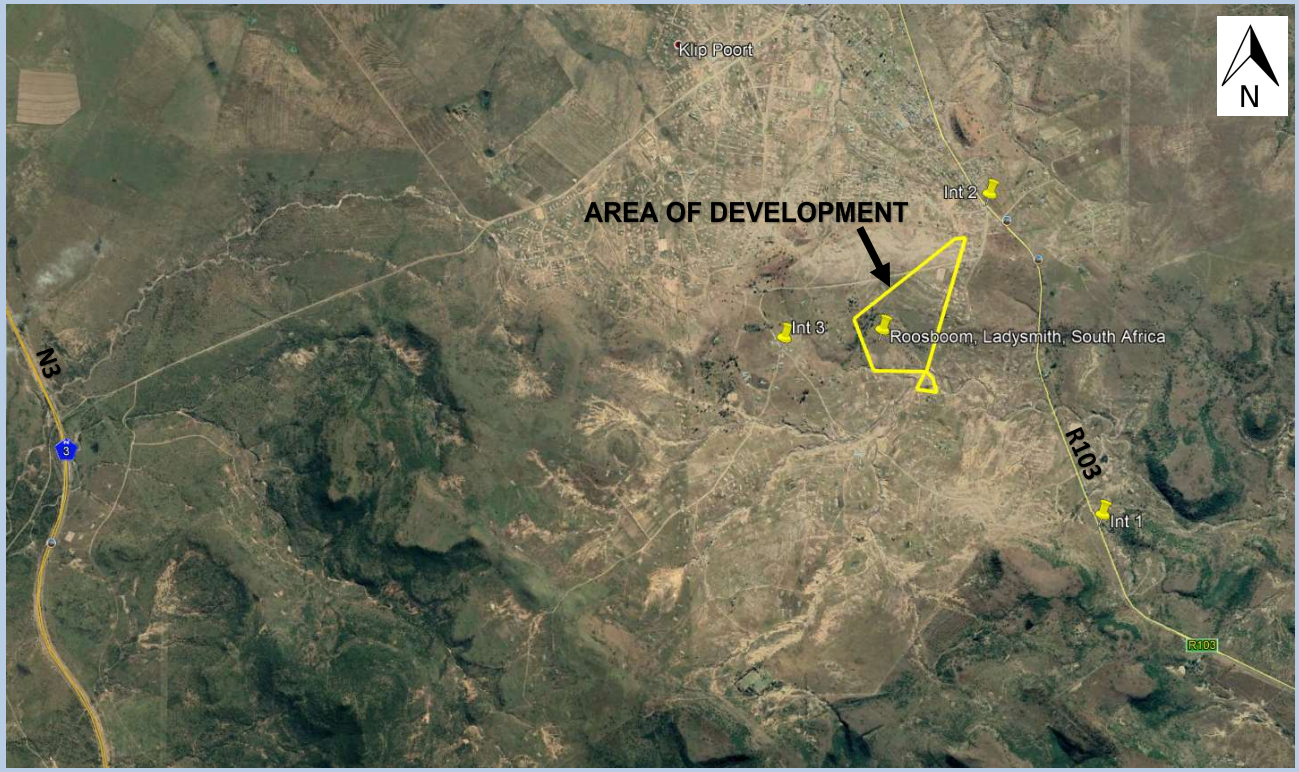
PROPOSED MIXED LAND USE DEVELOPMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102- G.S

ALFRED DUMA LOCAL MUNICIPALITY



TRAFFIC IMPACT MASTER PLAN (TIMP)

August 2019

Submission Details		
Alfred Duma Local Municipality		
AlfredDuma Local Municipality Service Delivery beyond expectation.		

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Certification

It is herewith certified that this Traffic Impact Master Plan has been prepared according to requirements of the South African Traffic Impact and Site Traffic Assessment Manual.

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Contents

1 Introduction 7
1.1 Background 7
1.2 Purpose of the Report 7
1.3 Approval of Submission 7
2 Approach and Methodology 8
2.1 General 8
2.2 Data Collection 8
2.3 Scenarios Analysed 11
3 Existing Traffic Volumes 12
3.1 General 12
3.2 R103 and Gravel Road (Intersection 1) 12
3.3 R103 / D637 (Gravel Road) (Intersection 2) 12
3.4 Gravel Road B / Gravel Road C (Intersection 3) 12
4 Location of Development Sites and Surrounding Road Network 13
4.1 Site Location 13
4.2 Study Area 13
4.3 Existing Road Network 13
4.4 Future Road Network 14
5 Proposed Development and Site Access 16
5.1 Proposed Development 16
5.2 Site Accesses 17
6 Trip Generation 18
6.1 Traffic Growth 18
6.2 Future 2024 Background Peak Hour Traffic Volumes 18
6.3 Trip Generation 18
6.4 Trip Distribution and Assignment 22
7 Traffic Impact and Capacity Analysis 23
7.1 Scenarios Analysed 23
7.2 Existing 2019 Peak Hour Traffic Volumes 23
8 Road and Intersection Upgrades 29
8.1 Existing Intersections to be Upgraded 29
8.2 New Road and Intersections Required 29

9 Non-motorised and Public Transport 31
9.1 Background 31
9.2 Existing Public Transport Services 31
9.3 Proposed / New Facilities 32
10 Conclusions and Recommendations 34
11 References 36

Figures

Figure 1 Locality Plan

Figure 2 Existing 2019 Peak Hour Traffic Volumes

Figure 3 2024 Background Peak Hour Traffic Volumes

Figure 4 Expected Trip Distribution

Figure 5 Expected Trip Assignment

Figure 6 2024 Background Plus Development Generated Peak Hour Traffic

List of Tables

Table 1 Proposed Mixed Land Use Development

Table 2 Typical traffic growth rates

Table 3 Trip Generation Rates

Table 4 Trip Reduction Factors (%)

Table 5 Development Generated Trips

Table 6 Summary of SIDRA intersection capacity analysis results
R103 / Gravel Road Intersection, Scenario 2a

Table 7 Summary of SIDRA intersection capacity analysis results
D103 / D637 Intersection, Scenario 2a

Table 8 Summary of SIDRA intersection capacity analysis results
D103 / D637 Intersection, Scenario 2b (with upgrades)

Table 9 Summary of SIDRA intersection capacity analysis results
Unnamed Road B / Unnamed Road C Intersection, Scenario 2a

Table 10 Summary of SIDRA intersection capacity analysis results
Gravel Road B / Internal Road C Intersection, Scenario 2b (with upgrades)

Drawings

Drawing SKC001 Rev A: Proposed Intersection 2 Upgrades

Drawing SKC002 Rev A: Proposed Intersection Access Upgrades

Annexures

Annexure A

- Town planning Memorandum

Annexure B

- Proposed Township Development Layout Plan

Annexure C

- Proposed Development Trip Generation Calculation

Annexure D

- Detailed SIDRA Analysis Output

Annexure E

- Traffic Count Data

1 Introduction

1.1 BACKGROUND

CHRISEN CONSULTING (PTY) LTD Traffic and Transportation Engineers have been appointed by *ASPIRE CONSULTING ENGINEERS* to undertake a Traffic Impact Master Plan for the proposed mixed land use development on Portion 437 of the Farm Roosboom No 1102- G.S. The proposed mixed-use development will comprise of various land uses including residential, primary school, day care centres and places of worship, as indicated in the town planning memorandum attached in **Annexure A**.

The surrounding townships in close proximity to the site are Klip Poort, LadySmith and Colenso. The site is located approximately +/- 7,0 km from the intersection of N11 and Road R103 and falls within the Alfred Duma Local Municipality area of jurisdiction. The site locality plan is illustrated on **Figure 1**.

1.2 PURPOSE OF THE REPORT

The purpose of this Traffic Impact Master Plan is to illustrate the proposed developments impact on the surrounding road network and possible mitigation of the anticipated traffic impact. This report also comments on the proposed site accesses and non-motorised and public transport aspects. Individual traffic impact assessments will be done for each development during the site development plan stage.

1.3 APPROVAL OF SUBMISSION

This report will be submitted to the following road authorities for their comments and approval:

- Alfred Duma Local Municipality

2 Approach and Methodology

2.1 GENERAL

The application has been submitted according to the South African Traffic Impact and Site Traffic Assessment Manual (TMH 16, 2012). The horizon year for the purpose of the assessment for the impact on the transport system is 2024.

The areas surrounding the development sites are relatively undeveloped and further increase in traffic will be dominated by new development and not growth of existing traffic demand on the road network within the study area. It should be noted that these developments are assumed to be developed within a five-year period. The analysis undertaken in this report assumes that at least 100% of the development will realise by the year 2024. This assessment also discusses non-motorised and public transport and provides necessary requirements.

2.2 DATA COLLECTION

2.2.1 Site Visit

During August 2019 a site visit of the development was undertaken and the following was confirmed:

- Layouts of intersections considered in the study
- Appropriateness of recommended site accesses
- Intersection control of relevant intersections
- Presence of existing public transport and non-motorised facilities

This is a growing area which is relatively undeveloped. The R103 comprises of a continuously graded asphalt surface and intersect with several gravel roads along their alignments. The images below illustrate the existing road network conditions that were captured during the site visit.

Image 1: Road conditions on intersection of R103 and Unnamed Road A (Intersection 1)

Image 2: Road conditions on intersection of R103 and D637 (Intersection 2)

Image 3: Road conditions on intersection of Unnamed Road D and Unnamed Road C (Intersection 3)

2.2.2 Traffic Count Data

Traffic counts will be used to estimate the traffic demand and traffic volumes for the proposed development. A twelve (12) hour classified traffic count was commissioned by CHRISEN on Tuesday, 13th August 2019 at the following intersections (Refer to **Figure 1**):

- R103 and Gravel Road (Intersection 1)
- R103 / D637 (Gravel Road) (Intersection 2)
- Gravel Road B / Gravel Road C (Intersection 3)

The traffic count data reveals that the common peak hour is as follows:

- Weekday AM Peak Hour 06:30 - 07:30
- Weekday PM Peak Hour 16:30 - 17:30

The 2019 peak hour traffic volumes are illustrated on **Figures 2**.The traffic count data is attached as **Annexure E**.

2.3 SCENARIOS ANALYSED

The following will analysis will be undertaken in this Traffic Impact Master Plan.

→ **Scenario 1:** Existing 2019 peak hour traffic volumes

→ **Scenario 2a:** 2024 background plus development generated peak hour traffic volumes

→ **Scenario 2b:** 2024 background plus development generated peak hour traffic volumes (with upgrades)

- **Scenario 2a, Year 2024:** An analysis was done to determine the proposed developments impact on the existing road network by applying a distribution and assignment of trips incrementally in order to determine how much of the proposed development generated traffic can be accommodated onto the existing road network without undertaking any road upgrades.
- **Scenario 2b, Year 2024:** An analysis was done to determine the proposed developments impact on the improved road network (with proposed road upgrades) by applying a distribution and assignment of trips incrementally in order to determine how much of the proposed development generated traffic can be accommodated.

In order to determine the year 2024 background traffic volumes, the 2019 background traffic volumes will be grown by 5% per annum.

3 Existing Traffic Volumes

3.1 GENERAL

From the traffic count a common peak hour was determined (the busiest hour) for each counted period and was found to be as follows:

- Weekday AM Peak Hour 06:30 - 07:30
- Weekday PM Peak Hour 16:30 - 17:30

3.2 R103 AND GRAVEL ROAD (INTERSECTION 1)

This intersection has a stop two-way control with priority at R103 and has approximately 220 vph and 270 vph during the AM and PM peak hours respectively. The SIDRA results indicate the intersection performs at an overall LOS A during both the AM and PM peak hours.

3.3 R103 / D637 (GRAVEL ROAD) (INTERSECTION 2)

This intersection has a stop two-way control with priority at R103 and has approximately 300 vph and 310 vph during the AM and PM peak hours respectively. The SIDRA results indicate the intersection performs at an overall LOS A during both the AM and PM peak hours.

3.4 GRAVEL ROAD B / GRAVEL ROAD C (INTERSECTION 3)

This intersection has a stop two-way control with priority at Gravel Road B and has approximately 20 vph and 30 vph during the AM and PM peak hours respectively. The SIDRA results indicate the intersection performs at an overall LOS A during both the AM and PM peak hours.

4 Location of Development Sites and Surrounding Road Network

4.1 SITE LOCATION

The application will be undertaken according to the South African Traffic Impact and Site Traffic Assessment Manual (TMH 16, 2012). The site is currently vacant and is situated on Portion 437 of the Farm Roosboom No 1102- G.S.

4.2 STUDY AREA

In determining the site area TMH 16 volume 1 recommends the following:

- "*Class 4 and 5 roads in the vicinity of the development up to the first Class 1 to 3 roads that can be reached by the Class 4 and 5 road network from the development, up to and including the first connection(s) on the Class 1 to 3 roads.*
- *The elements shall be restricted to those within a maximum distance of 1.5km from the accesses to the site, measured along the shortest routes to the accesses, provided that there is at least one intersection within this distance. Where there is no such intersection, the distance will be extended to include at least one intersection."*

TMH 16 also states that judgement should be used in selecting the intersections considered and therefore specific elements like extent of the development were also considered. A larger development will by its nature require a wider study area to be considered while for a smaller development the opposite will be true.

4.3 EXISTING ROAD NETWORK

The following roads with brief descriptions play significant roles within the study area:

- **Route R103:** This road is a Class 2 rural road having one lane in each direction and runs in a north-south alignment east of the proposed development site. The R103 intersects with N11 to the north of the site. Route R103 intersects with D637 and will

provide access to the proposed development. The posted speed limit on R103 is 80 km/h.

- **D637:** This road is a Class 4 Gravel rural collector road and runs in a south east-north west alignment. Route D637 will provide access to the proposed development on portion 437 of the Farm Roosboom, no 1102 -G.S.

4.4 FUTURE ROAD NETWORK

The proposed development will comprise of a network of internal Class 4 and Class 5 roads. Access to the proposed development will be provided via the intersection of R103 and D637. The intersection of R103 and D637 currently requires a reconfiguration, in order to accommodate the proposed township development, the following is required:

Reconfiguration of R103 and D637 intersection: The intersection currently comprises of a skewed T – Junction with priority at R103 and requires upgrades. It should be noted that the intersection layout is an existing problem and the proposed township development does not negatively impact the existing road network layout.

It is proposed that the existing intersection of R103 and D637 be reconfigured as follows:

- The R103 and D637 intersection should comprise of a 90 degrees T-Junction
- Dedicated right-turn lane (60,0 m) on the southbound direction
- Dedicated left-turn lane (60,0 m) on the northbound direction
- Dedicated right-turn lane (60,0 m) on the eastbound direction
- Single lane in each direction for all the legs of the intersection

Proposed access intersection to the township development on Portion 437 of the Farm Roosboom No 1102- G.S:

The proposed township development will comprise of an intersection that will connect with the existing gravel Road and will be provided as follows:

- Dedicated right-turn lane (30,0 m) on the northbound direction
- A shared through and left turn lane on the northbound direction
- A receiving lane on the northbound direction
- Dedicated right-turn lane (30,0 m) on the eastbound direction

- A shared through and left turn lane on the eastbound direction
- Dedicated right-turn lane (30,0 m) on the southbound direction
- A shared through and left turn lane on the southbound direction
- A receiving lane on the southbound direction
- Dedicated right-turn lane (30,0 m) on the westbound direction
- A shared through and left turn lane on the westbound direction

Refer to **Drawings SKC001** and **SKC002** illustrating the above proposed upgrades.

5 Proposed Development and Site Access

5.1 PROPOSED DEVELOPMENT

The proposed development is a mixed-use type of development comprising of different types of land uses including residential, primary school, day care centres and places of worship as illustrated in **Table 1**. The layout plan detailed can be seen in **Annexure B**.

Table 1: Proposed Mixed Land Use Development

Zoning	Extent	No. of Erven	% of Total Area
Residential 1	35,5015 ha (826 units)	918	43,75
Residential 1 (encroachments)	3,9641 ha	28	4,89
Residential 3	3,1129 ha (113 units)	1	3,84
Educational	3,52 ha (1500 students)	1	4,34
Community Facility-Creche	0,2929 ha (500 students)	2	0,36
Community Facility-Church	0,4807 ha (5 000 seats)	4	0,59
Business 1	0,3044 ha	1	0,38
Public Open Space	18,6964 ha	11	23,04
Roads	15,2686 ha	-	18,82
Total Sites	**81,1415 ha**		**100,00**

5.2 SITE ACCESSES

The master plan provides a framework and ensures that the proposed development is sustainable from a traffic engineering point of view. The proposed development will have one access off the external road network (Gravel Road), refer to **Section 4.4**. In terms of accesses to various sites, it is proposed that each site will gain access from new internal Class 4 and Class 5 roads.

6 Trip Generation

6.1 TRAFFIC GROWTH

The proposed development is expected to generate **512** and **507** trips during the AM and PM peak hour respectively. This development generated trips were calculated by taking into account trip adjustment factors for mixed use developments, low vehicle ownership and transit node or corridors. TMH 17 recommends growth rates for developments as shown in **Table 2**.

Table 2: Typical traffic growth rates

DEVELOPMENT AREA	GROWTH RATES
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%

The above average growth rate of 5% was considered between the year 2019 to 2024.

6.2 FUTURE 2024 BACKGROUND PEAK HOUR TRAFFIC VOLUMES

The future 2024 background traffic volumes are determined by taking the existing 2019 traffic volumes and applying a growth rate of 5% per annum to make provision for normal traffic growth. The future 2024 background peak hour traffic volumes can be seen in **Figure 3.**

6.3 TRIP GENERATION

6.3.1 General

The South African Trip Data Manual, (TMH17 version 1.0, 2012) was used to estimate the trip generation for this development. The detailed development trip generation calculations can be seen in **Annexure C**.

6.3.2 Trip Generation Rates

Table 3 shows the trip generation rates which was used for the proposed mixed land use development.

Table 3: Trip Generation Rates

Proposed Rights	Land Use	Trip rates	
		Weekday AM	Weekday PM
		rate	rate
Residential	Single Dwelling Units	0,23	0,23
	Apartments and Flats	0,23	0,23
	Multi-Level Townhouses	0,31	0,31
Institutional	Public Primary School	0,10	0,04
	Places of Public Worship (Wknd)	0,01	0,01
	Pre-School (Day Care Centre)	0,16	0,13
Business 1	Shopping Centre	0,77	4,38

6.3.3 Trip Adjustment Factors

Various trip adjustment factors have been introduced…

- **Mixed Use Developments (MUD):** According to the COTO manual *"mixed use developments are defined as developments in an area that consist of two or more single-use developments between which trips can be made by means of non-motorised modes of transport (such as walking). This has the net effect of reducing the vehicle trip generation in the area."*

  Since this development will consist of a mixed-use development, the reduction factors recommended in the manual were applied

- **Low Vehicle Ownership (LVO) & Very Low Vehicle Ownership (VLVO):** According to the COTO manual *"the vehicle ownership in areas with high levels of vehicle ownership varies between one or two per household. In areas with a low level of vehicle ownership, the majority of households (more than 50%) does not own a vehicle and relies on public transport for transportation. In areas with very low level of vehicle ownership, nearly all households (more than 90%) do not own a vehicle and rely on public transportation."*

  This study considered very low vehicle ownership.

- **Transit Nodes or Corridors:** According to the COTO manual *"the transit reduction factors are applicable to developments that are located within a reasonable walking distance from a major transit node or stops on a major transit corridor."*

This study considered transit nodes and a 15% reduction factor has been applied for all land uses as recommended in the COTO manual.

Table 4 below illustrates the trip adjustment factors applied for each proposed land use.

Table 4: Trip Reduction Factors (%)

	Trip Reduction Factors (%)			
Land Use	**Mixed-use (Pm)**	**Vehicle Ownership (Pv)**	**Transit Nodes or Corridors (Pt)**	**Total (Pc)**
Single Dwelling Units	**10%**	**70%**	**15%**	**77,1%**
Apartments & Flats	**15%**	**50%**	**15%**	**63,9%**
Townhouses (Simplex/Duplex)	**15%**	**50%**	**15%**	**63,9%**
Public Primary School	**30%**	**80%**	**15%**	**88,1%**
Places of Public Worship (Wknd)	**10%**	**80%**	**15%**	**84,7%**
Pre-School (Day Care Centre)	**5%**	**80%**	**15%**	**83,9%**
Shopping Centre	**10%**	**60%**	**15%**	**69,4%**

6.3.4 Summary of Estimated Trip Generation

Table 5 shows that the proposed development is expected to generate approximately 512 trips and 507 trips (in and outbound) during the Weekday AM and Weekday PM peak hours respectively.

Table 5: Development Generated Trips

Land Use	Weekday AM PEAK			Weekday PM PEAK		
	In	Out	Total	In	In	Total
Single Dwelling Units	47	142	**190**	133	57	**190**
Apartments & Flats	5	16	**22**	15	7	**22**
Townhouses (Simplex/Duplex)	2	5	**6**	4	2	**6**
Public Primary School	76	76	**152**	27	27	**54**
Places of Public Worship (Wknd)	21	17	**38**	19	19	**38**
Pre- School (Day Care Centre)	40	40	**81**	32	32	**65**
Shopping Centre	15	8	**24**	67	67	**133**
Total	**207**	**305**	**512**	**297**	**210**	**507**

6.4 TRIP DISTRIBUTION AND ASSIGNMENT

Assumptions with respect to the expected trip distribution were based on the location of the site accesses in relation to the surrounding road network; the existing traffic volumes, travel patterns as well as the land use nature of the proposed development. Refer to **Figure 4** and **Figure 5** illustrating the Trip Distribution and Assignment respectively.

7 Traffic Impact and Capacity Analysis

7.1 SCENARIOS ANALYSED

The Weekday AM, Weekday PM and Saturday peak hour trip generation of the development was analysed. The critical peak hour analysis was considered for the following scenarios:

- **Scenario 1:** Existing 2019 peak hour traffic volumes
- **Scenario 2a:** 2024 background plus development generated peak hour traffic volumes
- **Scenario 2b:** 2024 background plus development generated peak hour traffic volumes (with upgrades)

This is in line with TMH16 document requirement for scenarios to be considered in a Traffic Impact Assessment. Refer to **Annexure D** illustrating the detailed SIDRA Results

7.2 EXISTING 2019 PEAK HOUR TRAFFIC VOLUMES

7.2.1 R103 / Gravel Road (Intersection 1)

- **Scenario 2a: 2023 Background plus Development Generated Peak Hour Traffic Volumes**

The expected development generated trips have been added onto the road network in this scenario. The SIDRA results indicate that the intersection will operate at an overall LOS A during both the AM and PM peak hour.

The summary of the SIDRA intersection results is contained in **Table 6**.

Table 6: Summary of SIDRA intersection capacity analysis results
R103 / Gravel Road Intersection, Scenario 2a
CONTROL: STOP TWO-WAY

APPROACH		OPERATING CONDITIONS					
		AM PEAK HOUR			PM PEAK HOUR		
		V/C	DELAYS (SEC)	LOS	V/C	DELAYS (SEC)	LOS
NORTH BOUND	LEFT	0,099	5,5	A	0,111	5,6	A
	THROUGH	0,099	0,0	A	0,111	0,0	A
	APPROACH	0,099	0,0	NA	0,111	0,0	NA
SOUTH BOUND	THROUGH	0,060	0,1	A	0,068	0,1	A
	RIGHT	0,060	6,1	A	0,068	6,1	A
	APPROACH	0,060	0,5	NA	0,068	0,4	NA
EAST BOUND	LEFT	0,008	8,7	A	0,011	8,8	A
	RIGHT	0,008	10,4	B	0,011	11,0	B
	APPROACH	0,008	8,9	A	0,011	9,0	A
ALL VEHICLES		0,099	0,5	NA	0,111	0,4	NA

7.2.2 R103 / D637 (Intersection 2)

→ **Scenario 2a: 2023 Background plus Development Generated Peak Hour Traffic Volumes**

The expected development generated trips have been added onto the road network in this scenario. The SIDRA results indicate that the intersection will operate at an overall LOS A during both the AM and PM peak hour.

The summary of the SIDRA intersection results is contained in **Table 7**.

Table 7: Summary of SIDRA intersection capacity analysis results
R103 / D637 Intersection, Scenario 2a
CONTROL: STOP TWO-WAY

APPROACH		OPERATING CONDITIONS					
		AM PEAK HOUR			PM PEAK HOUR		
		V/C	DELAYS (SEC)	LOS	V/C	DELAYS (SEC)	LOS
NORTH BOUND	LEFT	0,130	6,5	A	0,109	6,5	A
	THROUGH	0,130	0,0	A	0,109	0,0	A
	APPROACH	0,130	1,6	NA	0,109	1,7	NA
SOUTH BOUND	THROUGH	0,140	0,5	A	0,179	0,4	A
	RIGHT	0,140	5,4	A	0,179	5,3	A
	APPROACH	0,140	2,4	NA	0,179	1,9	NA
EAST BOUND	LEFT	0,205	8,2	A	0,130	8,0	A
	RIGHT	0,205	10,6	B	0,130	10,8	B
	APPROACH	0,205	9,3	A	0,130	9,4	A
ALL VEHICLES		0,205	4,0	NA	0,179	3,2	NA

→ **Scenario 2b: 2023 Background plus Development Generated Peak Hour Traffic Volumes (with upgrades)**

Intersection upgrades to the existing layout have been applied in order to aid to the efficiency of the intersection. The proposed upgrades are as follows:

- The R103 and D637 should comprise of a 90 degrees T-Junction
- Dedicated right-turn lane (60,0 m) on the southbound direction
- Dedicated left-turn lane (60,0 m) on the northbound direction
- Dedicated right-turn lane (60,0 m) on the eastbound direction
- Single lane in each direction for all the legs of the intersection

With the proposed upgrades mentioned above, the SIDRA results indicate that the intersection will operate at an overall LOS B during both the AM and PM peak hour.

The summary of the SIDRA intersection results is contained in **Table 8**.

Table 8: Summary of SIDRA intersection capacity analysis results
R103 / D637 Intersection, Scenario 2b
CONTROL: STOP TWO-WAY

APPROACH		OPERATING CONDITIONS					
		AM PEAK HOUR			PM PEAK HOUR		
		V/C	DELAYS (SEC)	LOS	V/C	DELAYS (SEC)	LOS
NORTH BOUND	LEFT	0,031	5,5	A	0,028	5,5	A
	THROUGH	0,094	0,0	A	0,078	0,0	A
	APPROACH	0,094	1,3	NA	0,078	1,4	NA
SOUTH BOUND	THROUGH	0,077	0,0	A	0,113	0,0	A
	RIGHT	0,079	6,5	A	0,083	6,3	A
	APPROACH	0,079	2,4	NA	0,113	2,0	NA
EAST BOUND	LEFT	0,101	9,0	A	0,055	8,7	A
	RIGHT	0,166	12,5	B	0,116	12,9	B
	APPROACH	0,166	10,6	B	0,116	10,8	B
ALL VEHICLES		0,166	4,3	NA	0,116	3,4	NA

7.2.3 Unnamed Rad B / Unnamed Road C (Intersection 3)

→ **Scenario 2a: 2023 Background plus Development Generated Peak Hour Traffic Volumes**

The expected development generated trips have been added onto the road network in this scenario. The SIDRA results indicate that the intersection will operate at an overall LOS A during both the AM and PM peak hour.

The summary of the SIDRA intersection results is contained in **Table 9**.

Table 9: Summary of SIDRA intersection capacity analysis results
Unnamed Road B / Unnamed Road C Intersection, Scenario 2a
CONTROL: STOP TWO-WAY

APPROACH		OPERATING CONDITIONS					
		AM PEAK HOUR			PM PEAK HOUR		
		V/C	DELAYS (SEC)	LOS	V/C	DELAYS (SEC)	LOS
NORTH BOUND	LEFT	0,015	5,5	A	0,020	5,5	A
	THROUGH	0,015	0,0	A	0,020	0,0	A
	APPROACH	0,015	0,2	NA	0,020	0,2	NA
SOUTH BOUND	THROUGH	0,040	0,1	A	0,033	0,1	A
	RIGHT	0,040	5,5	A	0,033	5,6	A
	APPROACH	0,040	2,9	NA	0,033	2,9	NA
EAST BOUND	LEFT	0,024	8,1	A	0,027	8,1	A
	RIGHT	0,024	7,9	A	0,027	7,8	A
	APPROACH	0,024	8,1	A	0,027	8,1	A
ALL VEHICLES		0,040	3,7	NA	0,033	3,5	NA

7.2.4 Gravel Road B / Internal Road A

→ **Scenario 2b: 2023 Background plus Development Generated Peak Hour Traffic Volumes (with upgrades)**

The proposed township development will comprise of an intersection that will provide assess and connect with the existing gravel Road and will be provided as follows:

- Dedicated right-turn lane (30,0 m) on the northbound direction
- A shared through and left turn lane on the northbound direction
- A receiving lane on the northbound direction
- Dedicated right-turn lane (30,0 m) on the eastbound direction
- A shared through and left turn lane on the eastbound direction
- Dedicated right-turn lane (30,0 m) on the southbound direction
- A shared through and left turn lane on the southbound direction
- A receiving lane on the southbound direction
- Dedicated right-turn lane (30,0 m) on the westbound direction
- A shared through and left turn lane on the westbound direction

With the proposed upgrades mentioned above, the SIDRA results indicate the southbound approach performs at an overall LOS B during both the AM and PM peak hour.

The summary of the SIDRA intersection results is contained in **Table 10**.

Table 10: Summary of SIDRA intersection capacity analysis results
Unnamed Road B / Unnamed Road C Intersection, Scenario 2a
CONTROL: STOP TWO-WAY

APPROACH		OPERATING CONDITIONS					
		AM PEAK HOUR			PM PEAK HOUR		
		V/C	DELAYS (SEC)	LOS	V/C	DELAYS (SEC)	LOS
NORTH BOUND	LEFT	0,061	8,2	A	0,086	8,1	A
	THROUGH	0,061	9,3	A	0,086	9,5	A
	RIGHT	0,353	10,5	B	0,194	10,5	B
	APPROACH	0,353	10,1	B	0,194	9,9	A
WEST BOUND	LEFT	0,106	5,6	A	0,099	5,6	A
	THROUGH	0,106	0,0	A	0,099	0,0	A
	RIGHT	0,002	5,6	A	0,016	5,6	A
	APPROACH	0,106	4,5	NA	0,099	5,3	NA
SOUTH BOUND	LEFT	0,023	8,1	A	0,065	8,1	A
	THROUGH	0,023	9,9	A	0,065	10,2	B
	RIGHT	0,009	9,2	A	0,020	9,4	A
	APPROACH	0,023	9,3	A	0,065	9,4	A
EAST BOUND	LEFT	0,010	5,5	A	0,015	5,5	A
	THROUGH	0,010	0,0	A	0,015	0,0	A
	RIGHT	0,026	6,1	A	0,029	6,0	A
	APPROACH	0,026	4,4	NA	0,029	5,1	NA
ALL VEHICLES		0,353	7,6	NA	0,194	7,4	NA

8 Road and Intersection Upgrades

8.1 EXISTING INTERSECTIONS TO BE UPGRADED

- **R103 and D637 Intersection (Intersection 2)**

It is proposed that the existing intersection of R103 and D637 be reconfigured as follows:

- The R103 and D637 should comprise of a 90 degrees T-Junction
- Dedicated right-turn lane (60,0 m) on the southbound direction
- Dedicated left-turn lane (60,0 m) on the northbound direction
- Dedicated right-turn lane (60,0 m) on the eastbound direction
- Single lane in each direction for all the legs of the intersection

8.2 NEW ROAD AND INTERSECTIONS REQUIRED

Proposed access intersection to township development on Portion 437 of the Farm Roosboom No 1102- G.S:

The proposed township development will comprise of an intersection that will provide access and connect with the existing gravel Road and will be provided as follows:

- Dedicated right-turn lane (30,0 m) on the northbound direction
- A shared through and left turn lane on the northbound direction
- A receiving lane on the northbound direction
- Dedicated right-turn lane (30,0 m) on the eastbound direction
- A shared through and left turn lane on the eastbound direction
- Dedicated right-turn lane (30,0 m) on the southbound direction
- A shared through and left turn lane on the southbound direction
- A receiving lane on the southbound direction

- Dedicated right-turn lane (30,0 m) on the westbound direction
- A shared through and left turn lane on the westbound direction

Refer to **Drawings SKC001** and **SKC002** illustrating the above proposed upgrades.

9 Non-motorised and Public Transport

9.1 BACKGROUND

In terms of the National Land Transport Act 5 of 2009, Section 38, it is a requirement that an assessment of the public transport be included in a Traffic Study. The proposed mixed-use township development will increase the demand for the public transport services within the area. Therefore, public transport infrastructure and services will need to be provided taking into account the road network planning.

9.2 EXISTING PUBLIC TRANSPORT SERVICES

The area surrounding the proposed development site is currently served by the following public transport services:

MINIBUS TAXIS AND BUSES

Minibus taxis and buses were observed operating along the surrounding road network. The following results were obtained from the minibus taxi and buses average link volume analysis for both the southbound and northbound approach along R103 during the 12-hour period:

- Minibus Taxis = 337
- Buses = 22

BUS / TAXI LAYBYS

There is an existing bus / taxi layby at the intersection of R103 and D637. Refer to Image X below.

Image 4: Existing bus / Taxi Layby

9.3 PROPOSED / NEW FACILITIES

- **Public Transport Lay-bys:** It is recommended that the main Class 4 link road within the proposed development have public transport lay-bys in the form of bus / taxi stops at appropriate locations within a maximum walking distance limited to 450,0 m. Refer to **Drawing SKC001** illustrating the location of the proposed transport lay-bys.
- **Minibus Taxi Rank / Holding Facility:** It is recommended that a common minibus taxi rank be provided which will serve the proposed township development.
- **Paved Sidewalks:** In order to ease and formalise the movement of pedestrians between the site accesses and the recommended lay-bys, it is proposed that 2,0 m wide paved (or dust free) sidewalks be constructed along at least one side of all Class 4 roads within the proposed development. It is also recommended that 2,0 m wide paved (or dust free) sidewalks be constructed along site boundaries of schools and commercial / business and retail nodes.

- **Raised Pedestrian Crossings:** To improve pedestrian safety, it is proposed that safe pedestrian crossings be implemented at suitable positions on the internal Class 4 roads near schools, commercial / business and retail nodes. This will be addressed in separate traffic impact studies.

With the above recommendations adhered to, the proposed developments are supported in terms of non-motorised and public transport viewpoint.

10 Conclusions and Recommendations

Based on assessment of the existing and planned future major road network, traffic counts, a traffic analysis and capacity analysis of road links in the study area, the following concluding remarks are relevant:

- A mixed land use development is proposed on Portion 437 of the Farm Roosboom No 1102- G.S. The proposed mixed-use development will comprise of various land uses including residential, primary school, day care centres and places of worship.
- The proposed development is expected to generate **512** and **507** trips during the AM and PM peak hour respectively.
- The master plan provides a framework and ensures that the proposed development is sustainable from a traffic engineering point of view. The proposed development will have one access off the external road network (Gravel Road). In terms of accesses to various sites, it is proposed that each site will gain access from new internal Class 4 and Class 5 roads.
- It is proposed that the existing intersection of R103 and D637 be reconfigured as follows:
  - The R103 and D637 should comprise of a 90 degrees T-Junction
  - Dedicated right-turn lane (60,0 m) on the southbound direction
  - Dedicated left-turn lane (60,0 m) on the northbound direction
  - Dedicated right-turn lane (60,0 m) on the eastbound direction
  - Single lane in each direction for all the legs of the intersection
- The proposed township development will comprise of an intersection that will provide access and connect with the existing gravel Road and will be provided as follows:
  - Dedicated right-turn lane (30,0 m) on the northbound direction
  - A shared through and left turn lane on the northbound direction
  - A receiving lane on the northbound direction
  - Dedicated right-turn lane (30,0 m) on the eastbound direction
  - A shared through and left turn lane on the eastbound direction
  - Dedicated right-turn lane (30,0 m) on the southbound direction

- A shared through and left turn lane on the southbound direction
- A receiving lane on the southbound direction
- Dedicated right-turn lane (30,0 m) on the westbound direction
- A shared through and left turn lane on the westbound direction

➢ Minibus taxis and buses were observed operating along the surrounding road network. There is an existing bus / taxi layby at the intersection of R103 and D637.

➢ It is recommended that the main Class 4 link road within the proposed development have public transport lay-bys in the form of bus / taxi stops at appropriate locations within a maximum walking distance limited to 450,0 m.

➢ It is recommended that a common minibus taxi rank be provided which will serve the proposed township development.

➢ In order to ease and formalise the movement of pedestrians between the site accesses and the recommended lay-bys, it is proposed that 2,0 m wide paved (or dust free) sidewalks be constructed along at least one side of all Class 4 roads within the proposed development. It is also recommended that 2,0 m wide paved (or dust free) sidewalks be constructed along site boundaries of schools and commercial / business and retail nodes.

➢ To improve pedestrian safety, it is proposed that safe pedestrian crossings be implemented at suitable positions on the internal Class 4 roads near schools, commercial / business and retail nodes. This will be addressed in separate traffic impact studies.

From a traffic engineering perspective, the proposed development is thus regarded as feasible and sustainable and is therefore supported.

11 References

1. TMH 16 Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, Version 1.0, Committee of Transport Officials (COTO) August 2012.
2. TMH 17 Volume 1, South African Trip Data Manual, Version 1.01, Committee of Transport Officials (COTO) September 2013.
3. Highway Capacity Manual, Transportation Research Board, National Research Council Washington D.C., 2010
4. Manual for Traffic Impact Studies, Department of Transport (DOT), October 1995
5. South African Trip Generation Rates, 2nd edition, Department of Transport, June 1995

Figures

Figure 1 Locality Plan

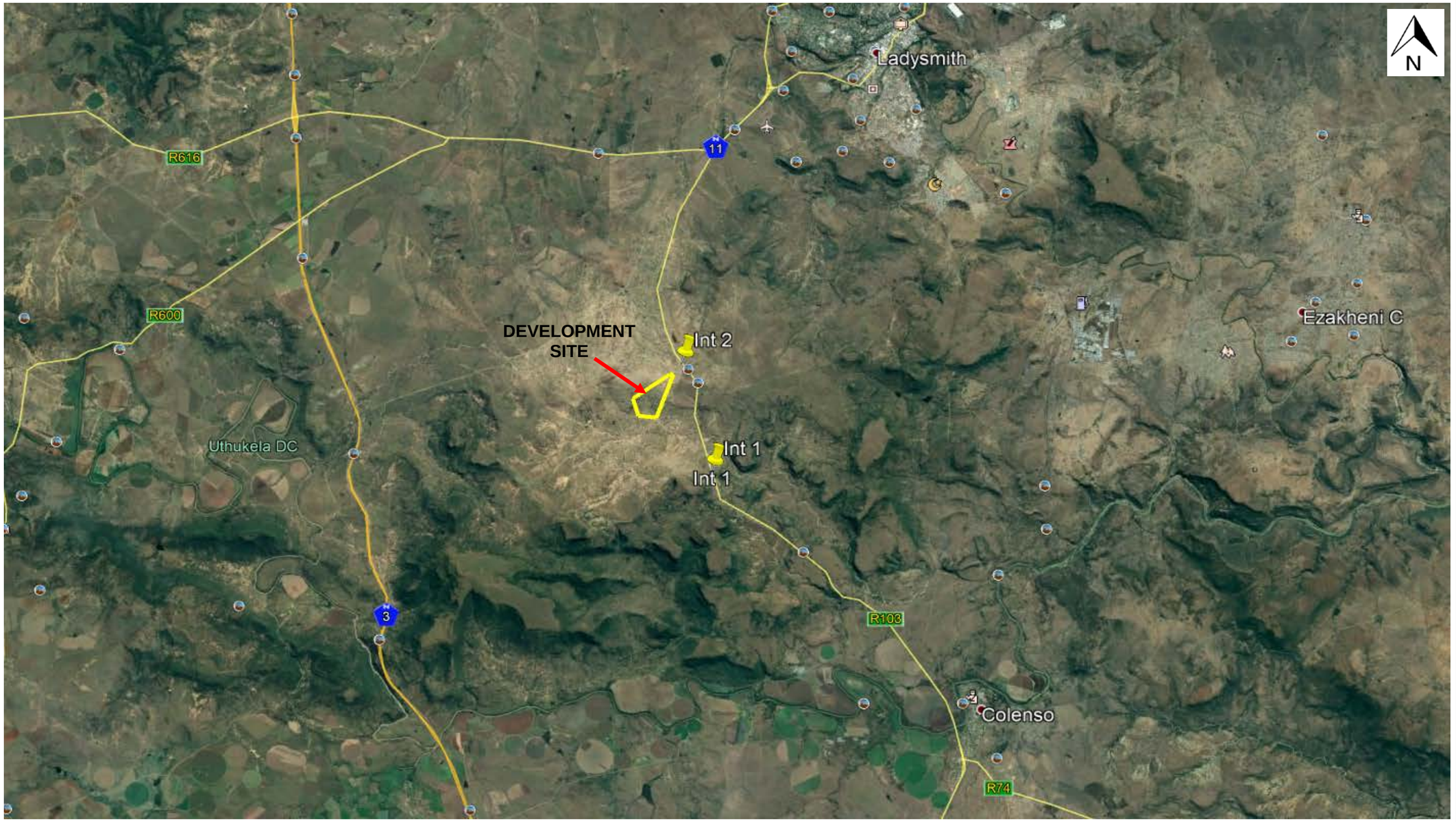
Figure 2 Existing 2019 Peak Hour Traffic Volumes

Figure 3 2024 Background Peak Hour Traffic Volumes

Figure 4 Expected Trip Distribution

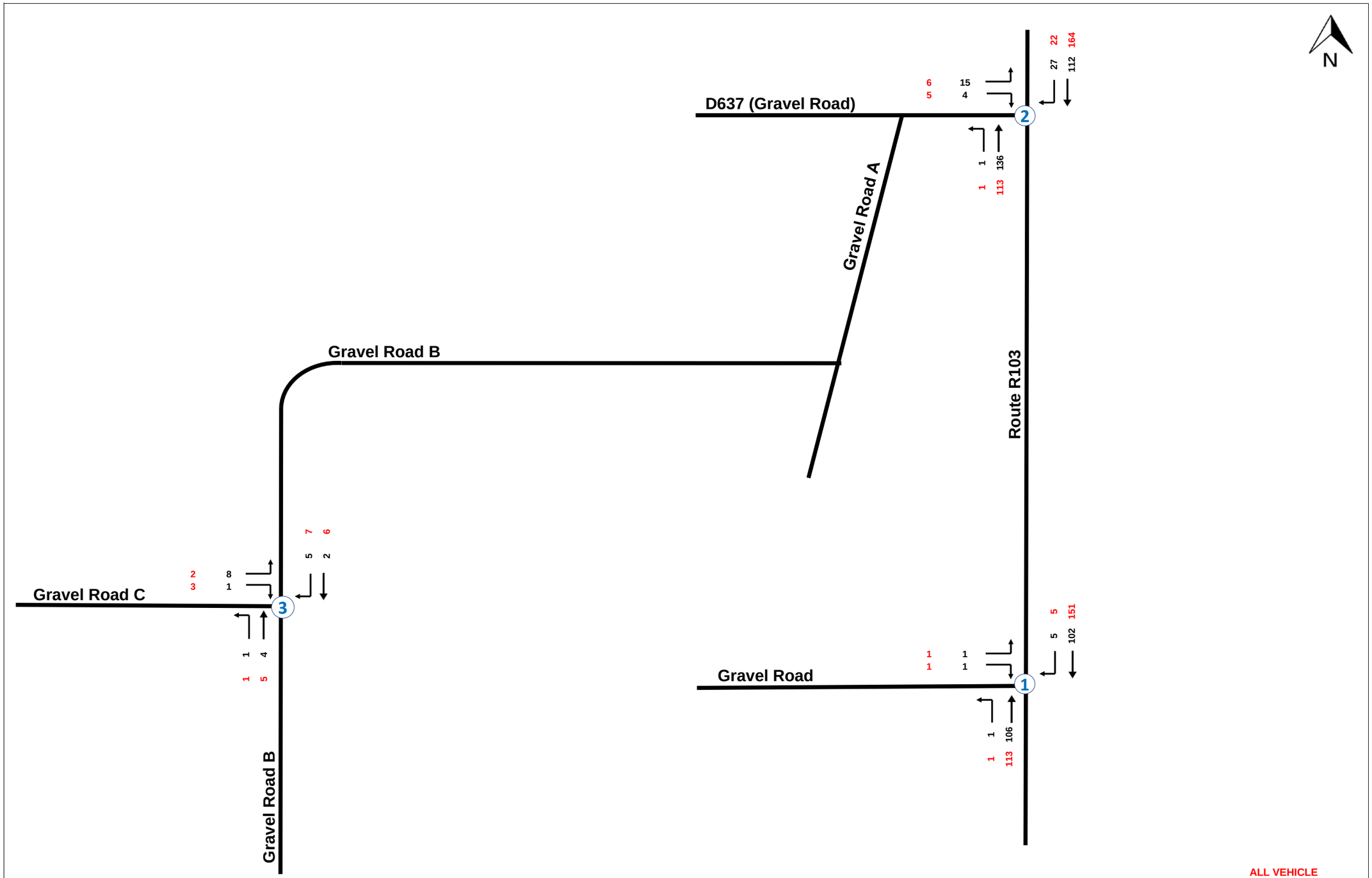
Figure 5 Expected Trip Assignment

Figure 6 2024 Background Plus Development Generated Peak Hour Traffic



CHRISEN CONSULTING CIVIL • STRUCTURAL • TRANSPORT • ENGINEERS	Project No.: C413-050419	Project: PROPOSED TOWNSHIP FOR ROOSBOOM SETTLEMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S	Figure Description: LOCLAITY PLAN	1a

CHRISEN CONSULTING CIVIL • STRUCTURAL • TRANSPORT • ENGINEERS	Project No.: C413-050419	Project: PROPOSED TOWNSHIP FOR ROOSBOOM SETTLEMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S	Figure Description: LOCLAITY PLAN	1b



ALL VEHICLE

Legend:

100	AM Hour, 06:30 - 07:30
100	PM Hour, 16:30 - 17:30

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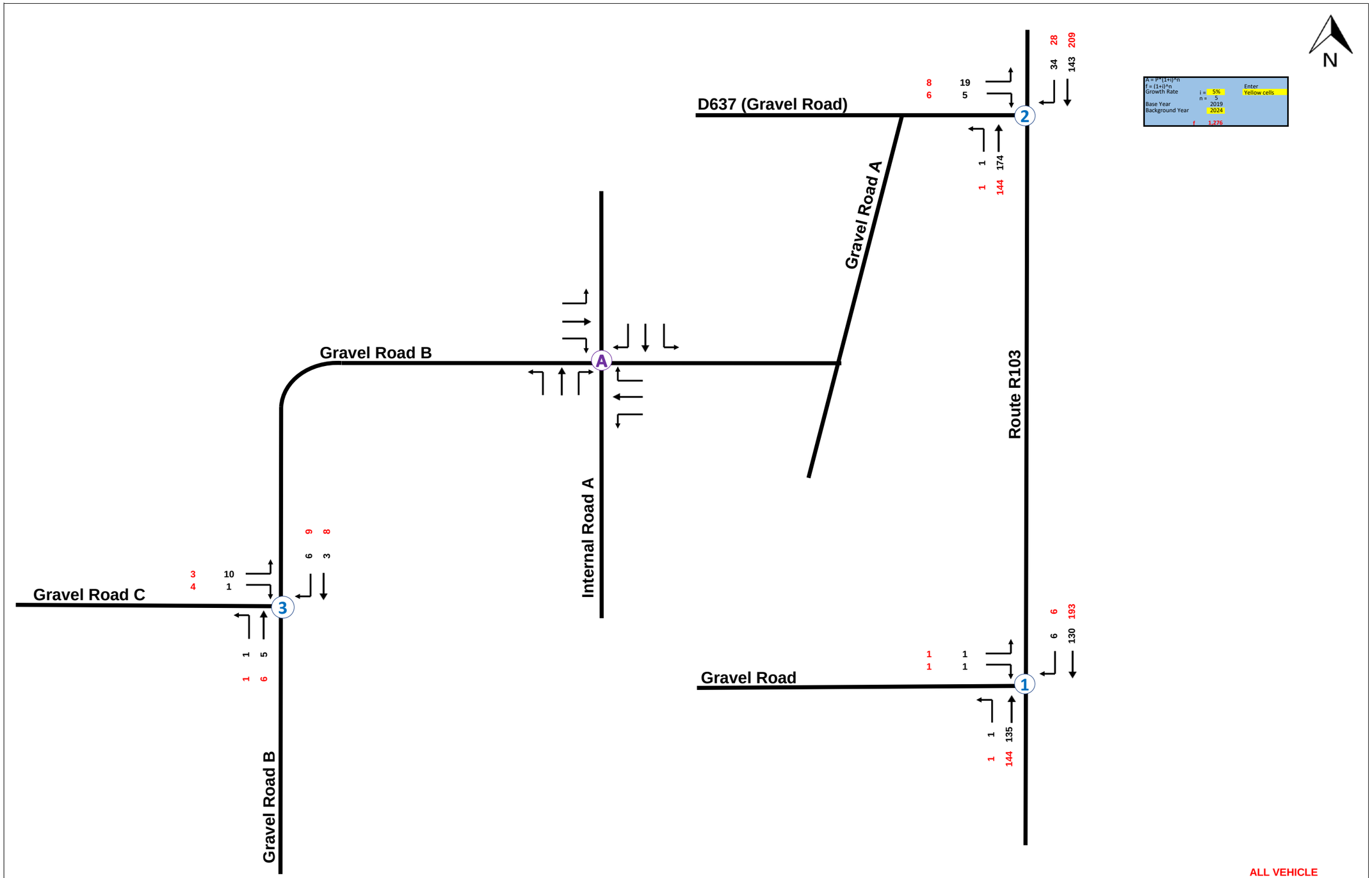
Project: PROPOSED TOWNSHIP FOR ROOSBOOM SETTLEMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S

Figure Description: 2019 WEEKDAY PEAK HOUR TRAFFIC VOLUMES

2

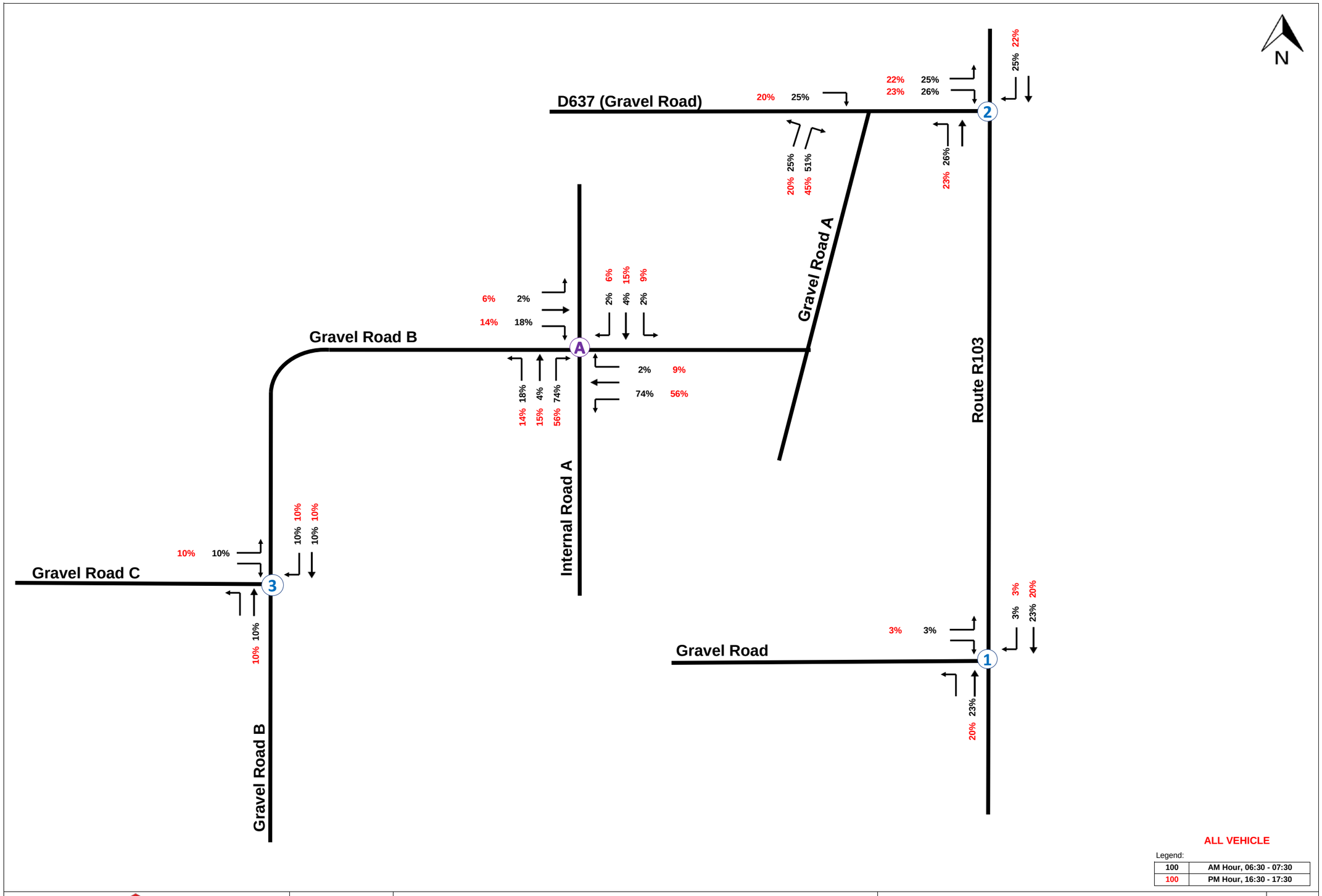


ALL VEHICLE

Legend:

100	AM Hour, 06:30 - 07:30
100	PM Hour, 16:30 - 17:30

CHRISEN CONSULTING	Project No.: C413-050419	Project: PROPOSED TOWNSHIP FOR ROOSBOOM SETTLEMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S	Figure Description: 2024 BACKGROUND PEAK HOUR TRAFFIC VOLUMES	3



ALL VEHICLE

Legend:

100	AM Hour, 06:30 - 07:30
100	PM Hour, 16:30 - 17:30

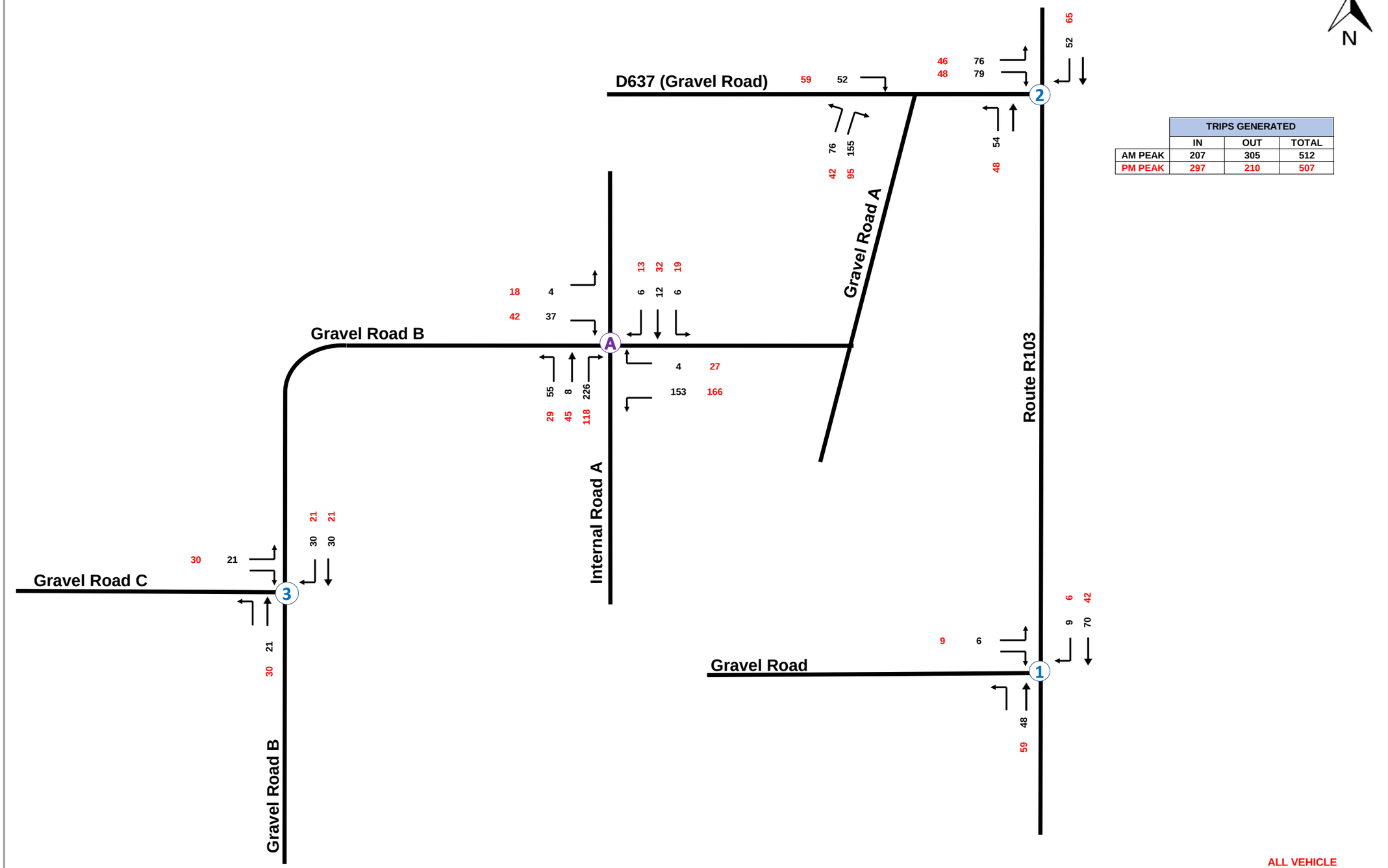
CHRISEN CONSULTING
CIVIL • STRUCTURAL • TRANSPORT • ENGINEERS

Project No.: C413-050419

Project: PROPOSED TOWNSHIP FOR ROOSBOOM SETTLEMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S

Figure Description: EXPECTED TRIP DISTRIBUTION

4



TRIPS GENERATED			
	IN	OUT	TOTAL
AM PEAK	207	305	512
PM PEAK	297	210	507

ALL VEHICLE

Legend:

100	AM Hour, 06:30 - 07:30
100	PM Hour, 16:30 - 17:30

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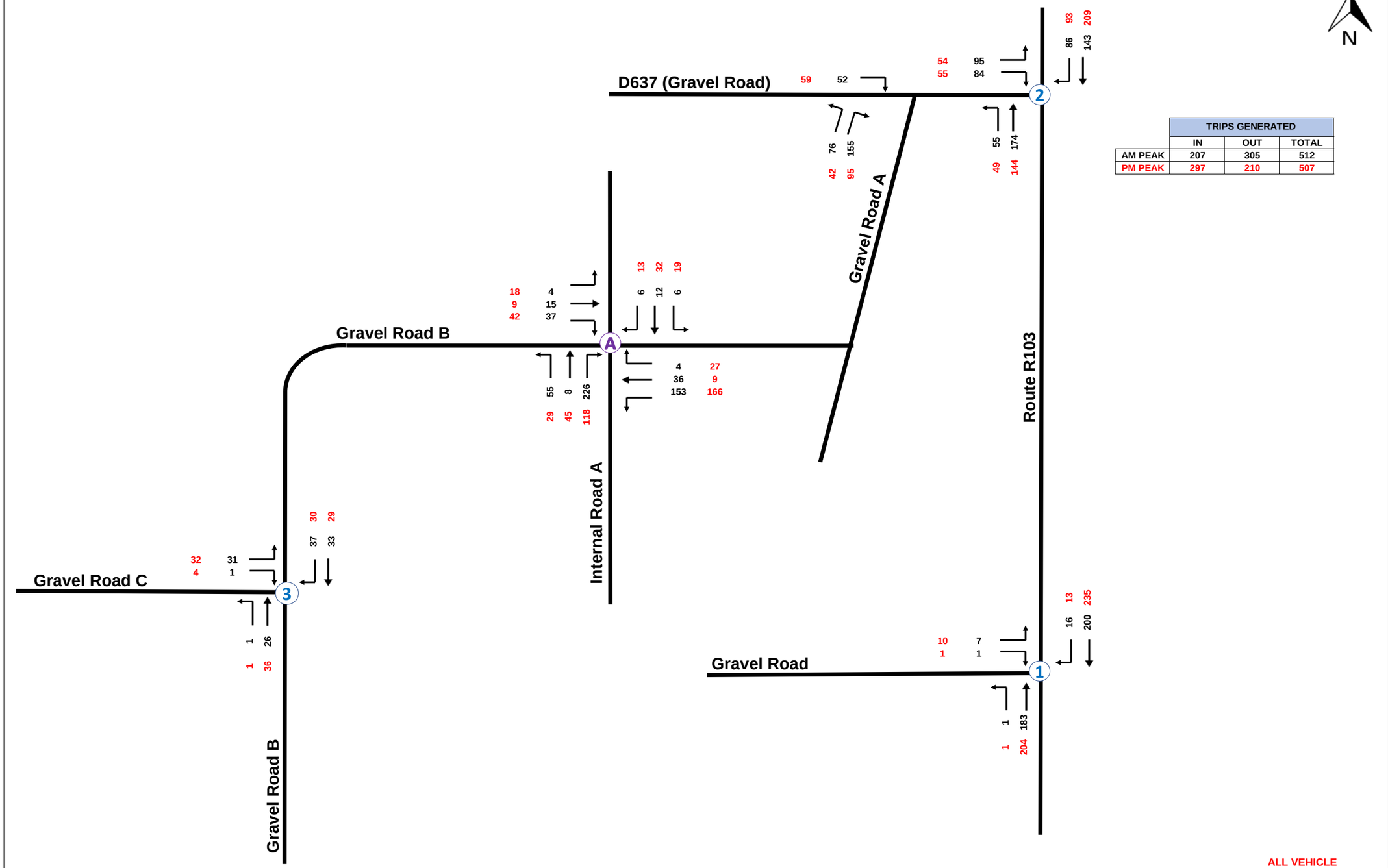
Project No.: C413-050419

Project: PROPOSED TOWNSHIP FOR ROOSBOOM SETTLEMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S

Figure Description: EXPECTED TRIP ASSIGNMENT

5



TRIPS GENERATED			
	IN	OUT	TOTAL
AM PEAK	207	305	512
PM PEAK	297	210	507

ALL VEHICLE

Legend:

100	AM Hour, 06:30 - 07:30
100	PM Hour, 16:30 - 17:30

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Project No.: C413-050419

Project: PROPOSED TOWNSHIP FOR ROOSBOOM SETTLEMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S

Figure Description: 2024 BACKGROUND PLUS DEVELOPMENT GENERATED PEAK HOUR TRAFFIC VOLUMES

6

Drawings

Drawing SKC001 Rev A: Proposed Intersection 2 Upgrades

Drawing SKC002 Rev A: Proposed Intersection Access Upgrades

REV	DATE	BY	DESCRIPTION	CHK	APD
A	2019/08/21	L.V.U	FOR INFORMATION	C.E.N	-

DRAWING STATUS: FOR INFORMATION

CLIENT: -

CHRISEN CONSULTING
CIVIL • STRUCTURAL • TRANSPORT • ENGINEERS

PROJECT: PROPOSED MIXED LAND DEVELOPMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S

TITLE: PROPOSED INTERSECTION 2 UPGRADES

SCALE @ A3:	CHECKED:	APPROVED:
1:1250	C.E NAIR	- PR No.: ---
DESIGN:	DRAWN:	DATE:
-	L.V UBISI	2019/08/21
PROJECT No:	DRAWING No:	REV:
C413-050419	SKC001	A

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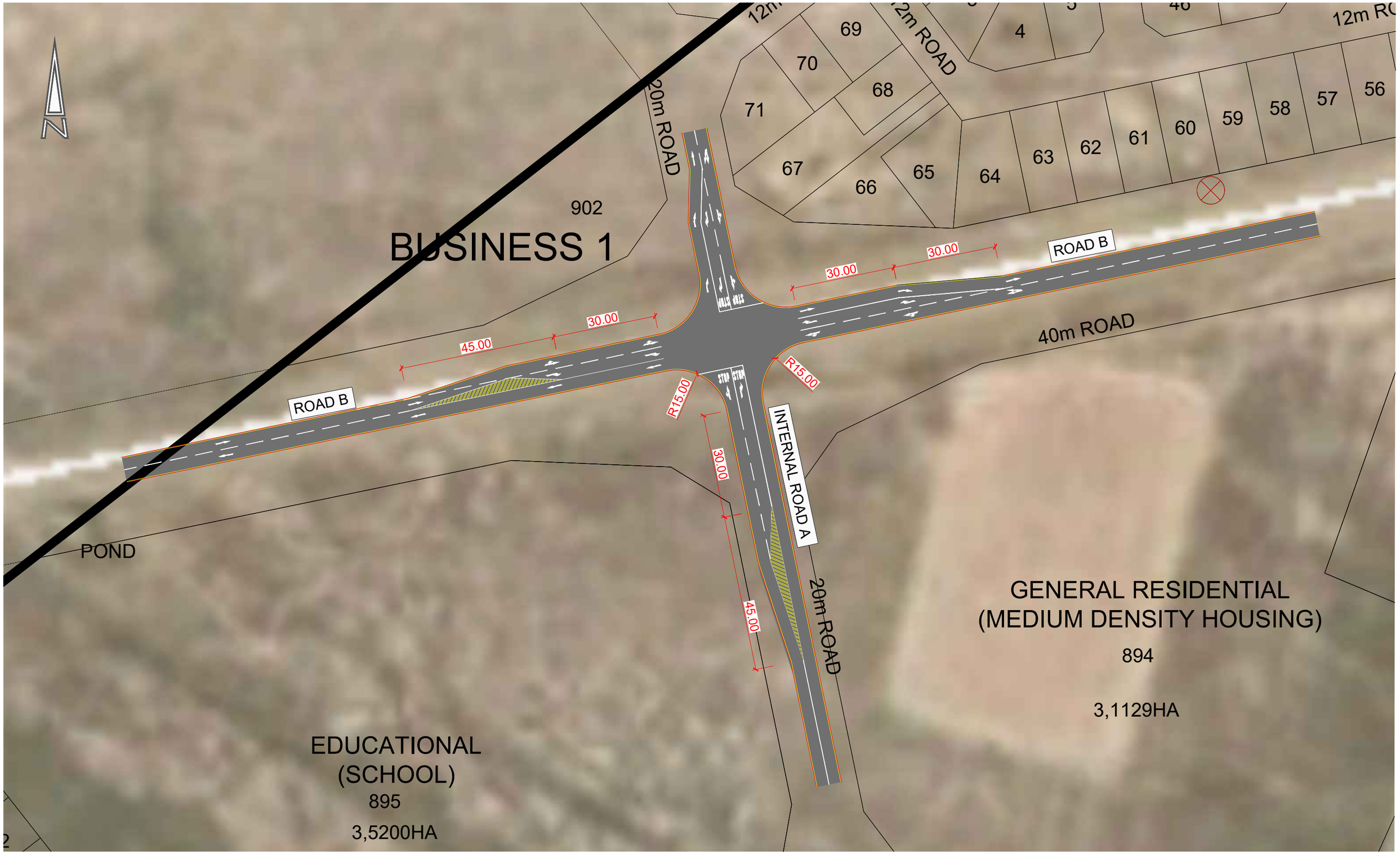

REV	DATE	BY	DESCRIPTION	CHK	APD
A	2019/08/21	L.V.U	FOR INFORMATION	C.E.N	-

DRAWING STATUS: FOR INFORMATION

CLIENT: -

CHRISEN CONSULTING
CIVIL • STRUCTURAL • TRANSPORT • ENGINEERS

PROJECT: PROPOSED MIXED LAND DEVELOPMENT ON PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S

TITLE: PROPOSED INTERSECTION ACCESS UPGRADES

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-	L.V UBISI	2019/08/21
PROJECT No:	DRAWING No:	REV:
C413-050419	SKC002	A

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Annexures

Annexure A

- Town planning Memorandum

ROOSBOOM HOUSING PROJECT

ALFRED DUMA LOCAL MUNICIPALITY

Alfred Duma
Local Municipality

PRELIMINARY PLANNING REPORT

Silver Shalonga

S·S·S
INVEST (Pty) Ltd

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TABLE OF CONTENTS

1. INTRODUCTION 4
   - 1.1 Purpose of the Report 4
   - 1.2 Project Description 4
   - 1.3 Project Aims and Objectives 5
   - 1.4 Location of the Project 6

2. POLICY FRAMEWORK 7
   - 2.1 Breaking New Ground 7
   - 2.2 Outcome 8: Sustainable Human Settlement and an Improved Quality of Life 7
   - 2.3 Provincial Human Settlements Master Spatial Plan 8
   - 2.4 Provincial Growth and Development Strategy 8
   - 2.5 Integrated Development Plan and Spatial Development Framework 9

3. DEMOGRAPHIC AND SOCIO-ECONOMIC PROFILE 10
   - 3.1 Alfred Duma Local Municipality 10
   - 3.2 Gender Composition: Household Heads 11
   - 3.3 Age Structure: Household Age 11
   - 3.4 Employment Status 12
   - 3.5 Household Income 12
   - 3.6 Dwelling Type 13
   - 3.7 Dwelling Size 14
   - 3.8 Household Size 14
   - 3.9 Implications 15
   - 3.10 Housing Need 16

4. SPATIAL ANALYSIS 16
   - 4.1 Access and Connectivity 16
   - 4.2 Settlement Pattern 16
   - 4.3 Current Land Use Analysis 18
   - 4.4 Land Use Management 19

5. NATURAL ENVIRONMENT 20
   - 5.1 Slope Analysis 20
   - 5.2 Watercourses 22
   - 5.3 Vegetation 22
   - 5.4 Biodiversity Areas 23

6. ACCESS TO FACILITIES 23
   - 6.1 Education Facilities 25
   - 6.2 Economic Facilities 25
7. PRELIMINARY LAYOUT PLAN 25
   - 7.1 Guiding Planning Principles 25
   - 7.2 Spatial Planning Concepts 26

7.2.1 Densification 26
7.2.2 Accessibility 26
7.2.3 Integrated Development 26
7.2.4 Environmental Sustainability 26
7.3 Land Use Plan 27
7.4 Movement System 27
7.5 Sub-divisional Plan / Sites 28

8. CONCLUSION 28

LIST OF MAPS

Map 1: Locality 6
Map 2: Development Constraints 17
Map 3: Land Cover 18
Map 4: Analysis 21
Map 5: Vegetation 22
Map 6: Public Facilities 24

LIST OF FIGURES

Figure 1: Household Head Gender 11
Figure 2: Household Head Age 11
Figure 3: Employment Status 12
Figure 4: Income 12
Figure 5: Dwelling Type 13
Figure 6: Dwelling Size 14
Figure 7: Household Size 14
Figure 8: Socio-Economic Implications 15

LIST OF TABLES

Table 1: Land Use Table 27

1 INTRODUCTION

The Alfred Duma Local Municipality has identified the Roosboom area, as an area in need of housing development. Accordingly, the municipality has initiated the Roosboom Housing Project and has commissioned the services of an implementing agent to administer the project, with the primary aim of providing qualifying beneficiaries with decent houses.

1.1 Purpose of the Report

This document presents a Preliminary Planning Report for the Roosboom Housing Project, involving the construction of 1000 low cost housing units in terms of the Housing Policy. The report forms part of a series of deliverables that will be produced as part of the project. It undertakes a basic assessment of the development, planning and spatial matters of the area, and performs a preliminary analysis of issues that can potentially have an effect on the proposed development. Its objectives are as follows:

- → To analyse the project area with a particular focus on the feasibility of, and need for, the proposed development of the area into a sustainable human settlement.
- → To prevent the preliminary layout plan that will act as a guide for future development.
- → To ensure that all relevant planning standards are met.
- → To facilitate housing development in Roosboom.

The document forms part of a package of reports being produced towards the packaging of a tranche 1 application that Alfred Duma Municipality intends to submit to the Department of Human Settlements for the release of funds to undertake detailed investigations and planning.

1.2 Project Description

The project is an Integrated Residential Development Programme (IRDP) project. If approved, the project will involve the development of internal services and top structures in accordance with the norms and standards of the Department of Human Settlements. The project involves the erection of 1000 low cost housing structures. It is anticipated to benefit a total of 1000 beneficiaries, who are classified as people

with great need in the beneficiary qualification criteria which is provided for in the Housing Policy.

The project forms part of, and aims to give effect to, the municipal housing agenda as outlined in the Integrated Development Plan. It seeks to address the expressed housing need and facilitate the development of sustainable human settlements as envisaged in the national housing policy – Breaking New Ground (BNG). The project will unfold in different broad phases as follows:

→ Phase 1: Preliminary investigations

→ Phase 2: Feasibility Study

→ Phase 3: Implementation

1.3 Project Aims and Objectives

The preliminary aim of this project is to inform a process towards the development of the Roosboom area as a Sustainable Human Settlement through the development of low income housing units. Its objectives are as follows:

→ Investigating the feasibility and need for housing in Roosboom;

→ Creating opportunities for training and job creation during the implementation of the project; and

→ Mobilising the community and developing internal capacity to drive project implementation.

1.4 Location of the project

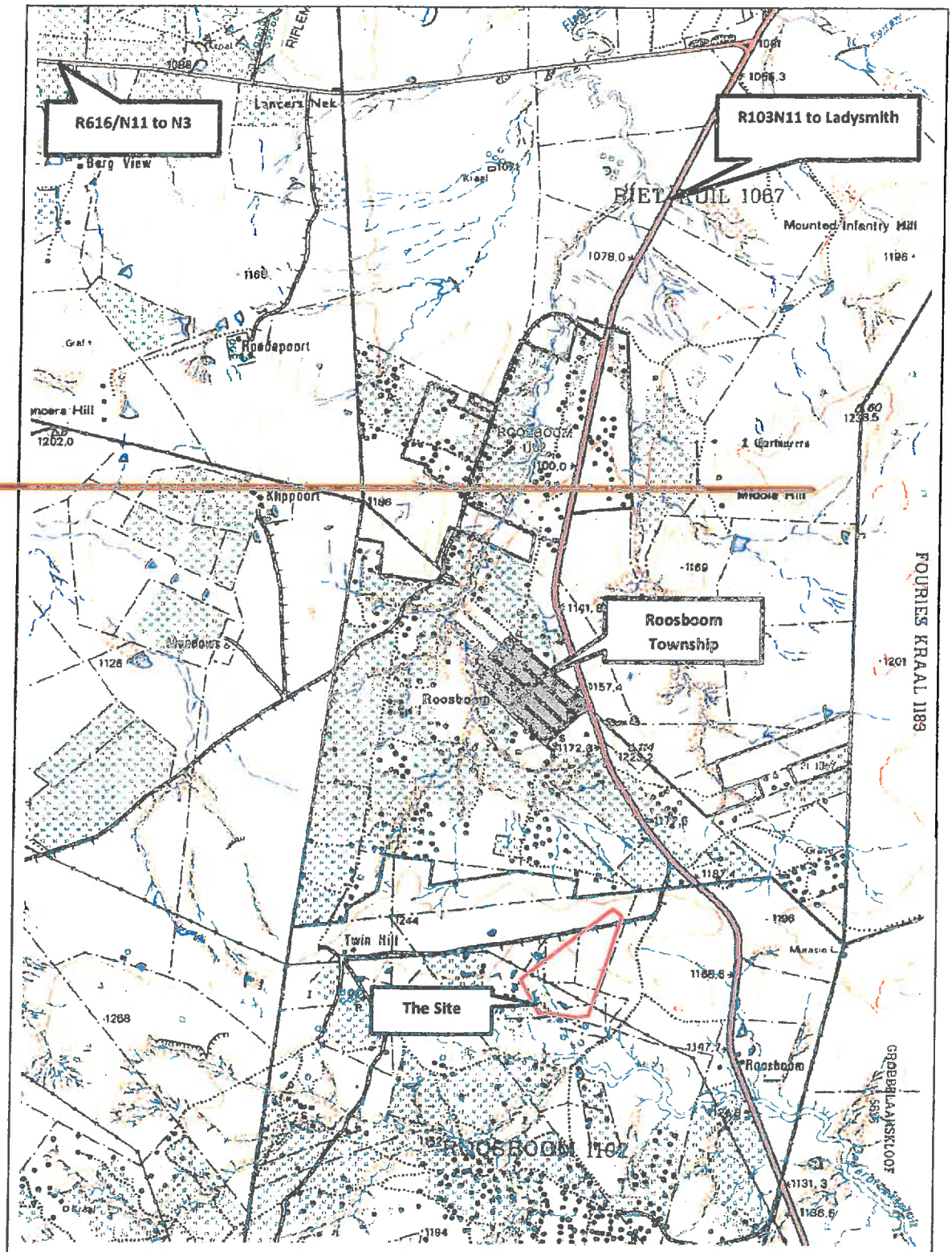


Figure 1 Locality Map (2829DA)

The project area comprises of two sites located in the southern portion of Alfred Duma Municipality, within the administrative boundaries of Uthukela District Municipality. It lies at an approximate latitude and longitudinal position of S28°27'14" and E29°43'20", respectively. The project are is located within ward 25 of Alfred Duma Municipality. The two sites of the project area are located on either side of the Onderbroekspruit. The site is located approximately 12km southwest of the Town Ladysmith. Access to the site is available via the R103/N11 (Ladysmith / Colenso Road) approximately 6.5km south of the R616/N11 Road to the N3.

2 POLICY FRAMEWORK

2.1. Breaking New Ground

Since the introduction of the Housing Act, (Act No 107 of 1997), the National Government has introduced a comprehensive programme that addresses a range of housing needs in South Africa. The programme is outlined in the National Housing Code and the Comprehensive Plan for the Creation of Sustainable Human Settlements (commonly known as Breaking New Ground).

The breaking New Ground Policy (BNG) provides a framework for the development of human settlements in the South African context. It aims to facilitate a shift from merely providing housing to ensuring the creation of sustainable human settlements. It also grants municipalities a greater responsibility in the housing delivery process. BNG includes a number of programmes that are intended to facilitate the successful implementation of the human settlements development agenda. It comes with 7 business plans. Business Plan 2: Spatial Restructuring and Sustainable Human Settlements, is of particular pertinence and significance to the Roosboom Housing Project. The project is in line with this business plan and also other business plans such as the Housing and Job Creation business plan.

2.2. Outcome 8: Sustainable Human Settlement and an Improved Quality of Life

The National Government embarked on a process to determine outcomes that must be achieved in 2012. From this process 12 outcomes were identified, which were set to be the key focus of government. The issue of sustainable human settlement linked with quality of household life was identified as outcome 8. This outcome contains four (4) outputs and targets as follows:

→ Output 1: Accelerated Delivery of Housing Opportunities.

→ Output 2: Access to basic services.

→ Output 3: Mobilization of well-located public land for low income and affordable housing with increased densities on this land and in general.

→ Output 4: Improved Property Market.

The proposed Roosboom Housing Project represents a stride towards the fulfilment of Outcome 8. It embodies all four outputs of Outcome 8 and will facilitate their achievement.

2.3. Provincial Human Settlements Mater Spatial Plan

The KZN Provincial Mater Spatial Plan aims to translate the Provincial Growth and Development Plan (PGDP) into a detailed implementation plan for assisting with the identification of sustainable land for housing delivery in the province. It focuses on strategic goal 3 (human and community development) and strategic objective 3.4 of the PGDP which talks to the promotion of sustainable human settlements. The plan broadly identifies focus areas for investment in human settlements in the province, in alignment with the Provincial Spatial Development framework. The human settlements targets for Uthukela District Municipality include spatial intervention such as increasing the housing capacity of the municipality and densification at main centres to meet service delivery needs. The Roosboom area is one of the main centres identified for densification within Uthukela. Additional, the Roosboom area forms part of the areas identified as provincial human settlements investment focus areas.

2.4. Provincial Growth and Development Strategy

The Provincial Growth and Development Strategy (PGDS), outlines the development vision and agenda for the KwaZulu-Natal Provincial Government. It identifies 7 strategic goals and 31 strategic objectives.

This strategy commits the provincial government to ensuring that all households within the province have secure residential tenure and access to basic utility services. This will be achieved through:

→ Integrated Development Planning.

→ Densification of settlement patterns.

→ Slums Clearance.

→ Improved access to basic services such as water, sanitation and electricity.

→ Addressing the housing gap market.

The Roosboom Housing Project is a response to these provincial policy directives and provides for their attainment within the Alfred Duma Municipal area.

2.5. Integrated Development Plan and Spatial Development Framework

The Roosboom Housing Project is identified in the Alfred Duma Municipality's Integrated Development Plan (IDP_. The IDP, as a key strategic overall guiding framework of the municipality, identifies a need to facilitate the provision of adequate housing to all deserving citizens. Therefore, the proposed development can be seen as way of giving effect to one of the municipality's key strategic and long terms objectives. The proposed development forms part of the municipality's mission to ameliorate the standards of living within its area of jurisdiction by providing housing and basic service needs.

The municipality is cognizant of the fact that it has to provide housing that is sustainable and promotes easy access to opportunities. This is further emphasised in the municipality's IDP.

The municipality's Spatial Development Framework identifies the Roosboom area as one of the areas that require housing interventions within the municipality. The project area falls within the broadest development vision of the municipality with regards to ensuring and facilitating the development of sustainable human settlements. The SDF identifies Roosboom as future settlement expansion Roosboom settlement as a tertiary node within the municipality. This essentially locates the project area within the broader sphere of influence within the municipality.

3 DEMOGRAPHIC AND SOCIO-ECONOMIC PROFILE

The Statistics South Africa Census Data of 2011 was used to analyse the demographic and socio-economic trends of project area. Primarily, the 2011 census data, based on the 2016 boundaries, was used to analyse the demographic trends of ward 25. The recent 2016 Community Survey results were only used in the overall analysis of Alfred Duma Municipality as the data is not based in the households or municipal wards.

3.1. Alfred Duma Local Municipality

Alfred Duma Municipality is one of the tree local municipalities that make the Uthukela District Municipality and is located on the southern region of the District Municipality. The other municipalities within the District include Inkosi Langalibalele Local Municipality and Okhahlamba Local Municipality.

Alfred Duma Municipality measures at approximately 3 764km^2 and is the largest in the District in terms of population size. The municipality was estimated to have a population of 356 274 people according to the Statistics South Africa 2016 Community Survey. This indicates an increase by approximately 16 497 people from population of 339 777 people in 2011. The municipality experiences a positive population growth rate of 4.86% between 2011 and 2016. An increasing population, amongst other things, reflects an increase in population as a result of births recorded and in-ward migration. Noteworthy, on the 3rd of August 2016, Emnambithi / Ladysmith Local Municipality and Indaka Local Municipality amalgamated to form the now Alfred Duma Local Municipality. The population is unevenly distributed across 36 wards. Ladysmith is the primary urban area while other urban settlements include Colenso and Ezakheni. According to the municipality's 2016/17 IDP, approximately 20% of the Municipality is urban while 80% is rural.

The municipality's main economic sectors include agriculture, industry, tourism and mining. The majority of the municipality faces challenges with regards to service delivery. Approximately, 45% of the municipality's population falls below the age of 18 indicating a need for investment in childhood and educational development.

3.2. Gender Composition: Household Heads

Figure 1: Household Head Gender

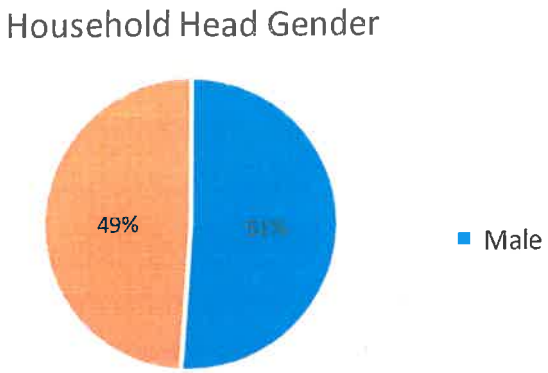
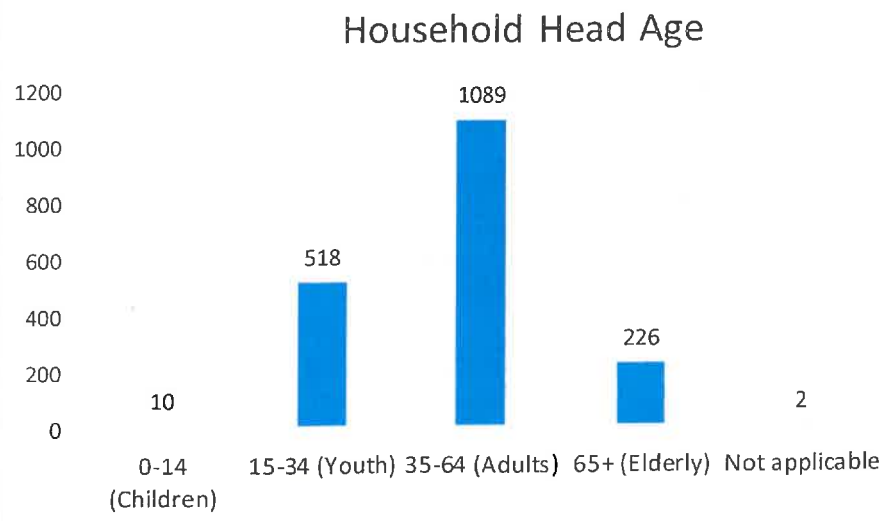


Figure 1 illustrates that the majority of the households in the project area are headed by females. This is very unusual as households are usually headed by males. This may be attributed to male migration, greater male mortality rates, family disruptions or other social issues. More importantly, this emphasizes the need for interventions and the direction of resources towards the Colenso community since females are commonly treated as one of the vulnerable and under resourced groups in society. Qualifying female headed households should be prioritized for housing opportunities in line with the government's agenda to address gender inequality and ensure the empowerment of women.

3.3. Age Structure: Household Age

Figure 2: Household Head Age



Age is particular important when assessing an area's socio-economic dynamics. When analysing the graph below, it is clear that the age structure of household heads is distributed across a number of age groups. A majority of the population within ward 25 fall within the adult age group (35 – 64 years), and account for 59% of the household heads. Approximately 25% (518) of the household heads are youths aged between 15 and 34 years of age. Approximately 0.56% of the households are child-headed, while 12% are headed by

the elderly. These age groups represent the most vulnerable groups in society of which resources to improve quality of life should be directed to.

3.4. Employment Status

Figure 3: Employment Status

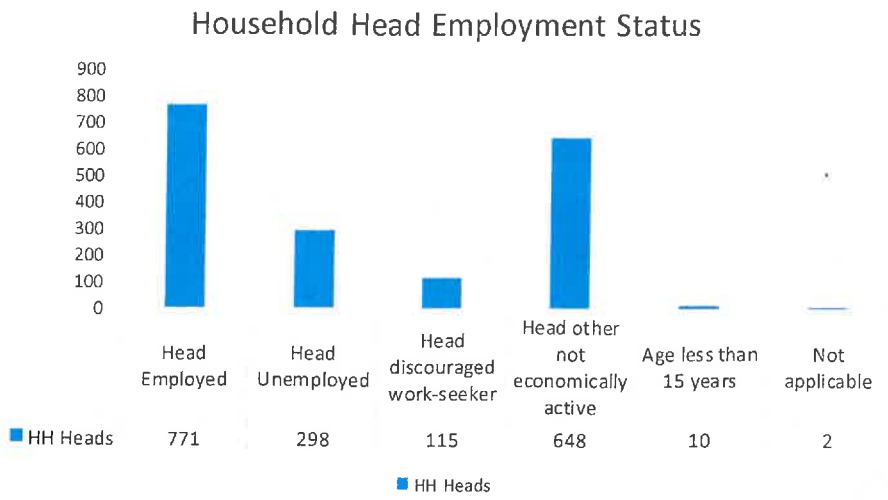


Figure 3 shows that 42% (771) of the household heads are employed, while 163% (298) are unemployed. The remainder are mainly those who are economically inactive and cannot contribute to the economy of the area. A need for the creation of job opportunities in the area exists. The need for initiatives and projects that will contribute to the improvement of livelihoods of the local community are clearly in demand.

3.5. Household Income

Figure 4: Income

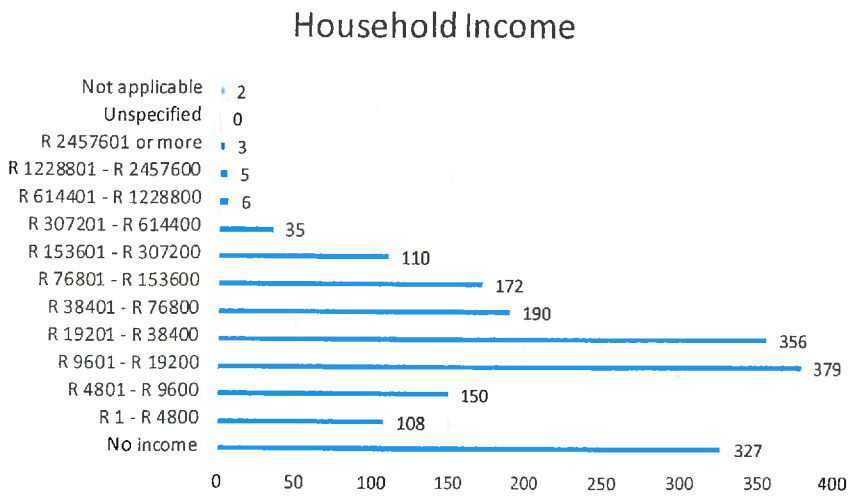


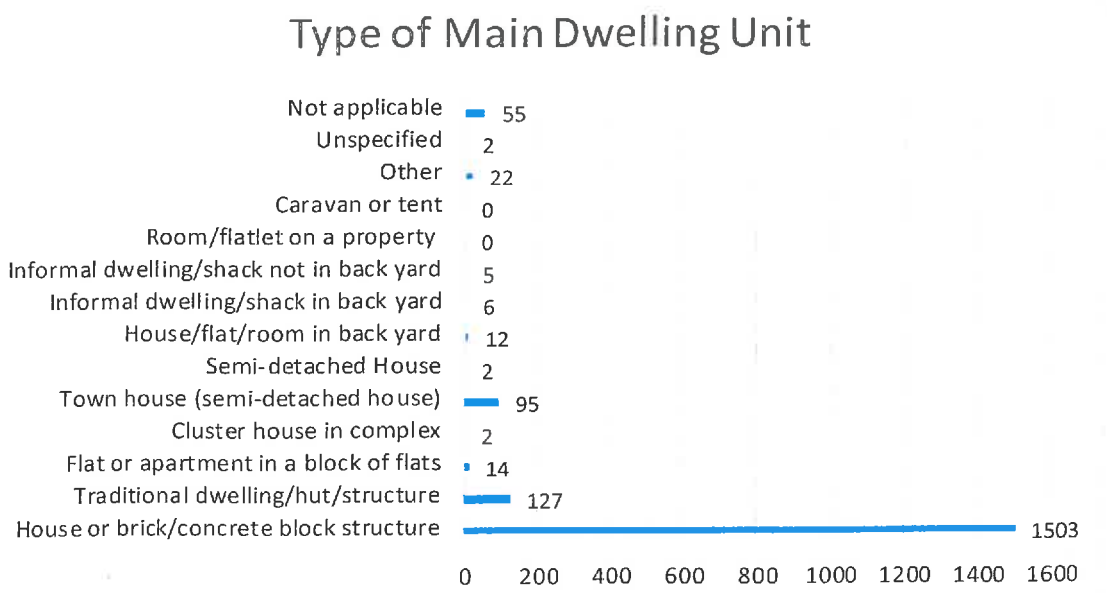
Figure 4 shows that income generated on a monthly basis by residents within the ward are very low. Essentially, a negative correlation exists between the number of households and income, as income increases, the number of households within higher income regions plummets significantly. 6% of the households earn an income between R1 – R 4800 and 21% earn an income greater than R 9600. A worrisome 18% of the households

within the wards earn no income. From this, it can be deduced that the Colenso community is generally an impoverished community.

3.6. Dwelling Type

The Census Data indicates that most of the households within ward 25 are made of brick structures. However, dwelling units in the area that are shacks and mud structures account for 7% of the households within the area. These do not meet the minimum building standards as specified by the National Home Builders Registration Council. This emphasizes the need for the project and the provision of adequate housing in the area.

Figure 5: Dwelling Type



3.7. Dwelling Size

Figure 6: Dwelling Size

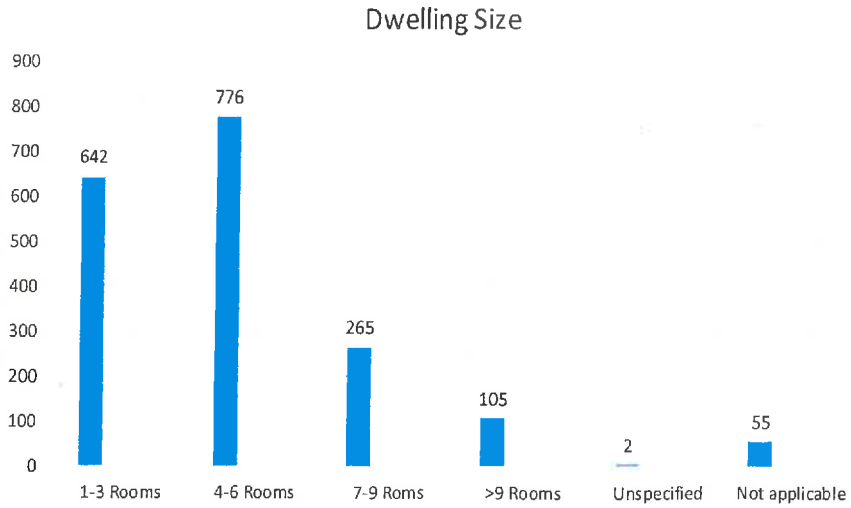
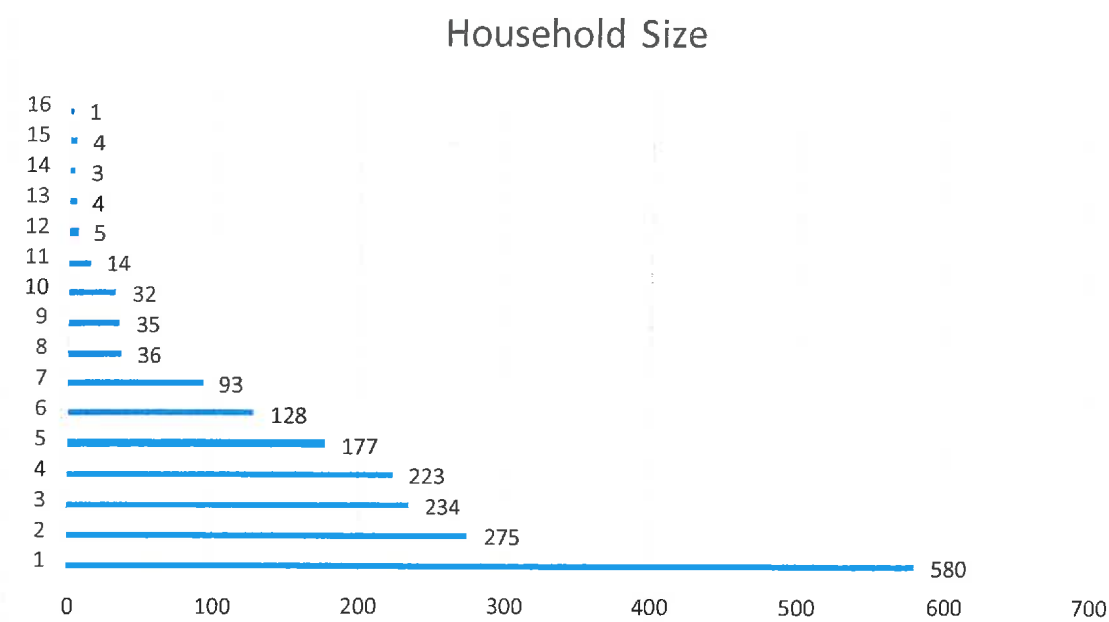


Figure 6 gives an indication of the size of dwelling structures within ward 25. The households in the area are generally small. 35% of the households have less than 4 rooms and only 14% have greater than 6 rooms. Against this background, it can be deducted that a need for the development of adequate housing exists.

3.8. Household Size

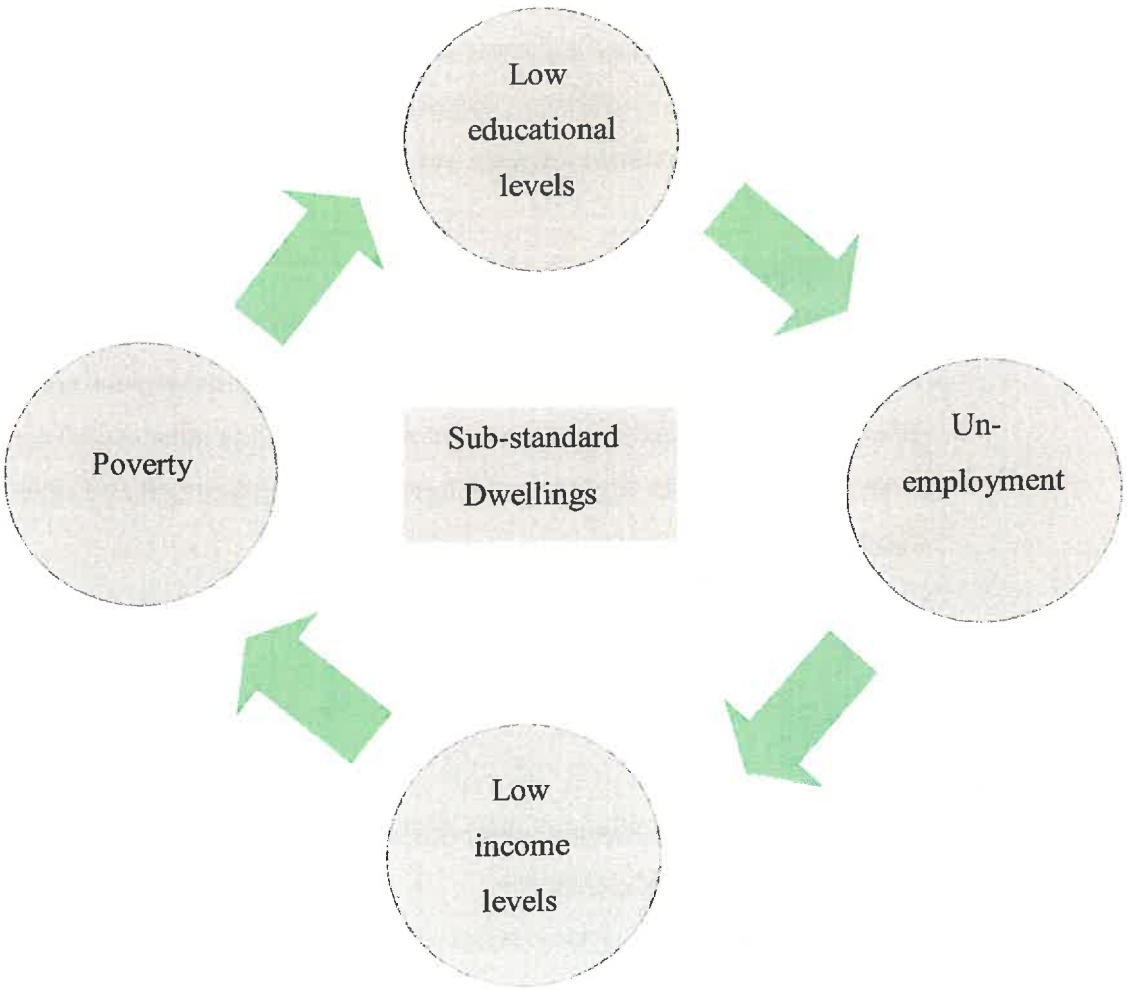
Figure 7 indicates the number of people per household and essentially translating to the household sizes. Households within the project area are generally small to medium sized. 59% of the households in the areas have between 1 and 3 people and only 12% have more than 6 dependants.

Figure 7: Household Size



3.9. Implications

From the above brief demographic and socio-economic analysis of the area, a few key issues clearly stand out. These include that the Roosboom is generally impoverished and has low incomes. Noteworthy, these issues emphasize the inability of the subject community to provide for their own housing. A ripple effect is noted whereby the low educational levels lead to unemployment and the unemployment subsequently leads to low income levels (refer to figure 8). This cycle directly translates to the people inhabiting or building substandard shelter, due to financial constraints. It is in the context of such a status quo that the Roosboom Housing Project should be viewed.



3.10. Housing Need

The income profile of the household heads in Roosboom provides perspective into the extent of housing need and demand in the project area. Approximately 24% of the households earn less than R 4800 per month, this also includes those eligible for low housing subsidies who earn less than R 3500 per month.

4 SPATIAL ANALYSIS

4.1. Access and Connectivity

The road network facilitating access to the project area is relevant will developed (refer to Map 1). Ingress to the development area is essentially obtained via the R103. There is an existing east west running gravel road which cuts through the northern section of the site and provides access to the site. The P103 plays a significant role as it links the project area with Ladysmith CBD to the north and Colenso in a southerly direction. The project area is located approximately 6.5km from the N3, which provides linkages at a regional scale.

4.2. Spatial Features / Structuring Elements

The spatial characteristics of the Roosboom Housing Project area is influenced by a number of structural elements and spatial features, some man-made and some natural. Some of these features are opportunities, while others can be seen as constraints. The main structuring elements within and immediately surrounding the Roosboom Housing Project area includes:

- → The R103, which is a major route that runs in a north-south direction located ± 500m east of the project.
- → A few structures located on the eastern boundary of the site of the project area.
- → The rivers and drainage lines which traverse both sites of the project area.
- → Scattered graves on the site.
- → The electrical powerline which traverse the project area.

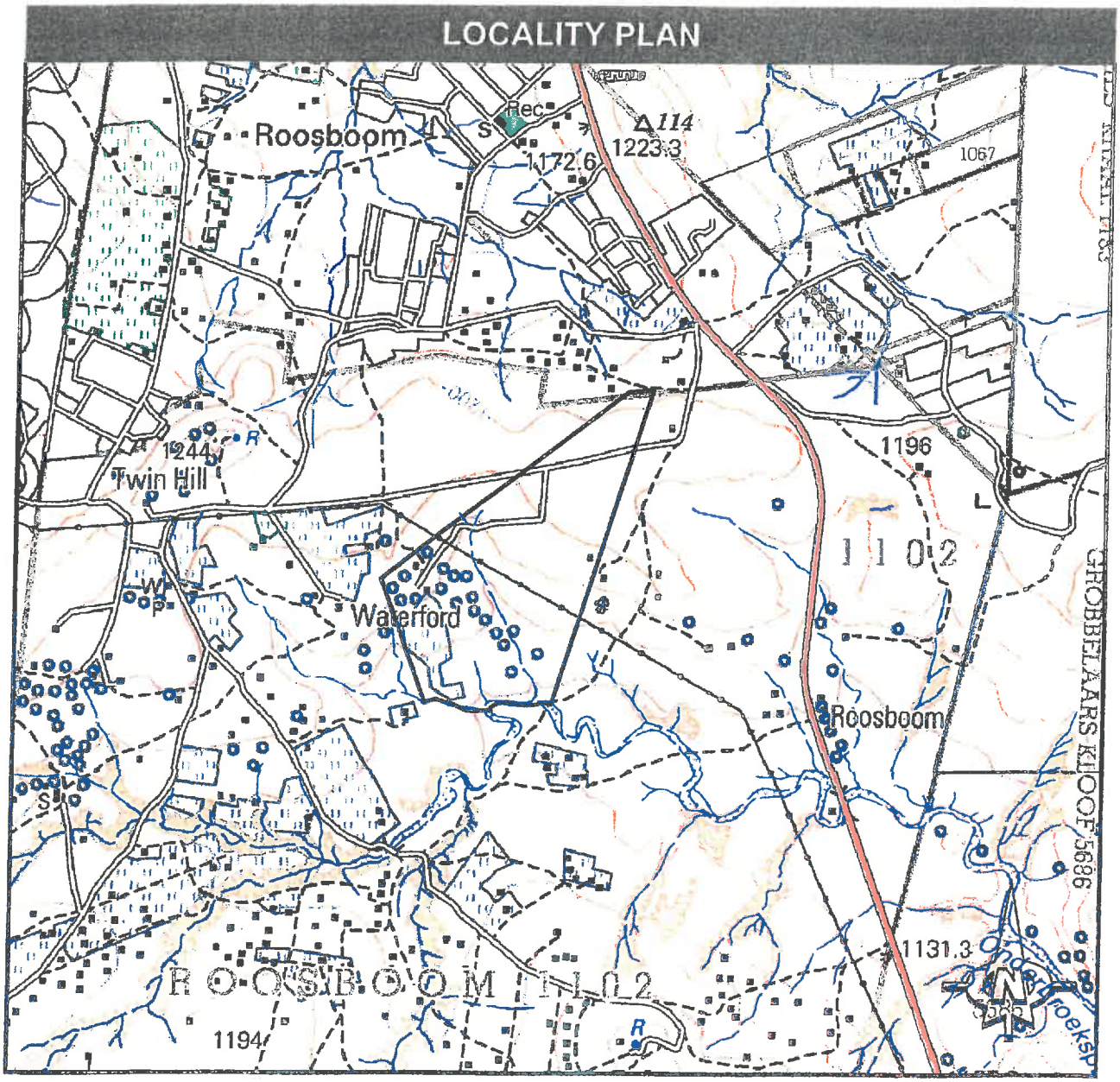
Map 2: Development Constraints

Figure 2 Landscape units without any buffers

Red	Upper Plateau
Green	Ridge/Koppie
Yellow	Lower Eastern Plateau
Brown	Western Plateau
Turquoise	River Floodplain
Blue	River course (southern border) and Non-perennial stream crossing site
Dark Blue	Dam

4.3. Current Land Use Analysis

Map 3: Land Cover



The site is predominantly vacant except for a few structures located to the eastern portion of site A (refer to Map 5). The Site comprises an upper plateau, ridge/koppie, lower eastern plateau, western plateau, river floodplain, river curse (southern border), non-perennial stream crossing, dam and wetland seep.

The **upper plateau** comprises a change in gradient and is generally steeper. This area represents a no go area as it serves as habitat for woody species and several aloes.

Below the ridge/koppie, is a gently undulating to level **eastern plateau** that gradually extends south wards and towards to perennial river that makes the boundary of the site. This area is likely to include a **wide river floodplain** that may make access difficult.

Extending from east to west and bisecting the site is a **non-perennial water course**. This water course follows a shallow valley down toward the river course in the south. This water course similarly offers constraints to development. **A farm dam and wetland seep** is located at the top end and adjacent to this water course.

The **western plateau** of the site also includes a uniformly steep topography. Development of this portion will trigger significant storm water management concerns owing to the steep gradient.

The fact that the site is largely vacant offers opportunities for maximising the number of housing units that can be developed within the site. Major land uses in the area and immediate surrounding include the following:

→ Structures which are spread in space on the eastern portion of site A, in a relatively informal nature.

→ Commercial facilities such as shops from immediate settlements to the north east of the site.

→ Vacant Land.

4.4. Land Use Management

The project area falls within the Ladysmith Town Planning Scheme. The site is zoned for "Low Impact Agriculture". The site has river reserves as demarcated by the scheme. The area currently has zoning controls imposed on it according to the scheme. It should be noted that some of the zoning controls might change as soon as Alfred Duma Municipality introduces a wall-to-wall scheme as per Spatial Planning and Land Use Management Act's requirements, meaning the project area might have

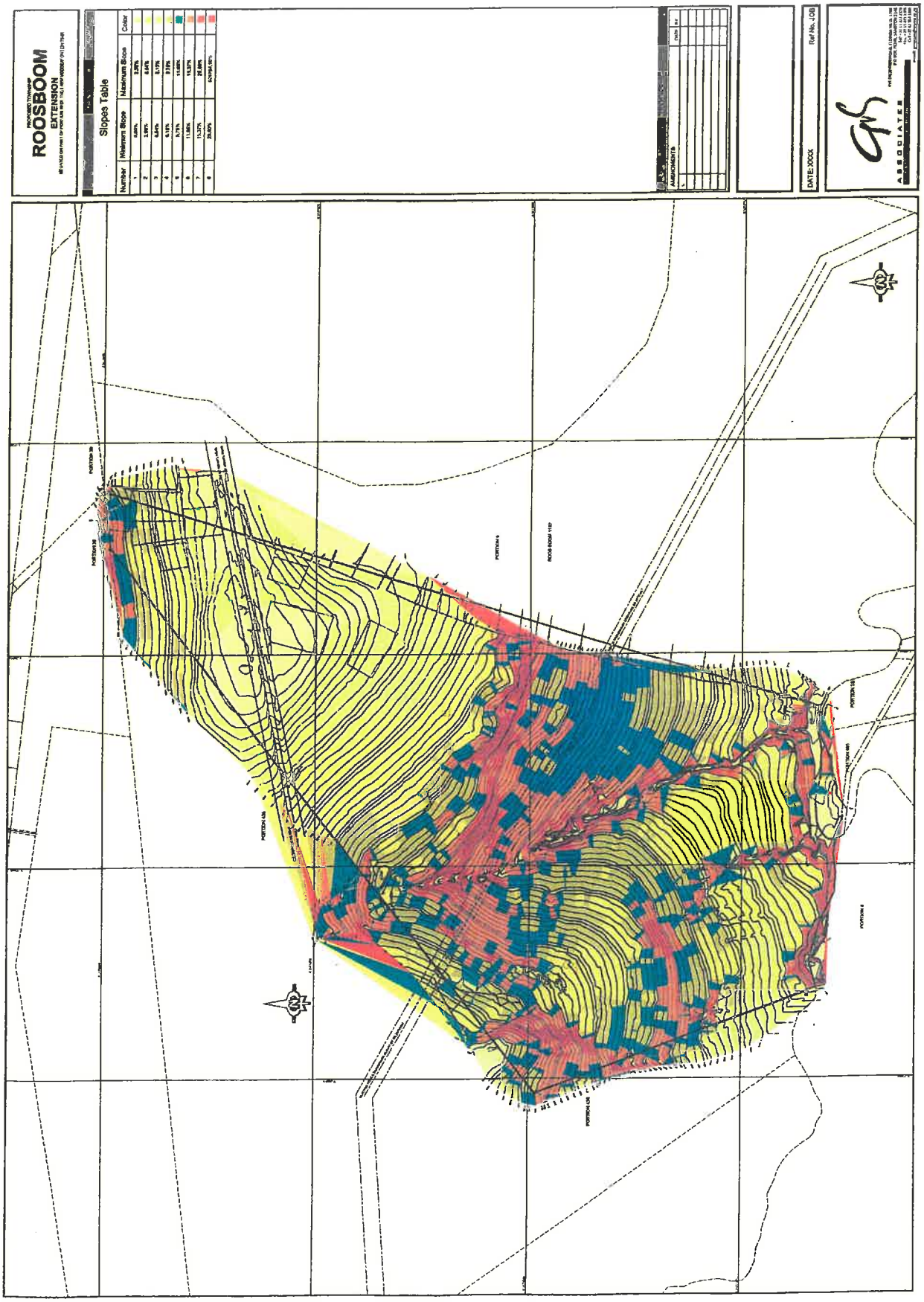
different zoning assigned to it in the near future. A rezoning and township establishment application will have to be submitted to the municipality to permit the proposed development. The proposed layout plan will serve as the basis for the wall-to-wall scheme.

5 NATURAL ENVIRONMENT

5.1. Slope Analysis

A detail slope analysis of the site has revealed that the site has a gradual slope in a southerly direction. The gradual slope is interrupted in the middle of the site by a ridgey koppie that traverses the site from east to west. The norther and southern part of the site are relatively flat and suitable for development. The ridge area constitutes a development constraint. In light of the human settlements planning principles, development cannot be undertaken on slopes greater than 1:3. Such areas do not allow for settlement purposes.

Map 4: Analysis



5.2. Watercourses

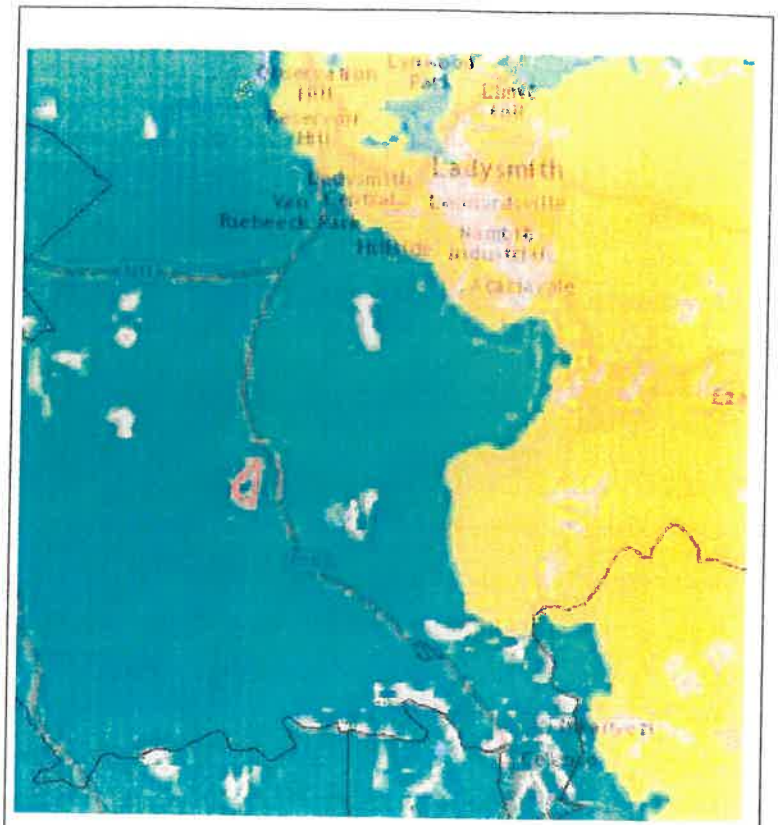
The site includes a farm dam and lies in the headwaters of a non-perenial stream that drains south eastwards into the Verbroek Spruit which in turn bisects the site in an east west direction (refer to Map 5). These are the areas that need to be excluded from development. Drainage lines can be observed running in a north-south direction of the project area. A 100m buffer will have to be delineated, where no housing development will take place within the buffer.

5.3. Vegetation

The project area is covered by the KwaZulu Natal Highveld Thornveld vegetation (refer to Map 9). This vegetation type is used to have a conservation status of least threatened.

Vegetation within the project area has been largely degrade. Degradation can be attributed to a number of factors, one of which may be livestock grazing.

Map 5: Vegetation



Vegetation Type Map of the study area (Mucina Rutherford 2006)

(Green: Kwazulu-Natal Highland Thornveld)

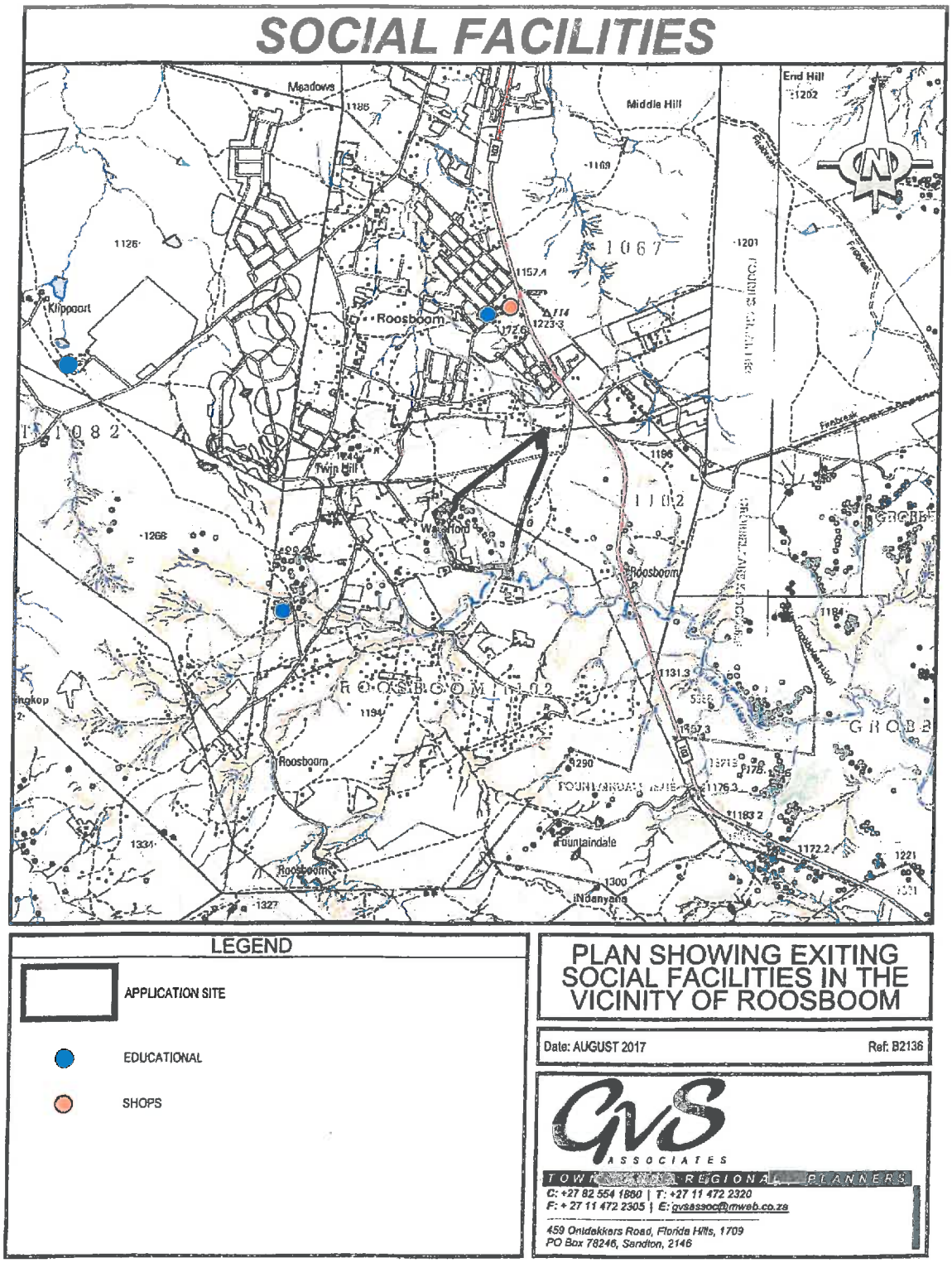
5.4. Biodiversity Areas

Most of the project area is not required for biodiversity conservation. This could be due to the level of transformation that the area has undergone. Only a small portion on the southern boundary falls within a Critical Biodiversity Area Optimal. Given the level of transformation on the site, and the fact that the most of the areas is not required for biodiversity conservation, no significant detrimental impacts are envisaged from the proposed development. The development of this area is not likely to impact significantly on the biodiversity conservation targets set for the province. A no-development option in terms of biodiversity may also not be necessary.

6 ACCESS TO FACILITIES

Very few facilities exist within the Roosboom area. However, residents do enjoy access to social facilities in close proximity in the surrounding settlements. As part of the project area's layout planning process and if necessary, more social facilities will be provided for in line with relevant guidelines on the provision of social facilities. There are no social facilities on the project area.

Map 6: Public Facilities



6.1. Education Facilities

There is a primary school to the south-east of the site (refer to Map 7). A secondary school exists to the north of the site at the existing Roosboom Township. Tertiary educational facilities are located within Ladysmith Town. Provision will be made for any additional school sites in the proposed Layout Plan.

6.2. Economic Facilities

The project area is devoid of any economic facilities except for a small shopping facility in the existing Roosboom Town to the north. However, the Ladysmith CBD is located ± 12km from the project area for residents to satisfy their shopping needs. Provision will also be made for a shopping facility in the proposed Layout Plan.

7 PRELIMINARY LAYOUT PLAN

7.1. Guiding Planning Principles

The planning of any settlement should embrace certain principles, which manifest themselves as important concepts and values that should guide the development of the area. The Preliminary Layout will give the area some form of structure and growth patterns so that it can develop into an efficient and sustainable settlement. The layout plan is based on the following spatial planning principles and embraces the planning concepts alluded to herein.

The Spatial Planning and Land Use Management Act, Act No 16 of 2013 (SPLUMA) is the foremost spatial planning legislation in the country. Hence, it is pivotal that all developments occurring within the republic adhere to the principles advocated by the SPLUMA. Thus, the preliminary layout plan takes cognisance of the following SPLUMA principles:

→ Spatial sustainability: the principle of spatial sustainability requires sustainable management and use of the resources making up the natural and built environment.

→ Spatial justice: the principle of spatial justice aims to redress imbalances of the past through improved access to land and efficient use of land.

→ Spatial; resilience: the principle of spatial resilience advocates for the formulation of spatial plans that will help ensure the creation of sustainable livelihood, particularly in communities highly vulnerable to climate change and concomitant natural climates.

→ Efficiency: the principle of efficiency advocated for the frugality in the ise of resources such as land and optimal use of existing infrastructure.

→ Good administration: this principle suggests the adoption of an integrated approach in spatial planning and land development.

7.2. Spatial Planning Concepts

The following presents some of the spatial planning concepts that have been embraced in the project / preparation of the layout plan.

7.2.1 Densification

The preliminary layout plan facilitates densification as a means to create sufficient thresholds for goods and services to be provided within the project area.

7.2.2 Accessibility

The movement pattern of the surrounding defines the current structure of the Roosboom area. The main routes are well defined, but the next level of roads require serious attention. The Preliminary Layout Plan recognises these existing roads within the Roosboom area. These routes are important n establishing better linkages between different parts of the area with the existing settlement in Roosboom and improving legibility of the structure.

7.2.3 Integrated Development

Although the project relates mainly to housing development, it is critically important to use the opportunity to plan for the provision of other public facilities and delivery of basic services in line with the provisions of the Integrated Development Plan. Hence, the detailed planning will provide an indication as to whether a need for more public facilities exists and the extent of such a need.

7.2.4 Environmental Sustainability

Finally, the layout plan recognizes and facilitates the protection of environmentally sensitive areas and keeps the drainage lines free of any development. Areas located along the rivers and wetlands are protected and

should not be utilized for the purpose of development. Flood lines will be determined and used to structure settlements. No development will be lows within floodline areas.

7.3. Land Use Plan

The layout plan recognizes the surrounding land uses within the Roosboom area. The majority of these are residential developments catering for the housing needs, with other supporting commercial and social land uses.

The layout plan earmarks sites for residential development. The layout plan also makes provision for social facilities. It also ensures that on land which consists of environmentally sensitive features such as rives and wetlands, no development takes place within the delineated buffer. The total potential yield of residential sites is 940 sites plus ± 93 medium density residential units. The preliminary proposed land uses and their extent is also detailed in Table 1 below:

Table 1: Land Use Table

Proposed Land Us	No. of Erven	Area n hectares	Percentage Area
Dwelling Units	912	34.29	44.9
General Residential	1	3.1	5
Business	1	0.3044	0.38
Primary School	1	3.52	4.34
Crèche	2	0.29	0.36
Religious Centre	4	0.48	0.59
Public Open Space	10	18.6	22.9
Public Roads	-	17.4	21.4
Total	**959**	**81.14**	**100**

7.4. Movement System

The movement network is guided by the existing surrounding settlement patterns, existing provincial roads and existing local access roads. The principle of frugality in the use of resources is embraced by optimising the use of existing road infrastructure. Access along the provincial roads, particularly R103 has been avoided in line with the Department of Transport's guidelines and to ensure the smooth flow of traffic.

Local access roads facilitating access to each household have also been designed as part of the layout plan. The proposed movement network is of a hierarchal nature as it cascades down from higher order limited access provincial roads to lower order local access roads.

7.5. Sub-divisional Plan / Sites

The design of the layout plan incorporates logical layout design patterns in a manner that gives the project area a unique character. These patterns are context specific and respond to the existing settlement patterns of the surroundings, the environmentally sensitive areas while ensuring that formal layout design guidelines are adhered to. The pattern also provides for continuity and integration with the surrounding areas. The potential yield of residential sites within the project area is 940 plus 93 flats, where 826 units are RDP units and 20 sites are FLISP units.

8 CONCLUSION

The Roosboom Housing Project seeks to address the housing need in Alfred Duma Municipality, as outlined in the Integrated Development Plan and associated Housing Sector Plan. The project will aid in working towards the development of the area into a sustainable human settlement and will provide 1000 low cost housing units and associated engineering services. It will provide appropriate and much needed residential opportunities which will help address the pervasive and critical problem of housing and also help lessen the municipality's housing backlog which currently stands at approximately 22000. It will also ensure that land, as a scarce resource, is used optimally and in line with the municipality's development prospects. The project acknowledges he existing character of development within the surrounding and will also facilitate densification and improve accessibility within the area. In that, the conclusion of this preliminary planning report is that the area is suitable for development, with no major factors affecting development.

PRELIMINARY TOWNSHIP LAYOUT PLAN FOR ROOSBOOM SETTLEMENT SITUATED ON PORTION 437 OF THE FARM ROOSBOOM NO 1102 – G.S (ALFRED DUMA LOCAL MUNICIPALITY IN LADYSMITH)

TOWN PLANNING APPROACH

Ref: B2136
July 2017

PREPARED BY:

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1. APPLICATION

1.1 Aim

To develop the application site in a way that is responsive to the needs of the Municipality as a whole and the residents of the surrounding regions and in so doing create a living environment where people will feel safe and happy to live. The proposed development will comprise ± 911 Residential Erven, 1 Business Erf and 9 Public Open Space Erven.

1.2 Development Application

It is herewith proposed that a township to be known as Roosboom be established on Portion 437 of the Farm Roosboom No 1102 – G.S

1.3 Property Particulars

1.5.1 Property Description and Areas

According to Deed of Transfer No T43362/2014 the land measures 77.6997 hectares in extent.

DESCRIPTION	DEED NO	TOTAL AREA (ha)
Roosboom Portion 437 of the Farm Roosboom No 1102 – G.S	T43362/2014	77.6997 ha

1.5.2 Ownership

The land is registered in the name of Emanambithi / Ladysmith Municipality

1.5.3 Locality

The land is located in the southern part of the Alfred Duma Local Municipality area of jurisdiction approximately 12 km south of Ladysmith Town on the R103 Provincial Road to Colenso. In local context, the site is situated approximately 1.5km south of the existing Roosboom Settlement.

1.5.4 Existing Use

The land is predominately vacant at present except for a number of rural residential properties encroaching along the eastern boundary. There are also a number of graves on the site which will be accommodated by means of parks in the layout plan.

1.5.5 Surrounding Area

The site is surrounded by Peri Urban Residential Settlements which is characterized by relatively low residential densities of 1.2 and 1.8 households per hectare.

2. TECHNICAL INFORMATION PERTAINING TO THE SITE

2.1 Existing Road Network and Access

The site is located approximately 1km west of the R103 Provincial Road to Colenso. Access to this road is by means of an unmarked gravel road which traverses the site in an east west direction. In view of the fact that this road also serves as the main access to the area to the west of the site to the Provincial Road it will be formalized as a district level road in the proposed layout plan.

The proposed township is therefore highly accessible, not only from a local and sub-regional perspective, but also from a regional point of view and will thus contribute to an integrated environment.

2.2 Topography and Surface Hydrology

A detail slope analysis of the site has revealed that the site has a gradual slope in a southerly direction. This gradual slope is interposed in the middle of the site by a ridgey koppie that traverses the site from east to west. The northern and southern parts of the site are relative flat and suitable for a development. The ridge area which constitutes a development constraint.

2.3 Geology and Soils

Soilcraft Geotechnical Engineers were commissioned during July 2014 to undertake an Investigation Report of the site. A copy of the Preliminary Report accompanies the application.

There are no significant geotechnical constraints affecting the development potential of the land.

2.4 Environmental Considerations

In view of the size and nature of the Proposal and also in accordance with the Regulations to the Environmental Conservation Act, 1989, it will be a requirement to obtain Consent in terms of the abovementioned Legislation from the Kwa-Zulu Natal Department of Agriculture, and Rural Development.

Eco Assessments Environmental Consultants were appointed to undertake a Scoping Study and Report and implement the necessary steps for the Environmental Impact Assessment process required in terms of the relevant Legislation.

According to the preliminary scoping report, there are no compelling environmental issues hindering the proposed development, which is also in line with the Spatial Development Framework for sustainable development.

2.5 Floodlines

The site is bisected by two north south punning drainage lines. These are non-perennial drainage systems that drain into the Verbroekspruit along the southern boundary of the site. These drainage lines with its associated 1:50 and 1:100 year floodlines constitute a constraint on the development potential of the land. These drainage lines as well as the flood plian along the spruit will be accommodated by means of park erven in the layout plan.

3. THE PROPOSED LAYOUT PLAN

3.1 Design Rational and Land Use Rights

The following is a detail discussion of the preliminary Layout Plan attached to the application:

3.1.1 Land Use Rights

The proposed township will consist of 926 erven with the land uses stipulated in the land use table on the Township Layout Plan. The proposed zoning categories will be standard as per the applicable Town Planning Scheme.

3.1.2 Access and Design of Streets

The layout concept that has been utilized for the proposed Roosboom Extension is commonly referred to as "Planned Irregularity" or Conventional Layout. This type of Layout is commonly utilized in Township Layouts in new residential town's suburbs in South Africa. This concept approximates the pattern of settlement in neighbouring developments and it was preferred to other layout concepts, i.e. a "Superblock" Layout.

The concept makes use of a conventional two-deep block with the majority of erven directly adjoining a street. Wet services could be provided on the conventional mid-block basis (one stand on either side). Internally a series of 12m wide roads have been used in order to ensure good access.

Internally a hierarchy of roads have been used in order to ensure good access. Local Collector Roads of 16m and 20m have has provided in order to maximise access to the existing east west District Road. Linkage to these roads by internal 12m local residential streets will ensure good access for residents to all the areas of activity in the Ladysmith area.

The layout of the proposed Roosboom Extension provides the most suitable opportunity for Township Establishment within the physical and social limitations present. The layout, accordingly, attempts to minimise the quantity and particularly the distance over which basic services i.e. sewage, roads and water supply must be provided.

The site has been evaluated with due cognisance of the development criteria which would support an urban system that is complex and diverse and provides opportunity and choice to all its residents.
It was decided that the average size of the residential erven should be 250m^2 which is in line with the ruling size of Erven in the surrounding townships.

The following key aspects were considered with respect to the Layout Plan:

- The Layout Plan aims to comply with the Design Standards contained in the "Red Book" Guidelines for the Provisions of Engineering Services in residential townships;

- The orientation of street blocks, in general, were as far as possible placed at reasonable street gradients, to ensure relatively effective operation of a water borne sewage system, that is accompanied by stormwater flows that is concentrated within street reserves, and managed by means of "Surface Structures"; and
- Most of the properties have reasonable north-orientation in relation to the longest (side) boundary that could accommodate "north facing" housing structures.

The total township area is approximately 72.67 hectares in extent. The requirement that the level of services and the top structures should be suitable for middle income housing, necessitated erf sizes of between 350m² and 500m².

4. CONCLUSION

4.1 Based on the preliminary studies of the various development professionals, there are a number of physical constraints affecting the development potential of the land. The most significant constraints affecting the land include an east west running ridge / koppie in the middle of the site and two north south drainage lines as well as a spruit along the southern boundary.

4.2 Appropriate town planning standards were used together with a spatial interpretation of the IDP to compile a layout plan for the site taking the constraints into account.

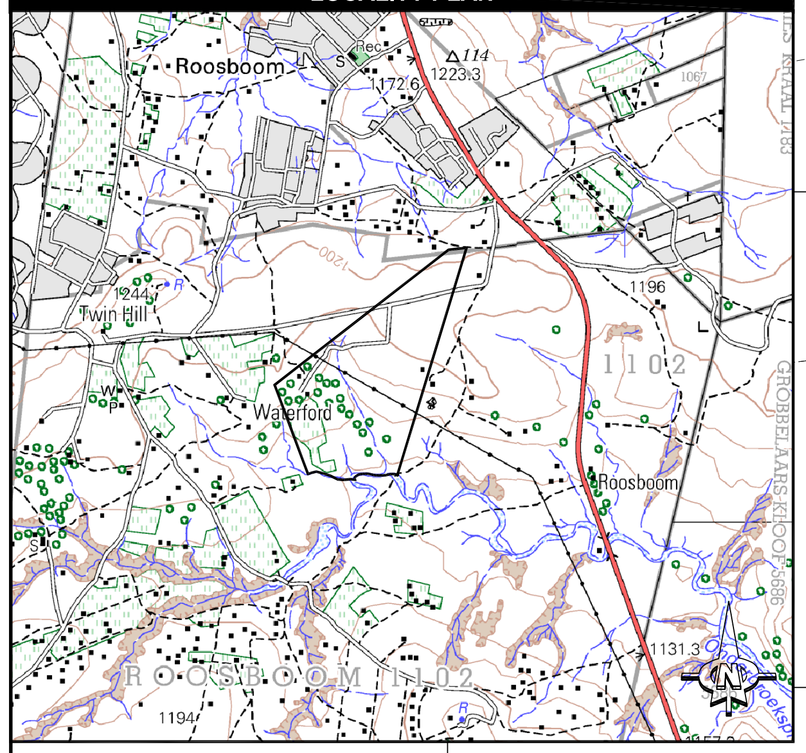
4.3 The site has been earmarked for "future settlement expansion" in terms of the Spatial Development Framework. The proposed township development will therefore be in line with the objectives and guidelines of the SDF.

GVS & ASSOCIATES

Annexure B

- Proposed Township Development Layout Plan

LOCALITY PLAN



EXISTING ENCROACHEMENTS

ERF NO	ERF SIZE m²	OCCUPANT
866	705m²	
867	1229m²	
868	1922m²	
869	2622m²	
870	2114m²	
871	921m²	
872	1208m²	
873	1736m²	
874	2664m²	
875	1769m²	
876	1443m²	
877	1585m²	
878	1263m²	
879	765m²	
880	27m²	
881	476m²	
882	222m²	
883	497m²	
884	319m²	
885	2837m²	
886	2489m²	
887	1925m²	
888	910m²	
889	1951m²	
890	1912m²	
891	1591m²	
892	665m²	
893	1853m²	

Floodline Certification

In accordance with Section 144 of Act 36 of 1998, it is hereby certified that the township shown on this plan is affected by the maximum flood in any public stream which would be caused by storms of recurrence intervals of 50 to 100 years

....
Name of Engineer Registration No. Date

Geological

This is to certify that the township layout on this plan is in accordance with the provisions and recommendations as set out in the Engineering Geological Report

....
Name of Engineer Registration No. Date

PROPOSED TOWNSHIP

ROOS BOOM

EXTENSION 1

SITUATED ON PORTION 437 AND PORTION 502
OF THE FARM ROOS BOOM No. 1102 - GS

LAND USE TABLE

ZONING	NOTATION	ERF NO'S	NO. OF ERVEN	AREA (HA)	% OF TOTAL AREA
RESIDENTIAL 1		1 TO 865	918	35,5015	43,75
RESIDENTIAL 1 (ENCROACHMENTS)		866 TO 893	28	3,9641	4,89
GENERAL RESIDENTIAL (RES 3)		894	1	3,1129	3,84
EDUCATIONAL		895	1	3,5200	4,34
COMMUNITY FACILITY - CRECHE		896 - 897	2	0,2929	0,36
COMMUNITY FACILITY - CHURCH		898 - 901	4	0,4807	0,59
BUSINESS 1		902	1	0,3044	0,38
PUBLIC OPEN SPACE		903 - 913	11	18,6964	23,04
ROADS				15,2686	18,82
TOTAL			913	81,1415	100,00

LEGEND

1. The figure **"ABC middle of river DEFG middle of river HIJKLMNOA"** represents Proposed Roos Boom Extension 1, situated on Portion 437 and Portion 502 of the farm ROOS BOOM No. 1102 - GS, measuring ±81,1415ha in extent to be consolidated.
2. Contours are in accordance with the standards laid down in regulation 18(2) and (3) of the Town Planning and Townships regulations, 1986 Contours are in 1m intervals Date : Sea Level
3. The grid values are based on WGS 84 Lo 29°
4. All sizes and dimensions are approximate and subject to final survey.
5. Minimum residential Erf sizes = ± 300m²
6. The township falls under the jurisdiction of Alfred Duma Local Municipality
7. Base plan information was obtained from A.S NONYANE AND ASSOCIATES Professional Land Surveyors
8. This Layout Plan has been checked by me

....
Town Planner Date

8. This Layout Plan has been checked by me

....
Land Surveyor Date

8. This Layout Plan has been checked by me

....
Alfred Duma Municipality Date

Alfred Duma Local Municipality
Service Delivery beyond expectation

REVISIONS

AMENDMENTS	DATE	BY
1.		

Director
Email: silvers@sssinvest.co.za
Tell: +27 11 984 2833 | Fax: +27 86 619 9735
SSS INVEST (Pty) Ltd

DATE: 18 JANUARY 2019 Ref No. B2136

GVS ASSOCIATES
TOWN AND REGIONAL PLANNERS
C: +27 82 554 1860 | T: +27 11 472 2320
F: + 27 11 472 2305 | E: gvsassoc@mweb.co.za
459 Ontdekkers Road, Florida Hills, 1709
PO Box 78246, Sandton, 2146

SCALE 1:3 500

Annexure C

- Proposed Development Trip Generation Calculation

Project No.: C413-050419

Date: 2019/08/20 21:31

Author: Christopher E Nair

PROPOSED TOWNSHIP AT PORTION 437 OF THE FARM ROOSBOOM NO 1102-G.S

DEVELOPMENT TRIP GENERATION TABLE

Trip Code	Land Use	Development	Size (m^2)	Unit of Measurement	COTO Peak Hour Base Trip Generation Rates (veh/h)									Trip Reduction Factors (%)				Size Adjustment Factor for Shopping Centres			Adjusted Peak Hour Trip Rate (veh/h)			Total Expected Peak Hour Trip Generation (Veh/h)								
					AM PEAK	SPLIT		PM PEAK	SPLIT		FRIDAY PM	SPLIT		Mixed-use (Pm)	Vehicle Ownership (Pv)	Transit Nodes or Corridors (Pt)	Total (Pc)	AM PEAK	FRIDAY PM	SATURDAY	AM PEAK	PM PEAK	FRIDAY PM	AM PEAK			PM PEAK			FRIDAY		
						IN	OUT		IN	OUT		IN	OUT											In	Out	TOTAL	In	Out	TOTAL	In	Out	TOTAL
210	Single Dwelling Units	Single Dwelling Units		826	1 D/Unit	1,00	25%	75%	1,00	70%	30%				10%	70%	15%	77,1%				**0,23**	**0,23**		47	142	**190**	133	57	**190**			**0**
220	Apartments & Flats	Apartments & Flats		93	1 D/Unit	0,65	25%	75%	0,65	70%	30%				15%	50%	15%	63,9%				**0,23**	**0,23**		5	16	**22**	15	7	**22**			**0**
231	Townhouses (Simplex/Duplex)	Townhouses (Simplex/Duplex)		20	1 D/Unit	0,85	25%	75%	0,85	70%	30%				15%	50%	15%	63,9%				**0,31**	**0,31**		2	5	**6**	4	2	**6**			**0**
520	Public Primary School	Public Primary School		1 500	1 Student	0,85	50%	50%	0,30	50%	50%				30%	80%	15%	88,1%				**0,10**	**0,04**		76	76	**152**	27	27	**54**			**0**
560	Places of Public Worship (Wknd)	Places of Public Worship (Wknd)		5 000	1 Seat	0,05	55%	45%	0,05	50%	50%				10%	80%	15%	84,7%				**0,01**	**0,01**		21	17	**38**	19	19	**38**			**0**
565	Pre-School (Day Care Centre)	Pre-School (Day Care Centre)		500	1 Student	1,00	50%	50%	0,80	50%	50%				5%	80%	15%	83,9%				**0,16**	**0,13**		40	40	**81**	32	32	**65**			**0**
820	Shopping Centre	Shopping Centre	3044,00	30	100m² GLA	0,60	65%	35%				3,40	50%	50%	10%	60%	15%	69,4%	2,525	14,311	18,941	**0,77**		**4,38**	15	8	**24**				67	67	**133**
																TOTAL DEVELOPMENT GENERATED TRIPS:							**207**	**305**	**512**	**230**	**143**	**374**	**67**	**67**	**133**

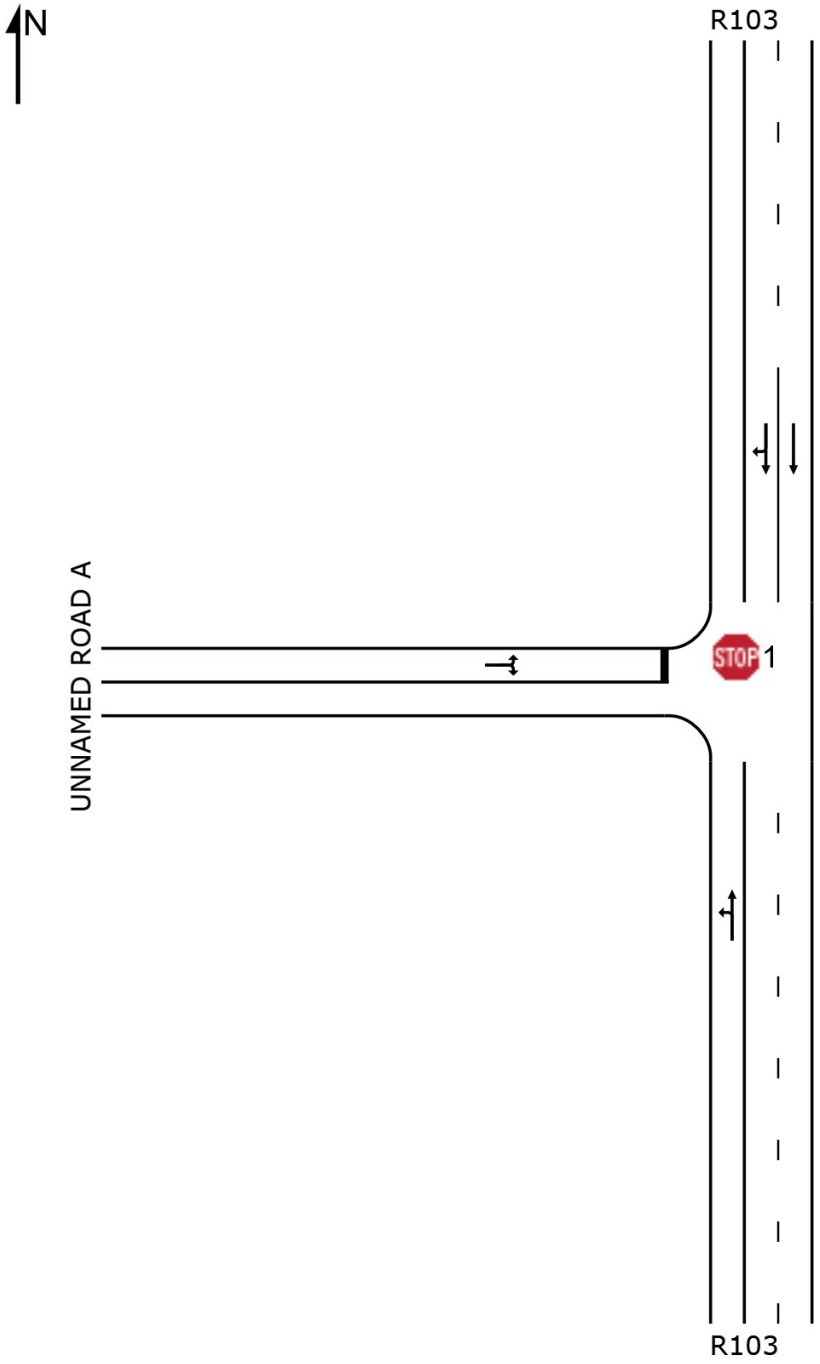
Annexure D

- Detailed SIDRA Analysis Output

INTERSECTION 1

Site: 1 [2019 AM Peak Hour]

1.R103 AND UNNAMED ROAD A - 2019 AM Peak Hour
Stop (Two-Way)



LANE LEVEL OF SERVICE

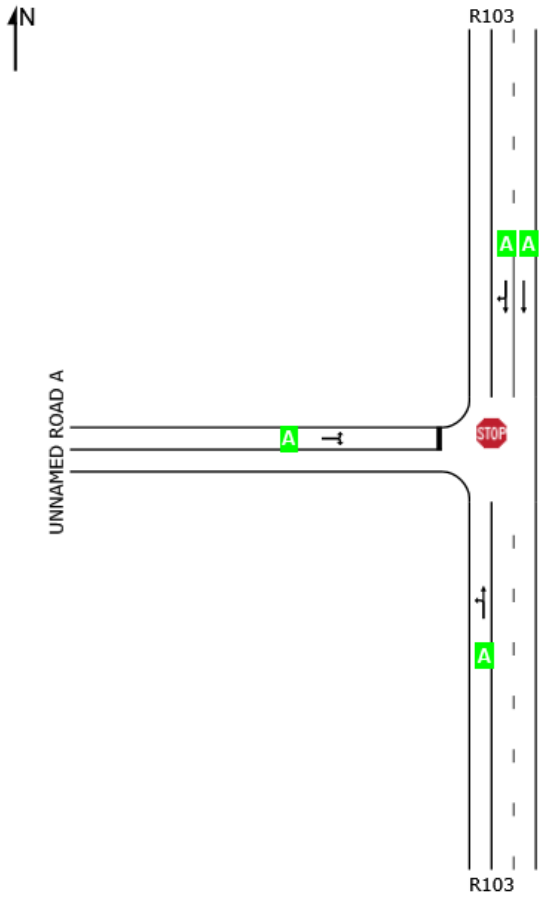
Lane Level of Service

Site: 1 [2019 AM Peak Hour]

1.R103 AND UNNAMED ROAD A - 2019 AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



LANE LEVEL OF SERVICE

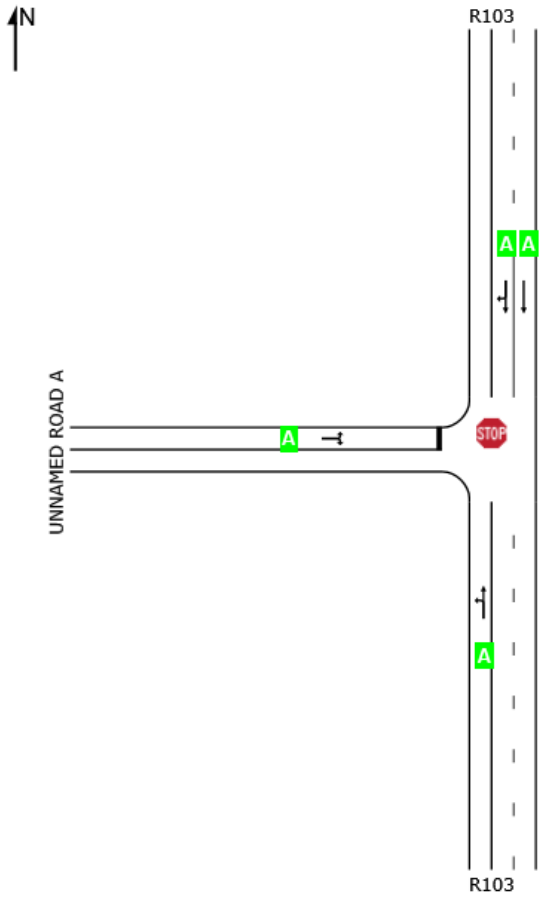
Lane Level of Service

Site: 1 [2019 PM Peak Hour]

1.R103 AND UNNAMED ROAD A - 2019 PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



MOVEMENT SUMMARY

Site: 1 [2019 AM Peak Hour]

1.R103 AND UNNAMED ROAD A - 2019 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1	L2	1	0,0	0,058	5,5	LOS A	0,0	0,0	0,00	0,01	58,3
2	T1	112	0,0	0,058	0,0	LOS A	0,0	0,0	0,00	0,01	59,9
Approach		113	0,0	0,058	0,1	NA	0,0	0,0	0,00	0,01	59,9
North: R103											
8	T1	107	0,0	0,029	0,0	LOS A	0,0	0,2	0,02	0,03	59,7
9	R2	5	0,0	0,029	5,8	LOS A	0,0	0,2	0,05	0,06	57,1
Approach		113	0,0	0,029	0,3	NA	0,0	0,2	0,02	0,03	59,5
West: UNNAMED ROAD A											
10	L2	1	0,0	0,002	8,4	LOS A	0,0	0,0	0,26	0,84	51,7
12	R2	1	0,0	0,002	8,8	LOS A	0,0	0,0	0,26	0,84	51,2
Approach		2	0,0	0,002	8,6	LOS A	0,0	0,0	0,26	0,84	51,4
All Vehicles		227	0,0	0,058	0,3	NA	0,0	0,2	0,01	0,02	59,6

MOVEMENT SUMMARY

Site: 1 [2019 PM Peak Hour]

1.R103 AND UNNAMED ROAD A - 2019 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1	L2	1	0,0	0,062	5,5	LOS A	0,0	0,0	0,00	0,01	58,3
2	T1	119	0,0	0,062	0,0	LOS A	0,0	0,0	0,00	0,01	59,9
Approach		120	0,0	0,062	0,1	NA	0,0	0,0	0,00	0,01	59,9
North: R103											
8	T1	159	0,0	0,042	0,0	LOS A	0,0	0,2	0,02	0,02	59,8
9	R2	5	0,0	0,042	5,8	LOS A	0,0	0,2	0,03	0,04	57,3
Approach		164	0,0	0,042	0,2	NA	0,0	0,2	0,02	0,02	59,7
West: UNNAMED ROAD A											
10	L2	1	0,0	0,002	8,4	LOS A	0,0	0,0	0,27	0,84	51,5
12	R2	1	0,0	0,002	9,2	LOS A	0,0	0,0	0,27	0,84	51,1
Approach		2	0,0	0,002	8,8	LOS A	0,0	0,0	0,27	0,84	51,3
All Vehicles		286	0,0	0,062	0,2	NA	0,0	0,2	0,01	0,02	59,7

LANE LEVEL OF SERVICE

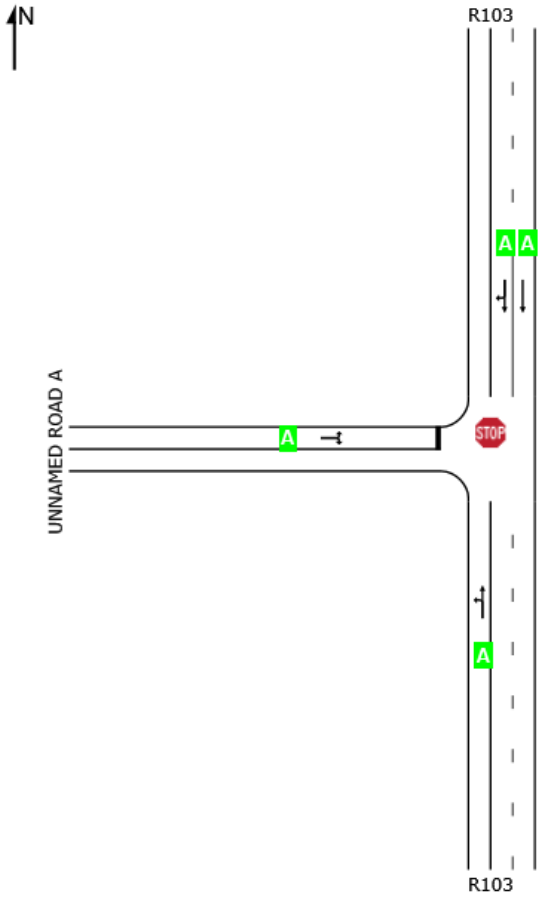
Lane Level of Service

Site: 1 [2024 Background AM Peak Hour]

1.R103 AND UNNAMED ROAD A -2024 Background AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



LANE LEVEL OF SERVICE

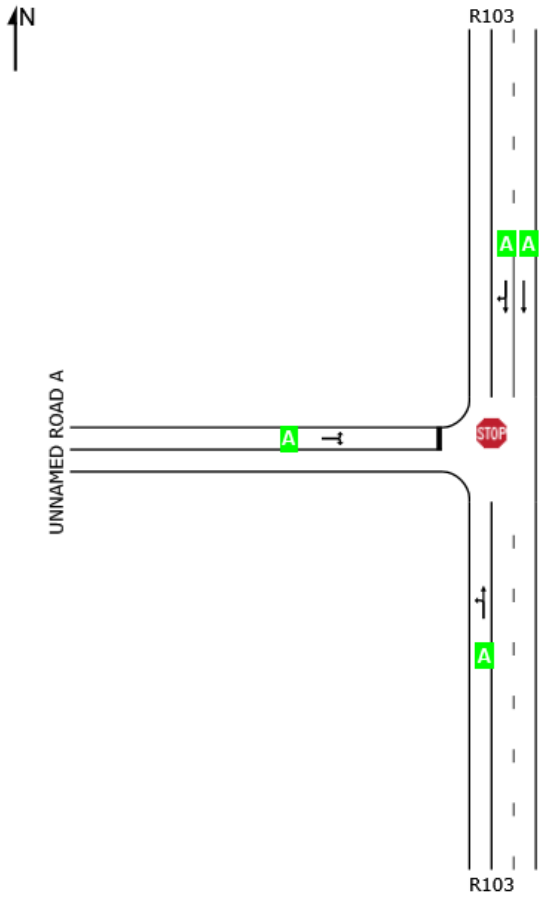
Lane Level of Service

Site: 1 [2024 Background PM Peak Hour]

1.R103 AND UNNAMED ROAD A - 2024 Background PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



MOVEMENT SUMMARY

Site: 1 [2024 Background AM Peak Hour]

1.R103 AND UNNAMED ROAD A -2024 Background AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1	L2	1	0,0	0,099	5,5	LOS A	0,0	0,0	0,00	0,00	58,3
2	T1	193	0,0	0,099	0,0	LOS A	0,0	0,0	0,00	0,00	60,0
Approach		194	0,0	0,099	0,0	NA	0,0	0,0	0,00	0,00	59,9
North: R103											
8	T1	211	0,0	0,060	0,1	LOS A	0,1	0,6	0,05	0,04	59,4
9	R2	17	0,0	0,060	6,1	LOS A	0,1	0,6	0,10	0,09	56,6
Approach		227	0,0	0,060	0,5	NA	0,1	0,6	0,05	0,04	59,2
West: UNNAMED ROAD A											
10	L2	7	0,0	0,008	8,7	LOS A	0,0	0,2	0,30	0,84	51,5
12	R2	1	0,0	0,008	10,4	LOS B	0,0	0,2	0,30	0,84	51,0
Approach		8	0,0	0,008	8,9	LOS A	0,0	0,2	0,30	0,84	51,5
All Vehicles		429	0,0	0,099	0,5	NA	0,1	0,6	0,03	0,04	59,4

MOVEMENT SUMMARY

Site: 1 [2024 Background PM Peak Hour]

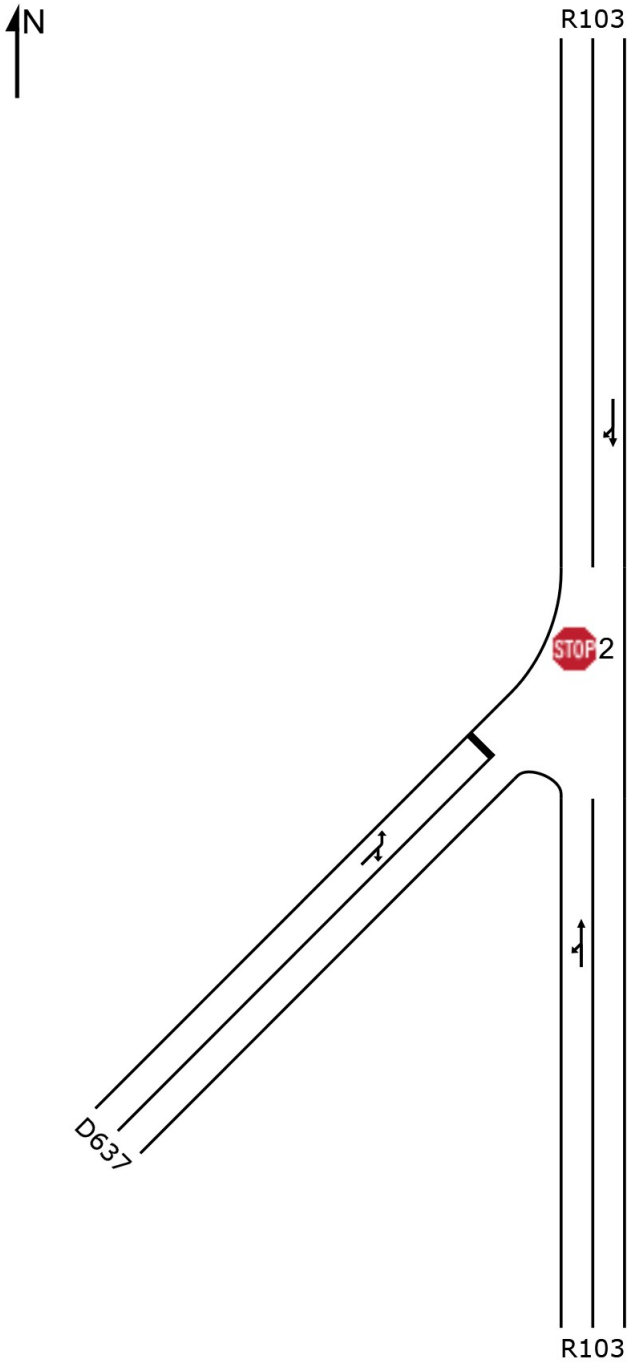
1.R103 AND UNNAMED ROAD A - 2024 Background PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1	L2	1	0,0	0,111	5,6	LOS A	0,0	0,0	0,00	0,00	58,3
2	T1	215	0,0	0,111	0,0	LOS A	0,0	0,0	0,00	0,00	60,0
Approach		216	0,0	0,111	0,0	NA	0,0	0,0	0,00	0,00	59,9
North: R103											
8	T1	247	0,0	0,068	0,1	LOS A	0,1	0,5	0,04	0,03	59,6
9	R2	14	0,0	0,068	6,1	LOS A	0,1	0,5	0,08	0,07	56,9
Approach		261	0,0	0,068	0,4	NA	0,1	0,5	0,04	0,03	59,4
West: UNNAMED ROAD A											
10	L2	11	0,0	0,011	8,8	LOS A	0,0	0,2	0,32	0,84	51,5
12	R2	1	0,0	0,011	11,0	LOS B	0,0	0,2	0,32	0,84	51,0
Approach		12	0,0	0,011	9,0	LOS A	0,0	0,2	0,32	0,84	51,5
All Vehicles		488	0,0	0,111	0,4	NA	0,1	0,5	0,03	0,04	59,4

SITE LAYOUT

Site: 2 [2019 AM Peak Hour]

1.R103 AND D637 -2019 AM Peak Hour
Stop (Two-Way)



LANE LEVEL OF SERVICE

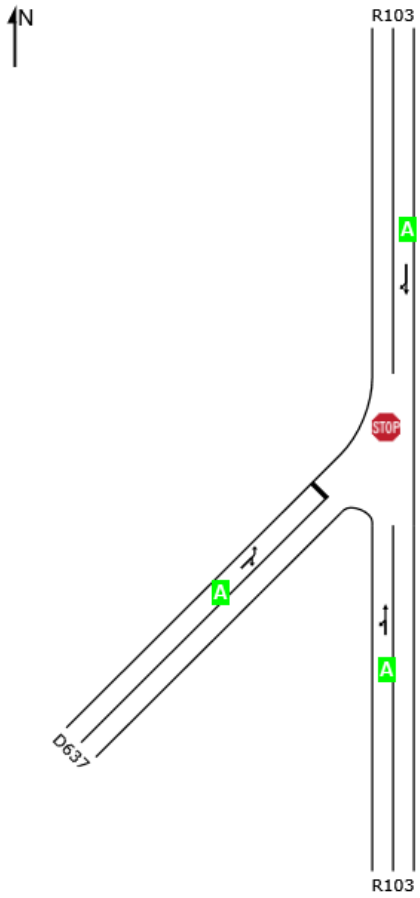
Lane Level of Service

Site: 2 [2019 AM Peak Hour]

1.R103 AND D637 -2019 AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	Southwest	Intersection
LOS	NA	NA	A	NA



LANE LEVEL OF SERVICE

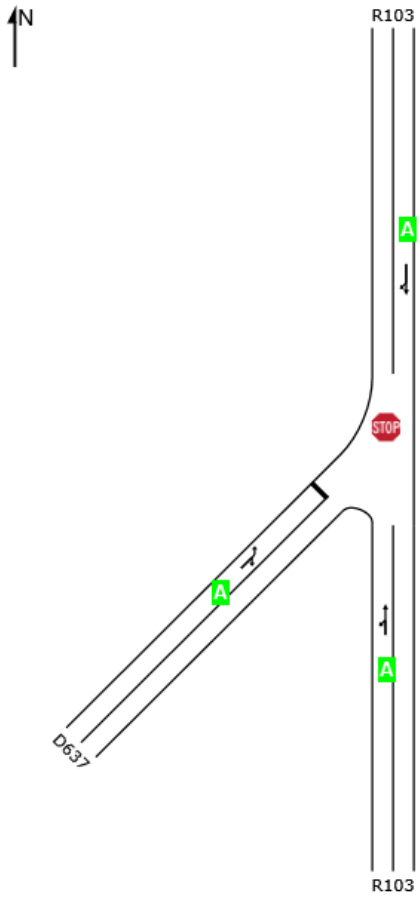
Lane Level of Service

Site: 2 [2019 PM Peak Hour]

1.R103 AND D637 -2019 AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	Southwest	Intersection
LOS	NA	NA	A	NA



MOVEMENT SUMMARY

Site: 2 [2019 AM Peak Hour]

1.R103 AND D637 -2019 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1b	L3	1	0,0	0,074	6,5	LOS A	0,0	0,0	0,00	0,01	58,8
2	T1	143	0,0	0,074	0,0	LOS A	0,0	0,0	0,00	0,01	59,9
Approach		144	0,0	0,074	0,1	NA	0,0	0,0	0,00	0,01	59,9
North: R103											
8	T1	118	0,0	0,061	0,0	LOS A	0,0	0,0	0,01	0,00	59,9
9a	R1	1	0,0	0,061	5,0	LOS A	0,0	0,0	0,01	0,00	58,3
Approach		119	0,0	0,061	0,0	NA	0,0	0,0	0,01	0,00	59,9
SouthWest: D637											
30a	L1	1	0,0	0,002	7,9	LOS A	0,0	0,0	0,26	0,85	51,3
32b	R3	1	0,0	0,002	8,9	LOS A	0,0	0,0	0,26	0,85	51,2
Approach		2	0,0	0,002	8,4	LOS A	0,0	0,0	0,26	0,85	51,3
All Vehicles		265	0,0	0,074	0,1	NA	0,0	0,0	0,00	0,01	59,8

MOVEMENT SUMMARY

Site: 2 [2019 PM Peak Hour]

1.R103 AND D637 -2019 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1b	L3	1	0,0	0,074	6,5	LOS A	0,0	0,0	0,00	0,01	58,8
2	T1	143	0,0	0,074	0,0	LOS A	0,0	0,0	0,00	0,01	59,9
Approach		144	0,0	0,074	0,1	NA	0,0	0,0	0,00	0,01	59,9
North: R103											
8	T1	118	0,0	0,061	0,0	LOS A	0,0	0,0	0,01	0,00	59,9
9a	R1	1	0,0	0,061	5,0	LOS A	0,0	0,0	0,01	0,00	58,3
Approach		119	0,0	0,061	0,0	NA	0,0	0,0	0,01	0,00	59,9
SouthWest: D637											
30a	L1	1	0,0	0,002	7,9	LOS A	0,0	0,0	0,26	0,85	51,3
32b	R3	1	0,0	0,002	8,9	LOS A	0,0	0,0	0,26	0,85	51,2
Approach		2	0,0	0,002	8,4	LOS A	0,0	0,0	0,26	0,85	51,3
All Vehicles		265	0,0	0,074	0,1	NA	0,0	0,0	0,00	0,01	59,8

LANE LEVEL OF SERVICE

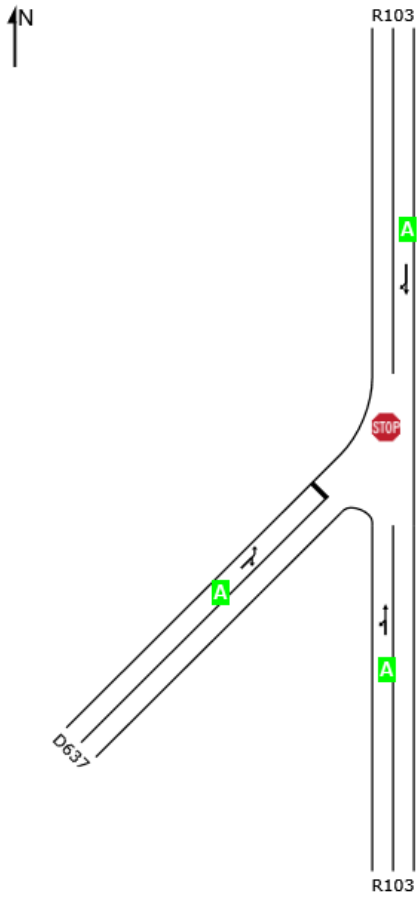
Lane Level of Service

Site: 2 [2024 Background AM Peak Hour]

1.R103 AND D637 -2024 Background AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	Southwest	Intersection
LOS	NA	NA	A	NA



LANE LEVEL OF SERVICE

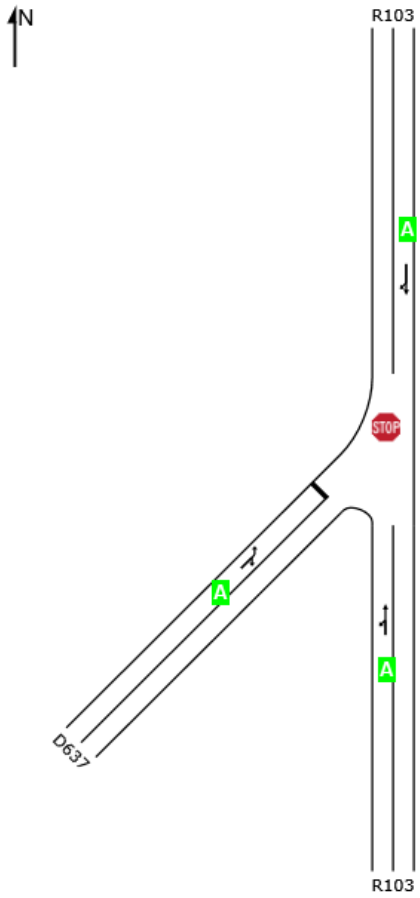
Lane Level of Service

Site: 2 [2024 Background PM Peak Hour]

1.R103 AND D637 -2024 Background PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	Southwest	Intersection
LOS	NA	NA	A	NA



MOVEMENT SUMMARY

Site: 2 [2024 Background AM Peak Hour]

1.R103 AND D637 -2024 Background AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1b	L3	58	0,0	0,130	6,5	LOS A	0,0	0,0	0,00	0,16	57,4
2	T1	183	0,0	0,130	0,0	LOS A	0,0	0,0	0,00	0,16	58,5
Approach		241	0,0	0,130	1,6	NA	0,0	0,0	0,00	0,16	58,2
North: R103											
8	T1	151	0,0	0,140	0,5	LOS A	0,4	3,1	0,27	0,21	57,3
9a	R1	91	0,0	0,140	5,4	LOS A	0,4	3,1	0,27	0,21	55,8
Approach		241	0,0	0,140	2,4	NA	0,4	3,1	0,27	0,21	56,7
SouthWest: D637											
30a	L1	100	0,0	0,205	8,2	LOS A	0,6	4,1	0,36	0,92	50,8
32b	R3	88	0,0	0,205	10,6	LOS B	0,6	4,1	0,36	0,92	50,7
Approach		188	0,0	0,205	9,3	LOS A	0,6	4,1	0,36	0,92	50,7
All Vehicles		671	0,0	0,205	4,0	NA	0,6	4,1	0,20	0,39	55,4

MOVEMENT SUMMARY

Site: 2 [2024 Background PM Peak Hour]

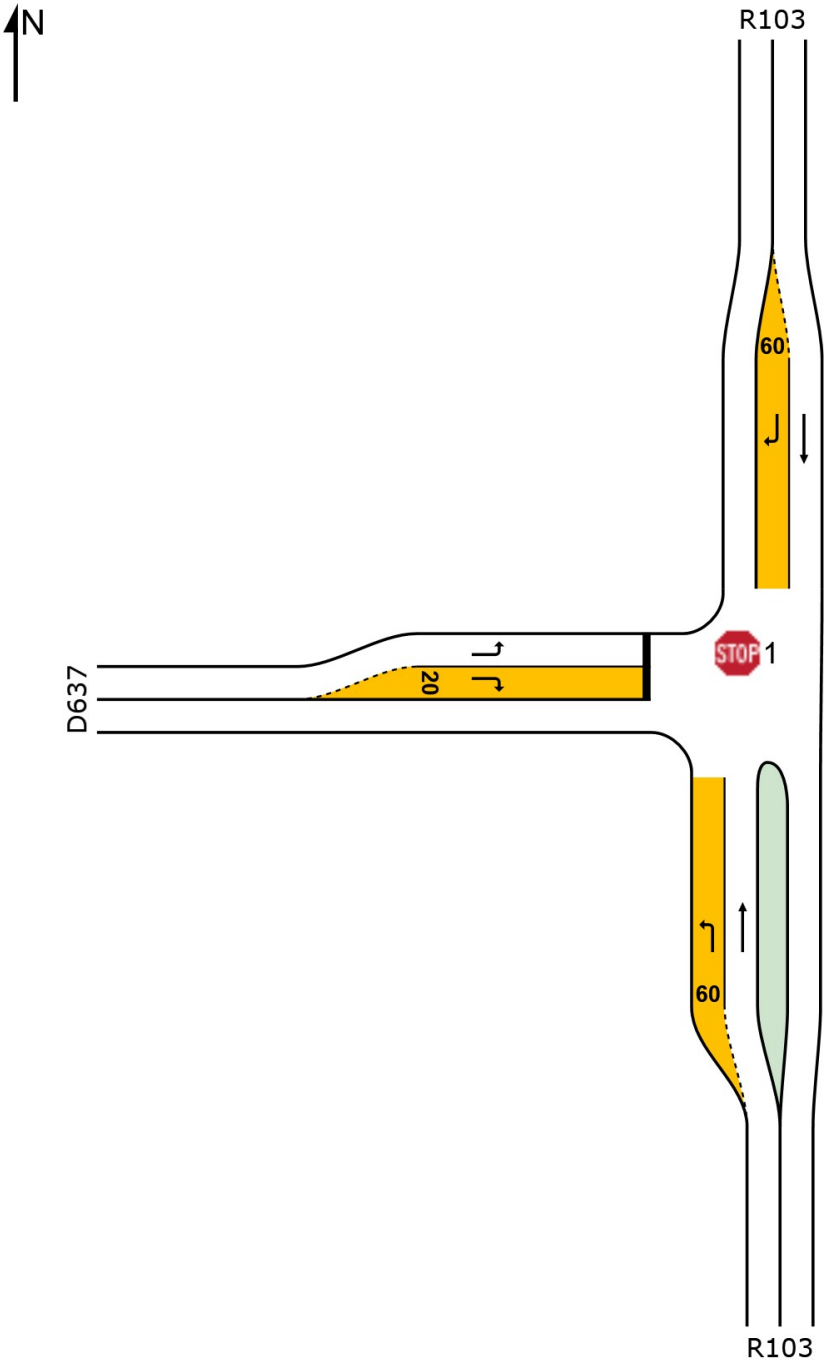
1.R103 AND D637 -2024 Background PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1b	L3	52	0,0	0,109	6,5	LOS A	0,0	0,0	0,00	0,17	57,3
2	T1	152	0,0	0,109	0,0	LOS A	0,0	0,0	0,00	0,17	58,4
Approach		203	0,0	0,109	1,7	NA	0,0	0,0	0,00	0,17	58,1
North: R103											
8	T1	220	0,0	0,179	0,4	LOS A	0,5	3,5	0,22	0,17	57,8
9a	R1	98	0,0	0,179	5,3	LOS A	0,5	3,5	0,22	0,17	56,2
Approach		318	0,0	0,179	1,9	NA	0,5	3,5	0,22	0,17	57,3
SouthWest: D637											
30a	L1	57	0,0	0,130	8,0	LOS A	0,3	2,4	0,32	0,92	50,7
32b	R3	58	0,0	0,130	10,8	LOS B	0,3	2,4	0,32	0,92	50,6
Approach		115	0,0	0,130	9,4	LOS A	0,3	2,4	0,32	0,92	50,6
All Vehicles		636	0,0	0,179	3,2	NA	0,5	3,5	0,17	0,31	56,2

SITE LAYOUT

Site: 1 [2024 Background AM Peak Hour - WITH UPGRADES]

1.R103 AND D637 -2024 Background PM Peak Hour
Stop (Two-Way)



LANE LEVEL OF SERVICE

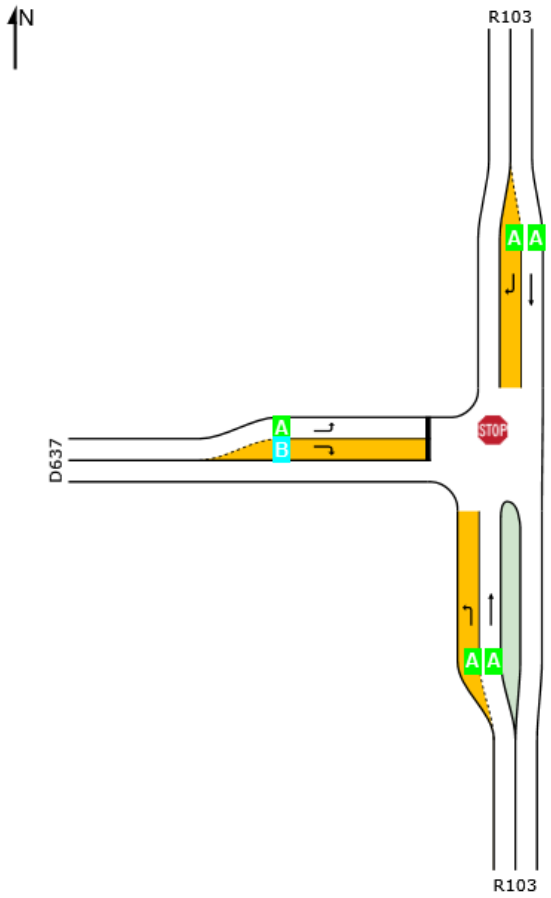
Lane Level of Service

Site: 1 [2024 Background AM Peak Hour - WITH UPGRADES]

1.R103 AND D637 -2024 Background PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	B	NA



LANE LEVEL OF SERVICE

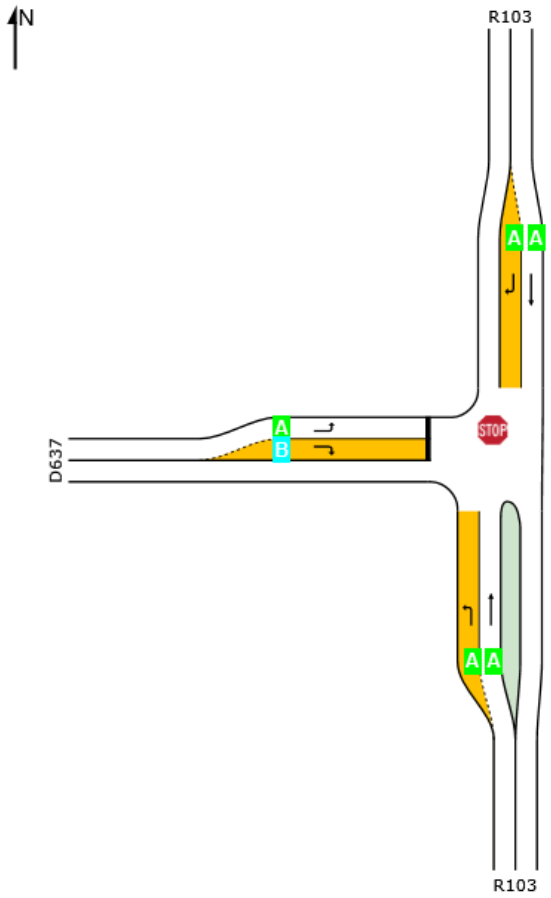
Lane Level of Service

Site: 1 [2024 Background PM Peak Hour -WITH UPGRADES]

1.R103 AND D637 -2024 Background PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	B	NA



MOVEMENT SUMMARY

Site: 1 [2024 Background AM Peak Hour - WITH UPGRADES]

1.R103 AND D637 -2024 Background PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1	L2	58	0,0	0,031	5,5	LOS A	0,0	0,0	0,00	0,58	53,6
2	T1	183	0,0	0,094	0,0	LOS A	0,0	0,0	0,00	0,00	60,0
Approach		241	0,0	0,094	1,3	NA	0,0	0,0	0,00	0,14	58,3
North: R103											
8	T1	151	0,0	0,077	0,0	LOS A	0,0	0,0	0,00	0,00	60,0
9	R2	91	0,0	0,079	6,5	LOS A	0,2	1,6	0,34	0,60	52,4
Approach		241	0,0	0,079	2,4	NA	0,2	1,6	0,13	0,22	56,9
West: D637											
10	L2	100	0,0	0,101	9,0	LOS A	0,3	1,9	0,30	0,88	51,5
12	R2	88	0,0	0,166	12,5	LOS B	0,5	3,3	0,55	0,97	49,2
Approach		188	0,0	0,166	10,6	LOS B	0,5	3,3	0,42	0,92	50,4
All Vehicles		671	0,0	0,166	4,3	NA	0,5	3,3	0,16	0,39	55,4

MOVEMENT SUMMARY

Site: 1 [2024 Background PM Peak Hour -WITH UPGRADES]

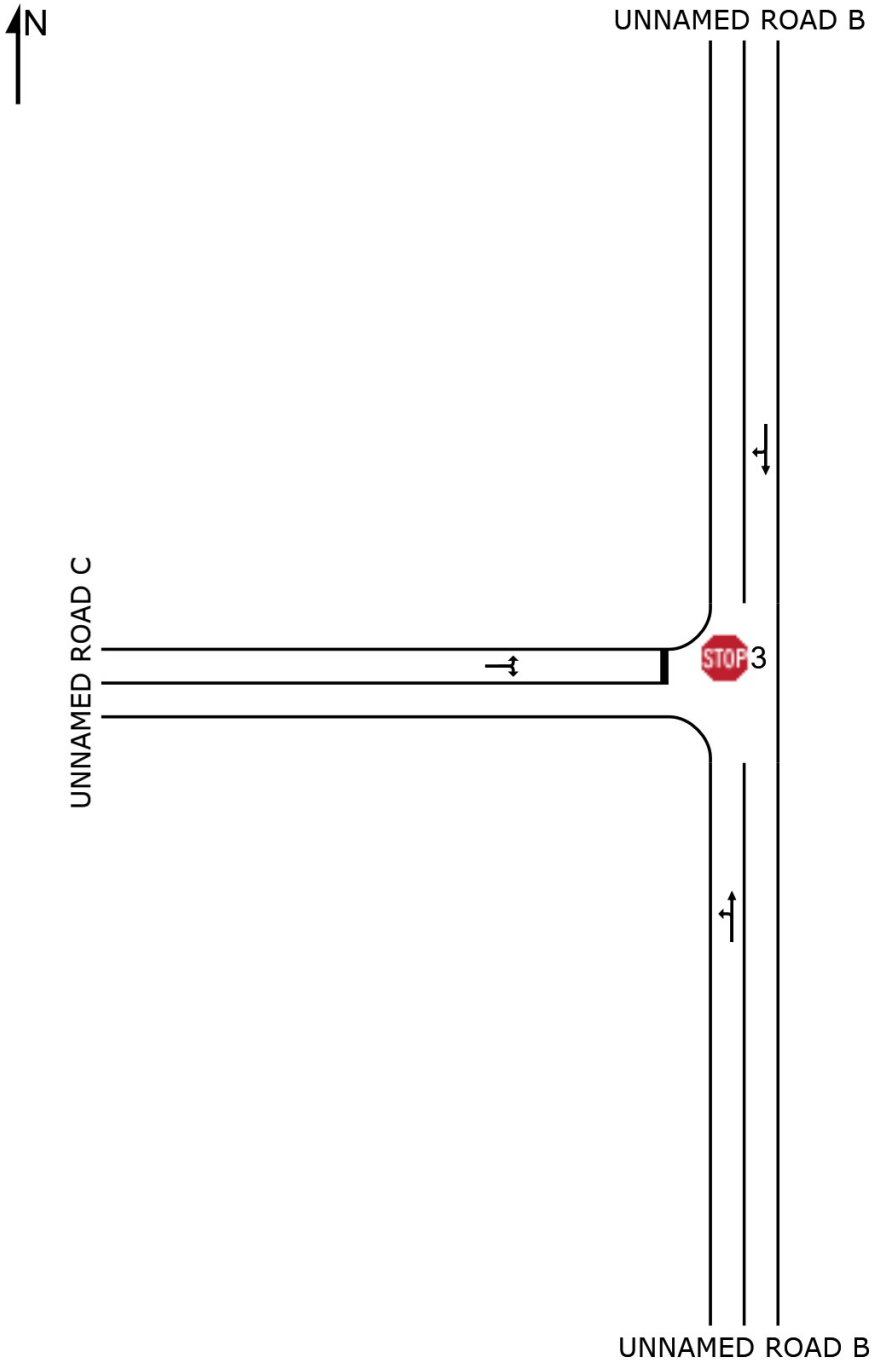
1.R103 AND D637 -2024 Background PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: R103											
1	L2	52	0,0	0,028	5,5	LOS A	0,0	0,0	0,00	0,58	53,6
2	T1	152	0,0	0,078	0,0	LOS A	0,0	0,0	0,00	0,00	60,0
Approach		203	0,0	0,078	1,4	NA	0,0	0,0	0,00	0,15	58,2
North: R103											
8	T1	220	0,0	0,113	0,0	LOS A	0,0	0,0	0,00	0,00	60,0
9	R2	98	0,0	0,083	6,3	LOS A	0,2	1,7	0,31	0,59	52,5
Approach		318	0,0	0,113	2,0	NA	0,2	1,7	0,10	0,18	57,5
West: D637											
10	L2	57	0,0	0,055	8,7	LOS A	0,1	1,0	0,26	0,88	51,6
12	R2	58	0,0	0,116	12,9	LOS B	0,3	2,2	0,56	0,97	48,9
Approach		115	0,0	0,116	10,8	LOS B	0,3	2,2	0,41	0,92	50,2
All Vehicles		636	0,0	0,116	3,4	NA	0,3	2,2	0,12	0,30	56,2

INTERSECTION 3

Site: 3 [2019 AM Peak Hour]

3.UNNAMED ROAD B AND UNNAMED ROAD C - 2019 AM Peak Hour
Stop (Two-Way)



LANE LEVEL OF SERVICE

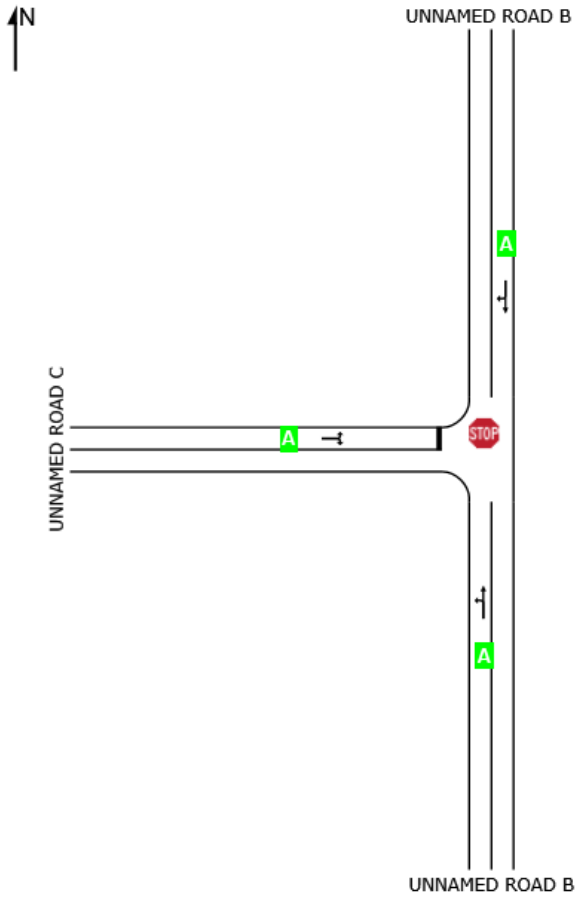
Lane Level of Service

Site: 3 [2019 AM Peak Hour]

3.UNNAMED ROAD B AND UNNAMED ROAD C - 2019 AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



LANE LEVEL OF SERVICE

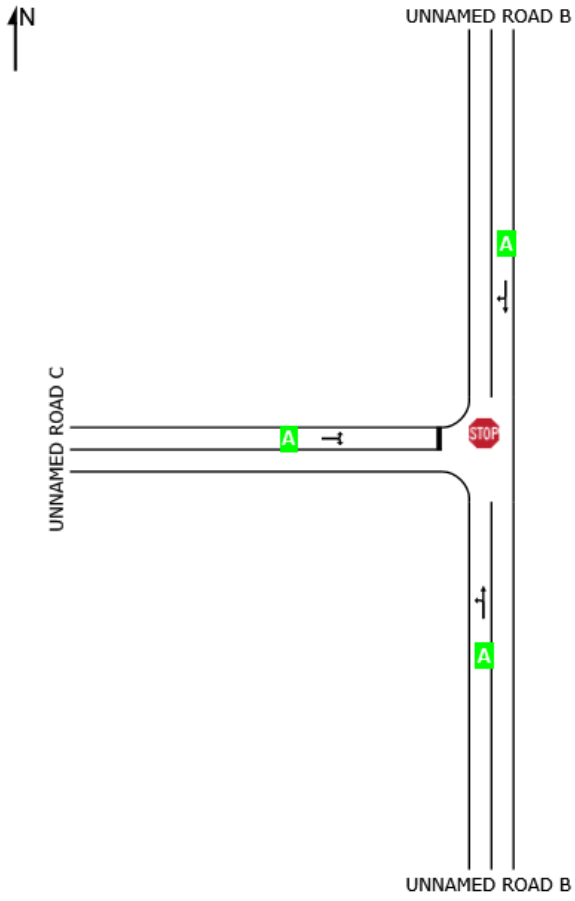
Lane Level of Service

Site: 3 [2019 PM Peak Hour]

3.UNNAMED ROAD B AND UNNAMED ROAD C - 2019 PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



MOVEMENT SUMMARY

Site: 3 [2019 AM Peak Hour]

3.UNNAMED ROAD B AND UNNAMED ROAD C - 2019 AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: UNNAMED ROAD B											
1	L2	1	0,0	0,003	5,5	LOS A	0,0	0,0	0,00	0,12	57,3
2	T1	4	0,0	0,003	0,0	LOS A	0,0	0,0	0,00	0,12	58,9
Approach		5	0,0	0,003	1,1	NA	0,0	0,0	0,00	0,12	58,6
North: UNNAMED ROAD B											
8	T1	2	0,0	0,004	0,0	LOS A	0,0	0,1	0,03	0,42	56,3
9	R2	5	0,0	0,004	5,5	LOS A	0,0	0,1	0,03	0,42	54,3
Approach		7	0,0	0,004	3,9	NA	0,0	0,1	0,03	0,42	54,8
West: UNNAMED ROAD C											
10	L2	8	0,0	0,007	8,0	LOS A	0,0	0,1	0,03	0,97	51,8
12	R2	1	0,0	0,007	7,5	LOS A	0,0	0,1	0,03	0,97	51,3
Approach		9	0,0	0,007	8,0	LOS A	0,0	0,1	0,03	0,97	51,7
All Vehicles		22	0,0	0,007	5,0	NA	0,0	0,1	0,02	0,59	54,3

MOVEMENT SUMMARY

Site: 3 [2019 PM Peak Hour]

3.UNNAMED ROAD B AND UNNAMED ROAD C - 2019 PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: UNNAMED ROAD B											
1	L2	1	0,0	0,003	5,5	LOS A	0,0	0,0	0,00	0,10	57,5
2	T1	5	0,0	0,003	0,0	LOS A	0,0	0,0	0,00	0,10	59,1
Approach		6	0,0	0,003	0,9	NA	0,0	0,0	0,00	0,10	58,8
North: UNNAMED ROAD B											
8	T1	6	0,0	0,007	0,0	LOS A	0,0	0,2	0,03	0,32	57,1
9	R2	7	0,0	0,007	5,5	LOS A	0,0	0,2	0,03	0,32	55,1
Approach		14	0,0	0,007	2,9	NA	0,0	0,2	0,03	0,32	56,0
West: UNNAMED ROAD C											
10	L2	2	0,0	0,004	8,0	LOS A	0,0	0,1	0,04	0,97	52,0
12	R2	3	0,0	0,004	7,5	LOS A	0,0	0,1	0,04	0,97	51,5
Approach		5	0,0	0,004	7,7	LOS A	0,0	0,1	0,04	0,97	51,7
All Vehicles		25	0,0	0,007	3,4	NA	0,0	0,2	0,03	0,40	55,7

LANE LEVEL OF SERVICE

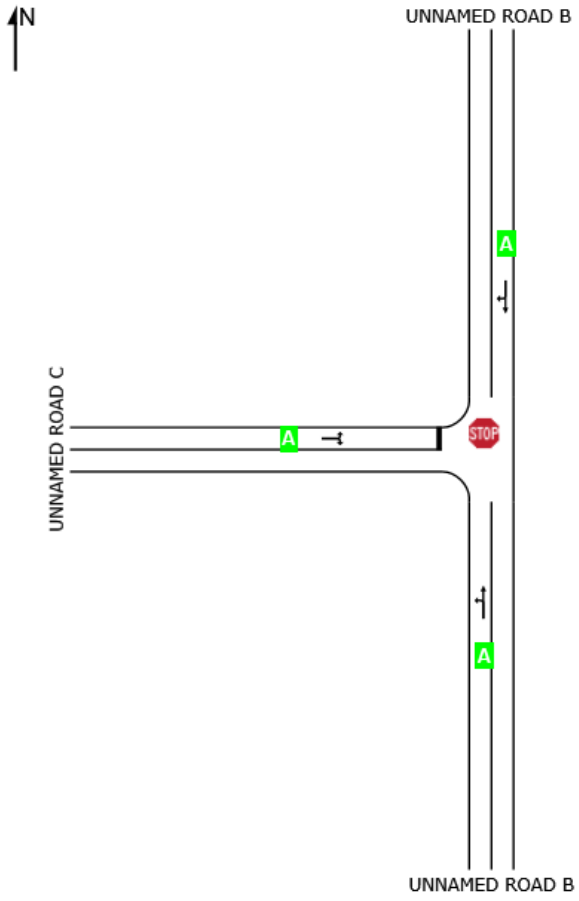
Lane Level of Service

Site: 3 [2024 Background AM Peak Hour]

3.UNNAMED ROAD E AND UNNAMED ROAD D -2024 Background AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



LANE LEVEL OF SERVICE

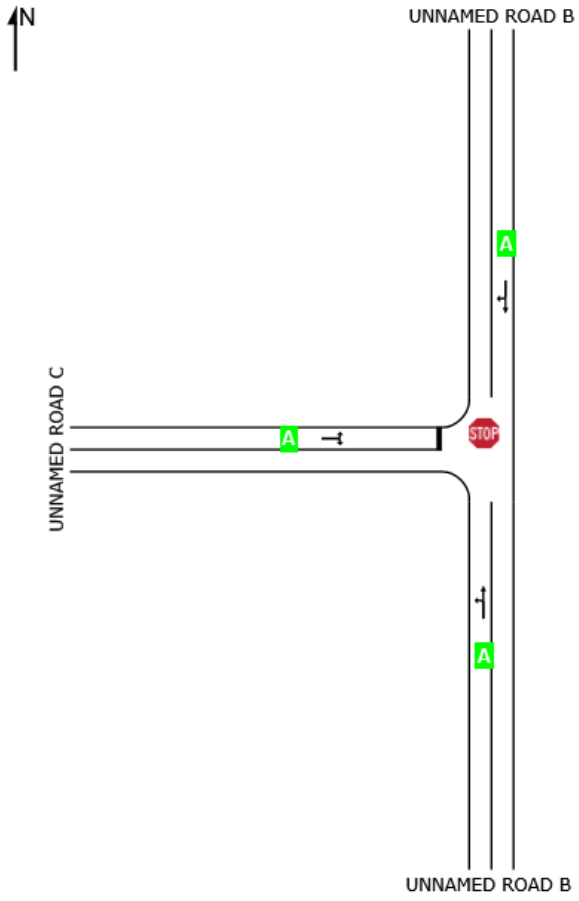
Lane Level of Service

Site: 3 [2024 Background PM Peak Hour]

3.UNNAMED ROAD B AND UNNAMED ROAD C - 2024 Background PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



MOVEMENT SUMMARY

Site: 3 [2024 Background AM Peak Hour]

3.UNNAMED ROAD E AND UNNAMED ROAD D -2024 Background AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: UNNAMED ROAD B											
1	L2	1	0,0	0,014	5,5	LOS A	0,0	0,0	0,00	0,02	58,2
2	T1	26	0,0	0,014	0,0	LOS A	0,0	0,0	0,00	0,02	59,8
Approach		27	0,0	0,014	0,2	NA	0,0	0,0	0,00	0,02	59,7
North: UNNAMED ROAD B											
8	T1	35	0,0	0,040	0,1	LOS A	0,1	0,9	0,08	0,30	57,0
9	R2	38	0,0	0,040	5,5	LOS A	0,1	0,9	0,08	0,30	55,0
Approach		73	0,0	0,040	2,9	NA	0,1	0,9	0,08	0,30	55,9
West: UNNAMED ROAD C											
10	L2	32	0,0	0,023	8,1	LOS A	0,1	0,5	0,09	0,93	51,8
12	R2	1	0,0	0,023	7,8	LOS A	0,1	0,5	0,09	0,93	51,3
Approach		33	0,0	0,023	8,1	LOS A	0,1	0,5	0,09	0,93	51,7
All Vehicles		133	0,0	0,040	3,6	NA	0,1	0,9	0,07	0,40	55,5

MOVEMENT SUMMARY

Site: 3 [2024 Background PM Peak Hour]

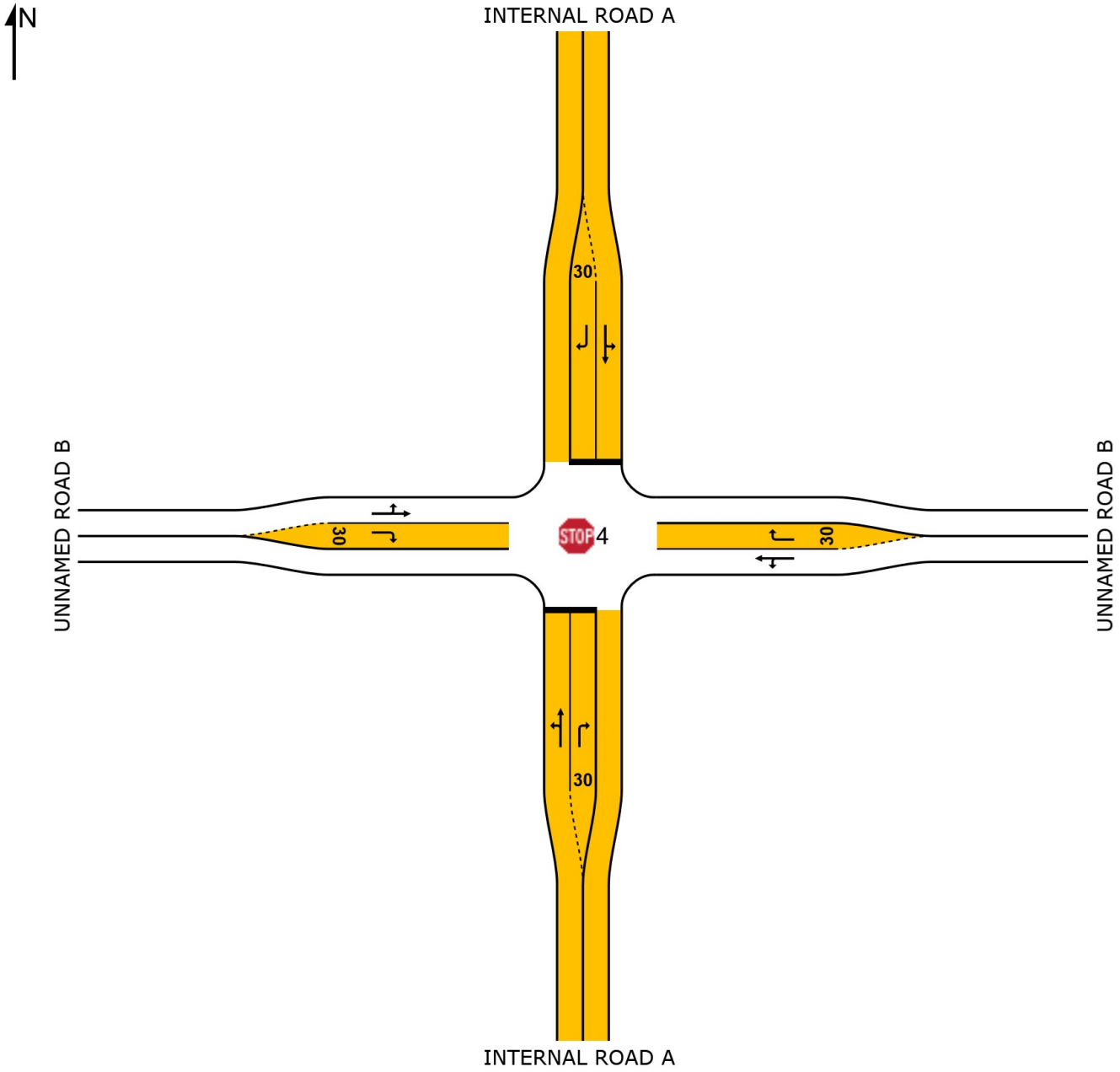
3.UNNAMED ROAD B AND UNNAMED ROAD C - 2024 Background PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: UNNAMED ROAD B											
1	L2	1	0,0	0,020	5,5	LOS A	0,0	0,0	0,00	0,02	58,2
2	T1	38	0,0	0,020	0,0	LOS A	0,0	0,0	0,00	0,02	59,8
Approach		39	0,0	0,020	0,2	NA	0,0	0,0	0,00	0,02	59,8
North: UNNAMED ROAD B											
8	T1	29	0,0	0,033	0,1	LOS A	0,1	0,7	0,10	0,29	57,0
9	R2	31	0,0	0,033	5,6	LOS A	0,1	0,7	0,10	0,29	55,0
Approach		60	0,0	0,033	2,9	NA	0,1	0,7	0,10	0,29	56,0
West: UNNAMED ROAD C											
10	L2	34	0,0	0,027	8,1	LOS A	0,1	0,5	0,11	0,92	51,8
12	R2	3	0,0	0,027	7,8	LOS A	0,1	0,5	0,11	0,92	51,3
Approach		37	0,0	0,027	8,1	LOS A	0,1	0,5	0,11	0,92	51,7
All Vehicles		136	0,0	0,033	3,5	NA	0,1	0,7	0,07	0,38	55,7

NEW INTERSECTION

Site: 4 [2024 Background AM Peak Hour]

4.UNNAMED ROAD B AND INTERNAL ROAD A - 2024 Background AM Peak Hour
Stop (Two-Way)



LANE LEVEL OF SERVICE

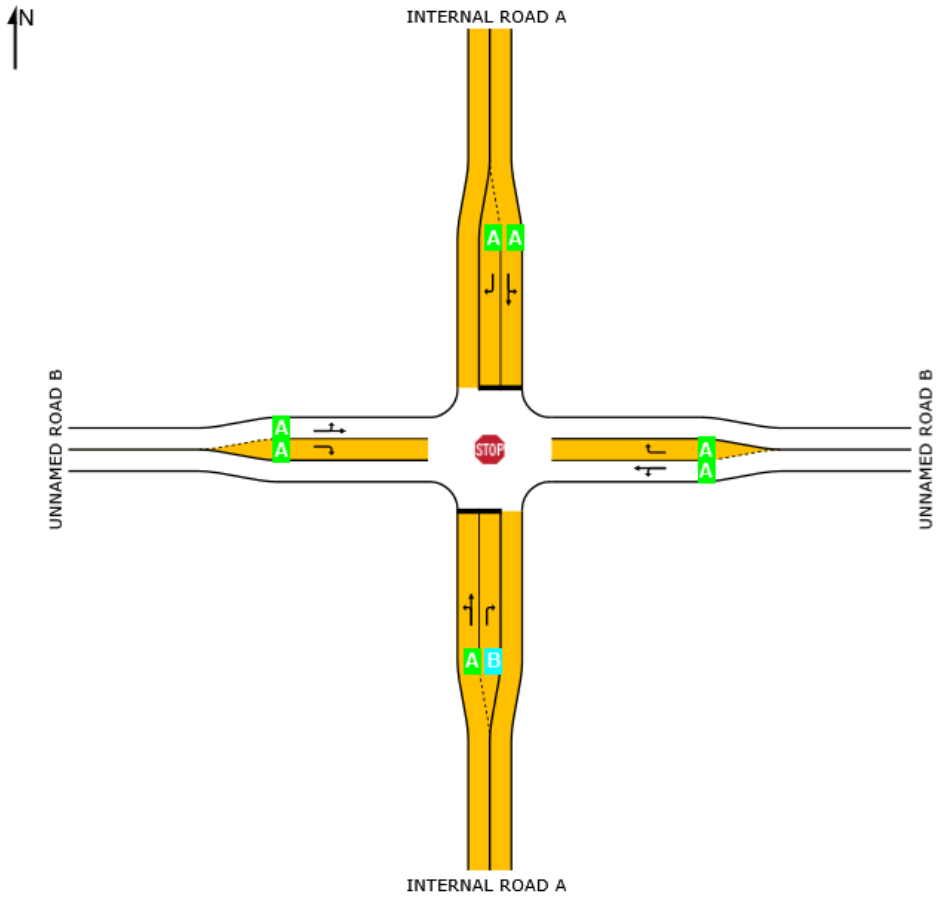
Lane Level of Service

Site: 4 [2024 Background AM Peak Hour]

4.UNNAMED ROAD B AND INTERNAL ROAD A - 2024 Background AM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	East	North	West	Intersection
LOS	B	NA	A	NA	NA



LANE LEVEL OF SERVICE

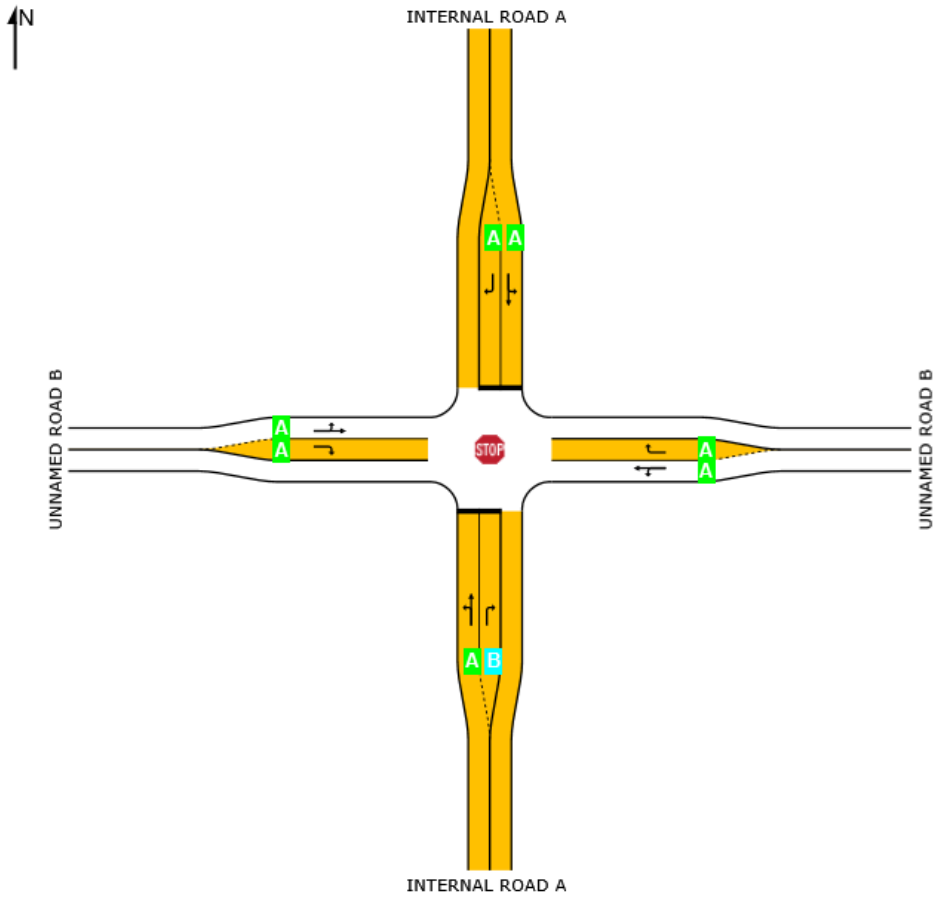
Lane Level of Service

Site: 4 [2024 Background PM Peak Hour]

4.UNNAMED ROAD B AND INTERNAL ROAD A - 2024 Background PM Peak Hour
Stop (Two-Way)

All Movement Classes

	South	East	North	West	Intersection
LOS	A	NA	A	NA	NA



MOVEMENT SUMMARY

Site: 4 [2024 Background AM Peak Hour]

4.UNNAMED ROAD B AND INTERNAL ROAD A - 2024 Background AM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: INTERNAL ROAD A											
1	L2	58	0,0	0,061	8,2	LOS A	0,2	1,2	0,12	0,92	51,7
2	T1	8	0,0	0,061	9,3	LOS A	0,2	1,2	0,12	0,92	51,6
3	R2	238	0,0	0,353	10,5	LOS B	1,3	9,3	0,47	0,91	50,4
Approach		304	0,0	0,353	10,1	LOS B	1,3	9,3	0,39	0,91	50,7
East: UNNAMED ROAD B											
4	L2	161	0,0	0,106	5,6	LOS A	0,0	0,0	0,00	0,47	54,5
5	T1	38	0,0	0,106	0,0	LOS A	0,0	0,0	0,00	0,47	55,9
6	R2	4	0,0	0,002	5,6	LOS A	0,0	0,1	0,08	0,55	53,2
Approach		203	0,0	0,106	4,5	NA	0,0	0,1	0,00	0,47	54,7
North: INTERNAL ROAD A											
7	L2	6	0,0	0,023	8,1	LOS A	0,1	0,5	0,10	0,95	50,9
8	T1	13	0,0	0,023	9,9	LOS A	0,1	0,5	0,10	0,95	50,8
9	R2	6	0,0	0,009	9,2	LOS A	0,0	0,2	0,32	0,84	51,1
Approach		25	0,0	0,023	9,3	LOS A	0,1	0,5	0,15	0,92	50,9
West: UNNAMED ROAD B											
10	L2	4	0,0	0,010	5,5	LOS A	0,0	0,0	0,00	0,13	57,3
11	T1	16	0,0	0,010	0,0	LOS A	0,0	0,0	0,00	0,13	58,9
12	R2	39	0,0	0,026	6,1	LOS A	0,1	0,6	0,30	0,55	52,5
Approach		59	0,0	0,026	4,4	NA	0,1	0,6	0,20	0,41	54,4
All Vehicles		592	0,0	0,353	7,6	NA	1,3	9,3	0,23	0,71	52,4

MOVEMENT SUMMARY

Site: 4 [2024 Background PM Peak Hour]

4.UNNAMED ROAD B AND INTERNAL ROAD A - 2024 Background PM Peak Hour
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: INTERNAL ROAD A											
1	L2	31	0,0	0,086	8,1	LOS A	0,3	1,8	0,06	0,97	51,2
2	T1	47	0,0	0,086	9,5	LOS A	0,3	1,8	0,06	0,97	51,1
3	R2	124	0,0	0,194	10,5	LOS B	0,6	4,2	0,44	0,91	50,4
Approach		202	0,0	0,194	9,9	LOS A	0,6	4,2	0,30	0,93	50,7
East: UNNAMED ROAD B											
4	L2	175	0,0	0,099	5,6	LOS A	0,0	0,0	0,00	0,55	53,8
5	T1	9	0,0	0,099	0,0	LOS A	0,0	0,0	0,00	0,55	55,2
6	R2	28	0,0	0,016	5,6	LOS A	0,1	0,4	0,09	0,55	53,1
Approach		213	0,0	0,099	5,3	NA	0,1	0,4	0,01	0,55	53,8
North: INTERNAL ROAD A											
7	L2	20	0,0	0,065	8,1	LOS A	0,2	1,3	0,06	0,97	50,8
8	T1	34	0,0	0,065	10,2	LOS B	0,2	1,3	0,06	0,97	50,7
9	R2	14	0,0	0,020	9,4	LOS A	0,1	0,4	0,34	0,85	51,0
Approach		67	0,0	0,065	9,4	LOS A	0,2	1,3	0,12	0,95	50,8
West: UNNAMED ROAD B											
10	L2	19	0,0	0,015	5,5	LOS A	0,0	0,0	0,00	0,39	55,1
11	T1	9	0,0	0,015	0,0	LOS A	0,0	0,0	0,00	0,39	56,6
12	R2	44	0,0	0,029	6,0	LOS A	0,1	0,7	0,29	0,55	52,6
Approach		73	0,0	0,029	5,1	NA	0,1	0,7	0,17	0,49	53,7
All Vehicles		555	0,0	0,194	7,4	NA	0,6	4,2	0,15	0,73	52,2

Annexure E

- Traffic Count Data

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.1)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM NAME	NORTH R 103															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	19	1	3	0	23	0	0	0	0	0	23
06:15 - 06:30	0	0	0	0	0	11	1	4	0	16	0	0	0	0	0	16
06:30 - 06:45	0	0	0	0	0	19	0	0	1	20	0	0	0	0	0	20
06:45 - 07:00	0	0	0	0	0	19	1	2	0	22	2	0	0	0	2	24
07:00 - 07:15	0	0	0	0	0	21	2	3	0	26	0	0	0	0	0	26
07:15 - 07:30	0	0	0	0	0	16	1	1	0	18	1	0	0	0	1	19
07:30 - 07:45	0	0	0	0	0	36	0	4	0	40	1	0	0	0	1	41
07:45 - 08:00	0	0	0	0	0	22	1	3	0	26	3	0	0	0	3	29
08:00 - 08:15	0	0	0	0	0	19	1	0	0	20	1	0	0	0	1	21
08:15 - 08:30	0	0	0	0	0	16	0	0	0	16	0	0	0	0	0	16
08:30 - 08:45	0	0	0	0	0	28	1	4	0	33	0	0	0	0	0	33
08:45 - 09:00	0	0	0	0	0	23	1	1	0	25	0	0	0	0	0	25
09:00 - 09:15	0	0	0	0	0	17	2	0	0	19	0	0	0	0	0	19
09:15 - 09:30	0	0	0	0	0	19	1	0	0	20	0	0	0	0	0	20
09:30 - 09:45	0	0	0	0	0	24	1	0	0	25	0	0	0	0	0	25
09:45 - 10:00	0	0	0	0	0	12	1	0	0	13	1	0	0	0	1	14
10:00 - 10:15	0	0	0	0	0	17	1	2	0	20	0	0	0	0	0	20
10:15 - 10:30	0	0	0	0	0	24	2	2	0	28	0	0	0	0	0	28
10:30 - 10:45	0	0	0	0	0	23	1	2	0	26	0	0	0	0	0	26
10:45 - 11:00	0	0	0	0	0	13	0	3	0	16	0	0	0	0	0	16
11:00 - 11:15	0	0	0	0	0	11	3	4	1	19	0	0	0	0	0	19
11:15 - 11:30	0	0	0	0	0	18	1	2	0	21	1	0	0	0	1	22
11:30 - 11:45	0	0	0	0	0	11	2	5	0	18	0	0	0	0	0	18
11:45 - 12:00	0	0	0	0	0	20	1	5	0	26	0	0	0	0	0	26
12:00 - 12:15	0	0	0	0	0	22	2	4	0	28	0	0	0	0	0	28
12:15 - 12:30	0	0	0	0	0	16	1	1	0	18	0	0	0	0	0	18
12:30 - 12:45	0	0	0	0	0	21	1	3	0	25	0	0	0	0	0	25
12:45 - 13:00	0	0	0	0	0	25	1	3	0	29	0	0	0	0	0	29
13:00 - 13:15	0	0	0	0	0	25	1	4	0	30	1	0	0	0	1	31
13:15 - 13:30	0	0	0	0	0	29	2	7	1	39	0	0	0	0	0	39
13:30 - 13:45	0	0	0	0	0	24	1	2	0	27	0	0	0	0	0	27
13:45 - 14:00	0	0	0	0	0	35	2	2	0	39	0	0	0	0	0	39
14:00 - 14:15	0	0	0	0	0	21	2	4	0	27	0	0	0	0	0	27
14:15 - 14:30	0	0	0	0	0	15	0	3	0	18	0	0	0	0	0	18
14:30 - 14:45	0	0	0	0	0	24	4	2	0	30	0	0	0	0	0	30
14:45 - 15:00	0	0	0	0	0	27	0	4	0	31	0	0	0	0	0	31
15:00 - 15:15	0	0	0	0	0	19	8	4	0	31	0	0	0	0	0	31
15:15 - 15:30	0	0	0	0	0	24	2	5	0	31	0	0	0	0	0	31
15:30 - 15:45	0	0	0	0	0	27	3	6	0	36	0	0	0	0	0	36
15:45 - 16:00	0	0	0	0	0	35	1	2	0	38	1	0	0	0	1	39
16:00 - 16:15	0	0	0	0	0	20	3	4	0	27	0	0	0	0	0	27
16:15 - 16:30	0	0	0	0	0	43	5	5	0	53	0	0	0	0	0	53
16:30 - 16:45	0	0	0	0	0	33	2	3	0	38	0	0	0	0	0	38
16:45 - 17:00	0	0	0	0	0	31	1	3	0	35	2	0	0	0	2	37
17:00 - 17:15	0	0	0	0	0	27	1	1	0	29	1	0	0	0	1	30
17:15 - 17:30	0	0	0	0	0	34	6	9	0	49	2	0	0	0	2	51
17:30 - 17:45	0	0	0	0	0	23	2	5	0	30	2	0	0	0	2	32
17:45 - 18:00	0	0	0	0	0	9	2	1	0	12	1	0	0	0	1	13
TOTAL	**0**	**0**	**0**	**0**	**0**	**1067**	**79**	**137**	**3**	**1286**	**20**	**0**	**0**	**0**	**20**	**1306**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.1)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM NAME	SOUTH R 103															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	7	1	0	0	8	0	0	0	0	0	8
06:15 - 06:30	0	0	0	0	0	13	2	5	0	20	0	0	0	0	0	20
06:30 - 06:45	3	0	0	0	3	21	1	5	0	27	0	0	0	0	0	30
06:45 - 07:00	0	0	0	0	0	25	4	2	1	32	0	0	0	0	0	32
07:00 - 07:15	0	0	0	0	0	27	8	3	0	38	0	0	0	0	0	38
07:15 - 07:30	1	0	0	0	1	26	2	7	0	35	0	0	0	0	0	36
07:30 - 07:45	0	0	0	0	0	21	1	4	0	26	0	0	0	0	0	26
07:45 - 08:00	0	0	0	0	0	24	0	0	0	24	0	0	0	0	0	24
08:00 - 08:15	0	0	0	0	0	24	1	2	0	27	0	0	0	0	0	27
08:15 - 08:30	0	0	0	0	0	27	0	2	0	29	0	0	0	0	0	29
08:30 - 08:45	0	0	0	0	0	34	3	4	0	41	0	0	0	0	0	41
08:45 - 09:00	0	0	0	0	0	26	2	2	0	30	0	0	0	0	0	30
09:00 - 09:15	0	0	0	0	0	29	2	4	0	35	0	0	0	0	0	35
09:15 - 09:30	0	0	0	0	0	24	2	2	1	29	0	0	0	0	0	29
09:30 - 09:45	0	0	0	0	0	21	2	0	0	23	0	0	0	0	0	23
09:45 - 10:00	0	0	0	0	0	27	3	1	0	31	0	0	0	0	0	31
10:00 - 10:15	1	0	0	0	1	19	2	4	0	25	0	0	0	0	0	26
10:15 - 10:30	0	0	0	0	0	28	3	2	0	33	0	0	0	0	0	33
10:30 - 10:45	0	0	0	0	0	26	2	2	0	30	0	0	0	0	0	30
10:45 - 11:00	0	0	0	0	0	32	3	3	0	38	0	0	0	0	0	38
11:00 - 11:15	0	0	0	0	0	20	2	4	0	26	0	0	0	0	0	26
11:15 - 11:30	0	0	0	0	0	27	2	2	0	31	0	0	0	0	0	31
11:30 - 11:45	0	0	0	0	0	19	2	1	0	22	0	0	0	0	0	22
11:45 - 12:00	0	0	0	0	0	23	3	0	0	26	0	0	0	0	0	26
12:00 - 12:15	0	0	0	0	0	32	5	1	0	38	0	0	0	0	0	38
12:15 - 12:30	0	0	0	0	0	21	2	1	0	24	0	0	0	0	0	24
12:30 - 12:45	0	0	0	0	0	23	2	0	0	25	0	0	0	0	0	25
12:45 - 13:00	0	0	0	0	0	33	6	4	0	43	0	0	0	0	0	43
13:00 - 13:15	0	0	0	0	0	25	1	2	0	28	0	0	0	0	0	28
13:15 - 13:30	0	0	0	0	0	33	4	5	0	42	0	0	0	0	0	42
13:30 - 13:45	0	0	0	0	0	26	1	5	0	32	0	0	0	0	0	32
13:45 - 14:00	0	0	0	0	0	29	2	2	0	33	0	0	0	0	0	33
14:00 - 14:15	0	0	0	0	0	26	1	1	0	28	0	0	0	0	0	28
14:15 - 14:30	1	0	0	0	1	25	3	2	0	30	0	0	0	0	0	31
14:30 - 14:45	0	0	0	0	0	31	2	3	0	36	0	0	0	0	0	36
14:45 - 15:00	0	0	0	0	0	33	3	3	0	39	0	0	0	0	0	39
15:00 - 15:15	0	0	0	0	0	25	3	3	0	31	0	0	0	0	0	31
15:15 - 15:30	0	0	0	0	0	31	2	3	2	38	0	0	0	0	0	38
15:30 - 15:45	0	0	0	0	0	35	4	5	0	44	0	0	0	0	0	44
15:45 - 16:00	0	0	0	0	0	26	1	0	0	27	0	0	0	0	0	27
16:00 - 16:15	0	0	0	0	0	42	2	0	0	44	0	0	0	0	0	44
16:15 - 16:30	0	0	0	0	0	37	2	3	0	42	0	0	0	0	0	42
16:30 - 16:45	0	0	0	0	0	18	1	1	0	20	0	0	0	0	0	20
16:45 - 17:00	0	0	0	0	0	23	1	1	0	25	0	0	0	0	0	25
17:00 - 17:15	1	0	0	0	1	20	1	2	0	23	0	0	0	0	0	24
17:15 - 17:30	0	0	0	0	0	39	3	3	0	45	0	0	0	0	0	45
17:30 - 17:45	1	0	0	0	1	26	2	1	0	29	0	0	0	0	0	30
17:45 - 18:00	0	0	0	0	0	7	2	0	0	9	0	0	0	0	0	9
TOTAL	**8**	**0**	**0**	**0**	**8**	**1236**	**109**	**112**	**4**	**1461**	**0**	**0**	**0**	**0**	**0**	**1469**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.1)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM NAME	EAST															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 - 06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 - 06:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 - 07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 - 07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 - 07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 - 07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 - 08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 - 08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 - 08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 - 08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 - 09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 - 09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 - 09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 - 09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 - 10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 - 10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 - 10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 - 10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 - 11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 - 11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 - 11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 - 11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 - 12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 - 12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 - 12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 - 12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 - 13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00 - 13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15 - 13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30 - 13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45 - 14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:00 - 14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15 - 14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30 - 14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45 - 15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00 - 15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15 - 15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30 - 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30 - 16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 - 17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00 - 17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30 - 17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45 - 18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.1)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM NAME	WEST UNNAMED ROAD															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 - 06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 - 06:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 - 07:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
07:00 - 07:15	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
07:15 - 07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 - 07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 - 08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 - 08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 - 08:30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
08:30 - 08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 - 09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 - 09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 - 09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 - 09:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
09:45 - 10:00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
10:00 - 10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 - 10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 - 10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 - 11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 - 11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 - 11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 - 11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 - 12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 - 12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 - 12:30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
12:30 - 12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 - 13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00 - 13:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
13:15 - 13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30 - 13:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
13:45 - 14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:00 - 14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15 - 14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30 - 14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45 - 15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00 - 15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15 - 15:30	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
15:30 - 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30 - 16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 - 17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00 - 17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30 - 17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45 - 18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**2**	**2**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**6**	**10**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.2)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM NAME	NORTH R 103															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	11	1	1	0	13	1	1	0	0	2	15
06:15 - 06:30	0	0	0	0	0	12	1	3	0	16	0	5	0	0	5	21
06:30 - 06:45	0	0	0	0	0	16	1	3	0	20	2	2	1	1	6	26
06:45 - 07:00	0	0	0	0	0	21	0	2	0	23	4	4	0	0	8	31
07:00 - 07:15	0	0	0	0	0	23	1	3	0	27	2	4	0	1	7	34
07:15 - 07:30	0	0	0	0	0	17	0	0	0	17	3	3	0	2	8	25
07:30 - 07:45	0	0	0	0	0	34	0	3	0	37	5	1	0	0	6	43
07:45 - 08:00	0	0	0	0	0	14	0	4	0	18	2	5	1	0	8	26
08:00 - 08:15	0	0	0	0	0	27	1	1	0	29	2	5	0	0	7	36
08:15 - 08:30	0	0	0	0	0	23	1	4	0	28	2	4	0	0	6	34
08:30 - 08:45	0	0	0	0	0	21	0	0	0	21	3	0	0	0	3	24
08:45 - 09:00	0	0	0	0	0	17	1	1	0	19	1	2	0	0	3	22
09:00 - 09:15	0	0	0	0	0	28	1	2	0	31	3	1	1	0	5	36
09:15 - 09:30	0	0	0	0	0	28	0	2	0	30	2	2	0	0	4	34
09:30 - 09:45	0	0	0	0	0	29	0	3	0	32	0	1	0	0	1	33
09:45 - 10:00	0	0	0	0	0	19	1	3	0	23	1	2	0	0	3	26
10:00 - 10:15	0	0	0	0	0	18	0	1	0	19	1	0	0	0	1	20
10:15 - 10:30	0	0	0	0	0	19	2	2	0	23	2	1	0	2	5	28
10:30 - 10:45	0	0	0	0	0	24	0	1	0	25	2	2	0	0	4	29
10:45 - 11:00	0	0	0	0	0	15	0	2	0	17	1	0	0	0	1	18
11:00 - 11:15	0	0	0	0	0	14	2	5	1	22	3	1	0	0	4	26
11:15 - 11:30	0	0	0	0	0	12	0	1	0	13	0	1	0	0	1	14
11:30 - 11:45	0	0	0	0	0	10	1	6	0	17	2	0	0	0	2	19
11:45 - 12:00	0	0	0	0	0	19	1	3	0	23	0	1	0	0	1	24
12:00 - 12:15	0	0	0	0	0	17	1	4	0	22	3	1	0	0	4	26
12:15 - 12:30	0	0	0	0	0	24	0	1	0	25	2	2	0	0	4	29
12:30 - 12:45	0	0	0	0	0	23	1	3	0	27	1	0	0	0	1	28
12:45 - 13:00	0	0	0	0	0	23	0	3	0	26	2	1	0	0	3	29
13:00 - 13:15	0	0	0	0	0	21	1	4	1	27	1	2	0	0	3	30
13:15 - 13:30	0	0	0	0	0	28	0	5	0	33	3	0	0	0	3	36
13:30 - 13:45	0	0	0	0	0	29	3	3	0	35	1	1	0	0	2	37
13:45 - 14:00	0	0	0	0	0	33	3	1	0	37	2	0	1	0	3	40
14:00 - 14:15	0	0	0	0	0	29	2	5	0	36	2	0	0	0	2	38
14:15 - 14:30	0	0	0	0	0	23	0	3	0	26	3	0	0	0	3	29
14:30 - 14:45	0	0	0	0	0	27	4	2	0	33	2	0	0	0	2	35
14:45 - 15:00	0	0	0	0	0	24	1	5	0	30	1	1	0	0	2	32
15:00 - 15:15	0	0	0	0	0	23	8	5	0	36	4	0	0	0	4	40
15:15 - 15:30	0	0	0	0	0	20	2	4	0	26	3	0	0	0	3	29
15:30 - 15:45	0	0	0	0	0	31	4	5	0	40	3	3	0	0	6	46
15:45 - 16:00	0	0	0	0	0	31	2	3	0	36	3	3	0	0	6	42
16:00 - 16:15	0	0	0	0	0	28	2	5	0	35	2	2	0	0	4	39
16:15 - 16:30	0	0	0	0	0	27	5	4	0	36	1	1	0	0	2	38
16:30 - 16:45	0	0	0	0	0	42	0	3	0	45	5	1	0	0	6	51
16:45 - 17:00	0	0	0	0	0	24	2	3	1	30	3	1	0	0	4	34
17:00 - 17:15	0	0	0	0	0	46	4	2	0	52	3	4	0	0	7	59
17:15 - 17:30	0	0	0	0	0	23	4	10	0	37	3	2	0	0	5	42
17:30 - 17:45	0	0	0	0	0	25	3	5	0	33	5	3	0	0	8	41
17:45 - 18:00	0	0	0	0	0	13	6	0	0	19	1	0	0	0	1	20
TOTAL	**0**	**0**	**0**	**0**	**0**	**1105**	**73**	**144**	**3**	**1325**	**103**	**76**	**4**	**6**	**189**	**1514**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.2)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM NAME	SOUTH R 103															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	4	2	0	0	6	0	0	0	0	0	6
06:15 - 06:30	0	0	0	0	0	15	1	0	0	16	0	0	0	0	0	16
06:30 - 06:45	0	0	0	0	0	39	1	7	0	47	0	0	0	0	0	47
06:45 - 07:00	2	1	0	0	3	26	2	5	0	33	0	0	0	0	0	36
07:00 - 07:15	0	1	1	0	2	43	6	0	0	49	0	0	0	0	0	51
07:15 - 07:30	0	1	0	0	1	31	2	5	1	39	0	0	0	0	0	40
07:30 - 07:45	1	0	0	0	1	42	1	7	0	50	0	0	0	0	0	51
07:45 - 08:00	0	0	0	0	0	23	0	2	0	25	0	0	0	0	0	25
08:00 - 08:15	0	2	0	0	2	24	0	1	0	25	0	0	0	0	0	27
08:15 - 08:30	1	0	0	0	1	36	0	0	0	36	0	0	0	0	0	37
08:30 - 08:45	1	0	0	0	1	30	2	6	0	38	0	0	0	0	0	39
08:45 - 09:00	0	0	0	0	0	22	1	6	0	29	0	0	0	0	0	29
09:00 - 09:15	0	0	0	0	0	23	0	0	0	23	0	0	0	0	0	23
09:15 - 09:30	0	2	0	0	2	26	1	4	0	31	0	0	0	0	0	33
09:30 - 09:45	0	0	0	0	0	32	2	0	1	35	0	0	0	0	0	35
09:45 - 10:00	1	0	0	0	1	26	3	1	0	30	0	0	0	0	0	31
10:00 - 10:15	0	0	0	0	0	45	1	3	0	49	0	0	0	0	0	49
10:15 - 10:30	0	1	0	0	1	25	2	2	0	29	0	0	0	0	0	30
10:30 - 10:45	0	0	0	0	0	31	1	2	0	34	0	0	0	0	0	34
10:45 - 11:00	0	1	0	0	1	40	1	2	0	43	0	0	0	0	0	44
11:00 - 11:15	0	0	0	0	0	21	4	5	0	30	0	0	0	0	0	30
11:15 - 11:30	0	0	0	0	0	26	2	4	0	32	0	0	0	0	0	32
11:30 - 11:45	0	0	2	0	2	15	2	1	0	18	0	0	0	0	0	20
11:45 - 12:00	0	0	0	0	0	22	2	0	0	24	0	0	0	0	0	24
12:00 - 12:15	0	0	0	0	0	33	4	0	0	37	0	0	0	0	0	37
12:15 - 12:30	0	0	0	0	0	28	2	1	0	31	0	0	0	0	0	31
12:30 - 12:45	0	0	0	0	0	41	1	1	0	43	0	0	0	0	0	43
12:45 - 13:00	0	1	0	0	1	27	3	3	0	33	0	0	0	0	0	34
13:00 - 13:15	4	0	0	0	4	29	6	2	0	37	0	0	0	0	0	41
13:15 - 13:30	0	0	0	0	0	30	2	4	0	36	0	0	0	0	0	36
13:30 - 13:45	2	0	0	0	2	42	3	7	0	52	0	0	0	0	0	54
13:45 - 14:00	0	1	0	0	1	19	3	3	0	25	0	0	0	0	0	26
14:00 - 14:15	5	0	0	0	5	19	1	2	0	22	0	0	0	0	0	27
14:15 - 14:30	0	0	0	0	0	41	4	2	0	47	0	0	0	0	0	47
14:30 - 14:45	3	0	0	0	3	22	1	2	0	25	0	0	0	0	0	28
14:45 - 15:00	2	0	0	0	2	30	4	2	0	36	0	0	0	0	0	38
15:00 - 15:15	2	0	0	0	2	41	5	3	0	49	0	0	0	0	0	51
15:15 - 15:30	0	0	0	0	0	23	2	3	0	28	0	0	0	0	0	28
15:30 - 15:45	0	0	0	0	0	58	6	5	0	69	0	0	0	0	0	69
15:45 - 16:00	1	0	0	0	1	54	2	1	0	57	0	0	0	0	0	58
16:00 - 16:15	0	0	0	1	1	22	0	2	0	24	0	0	0	0	0	25
16:15 - 16:30	2	2	1	0	5	31	3	2	0	36	0	0	0	0	0	41
16:30 - 16:45	4	0	0	0	4	24	1	1	0	26	0	0	0	0	0	30
16:45 - 17:00	2	1	0	0	3	23	3	1	0	27	0	0	0	0	0	30
17:00 - 17:15	1	2	0	0	3	25	3	2	0	30	0	0	0	0	0	33
17:15 - 17:30	4	0	1	2	7	23	5	2	0	30	0	0	0	0	0	37
17:30 - 17:45	0	2	0	0	2	17	0	0	0	17	0	0	0	0	0	19
17:45 - 18:00	3	2	1	1	7	13	7	0	0	20	0	0	0	0	0	27
TOTAL	**41**	**20**	**6**	**4**	**71**	**1382**	**110**	**114**	**2**	**1608**	**0**	**0**	**0**	**0**	**0**	**1679**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.2)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM NAME	EAST															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 - 06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 - 06:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 - 07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 - 07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 - 07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 - 07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 - 08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 - 08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 - 08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 - 08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 - 09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 - 09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 - 09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 - 09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 - 10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 - 10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 - 10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 - 10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 - 11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 - 11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 - 11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 - 11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 - 12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 - 12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 - 12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 - 12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 - 13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00 - 13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15 - 13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30 - 13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45 - 14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:00 - 14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15 - 14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30 - 14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45 - 15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00 - 15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15 - 15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30 - 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30 - 16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 - 17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00 - 17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30 - 17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45 - 18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF R103 AND UNNAMED ROAD (NO.2)

DATE: 12 HOUR COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

APPROACH FROM	WEST															TOTAL
NAME	UNNAMED ROAD															
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	1	3	0	0	4	0	0	0	0	0	0	1	0	0	1	5
06:15 - 06:30	1	0	0	0	1	0	0	0	0	0	1	1	0	0	2	3
06:30 - 06:45	3	4	0	0	7	0	0	0	0	0	1	0	0	1	2	9
06:45 - 07:00	4	3	0	0	7	0	0	0	0	0	0	3	0	0	3	10
07:00 - 07:15	5	5	0	0	10	0	0	0	0	0	2	3	0	0	5	15
07:15 - 07:30	3	0	0	0	3	0	0	0	0	0	1	1	0	0	2	5
07:30 - 07:45	2	2	0	0	4	0	0	0	0	0	1	0	0	0	1	5
07:45 - 08:00	2	1	0	0	3	0	0	0	0	0	0	0	0	0	0	3
08:00 - 08:15	3	2	0	0	5	0	0	0	0	0	0	2	0	0	2	7
08:15 - 08:30	1	2	0	0	3	0	0	0	0	0	1	0	0	0	1	4
08:30 - 08:45	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	2
08:45 - 09:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
09:00 - 09:15	3	2	0	0	5	0	0	0	0	0	0	1	0	0	1	6
09:15 - 09:30	3	1	0	0	4	0	0	0	0	0	0	0	0	0	0	4
09:30 - 09:45	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
09:45 - 10:00	3	1	0	0	4	0	0	0	0	0	1	0	0	0	1	5
10:00 - 10:15	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	2
10:15 - 10:30	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
10:30 - 10:45	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	2
10:45 - 11:00	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
11:00 - 11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 - 11:30	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
11:30 - 11:45	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	2
11:45 - 12:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
12:00 - 12:15	3	0	0	1	4	0	0	0	0	0	0	0	0	0	0	4
12:15 - 12:30	2	1	1	0	4	0	0	0	0	0	0	0	0	0	0	4
12:30 - 12:45	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
12:45 - 13:00	2	0	0	0	2	0	0	0	0	0	2	2	0	0	4	6
13:00 - 13:15	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
13:15 - 13:30	0	1	0	0	1	0	0	0	0	0	1	2	0	0	3	4
13:30 - 13:45	0	0	0	0	0	0	0	0	0	0	2	9	0	0	11	11
13:45 - 14:00	2	0	0	0	2	0	0	0	0	0	1	0	0	0	1	3
14:00 - 14:15	1	1	0	0	2	0	0	0	0	0	4	0	0	0	4	6
14:15 - 14:30	3	0	0	0	3	0	0	0	0	0	0	1	0	0	1	4
14:30 - 14:45	1	0	0	0	1	0	0	0	0	0	2	0	0	0	2	3
14:45 - 15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00 - 15:15	1	0	0	0	1	0	0	0	0	0	3	1	0	0	4	5
15:15 - 15:30	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
15:30 - 15:45	0	2	0	0	2	0	0	0	0	0	2	1	0	0	3	5
15:45 - 16:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
16:00 - 16:15	4	1	0	0	5	0	0	0	0	0	2	1	0	0	3	8
16:15 - 16:30	1	1	0	0	2	0	0	0	0	0	2	0	0	0	2	4
16:30 - 16:45	3	0	0	0	3	0	0	0	0	0	0	1	0	0	1	4
16:45 - 17:00	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	2
17:00 - 17:15	0	1	0	0	1	0	0	0	0	0	2	0	0	0	2	3
17:15 - 17:30	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	2
17:30 - 17:45	0	2	0	0	2	0	0	0	0	0	1	1	0	0	2	4
17:45 - 18:00	0	2	0	0	2	0	0	0	0	0	2	3	0	0	5	7
TOTAL	**71**	**42**	**2**	**1**	**116**	**0**	**0**	**0**	**0**	**0**	**37**	**38**	**0**	**1**	**76**	**192**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF UNNAMED ROAD AND UNNAMED ROAD

DATE: PEAK HOURS COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

AM PEAK

APPROACH FROM	NORTH															TOTAL
NAME	UNNAMED ROAD															
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2
06:15 - 06:30	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2
06:30 - 06:45	0	0	0	0	0	0	1	0	0	1	1	1	0	0	2	3
06:45 - 07:00	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
07:00 - 07:15	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	2
07:15 - 07:30	0	0	0	0	0	1	1	0	2	4	1	0	0	0	1	5
07:30 - 07:45	0	0	0	0	0	0	0	0	0	0	2	1	0	0	3	3
07:45 - 08:00	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
08:00 - 08:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
08:15 - 08:30	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	2
08:30 - 08:45	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
08:45 - 09:00	0	0	0	0	0	1	0	0	0	1	2	0	0	0	2	3
TOTAL	**0**	**0**	**0**	**0**	**0**	**3**	**4**	**0**	**3**	**10**	**9**	**6**	**1**	**1**	**17**	**27**

PM PEAK

APPROACH FROM	NORTH															TOTAL
NAME	UNNAMED ROAD															
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
15:00 - 15:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
15:15 - 15:30	0	0	0	0	0	1	1	0	0	2	1	1	0	0	2	4
15:30 - 15:45	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	2
15:45 - 16:00	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
16:00 - 16:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
16:15 - 16:30	0	0	0	0	0	2	1	0	0	3	0	1	0	0	1	4
16:30 - 16:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
16:45 - 17:00	0	0	0	0	0	2	1	0	0	3	3	0	0	0	3	6
17:00 - 17:15	0	0	0	0	0	0	1	0	0	1	2	1	0	0	3	4
17:15 - 17:30	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	2
17:30 - 17:45	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2
17:45 - 18:00	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	2
TOTAL	**0**	**0**	**0**	**0**	**0**	**10**	**5**	**0**	**0**	**15**	**10**	**5**	**0**	**0**	**15**	**30**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF UNNAMED ROAD AND UNNAMED ROAD

DATE: PEAK HOURS COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

AM PEAK

APPROACH FROM NAME	SOUTH UNNAMED ROAD															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
06:15 - 06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 - 06:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 - 07:00	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	2
07:00 - 07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 - 07:30	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
07:30 - 07:45	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
07:45 - 08:00	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
08:00 - 08:15	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	2
08:15 - 08:30	2	0	0	0	2	2	0	0	0	2	0	0	0	0	0	4
08:30 - 08:45	2	0	0	0	2	1	1	0	0	2	0	0	0	0	0	4
08:45 - 09:00	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
TOTAL	**5**	**0**	**0**	**0**	**5**	**6**	**6**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**17**

PM PEAK

APPROACH FROM NAME	SOUTH UNNAMED ROAD															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
15:00 - 15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15 - 15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30 - 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
16:00 - 16:15	0	0	0	0	0	2	1	0	0	3	0	0	0	0	0	3
16:15 - 16:30	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	2
16:30 - 16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 - 17:00	1	0	0	0	1	2	0	0	0	2	0	0	0	0	0	3
17:00 - 17:15	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
17:15 - 17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30 - 17:45	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
17:45 - 18:00	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	2
TOTAL	**1**	**0**	**0**	**0**	**1**	**8**	**4**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**13**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF UNNAMED ROAD AND UNNAMED ROAD

DATE: PEAK HOURS COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

AM PEAK

APPROACH FROM NAME	EAST															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 - 06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 - 06:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 - 07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 - 07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 - 07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 - 07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 - 08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 - 08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 - 08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 - 08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 - 09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

PM PEAK

APPROACH FROM NAME	EAST															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
15:00 - 15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15 - 15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30 - 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30 - 16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 - 17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00 - 17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30 - 17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45 - 18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

TRAFFIC SURVEY

CLIENT: CHRISEN CONSULTING ENGINEERS

SITE: INTERSECTION OF UNNAMED ROAD AND UNNAMED ROAD

DATE: PEAK HOURS COUNT ON TUESDAY 13 AUGUST 2019
UNITS: CLASSIFIED

AM PEAK

APPROACH FROM NAME	WEST UNNAMED ROAD															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
06:00 - 06:15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
06:15 - 06:30	2	1	0	0	3	0	0	0	0	0	1	0	1	0	2	5
06:30 - 06:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
06:45 - 07:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
07:00 - 07:15	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
07:15 - 07:30	2	1	0	0	3	0	0	0	0	0	0	0	0	0	0	3
07:30 - 07:45	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	2
07:45 - 08:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
08:00 - 08:15	1	1	0	1	3	0	0	0	0	0	0	0	0	0	0	3
08:15 - 08:30	3	1	0	0	4	0	0	0	0	0	0	0	0	0	0	4
08:30 - 08:45	1	2	0	0	3	0	0	0	0	0	1	0	0	0	1	4
08:45 - 09:00	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
TOTAL	**13**	**9**	**0**	**1**	**23**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**1**	**0**	**5**	**28**

PM PEAK

APPROACH FROM NAME	WEST UNNAMED ROAD															TOTAL
MOVEMENT	LEFT TURN					STRAIGHT					RIGHT TURN					ALL
TIME	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	MOVEMENTS
15:00 - 15:15	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	2
15:15 - 15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30 - 15:45	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
15:45 - 16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
16:30 - 16:45	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	2
16:45 - 17:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
17:00 - 17:15	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
17:15 - 17:30	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
17:30 - 17:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
17:45 - 18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**2**	**4**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**0**	**0**	**4**	**10**