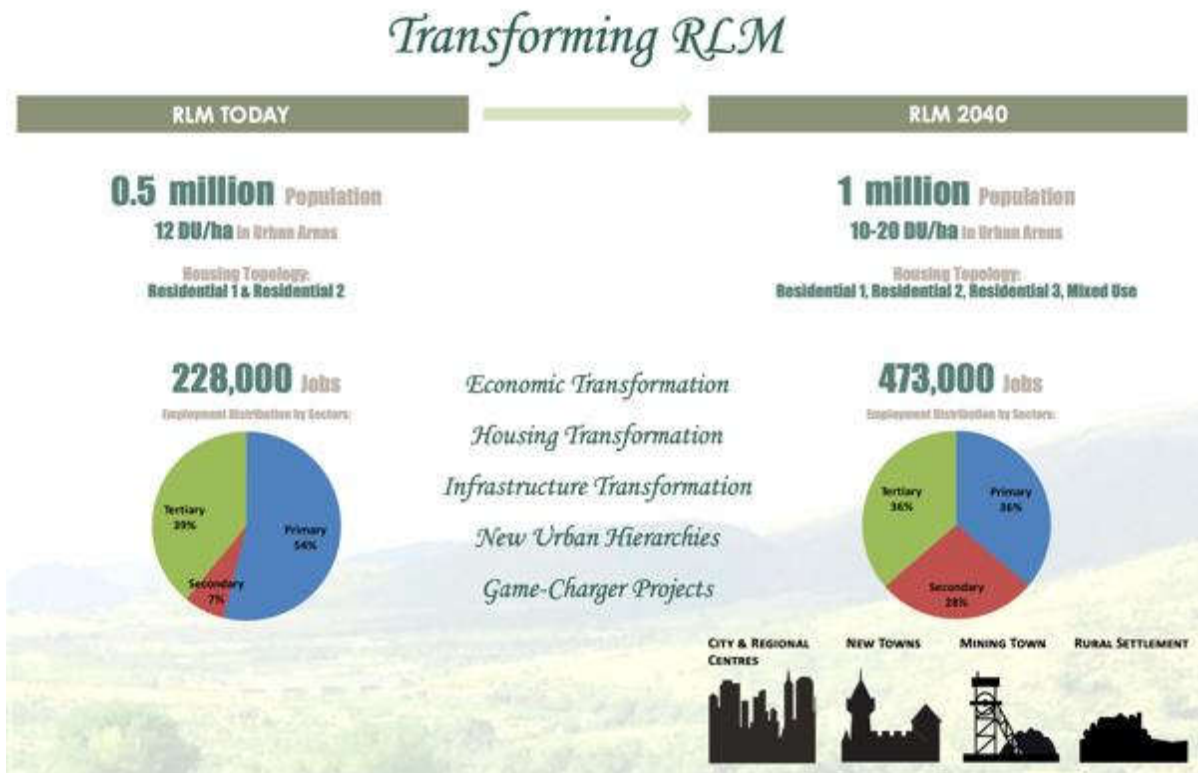


Figure 14– Social Economic Demographics SDF 2018/2019

As extracted from Master Integrated Plan for RLM, Boschoek area is earmarked for mixed use residential development

Table 11: Typical Traffic Growth Rates

Development Area	Growth rate
Low growth areas	0 - 3%
Average growth areas	3 - 4%
Above average growth areas	4 - 6%
Fast growing areas	6 - 8%
Exceptionally high growth areas	> 8%

Source: City Council of Pretoria (1998)

It was noted that the traffic trends going forward will be much the same as at present with the addition of traffic growth. Only traffic for the days (Friday and Saturday) were obtained and the higher value was considered for future traffic interpolation.



Fig.4.1 Broad Land Use Plan 2040

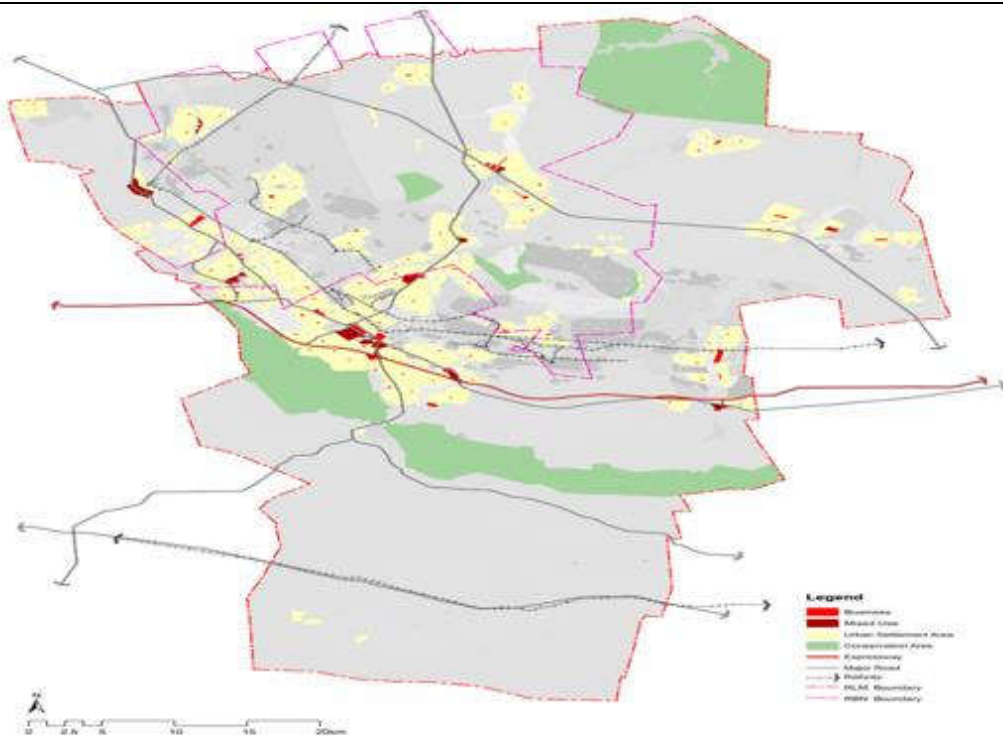


Fig.5.1 Proposed Broad Commercial Plan 2040

Figure 15 – Proposed Developments (Source: RLM Master Plan 2015)

There are proposed Mixed use development mainly residential for Boschoek under Rustenburg Local Municipality







As noted from the existing traffic there R565 is prioritised for upgrades, with a total of 1169 attracted traffic for Boschoek and Chaneng areas.

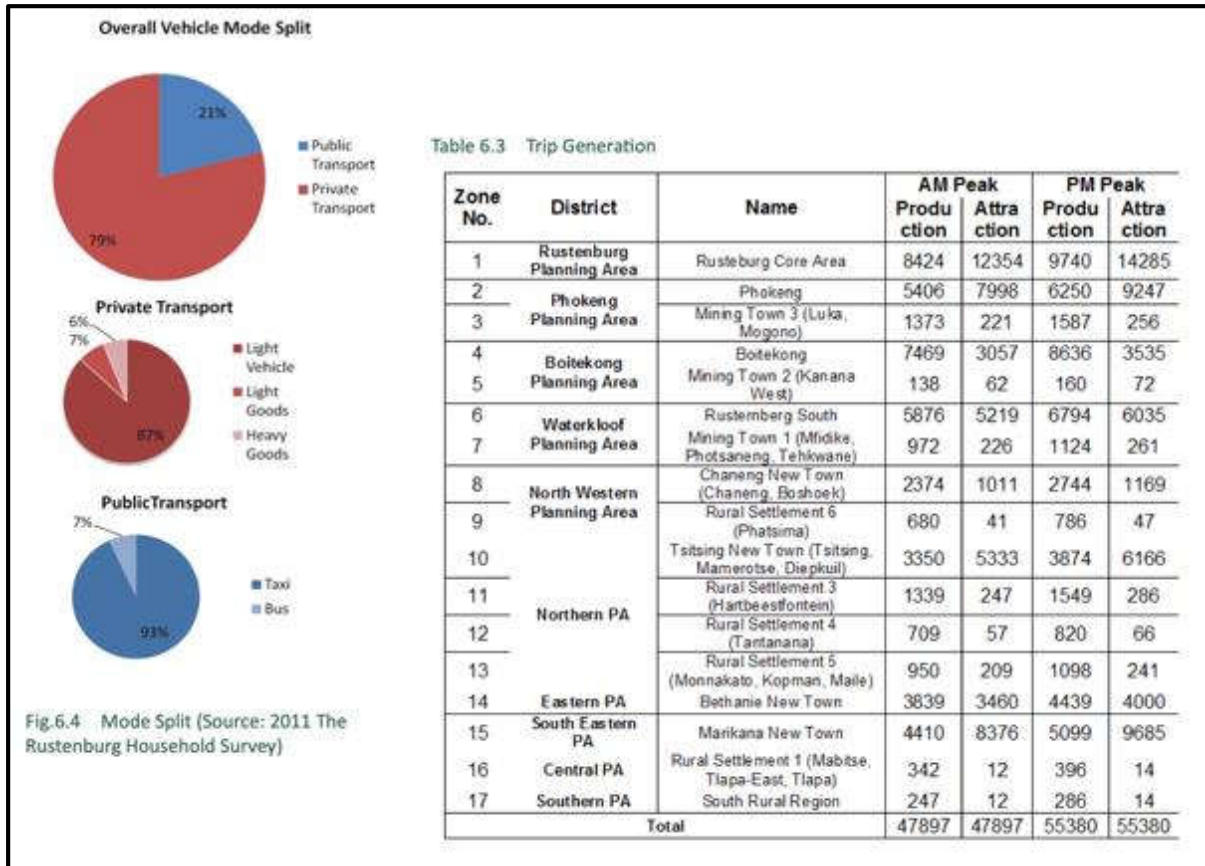


Figure20: RLM Planned Generated Traffic (Source: Master Plan 2015)

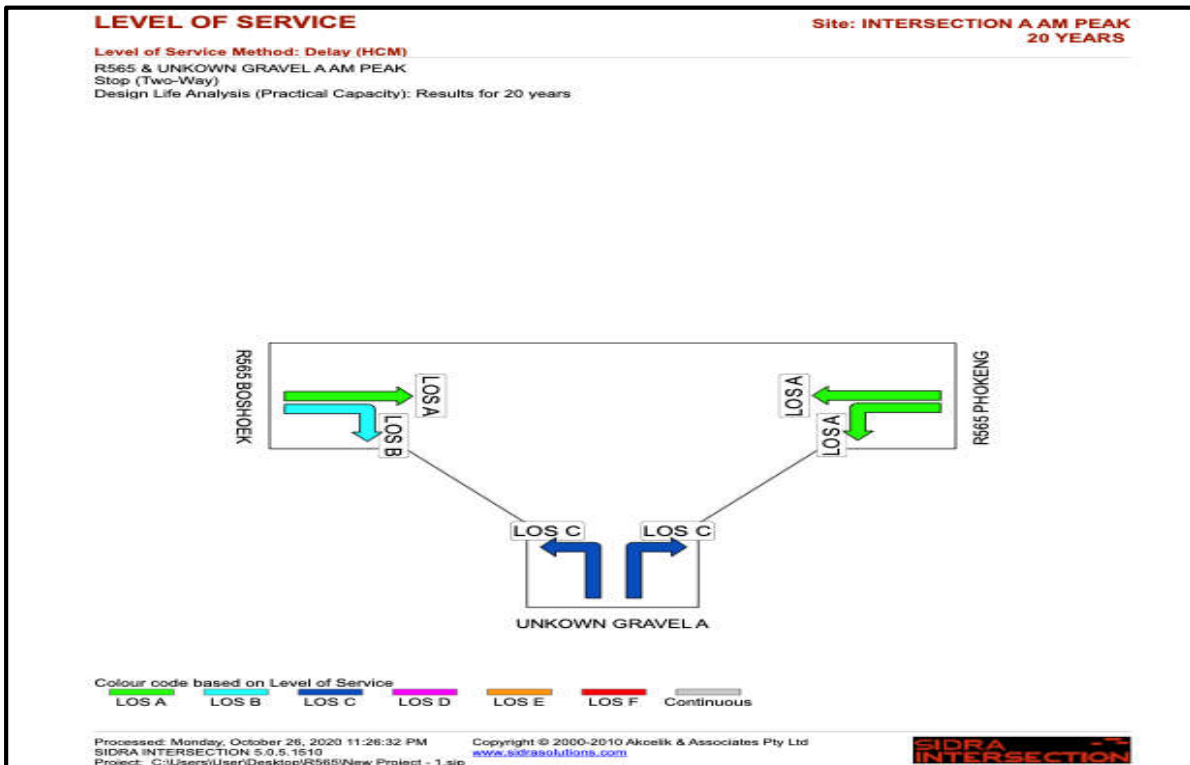


Table 12: 2040 Traffic Analysis (Intersection A).

Intersection A, was analysed as a 3-way stop controlled junction, however, there is need to upgrade the intersection.

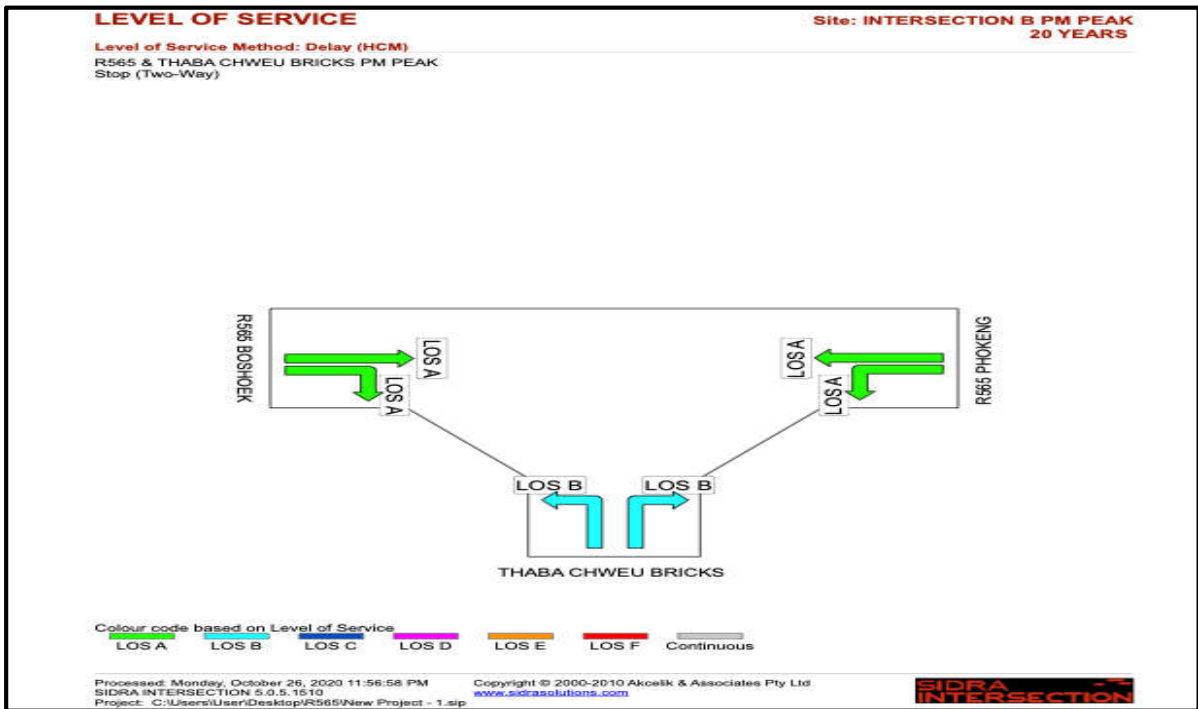


Table 16: 2040 Traffic Analysis (Intersection B).

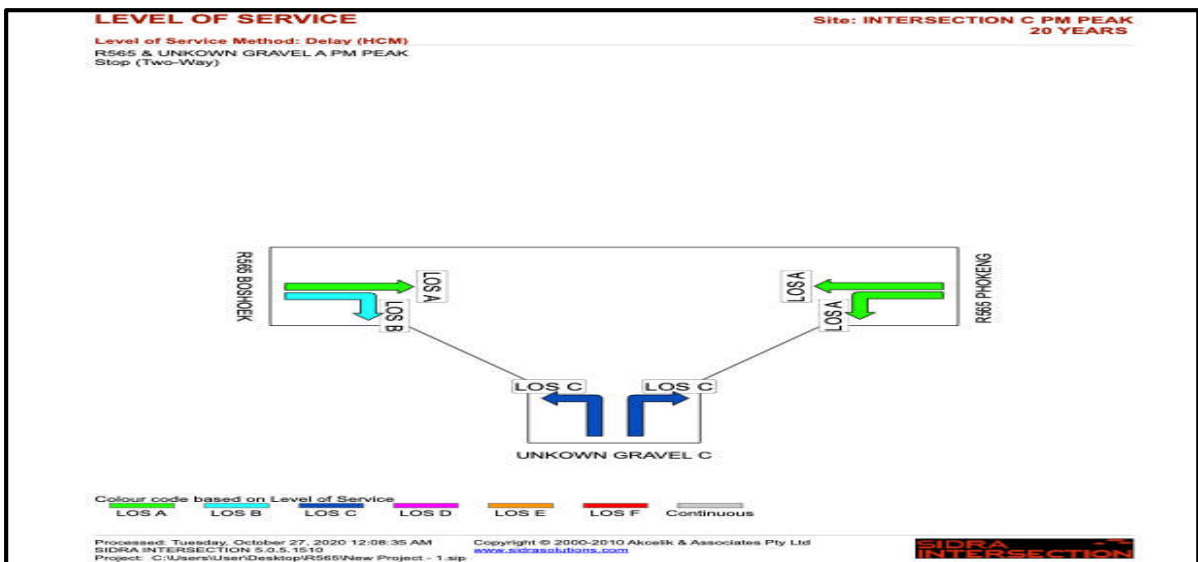


Table 17: 2040 Traffic Analysis (Intersection C).

## 5. PUBLIC TRANSPORT AND PARKING

### 5.1. 2020 Estimated Background Traffic

The AM and PM estimated traffic for the peak hours are indicated in tables above. The horizon year selected for the study is 2025.

### 5.2. Horizon Year

Based on information provided, the intension is to develop the proposed townships within a period of 5 years.

### 5.3. Latent Rights

For the purpose of the study no latent trips could be obtained stemming from the latest township applications and approvals.

### 5.4. Public Transport Drop Off Zones

The proposed project will generate and attract public transport and provision must be made especially along the busy R565 provincial road, and within the development in the manner of provision for Drop off zones close to schools, creche, places of worship etc. In that effect 2No. business and 2No. Municipal to have Bus drop off zones within the proposed spatial development in conjunction with Municipal's SDPs.

### 5.5. Road Reserve

It must be noted that the current situation does allow for 10m road reserve, and we recommend 10m streets on the proposed development.





Hi Ola Cahnge this picture

**Figure 17: Mushrooming Informal Structures**

Pedestrian movement is currently not catered for on the intersections, no paved walkways for pedestrians and cyclists and no Zebra Crossing on all intersections.

### **5.6. Road Classification**

The R565 road is classified as Urban major Arterial Provincial Distributor linking the great Suncity and Pretoria

### **5.7. Access and Intersection Spacing**

Intersection and access spacing along Class U4 roads is important for progress of traffic through an area. Comparing these minimum standards with the intersection spacing along the Class U4b roads in the development, and given that the intersections will be priority controlled intersection, comply with minimum standards for Class U4b roads.

### **5.8. Access Throat Length**

The queuing of vehicles on a roadway whilst waiting to enter a development could limit the capacity of a road. Developers should ensure that their development make provision, away from the municipal road network, for the queuing/storage of vehicles which want to enter their properties. The access throat lengths of 100m – 120m need to be provided for this development. The standard calculation methodology for access throat length prescribed in COTO – TMH 16, 2012 Volume 2, Chapter 10, need to be applied for this purpose. The proposed access road to provide acceptable throat lengths within the development.



## 5.9. Proposed Road Improvements

There is need for minor improvements on and along Intersection A, B and C:

- Three way stop/signal junction upgrade to Intersection B
- All culverts to have a raised wing-wall;
- Bus bays rather than taxi rank be constructed in close proximity to schools and places of worship and municipal offices;
- Proper road markings and signage to be installed.



Figure 18: Proposed Main Accesses

The R565 Junction would require upgrade and wayleave application to Provincial transport sector for a junction on provincial road. The signal control is the preferred upgrade method but because of rural locality an all-way stop (three way stop) have been proposed for further evaluation, with traffic calming humps towards junction. Also decelerating and accelerating lanes to be provided.



## 6. TRAFFIC ASSESSMENT

### 6.1. Traffic Operations

For safe operations, Boschoek Development will require upgrade from gravel to a paved road if funds permit and regular routine maintenance in the form of appropriate sidewalk, signage and road markings.

The issue of the impact of construction-traffic during construction must be considered. During the construction phase large, heavy trucks, plant and equipment will be accessing the site. The impact on traffic operations will be that these vehicles, being large, take up the majority of the available roadway, particularly on roads that are only 3.0m wide. Opposing traffic will be faced with a reduction in safety and will be forced onto the verge. Whilst this condition cannot be quantified the situation will present itself to existing users on random basis. Construction traffic should where possible utilise the proposed (*along the proposed main access side*) detour during morning and afternoon off-peaks.

### 6.2. Access

#### 6.2.1. Sight Distances and Visibility

When positioning an access it is important that the shoulder sight distance is adequate and meets or exceeds the minimum requirements for traffic safety reasons.

Normally the main item of concern for an un-signalised intersection is that of adequate shoulder sight distance (SSD), for this intersection shoulder sight distance isn't a concern since no new access is proposed. This is the distance along the road, which the driver of a vehicle exiting the access or turning right into the site needs to be able to see before pulling off from the stop line. The following table depicts the minimum shoulder sight distance requirements for light vehicles, a rigid truck (refuse vehicle, bus) and a heavy articulated truck for the two listed speeds below.

Table 13: Shoulder sight distance requirements (metres)

Vehicle Type	For Through Road Speed of:	
	40km/h	60km/h
Light vehicle (car, LDV, taxi)	75	115
Rigid vehicle (truck, bus)	130	180





Vehicle Type	For Through Road Speed of:	
	40km/h	60km/h
Articulated truck	150	230

## 7. CONCLUSIONS AND RECOMMENDATIONS

The proposed development can be supported from a traffic flow perspective.

### 7.1. Recommendations

Based on the conclusions above, it is further recommended that:

- To ensure safe and satisfactory operations, upgrade and routine maintenance for all roads and at intersections be identified along with improvements to road markings and signage;
- Proposed R565 Main Access (Intersection B) to have preferably a signal controlled intersection with dedicated left and right turning lanes from the proposed developments, together with acceleration and deceleration 120m lanes.
- The potential of the 2040 traffic growth will **require** upgrades to intersections B;
- The Proposed main access is the only major anticipated upgrade, a wayleave application with Provincial Roads Office
- It must be noted that, **Intersection A, B and C** are all viable options for alternative access and traffic tributaries.
- That the proposed development will generate 495 trips for AM peak, and 945 trips for PM peak, the same was used for traffic flow analysis.
- **Provided the above recommendations are adopted there is no reason of a traffic engineering nature why the proposed residential development should not be permitted to proceed.**

#### 7.1.1. Development Particulars

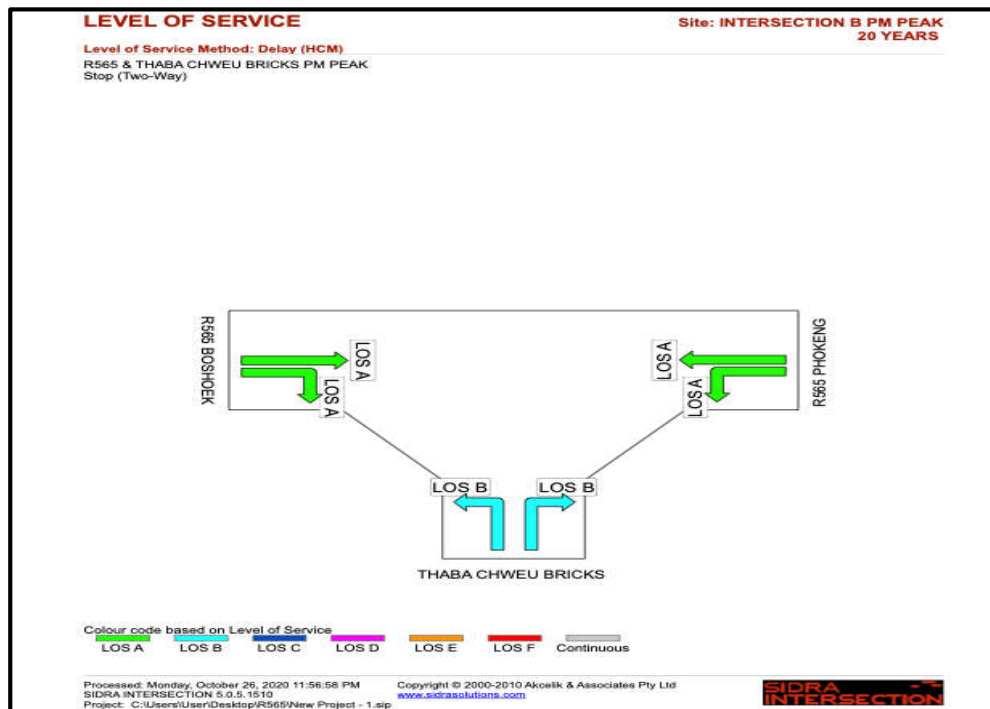
The proposed development comprises of a green field mixed-use development that will be developed within the next 5 years and is known as:

- Boschoek 103 JQ Township development.

- The estimated number of new trips that will be generated from the proposed developments are 2828 for AM trips and 2699 for PM trips in total and apportioned per development phase:
  - Boschoek Farm – 2828 and 2699 during the AM and PM trips respectively;

### 7.1.2. Capacity Analysis

The capacity analysis was done for the base year 2020 and the 2025 horizon year without and with development traffic. The capacity analysis resulted in acceptable LOS for both intersections.



### 7.1.3. Road Reserve

The required road reserves are allowed for in the proposed township layouts.



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#### **7.1.4. Site Specific Recommendations**

- **Public transport** facilities to provided
- **Pedestrian Facilities:** It is recommended that a pedestrian walkway of 1.5-2.0m is provided along the Class U4b roads within the proposed developments to facilitate pedestrian movement.

***It is thus recommended that the proposed development be supported from a traffic engineering point of view given the above recommendations are implemented.***

## ANNEXURE A – ON SITE PHOTOS



**Intersection A**



**Intersection A**



**Intersection B**



**Intersection B**



**Intersection C**



**Intersection C**





**Gravel Road (Intersection B)**



**Informal Structures**



**Informal Structures**



**Informal Structures**



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## ANNEXURE B – MANUAL COUNTS

15 minute period		UNKNOWN GRAVEL TO R565 BOSHOEK				UNKNOWN GRAVEL TO R565 PHOKENG				R565 BOSHOEK TO UNKNOWN GRAVEL				R565 PHOKENG TO UNKNOWN GRAVEL				R565 PHOKENG				R565 BOSHOEK			
		C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr
		6:00	6:15	6				4				4				2				55	7	1	6	60	9
6:15	6:30	8				2				3				2			2	73	6	1	6	67	5		15
6:30	6:45	5			1	1			1	4			1			2	69	7	2	4	58	6	4	6	
6:45	7:00	8	2			3				2			2				77	6		2	69	5		11	
7:00	7:15	9				1				1			3				49	1		2	57	3		7	
7:15	7:30	3	2			1				2			2				59	2	1	3	72	4		7	
7:30	7:45	5			2	4				1			2			1	57	3	2	1	72	1		6	
7:45	8:00	2				4				1			4				40	6		6	39	6		7	
8:00	8:15	3				9				11	1		6				47	9	6	7	59	4		9	
8:15	8:30	9				2							1				66	12		9	49	11	4	13	
8:30	8:45	3	1		1	1			1	4	2		1	1	1		65	2	1	10	48	2		20	
8:45	9:00	1				1				1			1				62	7	1	10	43	2		8	
9:00	9:15	4				4				2			1				63	9	3	11	32	5		13	
9:15	9:30	2				2				6			7				78	9	3	10	72	3		8	
9:30	9:45	8				1				7			6				83	6		10	65	3		6	
9:45	10:00	5				1				1			12			1	81	16	1	9	61	6	1	13	
10:00	10:15	11				3				4			6	2		4	87	6	3	14	75	2		10	
10:15	10:30	4				4				1			4	1			62	14	1	8	31	6		10	
10:30	10:45	6				2				4			1	4			34	5	1	8	30	2		13	
10:45	11:00	2				1				2			1	1			34	10		7	39	2		13	
11:00	11:15	8				8				8			16				82	11		15	83	5		11	
11:15	11:30	1				1				1			3	2		2	60	5		9	57	4	1	12	
11:30	11:45	2				2				1			3				80	6	1	10	80	9	1	8	
11:45	12:00	6				3				2	2		2	7			59	6		9	72	4	2	7	
12:00	12:15	2			1	3	1		1	3			5				22	4	1	12	39	4		4	
12:15	12:30	4	1			2				4			3				52	4		10	50	9		6	
12:30	12:45	7				5				1			2				63	2		15	32	8	8	1	
12:45	13:00	5				4				7	1		10				81	11		13	101	9	10	1	
13:00	13:15	1			1	4	1			1	1		3				72	7		14	73	16		12	
13:15	13:30	4				3	1		1	2	2		3	1			65	14	1	10	80	8	4	11	
13:30	13:45	3				9	1			8	1		9				85	6		12	82	16	5	11	
13:45	14:00	5				7				3			3	2	2		42	5		7	56	13	1	10	
14:00	14:15	8	2		2	5				1			5				47	4	1	2	87	12	3	9	
14:15	14:30	3	1			2	2	1	1	2	1		4	1		1	82	12	3	2	71	8		5	
14:30	14:45	3	2			3				1			4				59	7	1	6	54	11		1	
14:45	15:00	3	2			1	1			2	2		3	3			51	5		6	47	6	2	2	
15:00	15:15	1								2			6				73	6	5	4	42	5	4	7	
15:15	15:30	2				1				2			2	1			86	7	2	7	70	6		5	
15:30	15:45	2				2				4			2				72	2	6	5	47	8		5	
15:45	16:00	2	1			7				3			7				41	3		8	38	9	1	4	
16:00	16:15	8				1				4			5				81	3		8	48	4	4	1	
16:15	16:30	6				4				3			2				42	2	3	3	59	2		6	
16:30	16:45	1				1				1			1				47	3		10	80	4		11	
16:45	17:00	6				9				1			1				74	6		8	69	11		10	
17:00	17:15	5				5				1			5				64	9		8	73	2	5	13	
17:15	17:30	8				9				4			3				81	9	2	10	82	2	4	7	
17:30	17:45	9				7				2			2				76	14	1	13	71	5		9	
17:45	18:00	11				5				1			2				85	6		15	56	6	1	5	
		230	14	0	8	164	7	1	6	136	13	0	10	186	16	2	13	3065	322	54	394	2897	293	65	400



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15 minute period		THABA CHWEU BRICKS TO R565 BOSHOEK				THABA CHWEU BRICKS TO R565 PHOKENG				R565 BOSHOEK TO THABA CHWEU BRICKS				R565 PHOKENG TO THABA CHWEU BRICKS				R565 PHOKENG				R565 BOSHOEK			
		C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr
		6:00	6:15																	59	4	4	4	42	4
6:15	6:30																	68	7	6	10	76	3	1	11
6:30	6:45																	52	3	5	8	69	2	3	5
6:45	7:00																	49	3	3	4	61	4	1	9
7:00	7:15																	61	3	2	3	69	4	2	3
7:15	7:30				1													74	4	1	3	88	5	3	3
7:30	7:45																	61	2	2	6	71	6	1	4
7:45	8:00								2									74	4	3	6	84	6	2	7
8:00	8:15																	65	4	1	5	72	9	2	4
8:15	8:30																	69	3	4	5	78	3	1	4
8:30	8:45																	86	3	1	10	84	8	2	14
8:45	9:00				1													47	2	3	3	42	4	1	3
9:00	9:15	1																57	2	3	14	86	6	5	11
9:15	9:30																	71	1	2	6	61	12	3	9
9:30	9:45								1									58	3	1	3	94	3	5	8
9:45	10:00																	47	1	1	12	88	18	1	14
10:00	10:15																	53	1	2	4	79	4	3	17
10:15	10:30												1					58	2	3	3	68	4	1	5
10:30	10:45																	61	7	4	3	74	4	1	6
10:45	11:00																	49	3	4	7	84	7	2	7
11:00	11:15																	47	2	3	15	73	9	4	13
11:15	11:30				2													56	3	1	13	79	2	1	14
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12:00	12:15				1													69	4	3	11	81	2	2	5
12:15	12:30																	77	2	2	8	84	6	3	14
12:30	12:45	1																81	4	1	9	79	2	4	14
12:45	13:00																	79	2	1	9	84	5	1	9
13:00	13:15																	68	11	4	12	83	3	2	16
13:15	13:30																	59	9	6	6	136	6	4	13
13:30	13:45																	68	3	5	7	76	6	4	7
13:45	14:00																	55	12	3	6	141	4	3	11
14:00	14:15																	61	4	3	5	111	12	7	3
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15:45	16:00																	72	2	1	6	106	8	2	13
16:00	16:15																	69	5	5	4	98	6	3	10
16:15	16:30																	89	3	3	3	91	9	2	8
16:30	16:45				1													82	3	2	4	108	7	2	7
16:45	17:00																	90	3	1	4	112	5	1	11
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17:15	17:30																	80	4	3	6	105	6	2	13
17:30	17:45																	71	7	1	5	116	8	2	8
17:45	18:00																	94	2	4	5	107	7	2	14
		4	0	0	3	3	0	0	1	3	0	0	0	1	0	0	0	3299	192	138	326	4258	269	112	430



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R565 ROSHOKK R565 PHOKENG

ROSHOKK : 15 MINUTE CLASSIFIED COUNTING SHEET

DESCRIPTION OF INTERSECTION: R565 & UNKNOWN  
 DATE OF COUNT: 16 OCT 2020  
 COUNTED BY:  
 COORDINATE:

C= Car  
 T= Taxi  
 B= Bus  
 Tr= Truck

15 minute period																											
	UNKNOWN GRAVEL TO R565 ROSHOKK				UNKNOWN GRAVEL TO R565 PHOKENG				R565 ROSHOKK TO UNKNOWN GRAVEL				R565 PHOKENG TO UNKNOWN GRAVEL				R565 PHOKENG				R565 ROSHOKK						
	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr			
6:00-6:15																				59	4	4	4	40	4	2	7
6:15-6:30																				68	7	6	10	76	3	1	11
6:30-6:45																				52	3	5	8	69	2	3	5
6:45-7:00													1							49	3	3	4	61	4	1	8
7:00-7:15																				61	3	2	3	69	4	2	3
7:15-7:30																				74	4	1	3	88	5	3	3
7:30-7:45																				61	2	2	6	70	6	1	4
7:45-8:00													1							74	4	3	6	85	6	2	7
8:00-8:15																				65	4	1	5	72	9	2	4
8:15-8:30																				69	3	4	5	78	3	1	4
8:30-8:45	1																			96	3	1	10	94	8	2	14
8:45-9:00																				47	2	3	3	42	4	1	2
9:00-9:15																				57	2	3	14	86	6	3	11
9:15-9:30													1							71	1	2	6	60	12	5	9
9:30-9:45																				58	3	1	3	94	3	1	8
9:45-10:00																				47	1	1	12	88	18	3	14
10:00-10:15																				53	1	2	4	79	4	1	17
10:15-10:30																				58	2	3	3	68	4	1	5
10:30-10:45																				61	7	4	3	74	4	2	6
10:45-11:00																				49	3	4	7	84	7	4	7
11:00-11:15																				47	2	3	15	73	9	1	13
11:15-11:30																				56	3	1	13	79	2	2	14
11:30-11:45																				48	6	5	10	69	4	2	13
11:45-12:00																				57	2	4	4	77	3	2	5
12:00-12:15																				68	4	3	11	80	2	3	5
12:15-12:30																				77	2	2	8	84	6	4	14
12:30-12:45																				81	4	1	9	79	2	1	14
12:45-13:00																				79	2	1	9	84	5	2	8
13:00-13:15																				68	11	4	12	83	3	4	16
13:15-13:30																				59	9	6	6	136	6	4	13
13:30-13:45																				68	3	5	7	76	6	3	7
13:45-14:00																				55	12	3	6	140	4	7	10
14:00-14:15																				61	4	3	5	110	12	2	3
14:15-14:30																				89	7	2	8	89	3	1	5
14:30-14:45																				107	9	6	9	128	4	3	13
14:45-15:00																				81	3	3	5	137	3	2	10
15:00-15:15																				89	3	1	5	110	4	2	6
15:15-15:30																				81	3	7	13	98	3	2	8
15:30-15:45																				79	11	1	8	100	7	2	7
15:45-16:00																				72	2	1	6	106	8	3	13
16:00-16:15																				69	5	5	4	98	6	2	10
16:15-16:30																				89	3	3	3	90	9	2	8
16:30-16:45																				82	3	2	4	108	7	1	7
16:45-17:00																				90	3	1	4	112	5	3	17
17:00-17:15																				82	1	2	7	107	9	2	8
17:15-17:30																				80	2	3	6	114	6	2	13
17:30-17:45																				71	7	1	5	116	8	1	6
17:45-18:00																				94	4	4	5	107	7	2	14
	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3298	192	138	326	4237	269	108	429		





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**BOSHOEK : 15 MINUTE CLASSIFIED COUNTING SHEET**

DESCRIPTION OF INTERSECTION: R565 & UNKNOWN  
 DATE OF COUNT: 17 OCT 2020  
 COUNTED BY:  
 COORDINATE:

C= Car  
 T= Taxi  
 B= Bus  
 Tr= Truck

R565 BOSHOEK      R565 PHOKENG

UNKNOWN GRAVEL A

15 minute period	←				↶				↷				↵				→				←				
	UNKNOWN GRAVEL TO R565 BOSHOEK				UNKNOWN GRAVEL TO R565 PHOKENG				R565 BOSHOEK TO UNKNOWN GRAVEL				R565 PHOKENG TO UNKNOWN GRAVEL				R565 PHOKENG				R565 BOSHOEK				
	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	
6:00	6:15	3				1				3				1				60	4		5	55	5		10
6:15	6:30	4				2				2				2			1	78	7	1	4	56	6	1	12
6:30	6:45	5	1			3				3	1			2				71	5	1	6	60	7	2	14
6:45	7:00	7	1		1	2				3				3				87	6		3	71	4	3	15
7:00	7:15	8				3				2			1	4				63	4	1	4	63	4		9
7:15	7:30	2				2				3	1			1			1	63	3		4	66	5		10
7:30	7:45	4	1		1	3	1			2				2				61	2	1	5	63	6		12
7:45	8:00	3			1	2				1				3			1	55	4		4	44	7		13
8:00	8:15	2				5			1	7	2			5				51	5	5	6	45	8	1	19
8:15	8:30	7				7				4			1	2				73	11	1	8	43	9	2	12
8:30	8:45	4				3				3			1	1				62	10		12	48	10		21
8:45	9:00	2	1		1	2				2	1			2				65	8	2	11	53	1		18
9:00	9:15	6				1				1			1	1				81	7	2	13	41	4	1	12
9:15	9:30	7				4			1	5				5			1	72	5	1	15	61	4		9
9:30	9:45	8	1			3				6				4				72	6	1	17	59	5	1	8
9:45	10:00	8				2				2				9			1	71	11	2	8	63	7		11
10:00	10:15	9				2	1			3	1			7	2		1	73	12	2	9	68	8	1	9
10:15	10:30	5	1			3			1	2				5	1			66	9	2	10	71	3	1	10
10:30	10:45	4				1				5				2	4			41	8	1	9	63	4		11
10:45	11:00	2			1	2				3				2	1			42	9	1	8	41	2		10
11:00	11:15	5				6				5				8			1	61	10		6	56	1	1	14
11:15	11:30	1	2			5				2	1		1	4	2		1	78	9	1	8	75	3	1	11
11:30	11:45	3				3	1			1				4				83	8		9	61	5		9
11:45	12:00	5				2				1	1			9				65	7	1	8	59	6	1	8
12:00	12:15	1				4				2				4				44	6	1	9	51	7	1	5
12:15	12:30	2				1			1	3				6				52	5	1	11	45	8	2	6
12:30	12:45	5			1	4				2	1			3			1	48	8		12	42	9	3	8
12:45	13:00	7				5	1			4				8				41	10	2	14	78	8	7	7
13:00	13:15	3				3			1	2			1	4				77	8		16	71	11	6	9
13:15	13:30	3				4				1	1			4	1			86	16	2	9	75	9	3	11
13:30	13:45	4	1		1	8				5	1			6				91	16		8	65	12	4	13
13:45	14:00	4				6	1			4	1			2	2	2		84	14	3	7	71	16	5	11
14:00	14:15	6				6			1	4				4			1	88	11	2	5	78	11	2	19
14:15	14:30	7				3		1		3			1	5	1			91	8	1	4	61	9	1	15
14:30	14:45	4	1			2			1	2				4				65	9	2	7	66	10	1	3
14:45	15:00	4				2				1	1		1	3				71	4	1	5	74	11	3	4
15:00	15:15	5				1				2	1			7			1	83	7	4	4	61	7	4	8
15:15	15:30	3			1	1	1			2				3	1			77	8	3	6	56	8	2	9
15:30	15:45	3	1			1				3				1				91	4	2	7	41	9	1	3
15:45	16:00	1				5				4				2				51	4	2	9	43	8	1	4
16:00	16:15	6				2				3	1			4				92	5	1	11	35	7	2	2
16:15	16:30	5	1			3				2				3				61	6	2	5	46	6	3	4
16:30	16:45	3				5				2			1	2				74	2		4	53	4	1	10
16:45	17:00	8				8				1				1			1	83	3	1	15	61	5	2	9
17:00	17:15	6				6	1		1	2				4				55	6		10	78	3	5	15
17:15	17:30	7	1			7				3				2				80	8	1	11	74	5	3	8
17:30	17:45	5				5				1				1				77	11	2	12	67	6	2	8
17:45	18:00	8				3				2				1				75	10	1	11	44	7	2	6
		224	13	0	8	164	7	1	9	131	15	0	8	172	16	2	12	3331	359	60	404	2821	320	82	484



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15 minute period		THABA CHWEU BRICKS TO R565 BOSHOEK				THABA CHWEU BRICKS TO R565 PHOKENG				R565 BOSHOEK TO THABA CHWEU BRICKS				R565 PHOKENG TO THABA CHWEU BRICKS				R565 PHOKENG				R565 BOSHOEK							
		C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr
		6:00	6:15																	66	5	1	7	62	4	1	13		
6:15	6:30	1				1												84	8	2	6	63	5		15				
6:30	6:45																	77	6	2	8	67	6	1	17				
6:45	7:00									1								93	7	1	5	78	3	1	18				
7:00	7:15																	69	5	2	6	70	3	2	12				
7:15	7:30																	69	4	1	6	73	4	1	13				
7:30	7:45																	67	3	2	7	70	5	1	15				
7:45	8:00	1								1								61	5	1	6	51	6	2	16				
8:00	8:15					1								1				57	6	6	8	52	7	1	22				
8:15	8:30																	79	12	2	10	50	8	1	15				
8:30	8:45																	68	11	1	14	55	9	1	24				
8:45	9:00																	71	9	3	13	60			21				
9:00	9:15									1								87	8	3	15	48	3		15				
9:15	9:30																	78	6	2	17	68	3	1	12				
9:30	9:45											1						78	7	2	19	66	4		11				
9:45	10:00					1												77	12	3	10	70	6	1	14				
10:00	10:15																	79	13	3	11	75	7		12				
10:15	10:30	1																72	10	3	12	78	2		13				
10:30	10:45					1												47	9	2	11	70	3		14				
10:45	11:00																	48	10	2	10	48	1		13				
11:00	11:15																	67	11	1	8	63			17				
11:15	11:30																	84	10	2	10	82	2		14				
11:30	11:45																	89	9	1	11	68	4		12				
11:45	12:00																	71	8	2	10	66	5	1	11				
12:00	12:15																	50	7	2	11	58	6		8				
12:15	12:30					1												58	6	2	13	52	7	1	9				
12:30	12:45																	54	9	1	14	49	8	2	11				
12:45	13:00																	47	11	3	16	85	7	6	10				
13:00	13:15					1												83	9	1	18	78	10	5	12				
13:15	13:30																	92	17	3	11	82	8	2	14				
13:30	13:45	1																97	17	1	10	72	11	3	16				
13:45	14:00													1				90	15	4	9	78	15	4	14				
14:00	14:15																	94	12	3	7	85	10	1	22				
14:15	14:30									1								97	9	2	6	68	8		18				
14:30	14:45																	71	10	3	9	73	9		6				
14:45	15:00	1																77	5	2	7	81	10	2	7				
15:00	15:15									1								89	8	5	6	68	6	3	11				
15:15	15:30	1																83	9	4	8	63	7	1	12				
15:30	15:45																	97	5	3	9	48	8		6				
15:45	16:00																	57	5	3	11	50	7		7				
16:00	16:15																	98	6	2	13	42	6	1	5				
16:15	16:30																	67	7	3	7	53	5	2	7				
16:30	16:45													1				80	3	1	6	60	3		13				
16:45	17:00																	89	4	2	17	68	4	1	12				
17:00	17:15					1				1								61	7	1	12	85	2	4	18				
17:15	17:30																	86	9	2	13	81	4	2	11				
17:30	17:45																	83	12	3	14	74	5	1	11				
17:45	18:00																	81	11	2	13	51	6	1	9				
		6	0	0	3	4	0	0	1	6	0	0	0	3	0	0	0	3619	407	108	500	3157	272	57	628				



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**BOSHOEK : 15 MINUTE CLASSIFIED COUNTING SHEET**

DESCRIPTION OF INTERSECTION: R565 & UNKNOWN  
 DATE OF COUNT: 17 OCT 2020  
 COUNTED BY:  
 COORDINATE:

C= Car  
 T= Taxi  
 B= Bus  
 Tr= Truck

R565 BOSHOEK      R565 PHOKENG

UNKNOWN GRAVEL C

15 minute period	←				↶				↷				↵				→				←								
	UNKNOWN GRAVEL TO R565 BOSHOEK				UNKNOWN GRAVEL TO R565 PHOKENG				R565 BOSHOEK TO UNKNOWN GRAVEL				R565 PHOKENG TO UNKNOWN GRAVEL				R565 PHOKENG				R565 BOSHOEK								
	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr	C	T	B	Tr					
6:00	6:15															63	5		7	61	4		8						
6:15	6:30															81	8	1	6	62	5	1	10						
6:30	6:45															74	6	1	8	66	6	2	12						
6:45	7:00															90	7		5	77	3	3	13						
7:00	7:15															66	5	1	6	69	3		7						
7:15	7:30	1										1				66	4		6	72	4		8						
7:30	7:45															64	3	1	7	69	5		10						
7:45	8:00															58	5		6	50	6		11						
8:00	8:15															54	6	5	8	51	7	1	17						
8:15	8:30															76	12	1	10	49	8	2	10						
8:30	8:45											1				65	11		14	54	9		19						
8:45	9:00															68	9	2	13	59	0		16						
9:00	9:15															84	8	2	15	47	3	1	10						
9:15	9:30															75	6	1	17	67	3		7						
9:30	9:45															75	7	1	19	65	4	1	6						
9:45	10:00															74	12	2	10	69	6		9						
10:00	10:15															76	13	2	11	74	7	1	7						
10:15	10:30															69	10	2	12	77	2	1	8						
10:30	10:45											1				44	9	1	11	69	3		9						
10:45	11:00	1														45	10	1	10	47	1		8						
11:00	11:15															64	11		8	62	0	1	12						
11:15	11:30															81	10	1	10	81	2	1	9						
11:30	11:45															86	9		11	67	4		7						
11:45	12:00															68	8	1	10	65	5	1	6						
12:00	12:15															47	7	1	11	57	6	1	3						
12:15	12:30															55	6	1	13	51	7	2	4						
12:30	12:45															51	9		14	48	8	3	6						
12:45	13:00											1				44	11	2	16	84	7	7	5						
13:00	13:15															80	9		18	77	10	6	7						
13:15	13:30															89	17	2	11	81	8	3	9						
13:30	13:45															94	17		10	71	11	4	11						
13:45	14:00															87	15	3	9	77	15	5	9						
14:00	14:15															91	12	2	7	84	10	2	17						
14:15	14:30															94	9	1	6	67	8	1	13						
14:30	14:45															68	10	2	9	72	9	1	1						
14:45	15:00															74	5	1	7	80	10	3	2						
15:00	15:15															86	8	4	6	67	6	4	6						
15:15	15:30															80	9	3	8	62	7	2	7						
15:30	15:45											1				94	5	2	9	47	8	1	1						
15:45	16:00															54	5	2	11	49	7	1	2						
16:00	16:15															95	6	1	13	41	6	2	0						
16:15	16:30															64	7	2	7	52	5	3	2						
16:30	16:45															77	3		6	59	3	1	8						
16:45	17:00															86	4	1	17	67	4	2	7						
17:00	17:15															58	7		12	84	2	5	13						
17:15	17:30															83	9	1	13	80	4	3	6						
17:30	17:45															80	12	2	14	73	5	2	6						
17:45	18:00															78	11	1	13	50	6	2	4						
		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	3475	407	60	500	3109	272	82	388



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## ANNEXURE C – SIDRA ANALYSIS



## LEVEL OF SERVICE

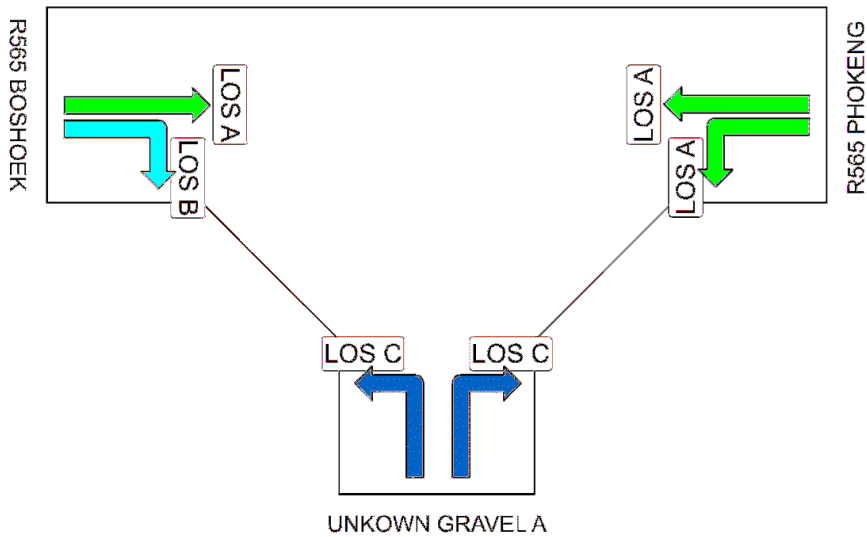
Site: INTERSECTION A AM PEAK  
 20 YEARS

Level of Service Method: Delay (HCM)

R565 & UNKOWN GRAVEL A AM PEAK

Stop (Two-Way)

Design Life Analysis (Practical Capacity): Results for 20 years



Colour code based on Level of Service

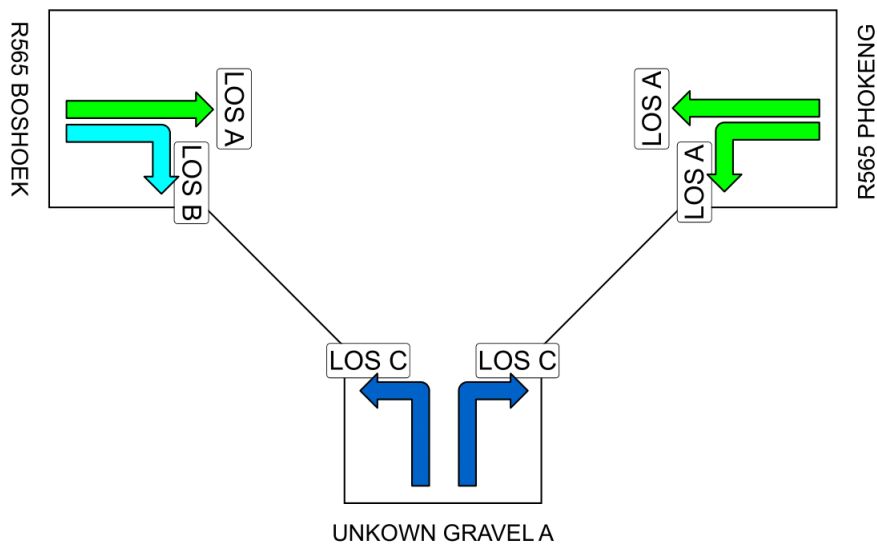
- █ LOS A
- █ LOS B
- █ LOS C
- █ LOS D
- █ LOS E
- █ LOS F
- █ Continuous

## LEVEL OF SERVICE

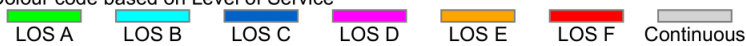
Site: INTERSECTION A PM PEAK  
 20 YEARS

Level of Service Method: Delay (HCM)

R565 & UNKOWN GRAVEL A PM PEAK  
 Stop (Two-Way)  
 Design Life Analysis (Practical Capacity): Results for 20 years



Colour code based on Level of Service





## MOVEMENT SUMMARY

Site: INTERSECTION A AM PEAK  
 20 YEARS

R565 & UNKOWN GRAVEL A AM PEAK  
 Stop (Two-Way)  
 Design Life Analysis (Practical Capacity): Results for 20 years

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: UNKOWN GRAVEL A												
1	L	50	2.0	0.218	17.5	LOS C	1.0	7.2	0.59	0.90	41.4	
3	R	46	2.0	0.219	17.3	LOS C	1.0	7.2	0.59	1.01	41.6	
Approach		96	2.0	0.218	17.4	LOS C	1.0	7.2	0.59	0.95	41.5	
East: R565 PHOKENG												
4	L	44	2.0	0.189	8.2	LOS A	0.0	0.0	0.00	1.01	49.0	
5	T	317	2.0	0.189	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
Approach		361	2.0	0.189	1.0	LOS A	0.0	0.0	0.00	0.12	58.4	
West: R565 BOSHOEK												
11	T	290	2.0	0.188	2.0	LOS A	1.8	13.0	0.52	0.00	50.8	
12	R	37	2.0	0.188	10.6	LOS B	1.8	13.0	0.52	0.96	48.8	
Approach		327	2.0	0.188	3.0	LOS B	1.8	13.0	0.52	0.11	50.5	
All Vehicles		784	2.0	0.218	3.8	NA	1.8	13.0	0.29	0.22	52.4	

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.

## MOVEMENT SUMMARY

Site: INTERSECTION A AM PEAK  
 20 YEARS

R565 & UNKOWN GRAVEL A AM PEAK  
 Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: UNKOWN GRAVEL A												
1	L	36	2.0	0.117	14.5	LOS B	0.5	3.9	0.47	0.85	43.7	
3	R	33	2.0	0.117	14.3	LOS B	0.5	3.9	0.47	1.00	43.9	
Approach		68	2.0	0.116	14.4	LOS B	0.5	3.9	0.47	0.92	43.8	
East: R565 PHOKENG												
4	L	32	2.0	0.135	8.2	LOS A	0.0	0.0	0.00	1.01	49.0	
5	T	226	2.0	0.135	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
Approach		258	2.0	0.135	1.0	LOS A	0.0	0.0	0.00	0.12	58.4	
West: R565 BOSHOEK												
11	T	207	2.0	0.131	1.2	LOS A	1.1	7.9	0.41	0.00	52.5	
12	R	26	2.0	0.132	9.7	LOS A	1.1	7.9	0.41	0.94	49.0	
Approach		234	2.0	0.131	2.2	LOS A	1.1	7.9	0.41	0.11	52.1	
All Vehicles		560	2.0	0.135	3.1	NA	1.1	7.9	0.23	0.21	53.5	

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.



## LANE SUMMARY

Site: INTERSECTION B AM PEAK  
 20 YEARS

R565 & THABA CHWEU BRICKS AM PEAK

Stop (Two-Way)

Design Life Analysis (Practical Capacity): Results for 20 years

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
South: THABA CHWEU BRICKS																
Lane 1	29	0	29	59	2.0	478	0.123	100	16.1	LOS C	0.6	4.0	500	-	0.0	0.0
Approach	29	0	29	59	2.0		0.123		16.1	LOS C	0.6	4.0				
East: R565 PHOKENG																
Lane 1	29	290	0	320	2.0	1916	0.167	100	0.8	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	29	290	0	320	2.0		0.167		0.8	LOS A	0.0	0.0				
West: R565 BOSHOEK																
Lane 1	0	265	29	295	2.0	1773	0.166	100	2.5	LOS A	1.5	11.0	500	-	0.0	0.0
Approach	0	265	29	295	2.0		0.166		2.5	LOS A	1.5	11.0				
Intersection				673	2.0		0.167		2.9	NA	1.5	11.0				

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).

Approach LOS values are based on the worst delay for any lane.

The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.

## LANE SUMMARY

Site: INTERSECTION B PM PEAK  
 20 YEARS

R565 & THABA CHWEU BRICKS PM PEAK

Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
South: THABA CHWEU BRICKS																
Lane 1	36	0	35	71	2.0	569	0.124	100	14.7	LOS B	0.6	4.1	500	-	0.0	0.0
Approach	36	0	35	71	2.0		0.124		14.7	LOS B	0.6	4.1				
East: R565 PHOKENG																
Lane 1	35	226	0	261	2.0	1912	0.137	100	1.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	35	226	0	261	2.0		0.137		1.1	LOS A	0.0	0.0				
West: R565 BOSHOEK																
Lane 1	0	216	33	248	2.0	1755	0.142	100	2.4	LOS A	1.2	8.5	500	-	0.0	0.0
Approach	0	216	33	248	2.0		0.142		2.4	LOS A	1.2	8.5				
Intersection				580	2.0		0.142		3.3	NA	1.2	8.5				

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Lane): LOS B. LOS Method for individual lanes: Delay (HCM).

Approach LOS values are based on the worst delay for any lane.





## MOVEMENT SUMMARY

Site: INTERSECTION B PM PEAK  
 20 YEARS

R565 & THABA CHWEU BRICKS PM PEAK  
 Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: THABA CHWEU BRICKS												
1	L	36	2.0	0.124	14.8	LOS B	0.6	4.1	0.48	0.85	43.5	
3	R	35	2.0	0.124	14.6	LOS B	0.6	4.1	0.48	1.01	43.7	
Approach		71	2.0	0.124	14.7	LOS B	0.6	4.1	0.48	0.93	43.6	
East: R565 PHOKENG												
4	L	35	2.0	0.137	8.2	LOS A	0.0	0.0	0.00	1.00	49.0	
5	T	226	2.0	0.136	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
Approach		261	2.0	0.137	1.1	LOS A	0.0	0.0	0.00	0.13	58.3	
West: R565 BOSHOEK												
11	T	216	2.0	0.142	1.3	LOS A	1.2	8.5	0.41	0.00	52.3	
12	R	33	2.0	0.141	9.8	LOS A	1.2	8.5	0.41	0.93	48.9	
Approach		248	2.0	0.142	2.4	LOS A	1.2	8.5	0.41	0.12	51.9	
All Vehicles		580	2.0	0.142	3.3	NA	1.2	8.5	0.24	0.22	53.3	

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

## LEVEL OF SERVICE

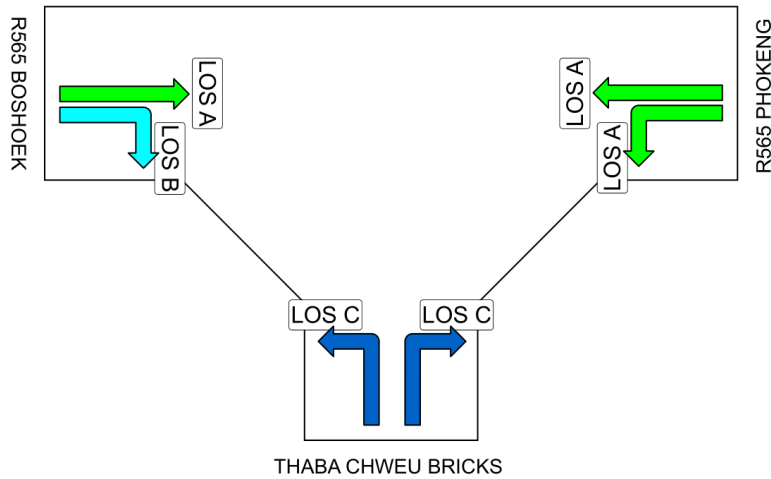
Site: INTERSECTION B AM PEAK  
 20 YEARS

Level of Service Method: Delay (HCM)

R565 & THABA CHWEU BRICKS AM PEAK

Stop (Two-Way)

Design Life Analysis (Practical Capacity): Results for 20 years



Colour code based on Level of Service

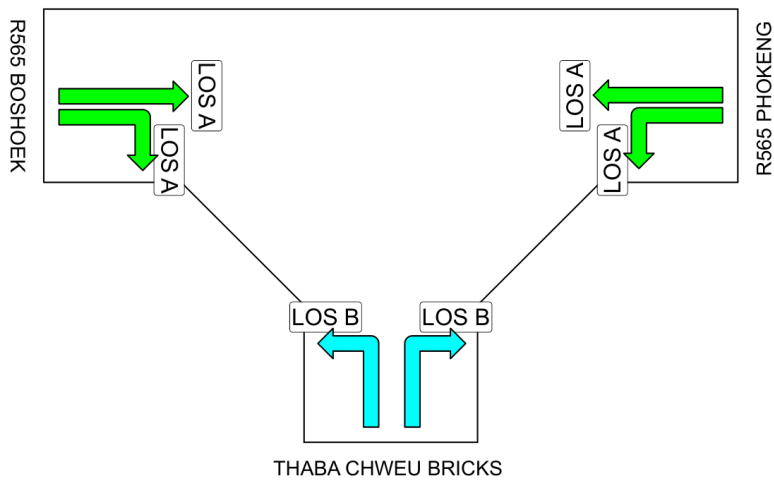
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 █ LOS B   
 █ LOS C   
 █ LOS D   
 █ LOS E   
 █ LOS F   
 █ Continuous

## LEVEL OF SERVICE

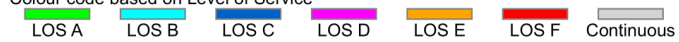
Site: INTERSECTION B PM PEAK  
 20 YEARS

Level of Service Method: Delay (HCM)

R565 & THABA CHWEU BRICKS PM PEAK  
 Stop (Two-Way)



Colour code based on Level of Service





## MOVEMENT SUMMARY

Site: INTERSECTION B AM PEAK  
 20 YEARS

R565 & THABA CHWEU BRICKS AM PEAK  
 Stop (Two-Way)  
 Design Life Analysis (Practical Capacity): Results for 20 years

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: THABA CHWEU BRICKS												
1	L	29	2.0	0.123	16.3	LOS C	0.6	4.0	0.54	0.87	42.3	
3	R	29	2.0	0.123	16.0	LOS C	0.6	4.0	0.54	1.01	42.5	
Approach		59	2.0	0.123	16.1	LOS C	0.6	4.0	0.54	0.94	42.4	
East: R565 PHOKENG												
4	L	29	2.0	0.167	8.2	LOS A	0.0	0.0	0.00	1.03	49.0	
5	T	290	2.0	0.167	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
Approach		320	2.0	0.167	0.8	LOS A	0.0	0.0	0.00	0.10	58.8	
West: R565 BOSHOK												
11	T	265	2.0	0.166	1.7	LOS A	1.5	11.0	0.48	0.00	51.4	
12	R	29	2.0	0.167	10.2	LOS B	1.5	11.0	0.48	0.95	49.0	
Approach		295	2.0	0.166	2.5	LOS B	1.5	11.0	0.48	0.10	51.2	
All Vehicles		673	2.0	0.167	2.9	NA	1.5	11.0	0.26	0.17	53.5	

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.





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## LANE SUMMARY

Site: INTERSECTION C PM PEAK  
 20 YEARS

R565 & UNKOWN GRAVEL A PM PEAK  
 Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
South: UNKOWN GRAVEL C																
Lane 1	21	0	21	42	2.0	487	0.086	100	15.8	LOS C	0.4	2.7	500	–	0.0	0.0
Approach	21	0	21	42	2.0		0.086		15.8	LOS C	0.4	2.7				
East: R565 PHOKENG																
Lane 1	35	292	0	326	2.0	1915	0.170	100	0.9	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	35	292	0	326	2.0		0.170		0.9	LOS A	0.0	0.0				
West: R565 BOSHOEK																
Lane 1	0	243	34	277	2.0	1740	0.159	100	2.7	LOS A	1.4	10.3	500	–	0.0	0.0
Approach	0	243	34	277	2.0		0.159		2.7	LOS A	1.4	10.3				
Intersection				645	2.0		0.170		2.7	NA	1.4	10.3				

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).

Approach LOS values are based on the worst delay for any lane.

## LANE SUMMARY

Site: INTERSECTION C AM PEAK  
 20 YEARS

R565 & UNKNOWN GRAVEL C AM PEAK  
 Stop (Two-Way)

Design Life Analysis (Practical Capacity): Results for 20 years

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
South: UNKOWN GRAVEL C																
Lane 1	29	0	29	59	2.0	490	0.120	100	15.9	LOS C	0.5	3.9	500	–	0.0	0.0
Approach	29	0	29	59	2.0		0.120		15.9	LOS C	0.5	3.9				
East: R565 PHOKENG																
Lane 1	3	290	0	293	2.0	1924	0.152	100	0.1	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	3	290	0	293	2.0		0.152		0.1	LOS A	0.0	0.0				
West: R565 BOSHOEK																
Lane 1	0	265	29	295	2.0	1782	0.165	100	2.4	LOS A	1.5	10.7	500	–	0.0	0.0
Approach	0	265	29	295	2.0		0.165		2.4	LOS A	1.5	10.7				
Intersection				647	2.0		0.165		2.6	NA	1.5	10.7				

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).

Approach LOS values are based on the worst delay for any lane.

The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.

## LEVEL OF SERVICE

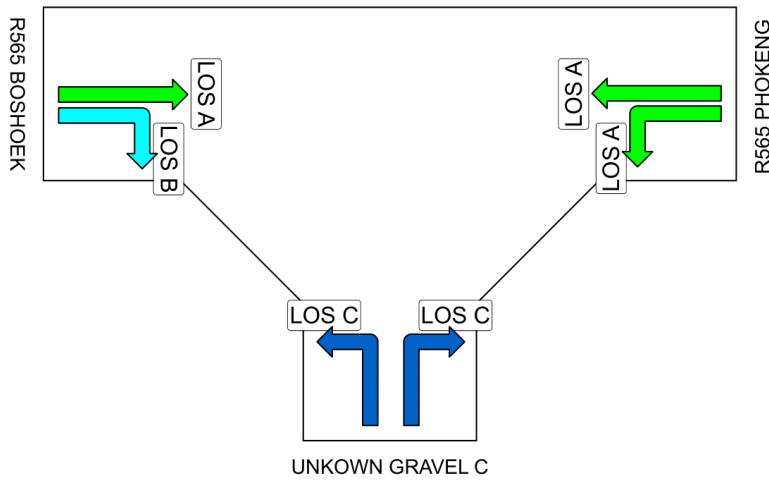
Site: INTERSECTION C AM PEAK  
 20 YEARS

Level of Service Method: Delay (HCM)

R565 & UNKNOWN GRAVEL C AM PEAK

Stop (Two-Way)

Design Life Analysis (Practical Capacity): Results for 20 years



Colour code based on Level of Service

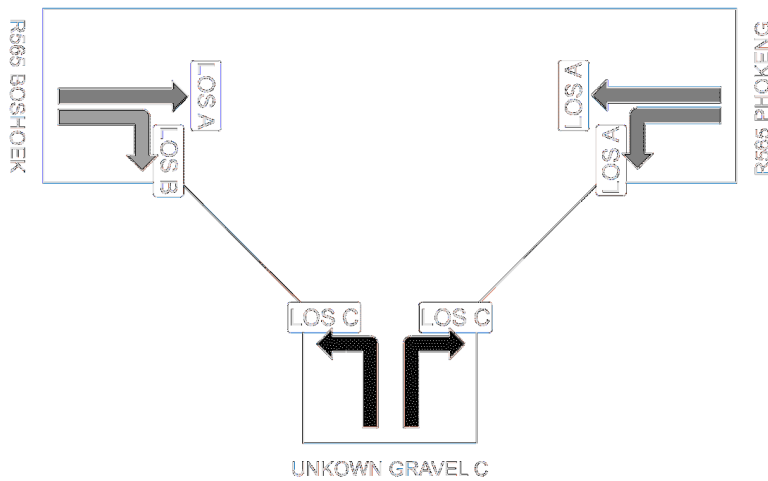
█ LOS A   
 █ LOS B   
 █ LOS C   
 █ LOS D   
 █ LOS E   
 █ LOS F   
 █ Continuous

## LEVEL OF SERVICE

Site: INTERSECTION C PM PEAK  
 20 YEARS

Level of Service Method: Delay (HCM)

R565 & UNKOWN GRAVEL A PM PEAK  
 Stop (Two-Way)



Colour code based on Level of Service

LOS A   LOS B   LOS C   LOS D   LOS E   LOS F   Continuous



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## MOVEMENT SUMMARY

Site: INTERSECTION C PM PEAK  
 20 YEARS

R565 & UNKOWN GRAVEL A PM PEAK  
 Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: UNKOWN GRAVEL C											
1	L	21	2.0	0.086	15.9	LOS C	0.4	2.7	0.53	0.86	42.6
3	R	21	2.0	0.086	15.7	LOS C	0.4	2.7	0.53	1.01	42.8
Approach		42	2.0	0.086	15.8	LOS C	0.4	2.7	0.53	0.93	42.7
East: R565 PHOKENG											
4	L	35	2.0	0.170	8.2	LOS A	0.0	0.0	0.00	1.02	49.0
5	T	292	2.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		326	2.0	0.170	0.9	LOS A	0.0	0.0	0.00	0.11	58.6
West: R565 BOSHOEK											
11	T	243	2.0	0.159	1.7	LOS A	1.4	10.3	0.48	0.00	51.4
12	R	34	2.0	0.159	10.2	LOS B	1.4	10.3	0.48	0.94	48.9
Approach		277	2.0	0.159	2.7	LOS B	1.4	10.3	0.48	0.11	51.1
All Vehicles		645	2.0	0.170	2.7	NA	1.4	10.3	0.24	0.17	53.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

## MOVEMENT SUMMARY

Site: INTERSECTION C AM PEAK  
 20 YEARS

R565 & UNKNOWN GRAVEL C AM PEAK  
 Stop (Two-Way)

Design Life Analysis (Practical Capacity): Results for 20 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: UNKOWN GRAVEL C											
1	L	29	2.0	0.120	16.0	LOS C	0.5	3.9	0.53	0.86	42.5
3	R	29	2.0	0.120	15.8	LOS C	0.5	3.9	0.53	1.01	42.7
Approach		59	2.0	0.120	15.9	LOS C	0.5	3.9	0.53	0.94	42.6
East: R565 PHOKENG											
4	L	3	2.0	0.155	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
5	T	290	2.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		293	2.0	0.152	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
West: R565 BOSHOEK											
11	T	265	2.0	0.165	1.5	LOS A	1.5	10.7	0.46	0.00	51.8
12	R	29	2.0	0.166	10.0	LOS B	1.5	10.7	0.46	0.95	49.1
Approach		295	2.0	0.165	2.4	LOS B	1.5	10.7	0.46	0.09	51.5
All Vehicles		647	2.0	0.165	2.6	NA	1.5	10.7	0.26	0.13	53.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

The specified Design Life Target was not reached by the final year in the Design Life Analysis. Results are reported for the final year.