PROPOSED RETAIL DEVELOPMENT ON PRESIDENT PARK X6, EMALAHLENI

TRAFFIC IMPACT ASSESSMENT REPORT

OCTOBER 2020
REVISION 0

ENGINEERING DESIGN LAB

Issue/revision	Revision 0	Revision 1	Revision 2	Revision 3
Remarks	Issued for Approval			
Date	October 2020			
Prepared by	J.M. van Rooyen (B.Eng)			
Checked by	E.D. Kotze Pr Tech Eng			
Signature				
Project number	20059			
File reference	Z:/PROJECTS/20001-20099/			

EDL Engineers (Pty) Ltd
1st Floor, Block D
The Village Office Park
c/o Glenwood Rd & Oberon Ave,
Fearie Glen, 0043
Cell: +27 (0)83 564 1563
Tel: +27 (0)87 897 5074/5/6
Email: eben@edlengineers.co.za
Website: www.edlengineers.co.za

ENGINEERING DESIGN LAB

B-BBEE LEVEL2 CONTRIBUTOR

CONTENTS

Figures

Drawings

Annexures

1 Introduction

EDL Consulting Engineers have been appointed by the landowners to conduct a Traffic Impact Assessment for the proposed development on President Park X6, Emalahleni, Mpumalanga.

The purpose of this traffic impact report is to investigate the expected peak hour traffic generated by the proposed Retail development, to quantify as well as evaluate its impact on the existing road network.

This study also evaluates the need for providing improvements to the existing road network which includes the key intersections.

As part of the study, we have also evaluated the NMT (Non-Motorised Transport) and Public Transport facilities for the proposed retail developments.

As can be seen in the chapters that follow, we have undertaken peak period traffic counts at the key intersections, identified according to the TMH16 and analysed the key intersections for possible capacity restraints and required upgrades.

Trip generation for the Retail development is calculated from the trip rates and vehicle splits as set out in TMH17 Table 3.3. Sidra™ Analyses are performed in the critical peak hours for various traffic scenarios, including the future 5-year horizon using a compound annual growth rate.

Based on the Sidra™ analyses results, intersection upgrades are discussed in Chapter 8.

Printouts of the Sidra™ analyses results of the key intersections are included in **Annexure A** at the back of the report after the Drawings.

2 Site Location

2.1 Site Location

As shown in **Figure 1,** the development is located on the President Park X6, Emalahleni. The proposed development site is located west of the N4 highway and south of Mandela Dr. The site is located between Nita Ave and Tswelopele Junction (Highveld Mall Western Access).

Noticeable attractions near the site includes the Nissan Dealership across Nita Ave, the N4 highway, located approx. 1.3km to the east, a major cargo corridor and Highveld Mall approx. 300m east of the site.

3 Surrounding Road Network and Traffic Flow

3.1 Surrounding Road Network

The following roads and streets are relevant to the study area.

N4 Highway Ramps: These ramps function as accesses to and from a Principal Arterial (Class 1). These roads are both surfaced single carriageway roads with one (1) lane or two (2) lanes per on-and-off-ramp. These ramps have signalised intersections with Mandela Dr. Traffic counts indicate that these roads carry traffic volumes of between 50vph and 850vph per direction during the Friday Afternoon (PM) and Saturday Morning (AM) peak hours near the site, depending on the specific ramp.

Mandela Dr: This road functions as a Minor Arterial (class 3) in the vicinity of the site. This road is a surfaced dual carriageway road with a large median and two (2) lanes in each direction. This road has a signalised intersection with the N4 on and off-ramps, Langa Cres/ Highveld Mall Access and an 'All-way' Stop intersection at Nita Ave. Traffic counts indicate that this road carries traffic volumes of between 650vph and 1300vph per direction, depending on the section of road during the Friday Afternoon (PM) and Saturday Morning (AM) peak hours.

Nita Ave: This road functions as a Collector Street (class 4). This road is a surfaced single carriageway road with no median and one (1) lane in each direction. This road has an 'all-way stop' T-junction with Mandela Dr. Traffic counts indicate that this road carries traffic volumes of between 110vph and 180vph per direction during the Friday Afternoon (PM) and Saturday Morning (AM) peak hours at the site.

Bethal Street: This road functions as a Collector Street (class 4). This road is a surfaced single carriageway road with no median and one (1) lane in each direction. This road has a Signalised intersection with Mandela Dr. Traffic counts indicate that this road carries traffic volumes of between 310vph and 590vph per direction during the Friday Afternoon (PM) and Saturday Morning (AM) peak hours near the site.

Langa Cres: This road functions as a Local or Access Street (class 5). This road is a surfaced single carriageway road with no median and one (1) lane in each direction. This road has a Signalised intersection with Mandela Dr. Traffic counts indicate that this road carries traffic volumes of between 30vph and 220vph per direction during the Friday Afternoon (PM) and Saturday Morning (AM) peak hours.

3.2 Future Road Network

The following roads and streets are relevant to the study area.

- Planned Major Arterial Road from the R555, in the north east of Emalahleni, south through Seekoewater A.H. and with an intersection on Mandela Drive just west of Highveld Mall, joining Tswelopele Road. This road then changes direction east to join Ben Fleur at Paul Sauer Street on the opposite side of the N4 highway.
- Extension of Nita Ave as a collector road south to join Enties St in Del Judor X1.
- Extension of Nita Ave as a collector road north past Mandela Dr to join Mona St in Modelpark.
- Emalahleni Master Road Planning (**Annexure B**)

3.3 Existing Traffic Flows

Given the type and extent of the proposed developments, the study area was defined to include five key intersections as required by COTO TMH and was analysed using SIDRA. Friday Afternoon and Saturday Morning Traffic Counts were therefore carried out during the Friday Afternoon (PM) and Saturday Morning (AM) commuter peak periods, in early October 2020, at the following identified intersections:

Key Intersections:
- N4 Westbound Ramps & Mandela Dr
- N4 Eastbound Ramps & Mandela Dr
- Mandela Dr & Nita Ave
- Mandela Dr & Bethal St
- Mandela Dr & Langa Cres / Highveld Mall Access

The existing Friday Afternoon (PM) and Saturday Morning (AM) peak hour traffic volumes at the above-mentioned key intersections are summarised in **Figure 2**. As the traffic counts were undertaken during Level 1 of the Covid-19 Lockdown, no adjustments to the traffic count volumes are deemed necessary as the peak hour traffic volumes already returned to normal levels.

3.4 Projected Future Traffic Flows

It is required to determine the Future 5-year Horizon traffic by applying an annual growth rate to the existing traffic. As the area is slowly densifying and the growth (although lower than in previous years due to slow/negative economic factors) is expected to be positive going forward, a maximum average growth rate of 3%/ Annum was adopted and applied to the existing 2020 peak hour traffic counts.

4 Proposed Development & Trip Generation

With reference to **Drawing 20059/AL/01**, the following sub-sections are relevant in respect of the proposed development and its proposed accesses.

4.1 Proposed Development

The proposed development is envisaged to consist of Retail (Shopping Centre). The proposed development site measures a total of approx. 30 454m² in area and is set out as explained in **Table 1** below.

Table 1: Extent of the Proposed Development

Proposed Use	SITE AREA (m²)	GLA(m²)
Retail	25 976	12 000
Possible Future Filling Station	4 478	-
Total	**30 454**	12 000

4.2 Trip Generation

The expected trip generation for the proposed land use is discussed below:

Retail: The standard trip rate for Retail (shopping centre) is 3.40vph / 100m² GLA, in the Friday PM and 4.50vph / 100m² GLA in the Saturday AM according to Table 3.3 of the COTO TMH 17 SA Trip Data Manual. The directional split of 50/50 for the Friday PM peak hour and 50/50 for the Saturday AM peak hour of the shopping centre was applied. Size Adjustment Factors were also applied as per the formula below:

Size Adjustment Factors:

$$Adjustment\ Factor = 1 + \frac{\mathrm{A}}{1 + \frac{\mathrm{GLA}}{\mathrm{B}}}$$

Trip Rate Adjustment: A = 6, B = 3500, GLA = 12 000m²
Adjustment Factor = 2.3548
Pass-by Adjustment: A = 1.950, B = 48 000, GLA = 12 000m²
Adjustment Factor = 2.56

Development Trip Reduction Factors:

Mixed Use (P_m): 0%
Transit Nodes (P_T): 15%
Vehicle Ownership (P_V): 0%
Combined Factors (P_C): 15%

Using the above recommended parameters, it is estimated that the proposed development, will generate a total of approx. 816vph during the Friday Afternoon (PM) and 1082vph during the Saturday Morning (AM) peak hours, with the 15% reduction factor used for a transit node (Mandela Drive), which borders the site.

Table 2: Summary of the Estimated Total Development Traffic

Land Use	Peak Hour	Trip Rate	Adj. Factors	Reduction Factors	Split %	TRIPS		
						In	Out	Total
Retail (12 000m² GLA)	Friday PM	3.4 vph / 100m² GLA	2.3548	15%	50/50	408	408	816
	Saturday AM	4.5 vph / 100m² GLA	2.3548	15%	50/50	541	541	1082
Total Trips		**Friday PM**				**408**	**408**	**816**
		Saturday AM				**541**	**541**	**1082**

Figures 3, 4, 5 & 6 shows the estimated trip generation and distribution for the proposed development.

5 Queueing Analysis & Proposed Site Accesses

5.1 Queueing Analysis

Calculations on the expected queue length were based on a maximum arrival rate at the respective access, in the worst peak hour for entering vehicles (Saturday AM) at the accesses.

The formula used for an exceedance of 95% is as follows:

$$\frac{\ln(0.05) - \ln(Qm)}{\ln(q)} - 1$$

Where:
Utilization factor (q):

$$\frac{\text{Arrival rate}}{(\text{Number of lanes}) * (\text{Service rate per lane})}$$

And by means of interpolation, Qm is determined by using **Table 3** below:

Table 3: Tabled values of the relationship between queue length, number of lanes and utilization factor (Qm)*

Table of Qm Values							
LANES	**1**	**2**	**3**	**4**	**6**	**8**	**10**
0,0	0,0000	0,0000	0,0000	0,0000			
0,1	0,1000	0,0182	0,0037	0,0008	0,0000	0,0000	0,0000
0,2	0,2000	0,0666	0,0247	0,0096	0,0015	0,0002	0,0000
0,3	0,3000	0,1385	0,0700	0,0370	0,0111	0,0036	0,0011
0,4	0,4000	0,2286	0,1411	0,0907	0,0400	0,0185	0,0088
0,5	0,5000	0,3333	0,2368	0,1739	0,0991	0,0591	0,0360
0,6	0,6000	0,4501	0,3548	0,2870	0,1965	0,1395	0,1013
0,7	0,7000	0,5766	0,4923	0,4286	0,3359	0,2706	0,2218
0,8	0,8000	0,7111	0,6472	0,5964	0,5178	0,4576	0,4093
0,9	0,9000	0,8526	0,8172	0,7878	0,7401	0,7014	0,6687
1	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000

*Source: Transportation and Land Development (Vergil G Stover / Frank J Koepke)

Nita Avenue:
Calculations on the expected queue length were based on a maximum arrival rate of 295vph, in the worst peak hour for entering vehicles (Saturday AM) at the Nita Ave access.

In a worst-case scenario with a 450vph service rate (Ticket Dispenser – Push Button) at a control gate or a security boom for the Development, with one (1) entrance lane serving vehicles at a control gate/boom, the utilization factor (q) equates to 0.656 and by then using **Table 3** above, Qm can be determined as 0.656. By solving for the exceedance of 95%, the queue length equates to 5.09 vehicles, which is rounded to 6 vehicles. This means the space required for vehicles queuing from the possible future filling station access towards the Entrance Gate is a minimum length (or stacking distance) of 6 vehicles, being a distance of 36m stacking space past the access of the possible future filling station. The proposed access has approx. 80m stacking available from the road edge to the gate.

Please refer to the enclosed **Drawing No. 20059/AL/01** for details.

Mandela Dr:
Calculations on the expected queue length were based on a maximum arrival rate of 247vph, in the worst peak hour for entering vehicles (Saturday AM) at the Mandela Dr access.

In a worst-case scenario with a 450vph service rate (Ticket Dispenser – Push Button) at a control gate or a security boom for the Development, with one (1) entrance lane serving vehicles at a control gate/boom, the utilization factor (q) equates to 0.549 and by then using **Table 3** above, Qm can be determined as 0.549. By solving for the exceedance of 95%, the queue length equates to 2.99 vehicles, which is rounded to 3 vehicles. This means the space required for vehicles queuing from the access road towards the Entrance Gate is a minimum length (or stacking distance) of 3 vehicles, being a distance of 18m stacking space past the access road. With the additional stacking space available to the edge of Mandela Drive, a total of 70m stacking space is available.

Please refer to the enclosed **Drawing No. 20059/AL/01** for details.

5.2 Proposed Site Accesses

The proposed development is planned to comprise of three (3) access points.

Nita Avenue Accesses:

A 'Full' access and short access road from Nita Avenue is proposed on the western boundary of the site approx. 80m south of the intersection of Mandela Dr and Nita Ave, this access is shared with the possible future filling station. This access has been approved in a previous TIA done by WSP in March of 2010.

The access will require 2 lanes 'IN' and 2 lanes 'OUT', according to the Queue analysis done in the previous sub-chapter this access must have a 4m vertical clearance and a 5.0m unobstructed width to allow for an Emergency vehicle such as a Fire Truck, to enter the development in case of an emergency.

The access must be surfaced (dust free). The exit lane of the access is proposed to have a 'STOP' condition, with Nita Avenue having the right of way.

There must be enough queueing distance allowed in front of any security boom or gate with a minimum of 36m proposed from the security boom to the edge of the road at the access – as per the Queueing analysis, for 6 vehicles (x6m) to queue.

A second 'Full' access with an access road (within the R.O.W. servitude) from Nita Ave is proposed on the western boundary of the site approx. 150m south of the intersection of Mandela Dr and Nita Ave. This access has been approved in a previous TIA done by WSP in March of 2010. The access will require 1 lane 'IN' and 1 lane 'OUT', and must be surfaced (dust free). The exit lane of the access is proposed to have a 'STOP' condition, with Nita Avenue having the right of way.

Mandela Drive Access:

One proposed 'Left-in' access and access road within the R.O.W. servitude from Mandela Dr on the northern boundary of the site approx. 290m east of the intersection of Mandela Dr and Nita Ave. This access has been approved in a previous TIA done by WSP in March of 2010.

The access will require 1 lane 'IN', according to the Queue analysis done in the previous sub-chapter this access must have a 4m vertical clearance and a 5.0m unobstructed width to allow for an Emergency vehicle such as a Fire Truck, to enter the development in case of an emergency.

The access must be surfaced (dust free).

There must be enough queueing distance allowed in front of any security boom or gate with a minimum of 18m proposed from the security boom to the edge of the road at the access – as per the Queueing analysis, for 3 vehicles (x6m) to queue.

All Accesses:

Please refer to **Drawing 20059/AL/01** for the accesses layouts.

Turning circles of a Single Unit + Trailer truck was tracked through the accesses, as shown on **Drawing 20059/AL/01**, to ensure that deliveries and trucks will be able to manoeuvre into and out of the site.

5.3 Sight Distance

As can be seen on **Drawing 20059/AL/01** Mandela Dr is relatively flat and, with an average slope of less than 2%, and straight sections of road to the east and to the west in the vicinity of the proposed access position. The Shoulder and Stopping Sight Distances to the east and

west on Mandela Drive is more than 180m and is more than adequate for the purpose of this access, and with a speed limit of 60km/h.

As can be seen on **Drawing 20059/AL/01** Nita Ave is of an average grade and, with an average slope of less than 4.5%, and straight sections of road to the north and to the south in the vicinity of the proposed access positions. The Shoulder and Stopping Sight Distances to the north and south on Nita Ave is more than 180m and is more than adequate for the purpose of this access, and with a speed limit of 60km/h.

5.4 Access Spacing

The 'Left-in' access road from Mandela Dr is proposed at approx. 290m from the intersection of Nita Ave. Two other proposed accesses are situated on Nita Ave approx. 80m and 150m south of the intersection of Mandela Dr.

It can be concluded that the proposed access spacing on Mandela Dr is acceptable for a class 3 road and the proposed access spacing on Nita Ave is acceptable for a class 4 road. These accesses are also approved by Emalahleni Local Municipality as previously mentioned.

6 Total Future Traffic Flows

The future traffic flow was calculated with a compounding growth factor of **3.0% per annum** and was based on the background traffic from the existing 2020 counts.

Figure 7 shows the existing 2020 peak hour traffic plus estimated development traffic, which is the summation of **Figures 2** and **6.**

Figure 9 shows the future 2025 peak hour traffic plus estimated development traffic, which is the summation of **Figures 6** and **8**

6.1 Trip Distribution

Assumptions on the expected trip distribution were based on the location of the proposed site accesses in relation to the surrounding road network, as well as possible residential locations and road network layout in particularly the roads N4 highway, Mandela Drive, Nita Avenue, Bethal Street and Langa Cres. The traffic was distributed as shown below and on the enclosed **Figure 3, 4 and 5**. These percentages are of the total development traffic.

Development Traffic

- N4 Highway:
    - 4% from the east in the Friday Afternoon and 2.5% in the Saturday Morning.
    - 4.5% to the east in the Friday Afternoon and 2% in the Saturday Morning.
    - 18% from the west in the Friday Afternoon and 15% in the Saturday Morning.
    - 9% to the west in the Friday Afternoon and 14% in the Saturday Morning.

- Mandela Drive:
    - 18% from the east in the Friday Afternoon and 20% in the Saturday Morning.
    - 16.5% to the east in the Friday Afternoon and 24% in the Saturday Morning.
    - 32% from the west in the Friday Afternoon and 35% in the Saturday Morning.
    - 31.5% to the west in the Friday Afternoon and 35% in the Saturday Morning.

- Nita Avenue:
    - 15% from the south in the Friday Afternoon and 10% in the Saturday Morning.
    - 15% to the south in the Friday Afternoon and 10% in the Saturday Morning.

- Bethal Street:
    - 8% from the north in the Friday Afternoon and 10% in the Saturday Morning.
    - 13.5% to the north in the Friday Afternoon and 10% in the Saturday Morning.

- Highveld Mall Access:
    - 1% from the south in the Friday Afternoon and 5% in the Saturday Morning.
    - 7% to the south in the Friday Afternoon and 5% in the Saturday Morning.

- Langa Cres:
    - 4% from the north in the Friday Afternoon and 2.5% in the Saturday Morning.
    - 3% to the north in the Friday Afternoon and 0% in the Saturday Morning.

7 Traffic Impact & Capacity Analyses

In order to determine the expected traffic impact of the proposed development at the key intersections, capacity analyses were carried out by using SIDRA 9, a well-known traffic engineering software package. The following intersections were analysed:

Key Intersections:
- N4 Westbound Ramps & Mandela Dr
- N4 Eastbound Ramps & Mandela Dr
- Mandela Dr & Nita Ave
- Mandela Dr & Bethal St
- Mandela Dr & Langa Cres / Highveld Mall Access

The following scenarios were analysed at the above-mentioned key intersections, namely:

- Existing 2020 Friday Afternoon (PM) and Saturday Morning (AM) peak hour without the development traffic (as per **Figure 2**).
- Existing 2020 Friday Afternoon (PM) and Saturday Morning (AM) peak hour with development traffic (as per **Figure 7**).
- Future 2025 Background Friday Afternoon (PM) and Saturday Morning (AM) peak hour without development traffic (as per **Figure 8**).
- Future 2025 Background Friday Afternoon (PM) and Saturday Morning (AM) peak hour with development traffic (as per **Figure 9**).

The next subsections illustrate the SIDRA results in six tables and briefly discusses the results and key conclusion at the analysed intersections, with the details of Sidra Intersection Capacity Analyses appended in Annexure A.

7.1 N4 Westbound Ramps & Mandela Dr –With Planned Upgrades

Also see Annexures A1.1 to A1.10 have reference:

Table 4 – Results of Sidra Analyses (worst approach only)

Intersection		1. N4 Westbound Ramps & Mandela Dr			
Scenario		Existing 2020	Exist 2020 + Dev	Future 2025 (with planned upgrades)	Future 2025 + Dev (with planned upgrades)
Level of Service	Friday Afternoon PM Peak Hour	F	F	C	D
	Saturday Morning AM Peak Hour	D	D	B	C
Average Delays	Friday Afternoon PM Peak Hour	113.3	169.5	33.0	45.3
	Saturday Morning AM Peak Hour	46.8	53.7	18.0	21.7
Remarks	The Intersection currently operates acceptably, with the development traffic added – no upgrades are required.				

7.2 N4 Eastbound Ramps & Mandela Dr – With Planned Upgrades

Also see Annexures A2.1 to A2.10 have reference:

Table 5 – Results of Sidra Analyses (worst approach only)

Intersection		2. N4 Eastbound Ramps & Mandela Dr			
Scenario		Existing 2020	Exist 2020 + Dev	Future 2025 (with planned upgrades)	Future 2025 + Dev (with planned upgrades)
Level of Service	Friday Afternoon PM Peak Hour	C	C	C	C
	Saturday Morning AM Peak Hour	B	B	B	B
Average Delays	Friday Afternoon PM Peak Hour	25.9	27.7	20.3	21.5
	Saturday Morning AM Peak Hour	13.6	15.3	13.3	13.9
Remarks	The Intersection currently operates acceptably, with the development traffic added – no upgrades are required.				

7.3 Mandela Dr & Nita Ave –Upgrades Required

Also see Annexures A3.1 to A3.8 have reference:

Table 6 – Results of Sidra Analyses (worst approach only)

Intersection		3. Mandela Dr & Nita Ave			
Scenario		Existing 2020	Exist 2020 + Dev	Future 2025	Future 2025 + Dev
Level of Service	Friday Afternoon PM Peak Hour	D	F	F	F
	Saturday Morning AM Peak Hour	B	F	B	F
Average Delays	Friday Afternoon PM Peak Hour	27.6	268.6	180.2	465.2
	Saturday Morning AM Peak Hour	11.0	145.1	13.2	297.1
Remarks	The Intersection currently operates unacceptably, with the development traffic added – upgrades are required.				

7.4 Mandela Dr & Nita Ave – Signal Conversion

Also see Annexures A3.9 to A3.16 have reference:

Table 7 – Results of Sidra Analyses (worst approach only)

Intersection		3. Mandela Dr & Nita Ave – Signal Conversion		
Scenario		Exist 2020 + Dev	Future 2025	Future 2025 + Dev
Level of Service	Friday Afternoon PM Peak Hour	C	C	C
	Saturday Morning AM Peak Hour	C	B	D
Average Delays	Friday Afternoon PM Peak Hour	23.0	22.2	34.2
	Saturday Morning AM Peak Hour	28.2	17.0	46.9
Remarks	Conversion from 'All-way' Stop to 'Two phase' signalised intersection.			

7.5 Mandela Dr & Bethal St – No upgrades Required

Also see Annexures A4.1 to A4.10 have reference:

Table 8 – Results of Sidra Analyses (worst approach only)

Intersection		4. Mandela Dr & Bethal St			
Scenario		Existing 2020	Exist 2020 + Dev	Future 2025	Future 2025 + Dev
Level of Service	Friday Afternoon PM Peak Hour	C	C	C	D
	Saturday Morning AM Peak Hour	B	B	B	C
Average Delays	Friday Afternoon PM Peak Hour	23.4	29.6	31.0	40.8
	Saturday Morning AM Peak Hour	17.1	18.5	17.6	21.3
Remarks	The Intersection currently operates acceptably, with the development traffic added – no upgrades are required.				

7.6 Mandela Dr & Langa Cres – No upgrades Required

Also see Annexures A5.1 to A5.10 have reference:

Table 9 – Results of Sidra Analyses (worst approach only)

Intersection		5. Mandela Dr & Langa Cres			
Scenario		Existing 2020	Exist 2020 + Dev	Future 2025	Future 2025 + Dev
Level of Service	Friday Afternoon PM Peak Hour	C	C	D	D
	Saturday Morning AM Peak Hour	C	C	C	C
Average Delays	Friday Afternoon PM Peak Hour	29.0	32.8	38.7	42.0
	Saturday Morning AM Peak Hour	22.1	23.0	23.1	25.7
Remarks	The Intersection currently operates acceptably, with the development traffic added – no upgrades are required.				

7.7 SIDRA Analysis Conclusions

N4 Westbound Ramps & Mandela Dr:

The intersection of N4 Westbound Ramps & Mandela Dr currently operates at a worst-case LOS F with an average delay of 113.3 seconds. With the implementation of the **planned upgrades as set out for SANRAL by L&S Consulting** and the addition of the proposed development and the estimated 5-year traffic growth, this intersection will have a worst-case Level of Service of LOS D with an average delay of 45.3 seconds. The intersection will operate at acceptable conditions (good Levels of Service and Ave. Delays) with the implementation of the upgrades proposed by L&S Consulting (**Annexure C**).

N4 Eastbound Ramps & Mandela Dr:

The intersection of N4 Eastbound Ramps & Mandela Dr currently operates at a worst-case LOS C with an average delay of 25.9 seconds. With the implementation of the **planned upgrades as set out for SANRAL by L&S Consulting** and the addition of the proposed development and the estimated 5-year traffic growth, this intersection will have a worst-case Level of Service of LOS C with an average delay of 21.5 seconds. The intersection will operate at acceptable conditions (good Levels of Service and Ave. Delays) with the implementation of the upgrades proposed by L&S Consulting (**Annexure C**).

Mandela Dr & Nita Ave:

The intersection of Mandela Dr & Nita Ave currently operates at a worst-case LOS D with an average delay of 27.6 seconds. With the implementation of the proposed development and the additional estimated 5-year traffic growth, this intersection will still have a worst-case Level of Service of LOS F but with a longer average delay of 465.2 seconds. The intersection will not operate at acceptable conditions (good Levels of Service and Ave. Delays) and therefore some upgrades are proposed at this intersection for the proposed development.

The conversion from an 'All-way' stop to a 'two-phase' signalised intersection is proposed for this intersection as well as two additional lanes as set out in **Chapter 8.1 and Drawing 20059/AL/01**. This will result in a LOS D with a 46.9 seconds average delay in the Future 2025 Background plus development traffic scenario.

Mandela Dr & Bethal St:

The intersection of Mandela Dr & Bethal St currently operates at a worst-case LOS C with an average delay of 23.4 seconds. With the implementation of the proposed development and the additional estimated 5-year traffic growth, this intersection will have a worst-case Level of Service of LOS D with a longer average delay of 40.8 seconds. The intersection will still operate at acceptable conditions (good Levels of Service and Ave. Delays) and therefore no upgrades are proposed at this intersection for the proposed development.

Mandela Dr & Langa Cres:

The intersection of Mandela Dr & Langa Cres currently operates at a worst-case LOS C with an average delay of 29.0 seconds. With the implementation of the proposed development and the additional estimated 5-year traffic growth, this intersection will still have a worst-case Level of Service of LOS C but with a longer average delay of 42.0 seconds. The intersection will still operate at acceptable conditions (good Levels of Service and Ave. Delays) and therefore no upgrades are proposed at this intersection for the proposed development.

8 Road and/or Intersection Improvements

8.1 Proposed Road Improvements

An upgrade is proposed for the intersection of Mandela Dr & Nita Ave. (See **Drawing 20059/AL/01**)

The proposed upgrade includes the following:

- Conversion of the 'All-way' stop to a 'two-phase' signalised intersection
- Addition of a left-turn lane on western side of Nita Ave
- Addition of a slip exit lane on the eastern side of Nita Ave
-

8.2 Planned Road Improvements (By Others)

A congestion study was done **by MPE** in April 2017 for the N4 & Mandela Dr interchange and the Highveld Mall Accesses. Upgrades are proposed by **L&S Consulting** for both the N4 ramps intersections (See **Annexure C**).

These upgrades include the following:

Eastbound Ramps:

- Widening of the off-ramp on the eastern side to accommodate an additional short lane for the off-ramp and adding an additional right-turn lane by converting the existing left-turn lane to a right-turn lane.
- Construction of a kerbed island and left-slip lane for the off-ramp.
- For the eastern approach (Mandela Dr) the existing left-turn lane will be converted to a left-through lane. The western approach will be widened on the northern side to accommodate the corresponding short through-lane.

Westbound Ramps:

- Widening of Mandela Dr on the northern side to accommodate an additional short through-lane and the corresponding short exit lane.
- Conversion of the existing through-lane to a through-right lane.
- Widening of the on-ramp on the eastern side to accommodate an additional short lane.

9 Public Transport Assessment

9.1 Pedestrian Walkways & Crossings

It is recommended that a pedestrian walkway (proposed 1.5m wide) be provided along the northern and western site boundary from the 'left-in' access on the northern boundary to the 'full' access on the western boundary, in consultation with the Emalahleni Metropolitan Municipality. Refer to enclosed **Drawing 20059/AL/01.**

9.2 Public Transport Facilities

In terms of the National Land Transport Transition Act (NLTTA) 22 of 2000, Section 29, it is a requirement that an assessment of the public transport issues be included in the traffic impact assessments. The Act also requires that there be public transport facilities within 1km walking distance from a development in a built-up area.

Mandela Dr functions as a transit route between the N4 and the CBD with minibus taxis comprising approx. 6% of the daily traffic.

A formal public transport facility (taxi rank) is available, within 1km from the proposed access positions. A taxi rank is available within 700m from the proposed development at Highveld Mall, however it is proposed that a formal pick-up/drop-off/waiting area for taxis are provided within the parking area of the proposed development. One (1) taxi bay is proposed per 1000m² GLA retail development, resulting in twelve(12) taxi bays proposed for the proposed development of 12 000m² GLA retail shopping centre.

10 Conclusions & Recommendations

Based on the content of this traffic impact report, the following key conclusions and recommendations are relevant:

- The proposed development with total of site area approx. 30 454m² is located on President Park X6, with a proposed total of ±12 000m² GLA for Retail.
- As shown in Figure 1, the development is located on the President Park X6, Emalahleni. The proposed development site is located west of the N4 highway and south of Mandela Dr. The site is located between Nita Ave and Tswelopele Junction, opposite the Nissan Dealership.
- It is estimated that the proposed development with Retail Land-use will generate (as a worst case) a total of 816vph trips (total 'In' plus 'Out') during the Friday Afternoon (PM) and 1082vph trips (total 'In' plus 'Out') during the Saturday Morning (AM) peak hours.
- Sidra Intersection Capacity Analyses, were carried out for the Friday Afternoon and Saturday Morning peak periods at the key intersections and some upgrades are proposed for the development as shown on **Drawing 20059/AL/01.**

  The proposed upgrades for the intersection of Mandela Dr & Nita Ave includes the following:

  - Conversion of the 'All-way' stop to a 'two-phase' signalised intersection
  - Addition of a left-turn lane on western side of Nita Ave
  - Addition of a slip exit lane on the eastern side of Nita Ave
- There are three (3) site accesses proposed (and approved) for the use of the development. Two proposed 'Full' accesses from Nita Avenue and one 'Left-in' access from Mandela Dr.
- On Nita Ave a minimum of six (6) vehicles queuing (stacking) space of 36m from the future filling station access is required at the access in front of security gates/booms (if any) at the access. On Mandela Dr a minimum of three (3) vehicles queuing (stacking) space of 18m from the access road is required at the access in front of security gates/booms (if any) at the access. Refer to **Drawing 20059/AL/01** for details.
- With regard to non-motorised and public transport, a 1.5m wide sidewalk is proposed on the northern boundary and western boundary of the site. An additional public transport facility is proposed to accommodate 12 minibus taxis within the parking area of the shopping centre.

It is therefore recommended that the proposed development is supported from a traffic engineering perspective, provided that the road upgrades and the access is implemented as proposed in this report (and on **Drawing 20059/AL/01**) and to the relevant standards of the Emalahleni Local Municipality.

11 Bibliography

- TMH 17 - South African Trip Data Manual. (2013). South African Committee of Transport Officials.
- SIDRA Intersection 7. (2017). Australia: Department of Planning Transport and Infrastructure.
- TRH 26 - South African Road Classification and Access Management Manual. (2012). 1st ed. South African Committee of Transport Officials.
- TMH 16 - Traffic Impact and Site Traffic Assessment Manual. (2012). 1st ed. South African Committee of Transport Officials.

Figures

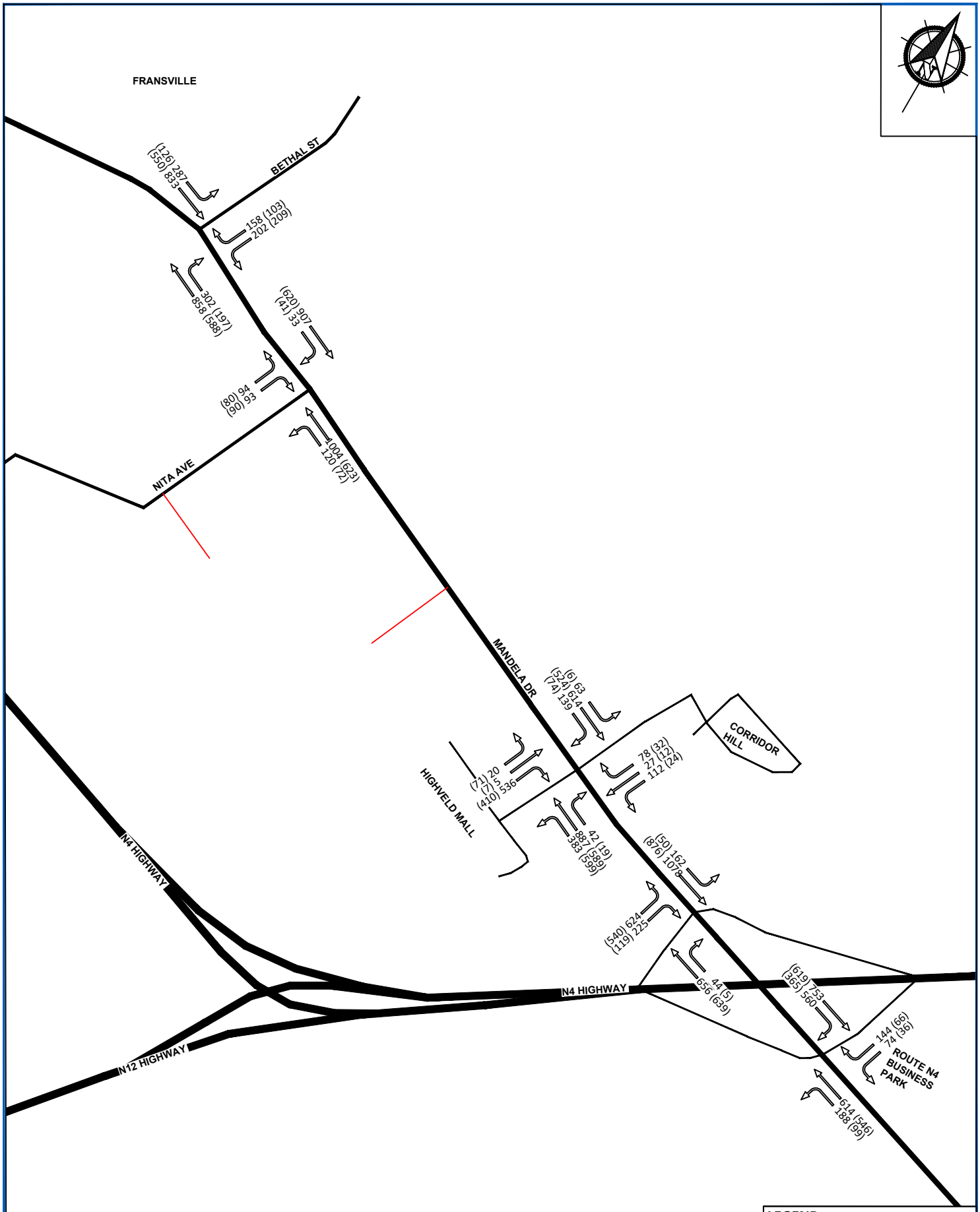
20059

SITE:
PRESIDENT PARK X6

TITLE:
LOCALITY

FIG 1

EDL ENGINEERS



LEGEND
PEAK HOUR TRAFFIC
FRIDAY PM / SATURDAY (AM)

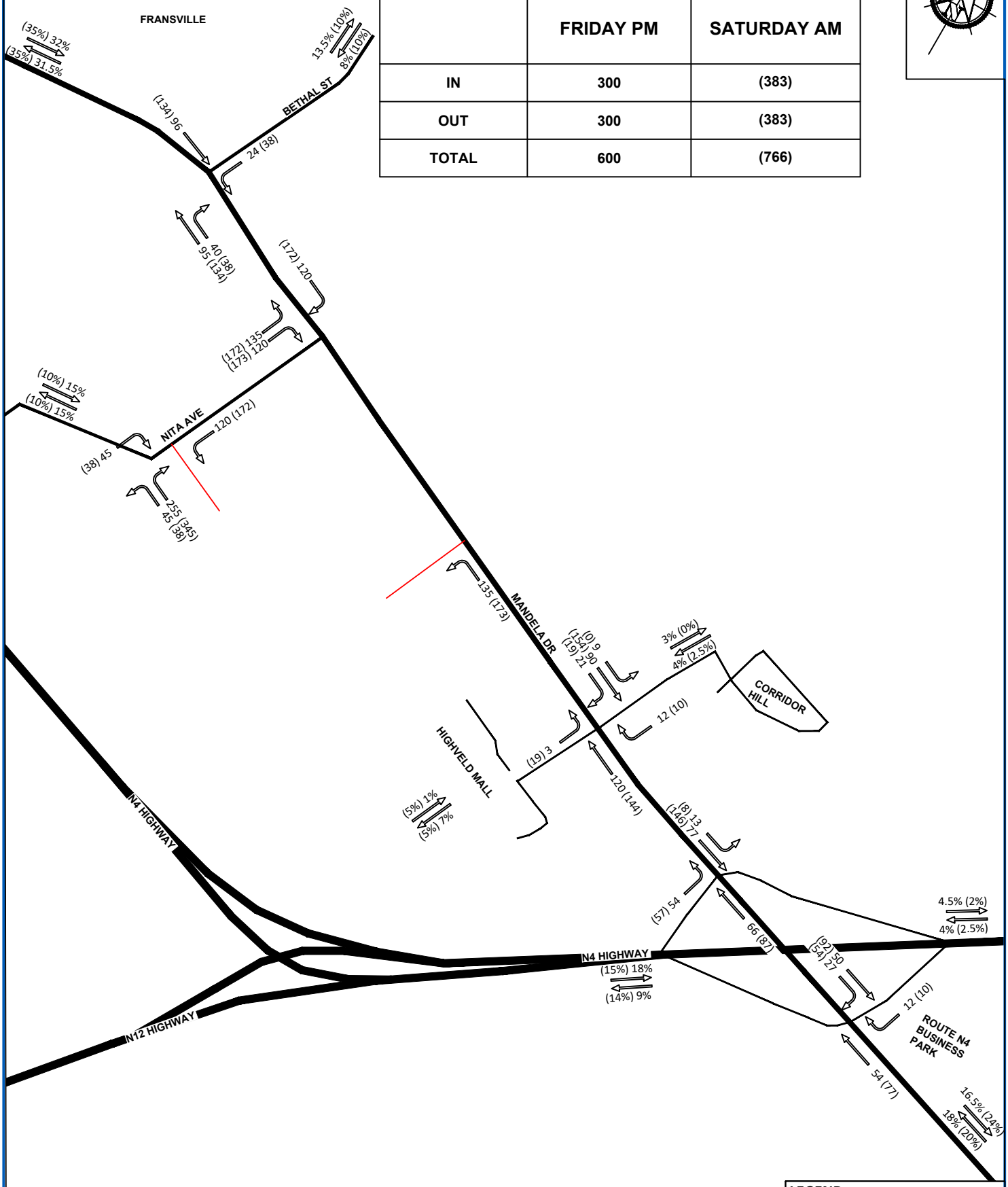
20059

SITE:	TITLE:	
PRESIDENT PARK X6	**EXISTING 2020 PEAK HOUR TRAFFIC**	**FIG 2**

EDL ENGINEERS

PRIMARY DEVELOPMENT PEAK HOUR TRAFFIC

	FRIDAY PM	SATURDAY AM
IN	300	(383)
OUT	300	(383)
TOTAL	600	(766)



LEGEND
PEAK HOUR TRAFFIC
FRIDAY PM / SATURDAY (AM)

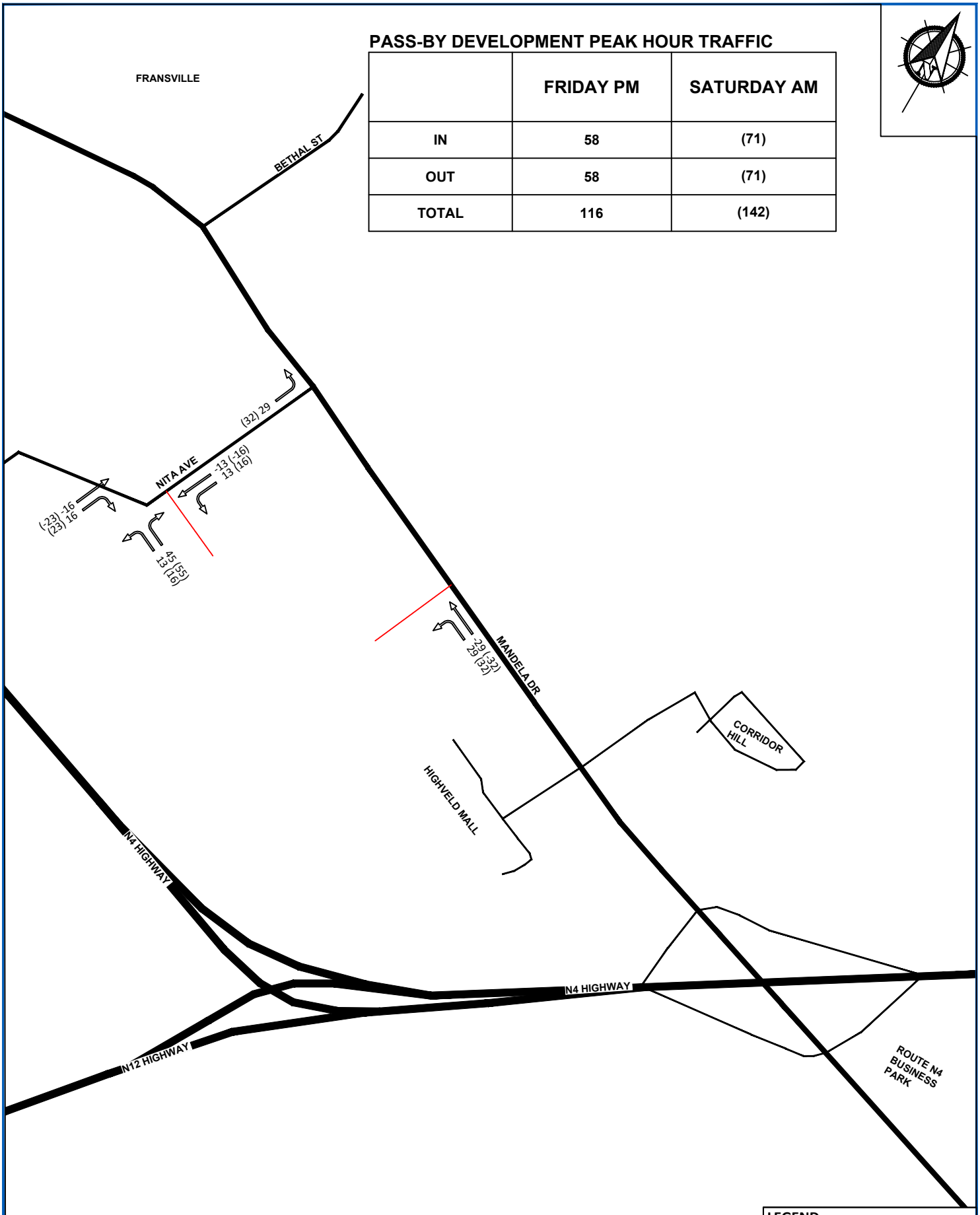
20059

SITE:	TITLE:	
PRESIDENT PARK X6	**PRIMARY DEVELOPMENT PEAK HOUR TRAFFIC**	**FIG 3**

EDL ENGINEERS

PASS-BY DEVELOPMENT PEAK HOUR TRAFFIC

	FRIDAY PM	SATURDAY AM
IN	58	(71)
OUT	58	(71)
TOTAL	116	(142)



LEGEND
PEAK HOUR TRAFFIC
FRIDAY PM / SATURDAY (AM)

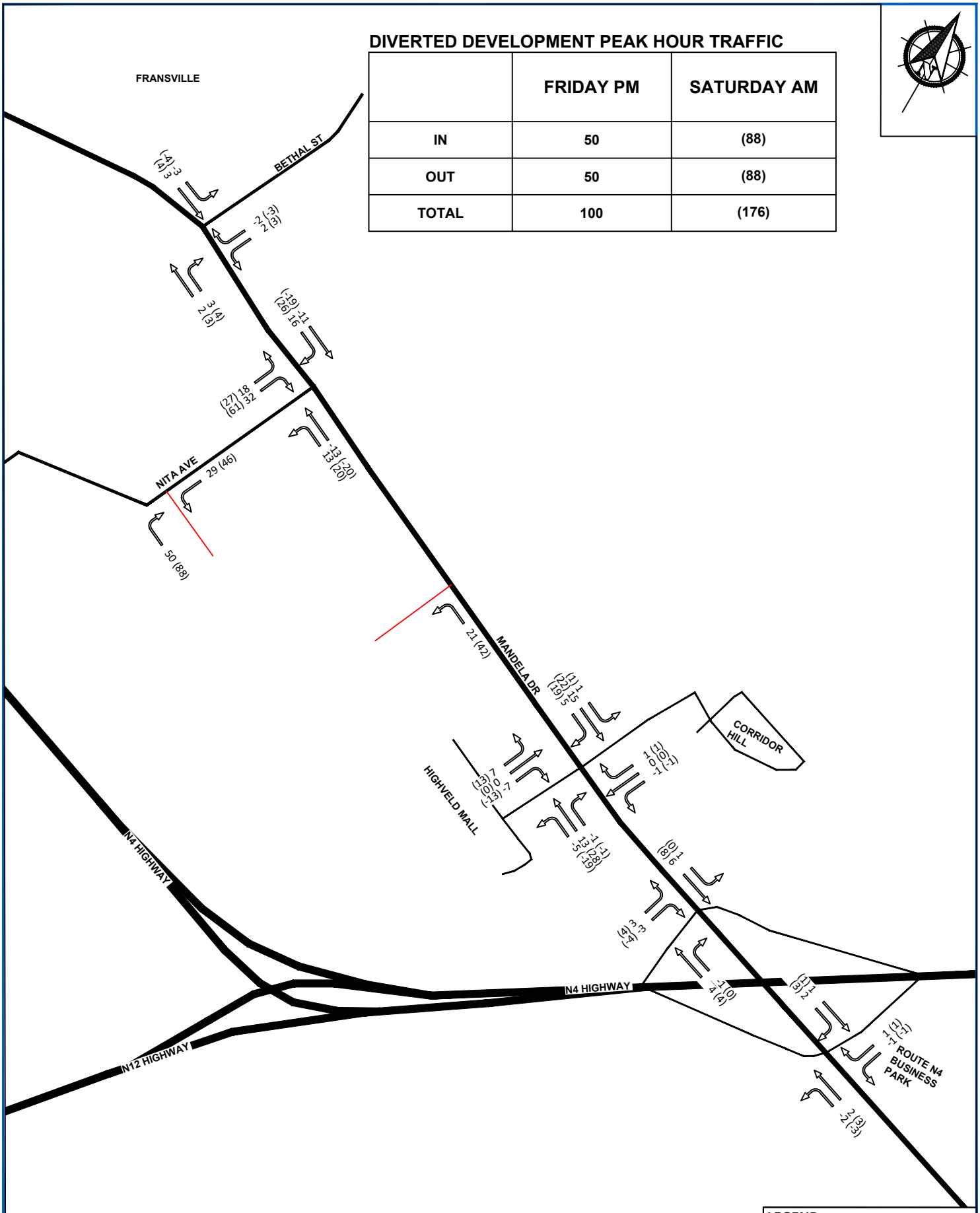
20059

SITE:	TITLE:	
PRESIDENT PARK X6	**PASS-BY DEVELOPMENT PEAK HOUR TRAFFIC**	**FIG 4**

EDL ENGINEERS

DIVERTED DEVELOPMENT PEAK HOUR TRAFFIC

	FRIDAY PM	SATURDAY AM
IN	50	(88)
OUT	50	(88)
TOTAL	100	(176)



LEGEND
PEAK HOUR TRAFFIC
FRIDAY PM / SATURDAY (AM)

20059

SITE: **PRESIDENT PARK X6**

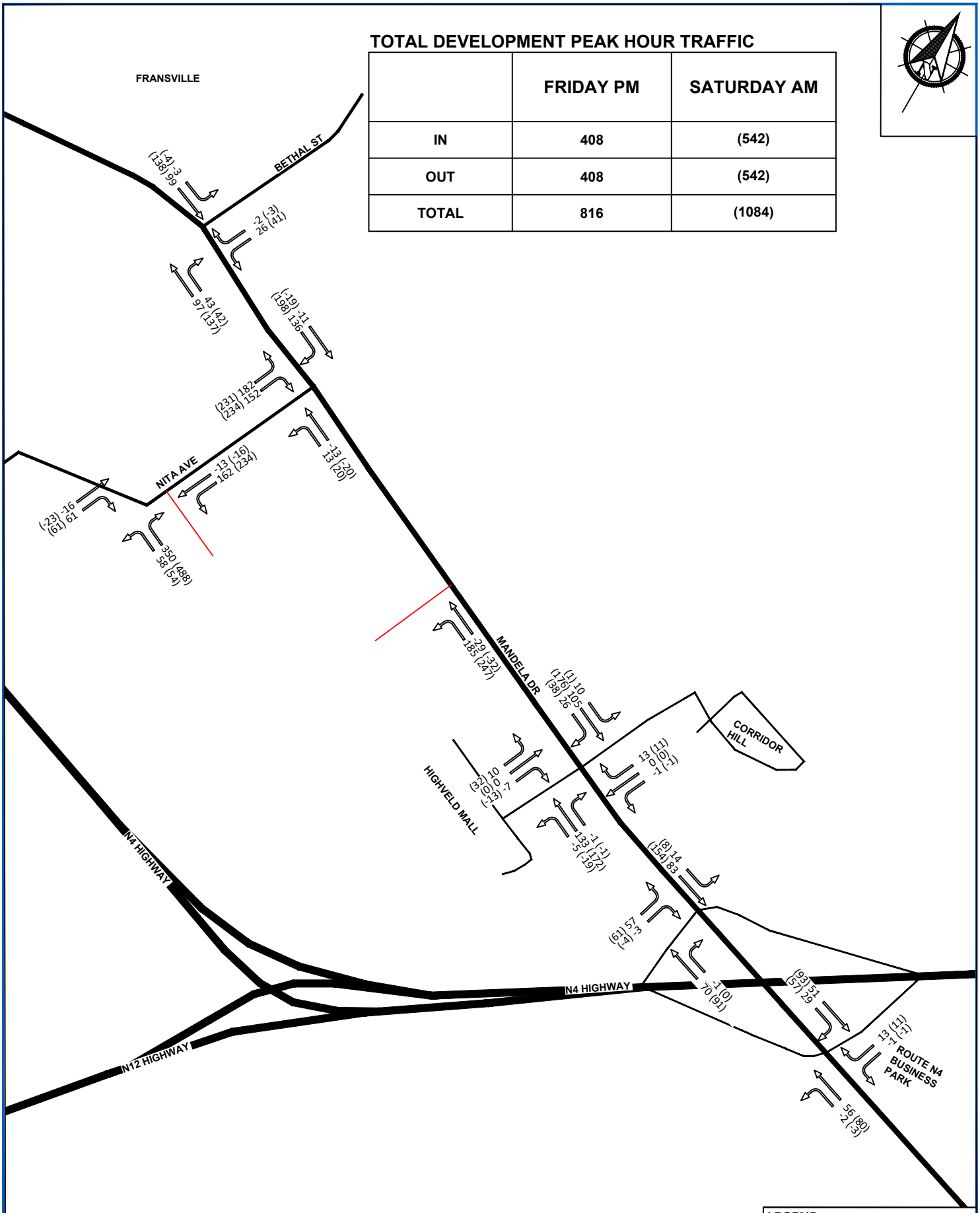
TITLE: **DIVERTED DEVELOPMENT PEAK HOUR TRAFFIC**

FIG 3

EDL ENGINEERS

TOTAL DEVELOPMENT PEAK HOUR TRAFFIC

	FRIDAY PM	SATURDAY AM
IN	408	(542)
OUT	408	(542)
TOTAL	816	(1084)



LEGEND
PEAK HOUR TRAFFIC
FRIDAY PM / SATURDAY (AM)

20059

SITE:	TITLE:	
PRESIDENT PARK X6	**TOTAL DEVELOPMENT PEAK HOUR TRAFFIC**	**FIG 6**

EDL ENGINEERS

LEGEND

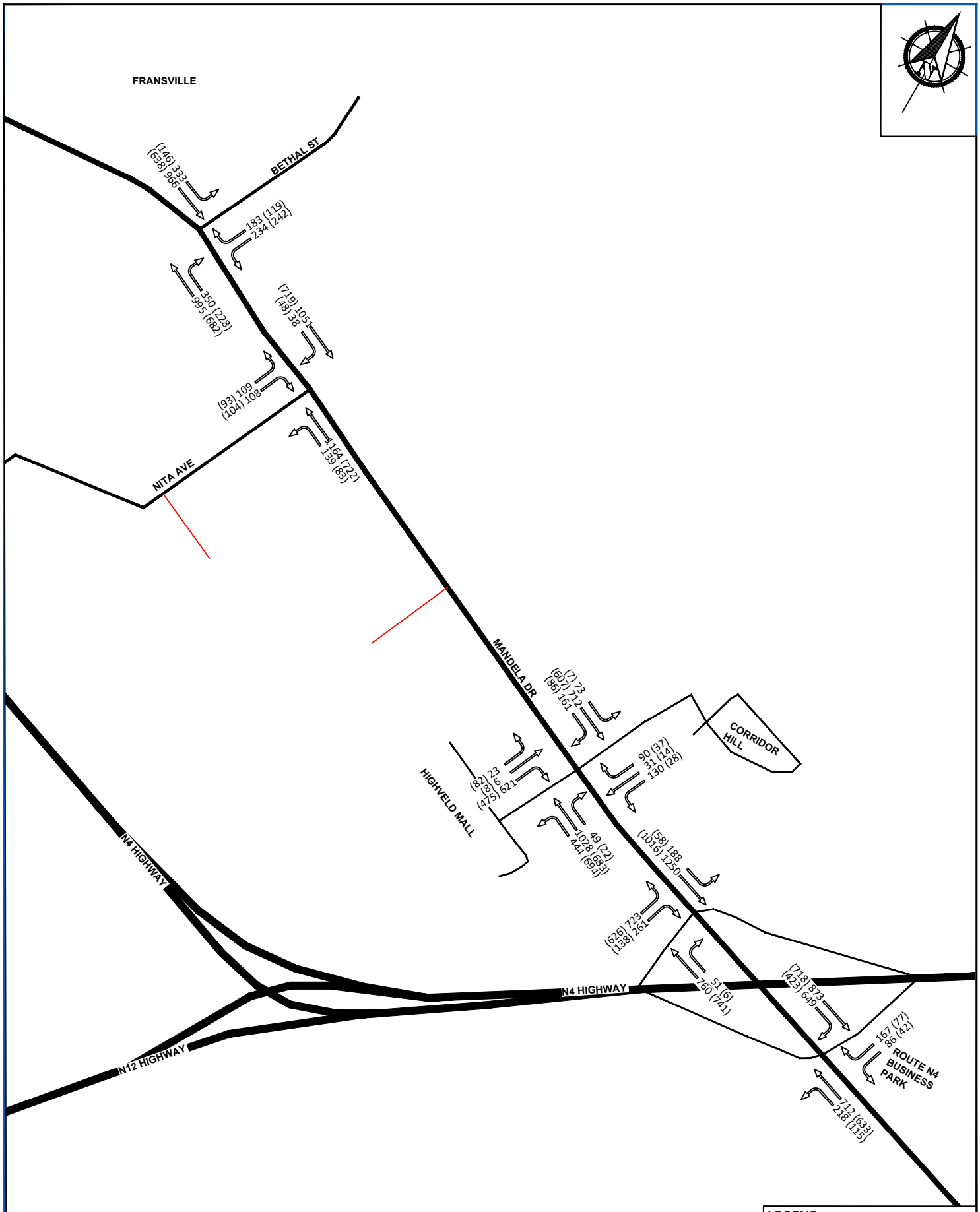
PEAK HOUR TRAFFIC

FRIDAY PM / SATURDAY (AM)

20059

SITE:	TITLE:	
PRESIDENT PARK X6	**EXISTING 2020 + TOTAL DEVELOPMENT PEAK HOUR TRAFFIC**	**FIG 7**

EDL ENGINEERS



LEGEND

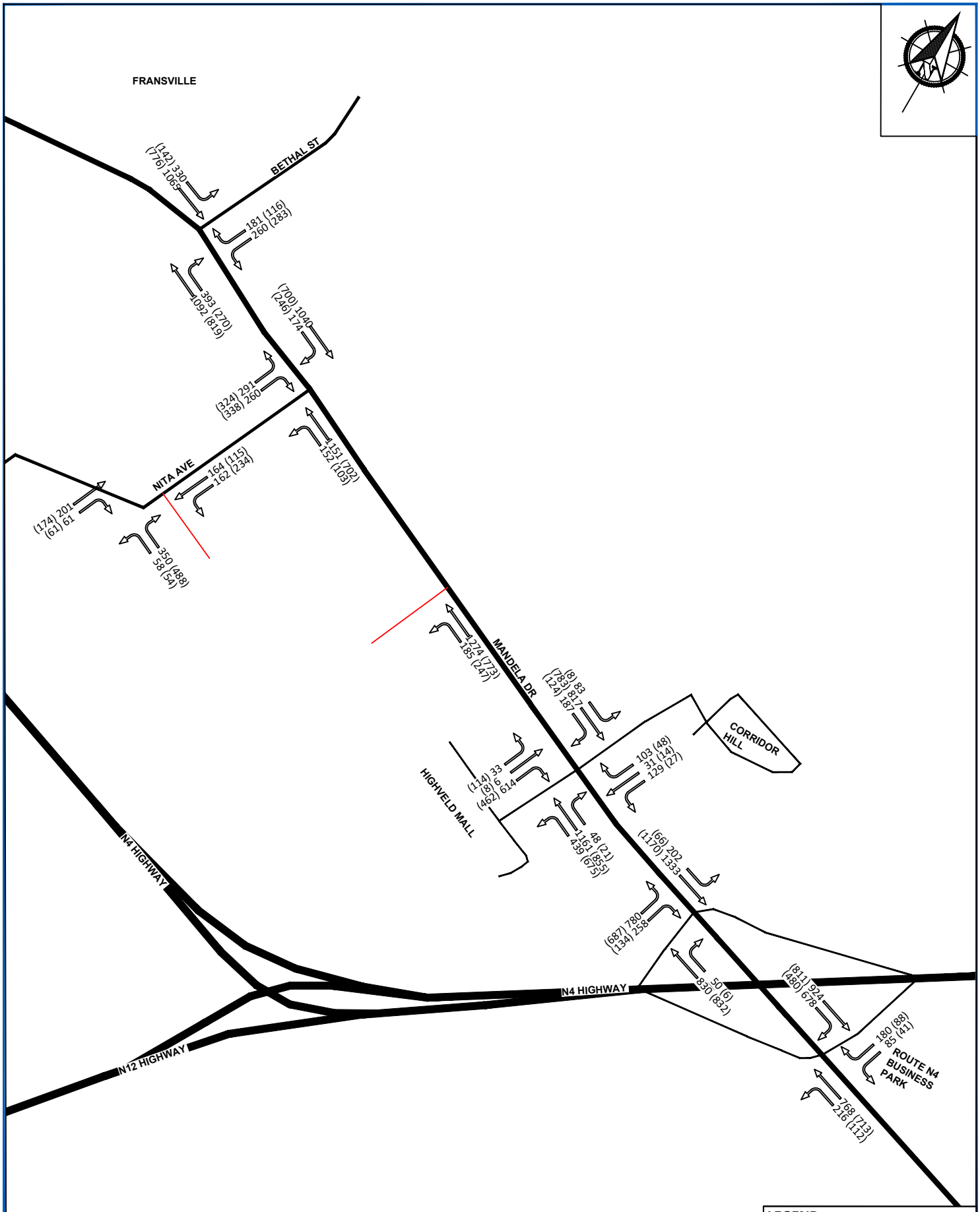
PEAK HOUR TRAFFIC

FRIDAY PM / SATURDAY (AM)

20059

SITE:	TITLE:	
PRESIDENT PARK X6	**FUTURE 2025 BACKGROUND PEAK HOUR TRAFFIC**	**FIG 8**

EDL ENGINEERS



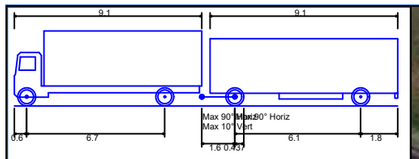
20059

SITE:	TITLE:	
PRESIDENT PARK X6	FUTURE 2025 BACKGROUND + DEVELOPMENT PEAK HOUR TRAFFIC	FIG 9

EDL ENGINEERS

Drawings

Drawing no: 20059/AL/01Proposed Accesses Layout & Proposed Intersection Upgrades



SU+T - Single Unit + Trailer

Overall Length	18.600m
Overall Width	2.500m
Overall Body Height	3.632m
Min Body Ground Clearance	0.337m
Track Width	2.500m
Lock to lock time	4.00s
Wall to Wall Turning Radius	10.000m

TURNING CIRCLES MODEL (SU+T)

PROPOSED 2-PHASE SIGNAL CONVERSION INTERSECTION UPGRADE

PROPOSED 1.5m WIDE WALKWAY

PROPOSED 1.5m WIDE WALKWAY

NISSAN DEALERSHIP

NITA AVE

MANDELA DR

POSSIBLE FUTURE FILLING STATION (±4200m²)

SITE (PRESIDENT PARK X6)

MIN 36.0 STACKING

MIN 18.0 STACKING

45.0 LANE

45.0 TAPER

R.O.W.

R.O.W.

R.O.W.

REMAINDER OF PORTION 121 ZEEKOEWATER 311JS

PORTION 120 ZEEKOEWATER 311JS

100.0 190.0 80.0 70.0 30.0 28.0 3.5 3.5 5.0 5.0 5.0 5.0 5.0 5.0 8.0 8.0 3.2 R15.0 R15.0 R15.0 R20.0 R20.0 R8.0 R8.0 R2 R2 R2 R1 R1 STOP STOP

LEGEND

- PROPOSED RETAIL ACCESSES LAYOUT
- PROPOSED PAVED SIDEWALK

REV:	DESCRIPTION:	BY:	DATE:
	AMENDMENTS:		

SITE: **PRESIDENT PARK X6**	**20059/AL/01** DRAWING NO.		**20059** PROJECT NO.	**30/10/2020** DATE.
TITLE: **PROPOSED ACCESSES LAYOUT & PROPOSED INTERSECTION UPGRADES**	**1:1250** SCALE AT A3.	**JMvR** DRAWN.	**ED KOTZE** CHECKED.	**0** REVISION.

ENGINEERING DESIGN LAB

EDL CONSULTING ENGINEERS
1st Floor, Block D
The Village Office Park
C/O Glenwood Rd & Oberon Ave,
Fearie Glen, 0043
Tel: 087 897 5074/5/6
eben@edlengineers.co.za
www.edlengineers.co.za

Annexure A

Relevant outputs of the SIDRA9 intersection capacity analyses at the key intersections

Annexure A1:

N4 Westbound Ramps & Mandela Dr

- A1.1 – Existing 2020 Friday PM Peak Hour Traffic
- A1.2 – Existing 2020 Saturday AM Peak Hour Traffic
- A1.3 – Existing 2020 Plus Development Friday PM Peak Hour Traffic
- A1.4 – Existing 2020 Plus Development Saturday AM Peak Hour Traffic
- A1.5 – Future 2025 Background Friday PM Peak Hour Traffic
- A1.6 – Future 2025 Background Saturday AM Peak Hour Traffic
- A1.7 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic
- A1.8 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic
- A1.9 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic – Signal Timing
- A1.10 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic – Signal Timing

Annexure A1.1

Sidra Output: N4 Westbound Ramps & Mandela Dr

Existing 2020 Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	188	5.0	198	5.0	0.268	24.5	LOS C	5.7	41.9	0.70	0.76	0.70	41.9
5	T1	614	5.0	646	5.0	0.832	30.7	LOS C	28.3	206.3	0.96	0.95	1.07	39.8
Approach		802	5.0	844	5.0	0.832	29.2	LOS C	28.3	206.3	0.90	0.90	0.99	40.3
North: N4 WB Off-ramp														
7	L2	74	5.0	78	5.0	0.558	52.0	LOS D	3.6	26.0	1.00	0.78	1.04	31.8
9	R2	144	5.0	152	5.0	* 1.087	144.8	LOS F	13.4	97.7	1.00	1.35	2.51	17.2
Approach		218	5.0	229	5.0	1.087	113.3	LOS F	13.4	97.7	1.00	1.16	2.01	20.4
West: Mandela Dr														
11	T1	753	5.0	793	5.0	* 1.021	89.8	LOS F	61.2	446.6	1.00	1.52	1.77	24.1
12	R2	560	5.0	589	5.0	* 0.870	41.1	LOS D	23.8	173.8	0.99	1.04	1.20	34.8
Approach		1313	5.0	1382	5.0	1.021	69.0	LOS E	61.2	446.6	1.00	1.32	1.53	27.7
All Vehicles		2333	5.0	2456	5.0	1.087	59.5	LOS E	61.2	446.6	0.96	1.16	1.39	29.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A1.2

Sidra Output: N4 Westbound Ramps & Mandela Dr

Existing 2020 Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	99	5.0	104	5.0	0.133	20.0	LOS C	2.4	17.7	0.63	0.72	0.63	44.1
5	T1	546	5.0	575	5.0	0.696	19.7	LOS B	18.2	133.2	0.87	0.77	0.87	45.3
Approach		645	5.0	679	5.0	0.696	19.7	LOS B	18.2	133.2	0.83	0.76	0.83	45.1
North: N4 WB Off-ramp														
7	L2	36	5.0	38	5.0	0.282	46.1	LOS D	1.5	11.0	0.98	0.73	0.98	33.6
9	R2	66	5.0	69	5.0	* 0.517	47.1	LOS D	2.8	20.7	1.00	0.76	1.02	33.0
Approach		102	5.0	107	5.0	0.517	46.8	LOS D	2.8	20.7	0.99	0.75	1.00	33.2
West: Mandela Dr														
11	T1	619	5.0	652	5.0	* 0.789	23.4	LOS C	23.4	171.0	0.92	0.88	0.99	43.3
12	R2	365	5.0	384	5.0	* 0.582	16.8	LOS B	8.4	61.4	0.86	0.84	0.86	45.3
Approach		984	5.0	1036	5.0	0.789	21.0	LOS C	23.4	171.0	0.90	0.87	0.94	44.0
All Vehicles		1731	5.0	1822	5.0	0.789	22.0	LOS C	23.4	171.0	0.88	0.82	0.90	43.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A1.3

Sidra Output: N4 Westbound Ramps & Mandela Dr

Existing 2020 + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	186	5.0	196	5.0	0.266	24.4	LOS C	5.7	41.4	0.70	0.76	0.70	41.9
5	T1	670	5.0	705	5.0	0.911	42.5	LOS D	37.2	271.6	1.00	1.12	1.27	35.3
Approach		856	5.0	901	5.0	0.911	38.6	LOS D	37.2	271.6	0.93	1.04	1.15	36.5
North: N4 WB Off-ramp														
7	L2	73	5.0	77	5.0	0.551	52.0	LOS D	3.5	25.6	1.00	0.78	1.03	31.8
9	R2	157	5.0	165	5.0	1.185 *	224.1	LOS F	19.2	140.4	1.00	1.56	3.08	12.3
Approach		230	5.0	242	5.0	1.185	169.5	LOS F	19.2	140.4	1.00	1.31	2.43	15.3
West: Mandela Dr														
11	T1	804	5.0	846	5.0	1.090 *	138.4	LOS F	81.3	593.2	1.00	1.88	2.22	18.1
12	R2	589	5.0	620	5.0	0.946 *	60.0	LOS E	33.0	240.7	1.00	1.14	1.43	29.4
Approach		1393	5.0	1466	5.0	1.090	105.3	LOS F	81.3	593.2	1.00	1.56	1.89	21.6
All Vehicles		2479	5.0	2609	5.0	1.185	88.2	LOS F	81.3	593.2	0.98	1.36	1.68	24.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A1.4

Sidra Output: N4 Westbound Ramps & Mandela Dr

Existing 2020 + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	96	5.0	101	5.0	0.124	20.7	LOS C	2.5	18.5	0.61	0.71	0.61	43.8
5	T1	626	5.0	659	5.0	0.766	23.0	LOS C	24.8	181.0	0.90	0.83	0.92	43.5
Approach		722	5.0	760	5.0	0.766	22.7	LOS C	24.8	181.0	0.86	0.81	0.88	43.5
North: N4 WB Off-ramp														
7	L2	35	5.0	37	5.0	0.308	51.9	LOS D	1.7	12.1	0.99	0.73	0.99	31.9
9	R2	77	5.0	81	5.0	* 0.678	54.5	LOS D	3.8	28.0	1.00	0.82	1.17	30.9
Approach		112	5.0	118	5.0	0.678	53.7	LOS D	3.8	28.0	1.00	0.79	1.11	31.2
West: Mandela Dr														
11	T1	712	5.0	749	5.0	* 0.871	32.6	LOS C	35.0	255.2	0.97	1.01	1.13	39.0
12	R2	422	5.0	444	5.0	* 0.681	24.9	LOS C	11.3	82.2	0.90	0.91	0.90	41.1
Approach		1134	5.0	1194	5.0	0.871	29.7	LOS C	35.0	255.2	0.95	0.97	1.05	39.8
All Vehicles		1968	5.0	2072	5.0	0.871	28.5	LOS C	35.0	255.2	0.92	0.90	0.99	40.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A1.5

Sidra Output: N4 Westbound Ramps & Mandela Dr

Future 2025 Background Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	218	5.0	229	5.0	0.295	17.6	LOS B	4.4	32.3	0.69	0.76	0.69	45.4
5	T1	712	5.0	749	5.0	0.916	33.6	LOS C	29.3	214.0	1.00	1.19	1.42	38.6
Approach		930	5.0	979	5.0	0.916	29.9	LOS C	29.3	214.0	0.93	1.09	1.25	40.0
North: N4 WB Off-ramp														
7	L2	86	5.0	91	5.0	0.138	19.9	LOS B	1.8	13.1	0.70	0.72	0.70	44.4
9	R2	167	5.0	176	5.0	0.267	20.2	LOS C	3.7	26.9	0.74	0.76	0.74	44.0
Approach		253	5.0	266	5.0	0.267	20.1	LOS C	3.7	26.9	0.73	0.75	0.73	44.1
West: Mandela Dr														
11	T1	873	5.0	919	5.0	* 0.936	34.5	LOS C	32.3	235.5	0.94	1.14	1.37	38.4
12	R2	649	5.0	683	5.0	* 0.864	30.9	LOS C	19.0	138.7	0.97	1.07	1.23	38.5
Approach		1522	5.0	1602	5.0	0.936	33.0	LOS C	32.3	235.5	0.95	1.11	1.31	38.5
All Vehicles		2705	5.0	2847	5.0	0.936	30.7	LOS C	32.3	235.5	0.92	1.07	1.23	39.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A1.6

Sidra Output: N4 Westbound Ramps & Mandela Dr

Future 2025 Background Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	115	5.0	121	5.0	0.159	13.4	LOS B	1.5	10.9	0.65	0.72	0.65	47.9
5	T1	633	5.0	666	5.0	* 0.830	16.8	LOS B	14.7	107.4	0.95	1.01	1.24	47.0
Approach		748	5.0	787	5.0	0.830	16.3	LOS B	14.7	107.4	0.90	0.96	1.15	47.1
North: N4 WB Off-ramp														
7	L2	42	5.0	44	5.0	0.090	18.0	LOS B	0.7	4.9	0.77	0.71	0.77	45.4
9	R2	77	5.0	81	5.0	0.164	18.0	LOS B	1.3	9.2	0.79	0.73	0.79	45.2
Approach		119	5.0	125	5.0	0.164	18.0	LOS B	1.3	9.2	0.79	0.72	0.79	45.3
West: Mandela Dr														
11	T1	718	5.0	756	5.0	0.785	13.5	LOS B	12.6	92.3	0.88	0.86	1.04	49.2
12	R2	423	5.0	445	5.0	* 0.631	14.3	LOS B	5.8	42.4	0.86	0.86	0.88	46.8
Approach		1141	5.0	1201	5.0	0.785	13.8	LOS B	12.6	92.3	0.87	0.86	0.98	48.3
All Vehicles		2008	5.0	2114	5.0	0.830	15.0	LOS B	14.7	107.4	0.88	0.89	1.03	47.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A1.7

Sidra Output: N4 Westbound Ramps & Mandela Dr

Future 2025 Background + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	216	5.0	227	5.0	0.286	19.1	LOS B	5.0	36.4	0.68	0.75	0.68	44.6
5	T1	768	5.0	808	5.0	0.967	52.6	LOS D	43.1	314.8	1.00	1.35	1.59	32.1
Approach		984	5.0	1036	5.0	0.967	45.3	LOS D	43.1	314.8	0.93	1.22	1.39	34.2
North: N4 WB Off-ramp														
7	L2	85	5.0	89	5.0	0.129	21.3	LOS C	2.0	14.5	0.68	0.72	0.68	43.8
9	R2	180	5.0	189	5.0	0.274	21.6	LOS C	4.5	32.8	0.73	0.76	0.73	43.2
Approach		265	5.0	279	5.0	0.274	21.5	LOS C	4.5	32.8	0.71	0.75	0.71	43.4
West: Mandela Dr														
11	T1	924	5.0	973	5.0	* 0.969	47.5	LOS D	43.7	318.9	0.94	1.22	1.44	33.8
12	R2	678	5.0	714	5.0	* 0.895	38.3	LOS D	25.7	187.4	0.99	1.10	1.29	35.8
Approach		1602	5.0	1686	5.0	0.969	43.6	LOS D	43.7	318.9	0.96	1.17	1.38	34.6
All Vehicles		2851	5.0	3001	5.0	0.969	42.1	LOS D	43.7	318.9	0.93	1.15	1.32	35.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

v

Annexure A1.8

Sidra Output: N4 Westbound Ramps & Mandela Dr

Future 2025 Background + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
4	L2	112	5.0	118	5.0	0.141	15.5	LOS B	2.0	14.5	0.60	0.71	0.60	46.7
5	T1	713	5.0	751	5.0	* 0.852	22.7	LOS C	24.0	174.9	0.95	1.01	1.16	43.7
Approach		825	5.0	868	5.0	0.852	21.7	LOS C	24.0	174.9	0.90	0.97	1.08	44.1
North: N4 WB Off-ramp														
7	L2	41	5.0	43	5.0	0.072	20.9	LOS C	0.9	6.4	0.71	0.70	0.71	43.9
9	R2	88	5.0	93	5.0	0.155	21.0	LOS C	1.9	14.1	0.74	0.73	0.74	43.6
Approach		129	5.0	136	5.0	0.155	20.9	LOS C	1.9	14.1	0.73	0.72	0.73	43.7
West: Mandela Dr														
11	T1	811	5.0	854	5.0	0.807	17.8	LOS B	20.5	149.3	0.87	0.85	0.97	46.6
12	R2	480	5.0	505	5.0	* 0.669	19.9	LOS B	9.6	69.8	0.86	0.92	0.86	43.6
Approach		1291	5.0	1359	5.0	0.807	18.6	LOS B	20.5	149.3	0.86	0.87	0.93	45.4
All Vehicles		2245	5.0	2363	5.0	0.852	19.9	LOS B	24.0	174.9	0.87	0.90	0.98	44.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A1.9

Sidra Output: N4 Westbound Ramps & Mandela Dr – Signal Timing

Future 2025 Background + Development Friday PM Peak Hour Traffic

PHASING SUMMARY

Site: [Mandela Dr & N4 WB - Fut + Dev Fri PM (Site Folder: General)]

Future 2025 Background + Development Friday PM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

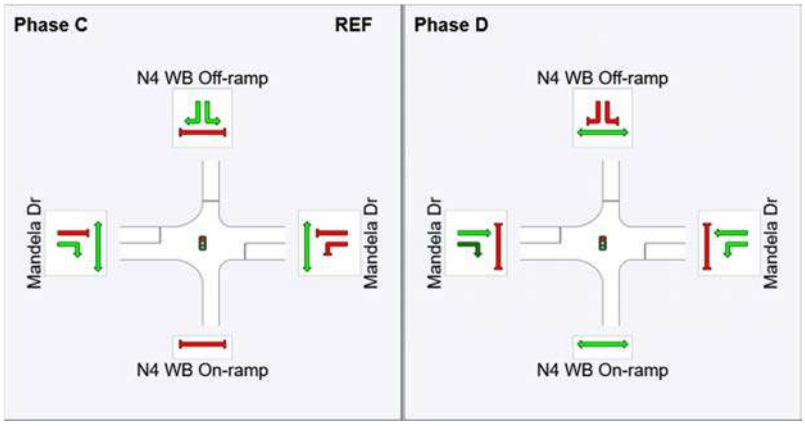
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase C
Input Phase Sequence: C, D
Output Phase Sequence: C, D

Phase Timing Summary

Phase	C	D
Phase Change Time (sec)	0	33
Green Time (sec)	27	31
Phase Time (sec)	33	37
Phase Split	47%	53%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A1.10

Sidra Output: N4 Westbound Ramps & Mandela Dr – Signal Timing

Future 2025 Background + Development Saturday AM Peak Hour Traffic

PHASING SUMMARY

Site: [Mandela Dr & N4 WB - Fut + Dev Fri PM (Site Folder: General)]

Future 2025 Background + Development Friday PM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

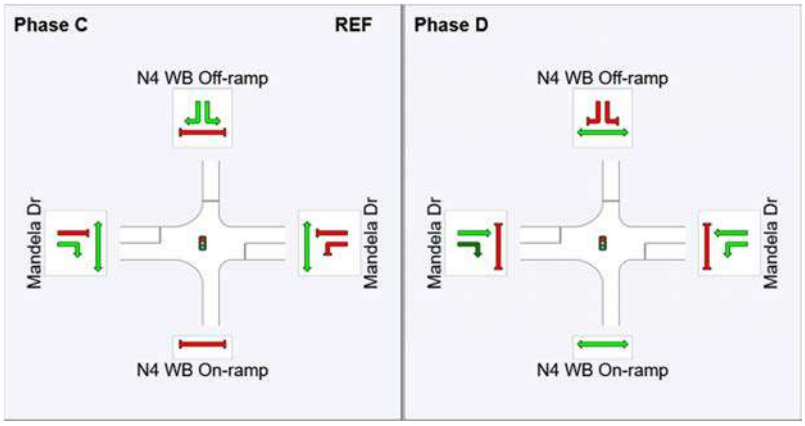
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase C
Input Phase Sequence: C, D
Output Phase Sequence: C, D

Phase Timing Summary

Phase	C	D
Phase Change Time (sec)	0	33
Green Time (sec)	27	31
Phase Time (sec)	33	37
Phase Split	47%	53%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A2:

N4 Eastbound Ramps & Mandela Dr

- A2.1 – Existing 2020 Friday PM Peak Hour Traffic
- A2.2 – Existing 2020 Saturday AM Peak Hour Traffic
- A2.3 – Existing 2020 Plus Development Friday PM Peak Hour Traffic
- A2.4 – Existing 2020 Plus Development Saturday AM Peak Hour Traffic
- A2.5 – Future 2025 Background Friday PM Peak Hour Traffic
- A2.6 – Future 2025 Background Saturday AM Peak Hour Traffic
- A2.7 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic
- A2.8 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic
- A2.9 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic - Signal Timing
- A2.10 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic - Signal Timing

Annexure A2.1

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Existing 2020 Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	624	5.0	657	5.0	0.366	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
3	R2	225	5.0	237	5.0	* 0.861	81.9	LOS F	18.7	136.5	1.00	0.92	1.22	25.1
Approach		849	5.0	894	5.0	0.861	25.9	LOS C	18.7	136.5	0.27	0.63	0.32	41.8
East: Mandela Dr														
5	T1	656	5.0	691	5.0	0.532	12.2	LOS B	24.3	177.6	0.54	0.49	0.54	50.0
6	R2	44	5.0	46	5.0	* 0.300	36.4	LOS D	2.1	15.6	0.86	0.77	0.86	36.4
Approach		700	5.0	737	5.0	0.532	13.7	LOS B	24.3	177.6	0.56	0.51	0.56	48.8
West: Mandela Dr														
10	L2	162	5.0	171	5.0	0.138	14.1	LOS B	4.2	30.6	0.37	0.67	0.37	47.5
11	T1	1078	5.0	1135	5.0	* 0.875	19.4	LOS B	63.7	465.0	0.86	0.81	0.86	45.4
Approach		1240	5.0	1305	5.0	0.875	18.7	LOS B	63.7	465.0	0.79	0.79	0.79	45.7
All Vehicles		2789	5.0	2936	5.0	0.875	19.7	LOS B	63.7	465.0	0.57	0.67	0.59	45.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.2

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Existing 2020 Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	540	5.0	568	5.0	0.317	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.6
3	R2	119	5.0	125	5.0	* 0.629	49.5	LOS D	5.6	41.0	1.00	0.81	1.06	32.3
Approach		659	5.0	694	5.0	0.629	13.6	LOS B	5.6	41.0	0.18	0.58	0.19	48.7
East: Mandela Dr														
5	T1	639	5.0	673	5.0	0.572	10.6	LOS B	17.2	125.4	0.63	0.57	0.63	51.0
6	R2	5	5.0	5	5.0	* 0.019	17.9	LOS B	0.1	0.7	0.69	0.66	0.69	44.7
Approach		644	5.0	678	5.0	0.572	10.7	LOS B	17.2	125.4	0.63	0.57	0.63	51.0
West: Mandela Dr														
10	L2	50	5.0	53	5.0	0.047	12.6	LOS B	0.9	6.4	0.41	0.66	0.41	48.5
11	T1	876	5.0	922	5.0	* 0.785	13.4	LOS B	29.7	216.7	0.80	0.74	0.80	49.1
Approach		926	5.0	975	5.0	0.785	13.4	LOS B	29.7	216.7	0.78	0.73	0.78	49.1
All Vehicles		2229	5.0	2346	5.0	0.785	12.7	LOS B	29.7	216.7	0.56	0.64	0.56	49.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.3

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Existing 2020 + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	681	5.0	717	5.0	0.400	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
3	R2	222	5.0	234	5.0	* 0.931	95.0	LOS F	20.2	147.4	1.00	0.97	1.38	23.0
Approach		903	5.0	951	5.0	0.931	27.7	LOS C	20.2	147.4	0.25	0.64	0.34	41.0
East: Mandela Dr														
5	T1	726	5.0	764	5.0	0.578	11.9	LOS B	27.5	200.6	0.55	0.51	0.55	50.2
6	R2	43	5.0	45	5.0	* 0.326	44.3	LOS D	2.4	17.5	0.92	0.77	0.92	33.7
Approach		769	5.0	809	5.0	0.578	13.7	LOS B	27.5	200.6	0.57	0.52	0.57	48.8
West: Mandela Dr														
10	L2	176	5.0	185	5.0	0.148	13.5	LOS B	4.4	32.1	0.36	0.67	0.36	47.9
11	T1	1161	5.0	1222	5.0	* 0.924	27.7	LOS C	82.1	599.0	0.93	0.92	0.98	41.2
Approach		1337	5.0	1407	5.0	0.924	25.8	LOS C	82.1	599.0	0.86	0.89	0.90	42.0
All Vehicles		3009	5.0	3167	5.0	0.931	23.3	LOS C	82.1	599.0	0.60	0.72	0.65	43.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.4

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Existing 2020 + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	601	5.0	633	5.0	0.353	5.8	LOS A	0.0	0.0	0.00	0.53	0.00	54.6
3	R2	115	5.0	121	5.0	* 0.675	65.1	LOS E	7.2	52.9	1.00	0.82	1.08	28.4
Approach		716	5.0	754	5.0	0.675	15.3	LOS B	7.2	52.9	0.16	0.57	0.17	47.7
East: Mandela Dr														
5	T1	730	5.0	768	5.0	0.581	9.6	LOS A	22.3	162.8	0.55	0.50	0.55	51.8
6	R2	5	5.0	5	5.0	* 0.025	22.3	LOS C	0.1	1.1	0.68	0.67	0.68	42.4
Approach		735	5.0	774	5.0	0.581	9.7	LOS A	22.3	162.8	0.55	0.51	0.55	51.7
West: Mandela Dr														
10	L2	58	5.0	61	5.0	0.049	11.4	LOS B	1.1	7.9	0.33	0.65	0.33	49.2
11	T1	1030	5.0	1084	5.0	* 0.820	13.4	LOS B	43.9	320.5	0.77	0.72	0.77	49.1
Approach		1088	5.0	1145	5.0	0.820	13.3	LOS B	43.9	320.5	0.75	0.72	0.75	49.1
All Vehicles		2539	5.0	2673	5.0	0.820	12.8	LOS B	43.9	320.5	0.52	0.62	0.53	49.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.5

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Future 2025 Background Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	723	5.0	761	5.0	0.424	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
3	R2	261	5.0	275	5.0	* 0.834	60.5	LOS E	9.7	70.6	0.99	0.87	1.19	30.4
Approach		984	5.0	1036	5.0	0.834	20.3	LOS C	9.7	70.6	0.26	0.62	0.31	45.2
East: Mandela Dr														
5	T1	760	5.0	800	5.0	0.557	5.3	LOS A	16.0	116.6	0.45	0.42	0.45	55.2
6	R2	51	5.0	54	5.0	* 0.255	22.9	LOS C	1.5	11.0	0.80	0.75	0.80	42.3
Approach		811	5.0	854	5.0	0.557	6.4	LOS A	16.0	116.6	0.47	0.44	0.47	54.2
West: Mandela Dr														
10	L2	188	5.0	198	5.0	0.442	15.2	LOS B	12.6	92.3	0.54	0.59	0.54	49.0
11	T1	1250	5.0	1316	5.0	* 0.819	16.6	LOS B	36.9	269.1	0.75	0.73	0.76	48.5
Approach		1438	5.0	1514	5.0	0.819	16.4	LOS B	36.9	269.1	0.73	0.71	0.73	48.6
All Vehicles		3233	5.0	3403	5.0	0.834	15.1	LOS B	36.9	269.1	0.52	0.61	0.54	48.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.6

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Future 2025 Background Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	626	5.0	659	5.0	0.367	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
3	R2	138	5.0	145	5.0	* 0.463	39.7	LOS D	3.2	23.6	0.97	0.76	0.97	35.8
Approach		764	5.0	804	5.0	0.463	11.9	LOS B	3.2	23.6	0.17	0.57	0.17	50.0
East: Mandela Dr														
5	T1	741	5.0	780	5.0	0.578	5.2	LOS A	12.9	94.2	0.53	0.48	0.53	55.3
6	R2	6	5.0	6	5.0	* 0.019	14.3	LOS B	0.1	0.6	0.68	0.65	0.68	47.0
Approach		747	5.0	786	5.0	0.578	5.3	LOS A	12.9	94.2	0.53	0.48	0.53	55.2
West: Mandela Dr														
10	L2	58	5.0	61	5.0	0.387	15.6	LOS B	7.8	56.9	0.62	0.57	0.62	49.6
11	T1	1016	5.0	1069	5.0	* 0.718	13.1	LOS B	18.9	138.3	0.75	0.68	0.75	49.9
Approach		1074	5.0	1131	5.0	0.718	13.3	LOS B	18.9	138.3	0.74	0.68	0.74	49.9
All Vehicles		2585	5.0	2721	5.0	0.718	10.6	LOS B	18.9	138.3	0.51	0.59	0.51	51.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.7

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Future 2025 Background + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	780	5.0	821	5.0	0.458	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
3	R2	258	5.0	272	5.0	* 0.837	69.1	LOS E	10.5	76.3	0.99	0.87	1.18	29.2
Approach		1038	5.0	1093	5.0	0.837	21.5	LOS C	10.5	76.3	0.25	0.61	0.29	45.0
East: Mandela Dr														
5	T1	830	5.0	874	5.0	0.599	5.6	LOS A	19.4	142.0	0.46	0.43	0.46	55.0
6	R2	50	5.0	53	5.0	* 0.281	26.7	LOS C	1.8	12.9	0.83	0.76	0.83	40.5
Approach		880	5.0	926	5.0	0.599	6.8	LOS A	19.4	142.0	0.48	0.45	0.48	53.9
West: Mandela Dr														
10	L2	202	5.0	213	5.0	0.455	15.0	LOS B	14.2	103.7	0.52	0.58	0.52	49.1
11	T1	1333	5.0	1403	5.0	* 0.843	19.8	LOS B	43.9	320.5	0.76	0.74	0.77	48.1
Approach		1535	5.0	1616	5.0	0.843	19.2	LOS B	43.9	320.5	0.72	0.72	0.73	48.2
All Vehicles		3453	5.0	3635	5.0	0.843	16.7	LOS B	43.9	320.5	0.52	0.61	0.54	48.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.8

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Future 2025 Background + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: N4 EB Off-ramp														
1	L2	687	5.0	723	5.0	0.403	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
3	R2	134	5.0	141	5.0	* 0.457	44.7	LOS D	3.6	26.0	0.97	0.76	0.97	34.3
Approach		821	5.0	864	5.0	0.457	12.1	LOS B	3.6	26.0	0.16	0.56	0.16	49.8
East: Mandela Dr														
5	T1	832	5.0	876	5.0	0.629	5.5	LOS A	16.6	121.0	0.53	0.49	0.53	55.0
6	R2	6	5.0	6	5.0	* 0.023	16.1	LOS B	0.1	0.8	0.69	0.66	0.69	46.0
Approach		838	5.0	882	5.0	0.629	5.6	LOS A	16.6	121.0	0.53	0.49	0.53	55.0
West: Mandela Dr														
10	L2	66	5.0	69	5.0	0.412	15.2	LOS B	9.6	69.9	0.58	0.55	0.58	49.8
11	T1	1170	5.0	1232	5.0	* 0.764	13.8	LOS B	24.9	181.4	0.74	0.68	0.74	49.8
Approach		1236	5.0	1301	5.0	0.764	13.9	LOS B	24.9	181.4	0.73	0.68	0.73	49.8
All Vehicles		2895	5.0	3047	5.0	0.764	11.0	LOS B	24.9	181.4	0.51	0.59	0.51	51.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A2.9

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Future 2025 Background + Development Friday PM Peak Hour Traffic – Signal Timing

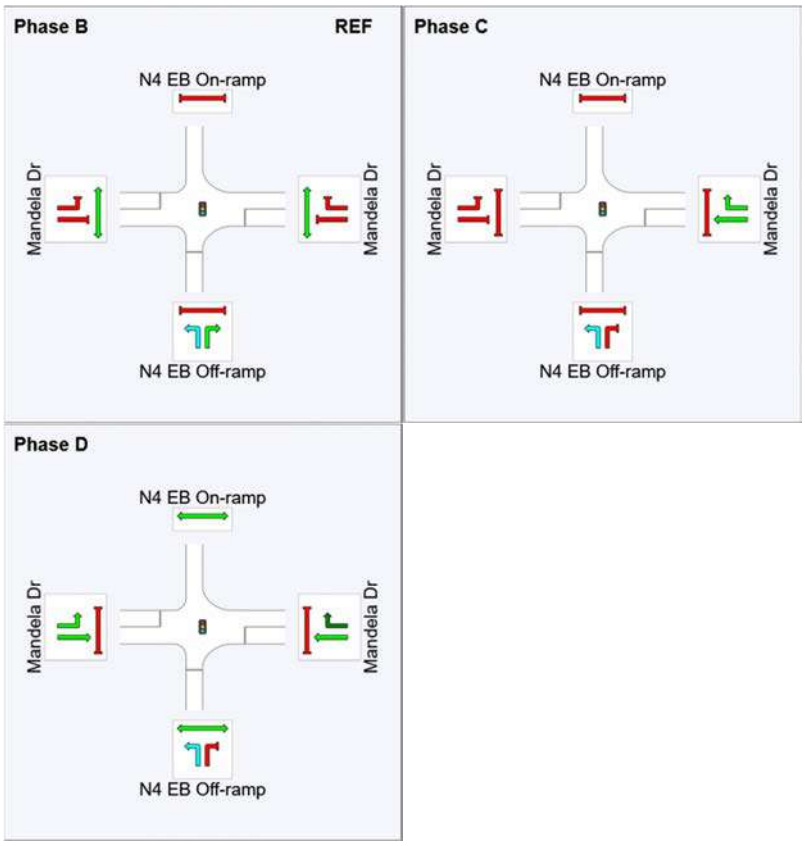
Future 2025 Background + Development Friday PM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Optimum Cycle Time - Minimum Delay)

Phase Timing Summary

Phase	B	C	D
Phase Change Time (sec)	0	19	31
Green Time (sec)	13	6	73
Phase Time (sec)	19	12	79
Phase Split	17%	11%	72%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A2.10

Sidra Output: N4 Eastbound Ramps & Mandela Dr

Future 2025 Background + Development Saturday AM Peak Hour Traffic – Signal Timing

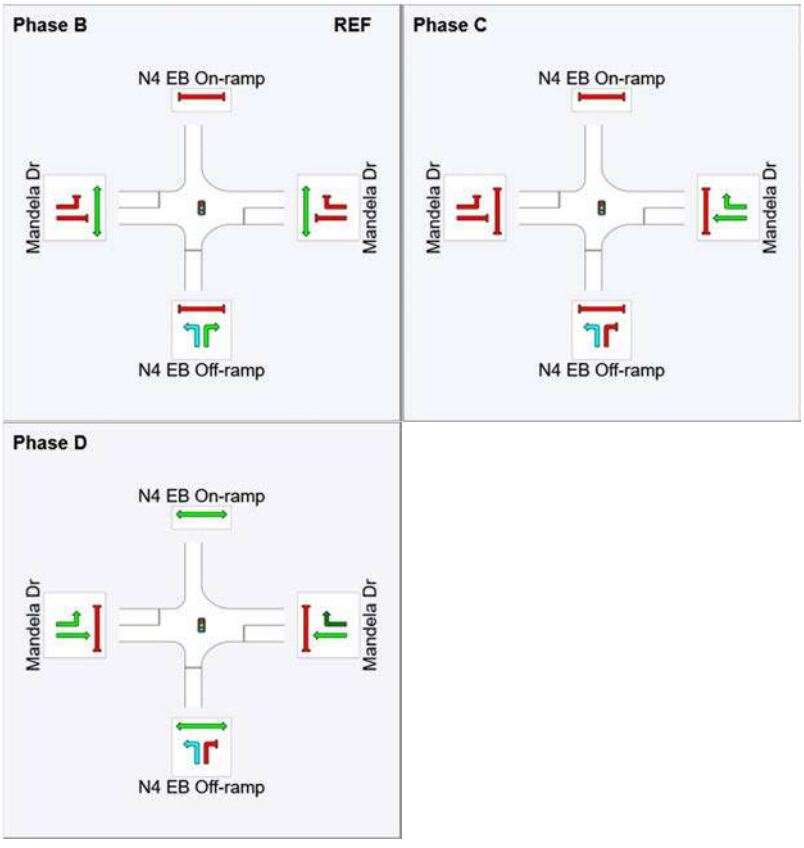
Future 2025 Background + Development Saturday AM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Phase Timing Summary

Phase	B	C	D
Phase Change Time (sec)	0	15	27
Green Time (sec)	9	6	47
Phase Time (sec)	15	12	53
Phase Split	19%	15%	66%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A3:

Mandela Dr & Nita Ave

- A3.1 – Existing 2020 Friday PM Peak Hour Traffic
- A3.2 – Existing 2020 Saturday AM Peak Hour Traffic
- A3.3 – Existing 2020 Plus Development Friday PM Peak Hour Traffic
- A3.4 – Existing 2020 Plus Development Saturday AM Peak Hour Traffic
- A3.5 – Future 2025 Background Friday PM Peak Hour Traffic
- A3.6 – Future 2025 Background Saturday AM Peak Hour Traffic
- A3.7 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic
- A3.8 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic
- A3.9 – Existing 2020 Plus Development Friday PM Peak Hour Traffic
- A3.10 – Existing 2020 Plus Development Saturday AM Peak Hour Traffic
- A3.11 – Future 2025 Background Friday PM Peak Hour Traffic
- A3.12 – Future 2025 Background Saturday AM Peak Hour Traffic
- A3.13 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic
- A3.14 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic
- A3.15 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic – Signal Timing
- A3.16 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic – Signal Timing

Annexure A3.1

Sidra Output: Mandela Dr & Nita Ave

Existing 2020 Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	94	5.0	99	5.0	0.485	21.1	LOS C	2.3	16.6	0.88	0.54	1.22	44.8
3	R2	93	5.0	98	5.0	0.485	22.1	LOS C	2.3	16.6	0.88	0.54	1.22	44.0
Approach		187	5.0	197	5.0	0.485	21.6	NA	2.3	16.6	0.88	0.54	1.22	44.4
East: Mandela Dr														
4	L2	120	5.0	126	5.0	0.082	5.8	LOS A	0.3	2.5	0.11	0.52	0.11	53.7
5	T1	1004	5.0	1057	5.0	0.891	30.2	LOS D	16.9	123.6	0.93	1.81	3.37	39.3
Approach		1124	5.0	1183	5.0	0.891	27.6	LOS D	16.9	123.6	0.84	1.67	3.02	40.5
West: Mandela Dr														
11	T1	907	5.0	955	5.0	0.253	4.3	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	33	5.0	35	5.0	0.246	34.9	LOS D	0.8	6.2	0.90	0.98	0.98	37.4
Approach		940	5.0	989	5.0	0.253	5.3	LOS A	0.8	6.2	0.03	0.55	0.03	53.8
All Vehicles		2251	5.0	2369	5.0	0.891	17.8	NA	16.9	123.6	0.51	1.11	1.63	45.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.2

Sidra Output: Mandela Dr & Nita Ave

Existing 2020 Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	80	5.0	84	5.0	0.246	10.6	LOS B	0.8	6.0	0.60	0.55	0.69	51.1
3	R2	90	5.0	95	5.0	0.246	11.4	LOS B	0.8	6.0	0.60	0.55	0.69	50.0
Approach		170	5.0	179	5.0	0.246	11.0	NA	0.8	6.0	0.60	0.55	0.69	50.6
East: Mandela Dr														
4	L2	72	5.0	76	5.0	0.049	5.8	LOS A	0.2	1.5	0.12	0.52	0.12	53.7
5	T1	623	5.0	656	5.0	0.432	9.4	LOS A	3.1	22.7	0.66	0.87	0.86	50.7
Approach		695	5.0	732	5.0	0.432	9.0	LOS A	3.1	22.7	0.60	0.84	0.78	51.0
West: Mandela Dr														
11	T1	620	5.0	653	5.0	0.173	4.2	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	41	5.0	43	5.0	0.132	16.1	LOS C	0.5	3.6	0.73	0.89	0.73	46.4
Approach		661	5.0	696	5.0	0.173	5.0	LOS A	0.5	3.6	0.05	0.55	0.05	54.1
All Vehicles		1526	5.0	1606	5.0	0.432	7.5	NA	3.1	22.7	0.36	0.68	0.45	52.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.3

Sidra Output: Mandela Dr & Nita Ave

Existing 2020 + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	276	5.0	291	5.0	1.270	267.9	LOS F	81.0	591.4	1.00	2.02	16.05	11.1
3	R2	245	5.0	258	5.0	1.270	269.3	LOS F	81.0	591.4	1.00	2.02	16.05	11.0
Approach		521	5.0	548	5.0	1.270	268.6	NA	81.0	591.4	1.00	2.02	16.05	11.1
East: Mandela Dr														
4	L2	133	5.0	140	5.0	0.103	6.3	LOS A	0.4	3.1	0.29	0.55	0.29	53.1
5	T1	991	5.0	1043	5.0	1.164	181.3	LOS F	61.2	447.0	1.00	4.14	11.03	14.8
Approach		1124	5.0	1183	5.0	1.164	160.6	LOS F	61.2	447.0	0.92	3.72	9.76	16.2
West: Mandela Dr														
11	T1	896	5.0	943	5.0	0.250	4.3	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	169	5.0	178	5.0	1.961	920.0	LOS F	61.6	449.8	1.00	3.52	11.45	3.6
Approach		1065	5.0	1121	5.0	1.961	149.6	LOS F	61.6	449.8	0.16	1.00	1.82	16.9
All Vehicles		2710	5.0	2853	5.0	1.961	177.0	NA	81.0	591.4	0.63	2.33	7.85	15.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.4

Sidra Output: Mandela Dr & Nita Ave

Existing 2020 + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	311	5.0	327	5.0	0.879	17.9	LOS C	8.3	60.3	1.00	0.74	2.83	46.2
3	R2	324	5.0	341	5.0	0.879	19.5	LOS C	8.3	60.3	1.00	0.74	2.83	45.3
Approach		635	5.0	668	5.0	0.879	18.7	NA	8.3	60.3	1.00	0.74	2.83	45.8
East: Mandela Dr														
4	L2	92	5.0	97	5.0	0.077	6.6	LOS A	0.3	2.3	0.34	0.57	0.34	52.9
5	T1	603	5.0	635	5.0	0.599	16.3	LOS C	4.8	34.7	0.79	1.11	1.42	46.3
Approach		695	5.0	732	5.0	0.599	15.0	LOS C	4.8	34.7	0.73	1.04	1.28	47.1
West: Mandela Dr														
11	T1	601	5.0	633	5.0	0.167	4.2	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	239	5.0	252	5.0	1.506	499.4	LOS F	60.3	440.1	1.00	4.02	12.68	6.4
Approach		840	5.0	884	5.0	1.506	145.1	LOS F	60.3	440.1	0.28	1.52	3.61	17.3
All Vehicles		2170	5.0	2284	5.0	1.506	66.5	NA	60.3	440.1	0.64	1.14	2.63	28.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.5

Sidra Output: Mandela Dr & Nita Ave

Future 2025 Background Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	109	5.0	115	5.0	0.822	41.6	LOS E	5.2	38.2	1.00	0.62	2.15	35.8
3	R2	108	5.0	114	5.0	0.822	43.0	LOS E	5.2	38.2	1.00	0.62	2.15	35.3
Approach		217	5.0	228	5.0	0.822	42.3	NA	5.2	38.2	1.00	0.62	2.15	35.6
East: Mandela Dr														
4	L2	139	5.0	146	5.0	0.095	5.8	LOS A	0.4	2.9	0.12	0.52	0.12	53.7
5	T1	1164	5.0	1225	5.0	1.192	201.1	LOS F	78.2	570.8	1.00	4.69	12.29	13.7
Approach		1303	5.0	1372	5.0	1.192	180.2	LOS F	78.2	570.8	0.91	4.25	10.99	14.9
West: Mandela Dr														
11	T1	1051	5.0	1106	5.0	0.293	4.3	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	38	5.0	40	5.0	0.439	61.2	LOS F	1.5	11.2	0.95	1.03	1.17	29.5
Approach		1089	5.0	1146	5.0	0.439	6.3	LOS A	1.5	11.2	0.03	0.55	0.04	53.1
All Vehicles		2609	5.0	2746	5.0	1.192	96.1	NA	78.2	570.8	0.55	2.40	5.68	22.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.6

Sidra Output: Mandela Dr & Nita Ave

Future 2025 Background Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	93	5.0	98	5.0	0.332	12.8	LOS B	1.3	9.3	0.71	0.56	0.88	49.7
3	R2	104	5.0	109	5.0	0.332	13.6	LOS B	1.3	9.3	0.71	0.56	0.88	48.7
Approach		197	5.0	207	5.0	0.332	13.2	NA	1.3	9.3	0.71	0.56	0.88	49.1
East: Mandela Dr														
4	L2	83	5.0	87	5.0	0.057	5.8	LOS A	0.2	1.7	0.13	0.52	0.13	53.6
5	T1	722	5.0	760	5.0	0.551	12.0	LOS B	4.8	34.7	0.74	1.04	1.18	48.9
Approach		805	5.0	847	5.0	0.551	11.4	LOS B	4.8	34.7	0.67	0.99	1.07	49.4
West: Mandela Dr														
11	T1	719	5.0	757	5.0	0.200	4.2	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	48	5.0	51	5.0	0.196	20.1	LOS C	0.7	5.2	0.80	0.92	0.83	44.1
Approach		767	5.0	807	5.0	0.200	5.2	LOS A	0.7	5.2	0.05	0.55	0.05	53.9
All Vehicles		1769	5.0	1862	5.0	0.551	8.9	NA	4.8	34.7	0.41	0.75	0.61	51.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.7

Sidra Output: Mandela Dr & Nita Ave

Future 2025 Background + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	291	5.0	306	5.0	1.951	877.2	LOS F	185.7	1355.9	1.00	2.80	24.34	3.9
3	R2	260	5.0	274	5.0	1.951	878.4	LOS F	185.7	1355.9	1.00	2.80	24.34	3.9
Approach		551	5.0	580	5.0	1.951	877.7	NA	185.7	1355.9	1.00	2.80	24.34	3.9
East: Mandela Dr														
4	L2	152	5.0	160	5.0	0.118	6.3	LOS A	0.5	3.6	0.29	0.55	0.29	53.0
5	T1	1151	5.0	1212	5.0	1.560	525.8	LOS F	147.4	1076.2	1.00	7.01	20.96	6.1
Approach		1303	5.0	1372	5.0	1.560	465.2	LOS F	147.4	1076.2	0.92	6.26	18.55	6.8
West: Mandela Dr														
11	T1	1040	5.0	1095	5.0	0.290	4.3	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	174	5.0	183	5.0	3.215	2047.5	LOS F	88.7	647.7	1.00	3.29	10.87	1.7
Approach		1214	5.0	1278	5.0	3.215	297.1	LOS F	88.7	647.7	0.14	0.93	1.56	9.9
All Vehicles		3068	5.0	3229	5.0	3.215	472.8	NA	185.7	1355.9	0.63	3.53	12.87	6.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.8

Sidra Output: Mandela Dr & Nita Ave

Future 2025 Background + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	324	5.0	341	5.0	1.067	85.2	LOS F	39.4	287.6	1.00	1.59	9.87	25.0
3	R2	338	5.0	356	5.0	1.067	86.6	LOS F	39.4	287.6	1.00	1.59	9.87	24.8
Approach		662	5.0	697	5.0	1.067	85.9	NA	39.4	287.6	1.00	1.59	9.87	24.9
East: Mandela Dr														
4	L2	103	5.0	108	5.0	0.086	6.6	LOS A	0.4	2.6	0.35	0.58	0.35	52.9
5	T1	702	5.0	739	5.0	0.772	24.2	LOS C	8.1	59.4	0.88	1.38	2.24	42.0
Approach		805	5.0	847	5.0	0.772	22.0	LOS C	8.1	59.4	0.81	1.28	2.00	43.2
West: Mandela Dr														
11	T1	700	5.0	737	5.0	0.195	4.2	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
12	R2	246	5.0	259	5.0	1.983	924.0	LOS F	88.1	643.2	1.00	4.49	14.93	3.6
Approach		946	5.0	996	5.0	1.983	243.4	LOS F	88.1	643.2	0.26	1.56	3.88	11.7
All Vehicles		2413	5.0	2540	5.0	1.983	126.3	NA	88.1	643.2	0.65	1.47	4.90	19.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.9

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades

Existing 2020 + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	276	5.0	291	5.0	0.162	7.0	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
3	R2	245	5.0	258	5.0	* 0.639	23.6	LOS C	5.0	36.7	0.96	0.85	1.05	43.1
Approach		521	5.0	548	5.0	0.639	14.8	LOS B	5.0	36.7	0.45	0.68	0.49	48.6
East: Mandela Dr														
4	L2	133	5.0	140	5.0	0.078	6.0	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	991	5.0	1043	5.0	0.581	8.5	LOS A	7.6	55.7	0.77	0.68	0.77	52.7
Approach		1124	5.0	1183	5.0	0.581	8.2	LOS A	7.6	55.7	0.68	0.66	0.68	52.9
West: Mandela Dr														
11	T1	896	5.0	943	5.0	0.526	8.2	LOS A	6.6	48.5	0.75	0.65	0.75	52.9
12	R2	169	5.0	178	5.0	* 0.665	22.5	LOS C	3.6	26.6	0.94	0.89	1.14	43.0
Approach		1065	5.0	1121	5.0	0.665	10.4	LOS B	6.6	48.5	0.78	0.69	0.81	51.1
All Vehicles		2710	5.0	2853	5.0	0.665	10.3	LOS B	7.6	55.7	0.67	0.67	0.70	51.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.10

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades

Existing 2020 + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	311	5.0	327	5.0	0.183	6.4	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
3	R2	324	5.0	341	5.0	* 0.713	19.4	LOS B	5.3	38.6	0.96	0.92	1.18	45.0
Approach		635	5.0	668	5.0	0.713	13.1	LOS B	5.3	38.6	0.49	0.73	0.60	49.3
East: Mandela Dr														
4	L2	92	5.0	97	5.0	0.054	6.1	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
5	T1	603	5.0	635	5.0	0.504	9.2	LOS A	4.0	28.9	0.85	0.71	0.85	52.1
Approach		695	5.0	732	5.0	0.504	8.8	LOS A	4.0	28.9	0.74	0.68	0.74	52.5
West: Mandela Dr														
11	T1	601	5.0	633	5.0	0.502	9.2	LOS A	3.9	28.8	0.85	0.71	0.85	52.2
12	R2	239	5.0	252	5.0	* 0.773	21.7	LOS C	4.3	31.5	1.00	0.97	1.43	43.4
Approach		840	5.0	884	5.0	0.773	12.8	LOS B	4.3	31.5	0.89	0.78	1.01	49.3
All Vehicles		2170	5.0	2284	5.0	0.773	11.6	LOS B	5.3	38.6	0.72	0.74	0.80	50.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.11

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades

Future 2025 Background Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	109	5.0	115	5.0	0.064	7.1	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
3	R2	108	5.0	114	5.0	* 0.475	34.6	LOS C	3.3	24.1	0.97	0.78	0.97	38.2
Approach		217	5.0	228	5.0	0.475	20.8	LOS C	3.3	24.1	0.48	0.65	0.48	45.1
East: Mandela Dr														
4	L2	139	5.0	146	5.0	0.082	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	1164	5.0	1225	5.0	* 0.487	5.3	LOS A	8.9	64.7	0.53	0.47	0.53	55.2
Approach		1303	5.0	1372	5.0	0.487	5.4	LOS A	8.9	64.7	0.47	0.48	0.47	55.1
West: Mandela Dr														
11	T1	1051	5.0	1106	5.0	0.439	5.1	LOS A	7.6	55.8	0.51	0.45	0.51	55.4
12	R2	38	5.0	40	5.0	0.159	14.4	LOS B	0.7	4.8	0.55	0.69	0.55	47.5
Approach		1089	5.0	1146	5.0	0.439	5.4	LOS A	7.6	55.8	0.51	0.46	0.51	55.1
All Vehicles		2609	5.0	2746	5.0	0.487	6.7	LOS A	8.9	64.7	0.49	0.49	0.49	54.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.12

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades

Future 2025 Background Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	93	5.0	98	5.0	0.055	6.4	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
3	R2	104	5.0	109	5.0	* 0.349	23.2	LOS C	2.0	14.8	0.92	0.76	0.92	43.0
Approach		197	5.0	207	5.0	0.349	15.3	LOS B	2.0	14.8	0.48	0.65	0.48	47.9
East: Mandela Dr														
4	L2	83	5.0	87	5.0	0.049	5.8	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
5	T1	722	5.0	760	5.0	* 0.383	6.2	LOS A	4.5	33.0	0.63	0.54	0.63	54.4
Approach		805	5.0	847	5.0	0.383	6.2	LOS A	4.5	33.0	0.57	0.54	0.57	54.5
West: Mandela Dr														
11	T1	719	5.0	757	5.0	0.382	6.2	LOS A	4.5	32.8	0.63	0.54	0.63	54.4
12	R2	48	5.0	51	5.0	0.133	13.7	LOS B	0.6	4.7	0.64	0.70	0.64	48.0
Approach		767	5.0	807	5.0	0.382	6.7	LOS A	4.5	32.8	0.63	0.55	0.63	54.0
All Vehicles		1769	5.0	1862	5.0	0.383	7.4	LOS A	4.5	33.0	0.59	0.56	0.59	53.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.13

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades

Future 2025 Background + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	291	5.0	306	5.0	0.171	7.4	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
3	R2	260	5.0	274	5.0	* 0.763	27.0	LOS C	5.9	43.3	1.00	0.95	1.29	41.5
Approach		551	5.0	580	5.0	0.763	16.6	LOS B	5.9	43.3	0.47	0.73	0.61	47.6
East: Mandela Dr														
4	L2	152	5.0	160	5.0	0.089	6.0	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	1151	5.0	1212	5.0	0.642	8.2	LOS A	9.0	65.6	0.79	0.70	0.79	52.9
Approach		1303	5.0	1372	5.0	0.642	7.9	LOS A	9.0	65.6	0.70	0.68	0.70	53.1
West: Mandela Dr														
11	T1	1040	5.0	1095	5.0	0.580	7.8	LOS A	7.8	56.6	0.75	0.66	0.75	53.2
12	R2	174	5.0	183	5.0	* 0.744	25.0	LOS C	4.1	29.9	0.96	0.96	1.34	41.8
Approach		1214	5.0	1278	5.0	0.744	10.3	LOS B	7.8	56.6	0.78	0.70	0.84	51.2
All Vehicles		3068	5.0	3229	5.0	0.763	10.4	LOS B	9.0	65.6	0.69	0.70	0.74	51.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.14

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades

Future 2025 Background + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nita Ave														
1	L2	324	5.0	341	5.0	0.190	6.6	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
3	R2	338	5.0	356	5.0	* 0.850	24.7	LOS C	6.6	48.5	1.00	1.09	1.62	42.4
Approach		662	5.0	697	5.0	0.850	15.8	LOS B	6.6	48.5	0.51	0.81	0.83	47.7
East: Mandela Dr														
4	L2	103	5.0	108	5.0	0.060	6.1	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	702	5.0	739	5.0	0.534	8.5	LOS A	4.5	33.0	0.83	0.71	0.83	52.6
Approach		805	5.0	847	5.0	0.534	8.2	LOS A	4.5	33.0	0.73	0.68	0.73	52.9
West: Mandela Dr														
11	T1	700	5.0	737	5.0	0.532	8.5	LOS A	4.5	32.8	0.83	0.70	0.83	52.6
12	R2	246	5.0	259	5.0	* 0.797	22.3	LOS C	4.6	33.6	0.99	1.01	1.51	43.1
Approach		946	5.0	996	5.0	0.797	12.1	LOS B	4.6	33.6	0.88	0.78	1.01	49.8
All Vehicles		2413	5.0	2540	5.0	0.850	11.8	LOS B	6.6	48.5	0.73	0.76	0.87	50.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A3.15

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades – Signal Timing

Future 2025 Background + Development Friday PM Peak Hour Traffic

PHASING SUMMARY

Site: v [Mandela Dr & Nita Ave - Fut + Dev Fri PM - Conversion (Site Folder: General)]

Future 2025 Background + Development Friday PM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

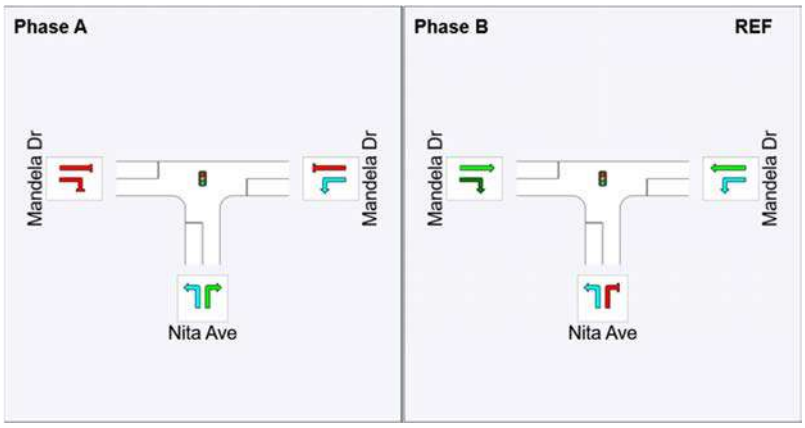
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	26	0
Green Time (sec)	8	20
Phase Time (sec)	14	26
Phase Split	35%	65%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A3.16

Sidra Output: Mandela Dr & Nita Ave – Signal Conversion + Upgrades – Signal Timing

Future 2025 Background + Development Saturday AM Peak Hour Traffic

PHASING SUMMARY

Site: v [Mandela Dr & Nita Ave - Fut + Dev Sat AM - Conversion (Site Folder: General)]

Future 2025 Background + Development Saturday AM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Optimum Cycle Time - Minimum Delay)

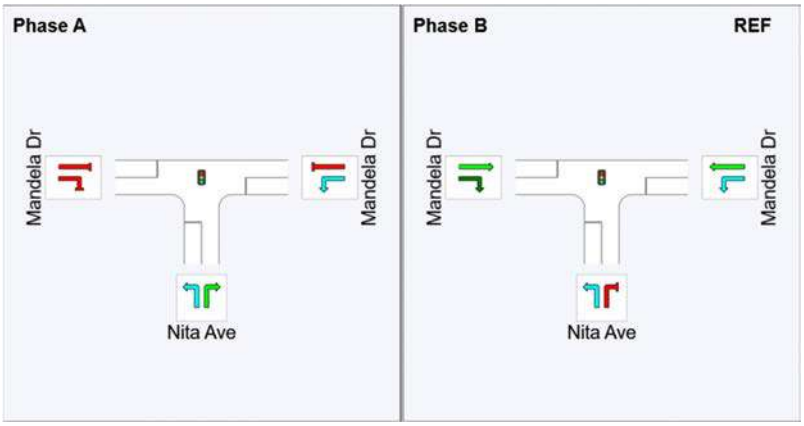
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	17	0
Green Time (sec)	7	11
Phase Time (sec)	13	17
Phase Split	43%	57%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A4:

Mandela Dr & Bethal St

- A4.1 – Existing 2020 Friday PM Peak Hour Traffic
- A4.2 – Existing 2020 Saturday AM Peak Hour Traffic
- A4.3 – Existing 2020 Plus Development Friday PM Peak Hour Traffic
- A4.4 – Existing 2020 Plus Development Saturday AM Peak Hour Traffic
- A4.5 – Future 2025 Background Friday PM Peak Hour Traffic
- A4.6 – Future 2025 Background Saturday AM Peak Hour Traffic
- A4.7 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic
- A4.8 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic
- A4.9 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic – Signal Timing
- A4.10 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic – Signal Timing

Annexure A4.1

Sidra Output: Mandela Dr & Bethal St

Existing 2020 Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	858	5.0	903	5.0	* 0.854	25.9	LOS C	13.1	95.3	1.00	1.06	1.37	42.1
6	R2	302	5.0	318	5.0	* 0.663	16.3	LOS B	4.5	32.6	0.94	0.84	1.01	46.4
Approach		1160	5.0	1221	5.0	0.854	23.4	LOS C	13.1	95.3	0.98	1.01	1.28	43.1
North: Bethal St														
7	L2	202	5.0	213	5.0	0.119	6.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
9	R2	158	5.0	166	5.0	* 0.515	27.9	LOS C	3.9	28.6	0.95	0.79	0.95	40.9
Approach		360	5.0	379	5.0	0.515	16.0	LOS B	3.9	28.6	0.42	0.64	0.42	47.7
West: Mandela Dr														
10	L2	287	5.0	302	5.0	0.168	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	833	5.0	877	5.0	0.829	24.1	LOS C	12.1	88.6	1.00	1.02	1.30	43.0
Approach		1120	5.0	1179	5.0	0.829	19.4	LOS B	12.1	88.6	0.74	0.90	0.97	45.5
All Vehicles		2640	5.0	2779	5.0	0.854	20.7	LOS C	13.1	95.3	0.80	0.91	1.03	44.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.2

Sidra Output: Mandela Dr & Bethal St

Existing 2020 Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	588	5.0	619	5.0	* 0.728	18.2	LOS B	6.4	46.7	0.98	0.91	1.18	46.2
6	R2	197	5.0	207	5.0	* 0.441	13.7	LOS B	2.4	17.5	0.89	0.78	0.89	48.0
Approach		785	5.0	826	5.0	0.728	17.1	LOS B	6.4	46.7	0.96	0.87	1.11	46.6
North: Bethal St														
7	L2	209	5.0	220	5.0	0.123	6.3	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
9	R2	103	5.0	108	5.0	* 0.345	23.0	LOS C	2.0	14.6	0.92	0.76	0.92	43.0
Approach		312	5.0	328	5.0	0.345	11.8	LOS B	2.0	14.6	0.30	0.60	0.30	50.3
West: Mandela Dr														
10	L2	126	5.0	133	5.0	0.074	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	550	5.0	579	5.0	0.681	17.3	LOS B	5.8	42.1	0.97	0.86	1.10	46.7
Approach		676	5.0	712	5.0	0.681	15.2	LOS B	5.8	42.1	0.79	0.80	0.90	48.1
All Vehicles		1773	5.0	1866	5.0	0.728	15.4	LOS B	6.4	46.7	0.78	0.80	0.89	47.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.3

Sidra Output: Mandela Dr & Bethal St

Existing 2020 + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	955	5.0	1005	5.0	* 0.887	32.8	LOS C	18.2	132.7	1.00	1.11	1.40	39.0
6	R2	345	5.0	363	5.0	* 0.741	20.8	LOS C	6.8	49.4	0.96	0.89	1.09	43.9
Approach		1300	5.0	1368	5.0	0.887	29.6	LOS C	18.2	132.7	0.99	1.05	1.32	40.2
North: Bethal St														
7	L2	228	5.0	240	5.0	0.134	6.9	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
9	R2	156	5.0	164	5.0	* 0.458	30.6	LOS C	4.4	32.4	0.93	0.79	0.93	39.8
Approach		384	5.0	404	5.0	0.458	16.5	LOS B	4.4	32.4	0.38	0.63	0.38	47.5
West: Mandela Dr														
10	L2	284	5.0	299	5.0	0.167	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	932	5.0	981	5.0	0.866	30.3	LOS C	16.9	123.5	1.00	1.07	1.34	40.1
Approach		1216	5.0	1280	5.0	0.866	24.5	LOS C	16.9	123.5	0.77	0.94	1.02	42.8
All Vehicles		2900	5.0	3053	5.0	0.887	25.7	LOS C	18.2	132.7	0.82	0.95	1.07	42.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.4

Sidra Output: Mandela Dr & Bethal St

Existing 2020 + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	725	5.0	763	5.0	* 0.722	19.8	LOS B	9.3	67.7	0.96	0.88	1.08	45.3
6	R2	239	5.0	252	5.0	* 0.496	14.4	LOS B	3.2	23.5	0.87	0.79	0.87	47.6
Approach		964	5.0	1015	5.0	0.722	18.5	LOS B	9.3	67.7	0.94	0.86	1.03	45.8
North: Bethal St														
7	L2	250	5.0	263	5.0	0.375	7.7	LOS A	2.8	20.1	0.05	0.54	0.05	53.8
9	R2	100	5.0	105	5.0	* 0.375	27.0	LOS C	2.8	20.1	0.92	0.77	0.92	41.2
Approach		350	5.0	368	5.0	0.375	13.2	LOS B	2.8	20.1	0.30	0.61	0.30	49.5
West: Mandela Dr														
10	L2	122	5.0	128	5.0	0.072	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	688	5.0	724	5.0	0.685	18.9	LOS B	8.5	62.2	0.95	0.85	1.02	45.8
Approach		810	5.0	853	5.0	0.685	16.9	LOS B	8.5	62.2	0.80	0.80	0.87	47.0
All Vehicles		2124	5.0	2236	5.0	0.722	17.0	LOS B	9.3	67.7	0.78	0.79	0.85	46.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.5

Sidra Output: Mandela Dr & Bethal St

Future 2025 Background Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	995	5.0	1047	5.0	* 0.858	34.0	LOS C	24.3	177.1	0.97	1.01	1.19	38.5
6	R2	350	5.0	368	5.0	* 0.669	22.4	LOS C	7.9	58.0	0.93	0.87	0.93	43.1
Approach		1345	5.0	1416	5.0	0.858	31.0	LOS C	24.3	177.1	0.96	0.97	1.12	39.6
North: Bethal St														
7	L2	234	5.0	246	5.0	0.137	6.9	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
9	R2	183	5.0	193	5.0	* 0.573	39.8	LOS D	7.1	51.9	0.96	0.81	0.96	36.2
Approach		417	5.0	439	5.0	0.573	21.3	LOS C	7.1	51.9	0.42	0.65	0.42	44.7
West: Mandela Dr														
10	L2	333	5.0	351	5.0	0.195	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	966	5.0	1017	5.0	0.769	27.4	LOS C	18.9	137.8	0.95	0.89	1.03	41.4
Approach		1299	5.0	1367	5.0	0.769	21.9	LOS C	18.9	137.8	0.71	0.80	0.76	44.2
All Vehicles		3061	5.0	3222	5.0	0.858	25.8	LOS C	24.3	177.1	0.78	0.85	0.87	42.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.6

Sidra Output: Mandela Dr & Bethal St

Future 2025 Background Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	682	5.0	718	5.0	* 0.679	18.8	LOS B	8.4	61.3	0.94	0.84	1.02	45.9
6	R2	228	5.0	240	5.0	* 0.462	14.0	LOS B	3.0	22.2	0.84	0.78	0.84	47.8
Approach		910	5.0	958	5.0	0.679	17.6	LOS B	8.4	61.3	0.92	0.83	0.97	46.3
North: Bethal St														
7	L2	242	5.0	255	5.0	0.142	6.4	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
9	R2	119	5.0	125	5.0	* 0.388	27.0	LOS C	2.9	20.9	0.92	0.77	0.92	41.2
Approach		361	5.0	380	5.0	0.388	13.2	LOS B	2.9	20.9	0.30	0.61	0.30	49.4
West: Mandela Dr														
10	L2	146	5.0	154	5.0	0.086	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	638	5.0	672	5.0	0.635	18.0	LOS B	7.6	55.4	0.93	0.80	0.96	46.3
Approach		784	5.0	825	5.0	0.635	15.7	LOS B	7.6	55.4	0.76	0.75	0.78	47.7
All Vehicles		2055	5.0	2163	5.0	0.679	16.1	LOS B	8.4	61.3	0.75	0.76	0.78	47.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.7

Sidra Output: Mandela Dr & Bethal St

Future 2025 Background + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	1092	5.0	1149	5.0	* 0.882	42.2	LOS D	39.1	285.4	0.93	0.98	1.12	35.5
6	R2	393	5.0	414	5.0	* 0.748	36.9	LOS D	15.5	113.4	0.96	0.96	0.99	36.8
Approach		1485	5.0	1563	5.0	0.882	40.8	LOS D	39.1	285.4	0.94	0.97	1.09	35.8
North: Bethal St														
7	L2	260	5.0	274	5.0	0.153	6.9	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
9	R2	181	5.0	191	5.0	* 0.615	53.2	LOS D	9.7	70.9	0.98	0.82	0.98	31.9
Approach		441	5.0	464	5.0	0.615	25.9	LOS C	9.7	70.9	0.40	0.65	0.40	42.4
West: Mandela Dr														
10	L2	330	5.0	347	5.0	0.194	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	1065	5.0	1121	5.0	0.821	34.0	LOS C	32.1	234.3	0.91	0.88	0.99	38.5
Approach		1395	5.0	1468	5.0	0.821	27.3	LOS C	32.1	234.3	0.70	0.79	0.76	41.5
All Vehicles		3321	5.0	3496	5.0	0.882	33.1	LOS C	39.1	285.4	0.77	0.85	0.86	38.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.8

Sidra Output: Mandela Dr & Bethal St

Future 2025 Background + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Mandela Dr														
5	T1	819	5.0	862	5.0	* 0.815	23.3	LOS C	11.7	85.3	0.99	1.00	1.27	43.4
6	R2	270	5.0	284	5.0	* 0.581	15.0	LOS B	3.7	27.2	0.91	0.80	0.91	47.2
Approach		1089	5.0	1146	5.0	0.815	21.3	LOS C	11.7	85.3	0.97	0.95	1.18	44.3
North: Bethal St														
7	L2	283	5.0	298	5.0	0.427	7.7	LOS A	3.2	23.2	0.05	0.54	0.05	53.9
9	R2	116	5.0	122	5.0	* 0.427	27.4	LOS C	3.2	23.2	0.93	0.78	0.93	41.1
Approach		399	5.0	420	5.0	0.427	13.5	LOS B	3.2	23.2	0.31	0.61	0.31	49.4
West: Mandela Dr														
10	L2	142	5.0	149	5.0	0.083	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
11	T1	776	5.0	817	5.0	0.772	21.4	LOS C	10.5	76.4	0.98	0.94	1.17	44.4
Approach		918	5.0	966	5.0	0.772	19.0	LOS B	10.5	76.4	0.83	0.88	0.99	45.8
All Vehicles		2406	5.0	2533	5.0	0.815	19.1	LOS B	11.7	85.3	0.81	0.87	0.96	45.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Annexure A4.9

Sidra Output: Mandela Dr & Bethal St – Signal Timing

Future 2025 Background + Development Friday PM Peak Hour Traffic

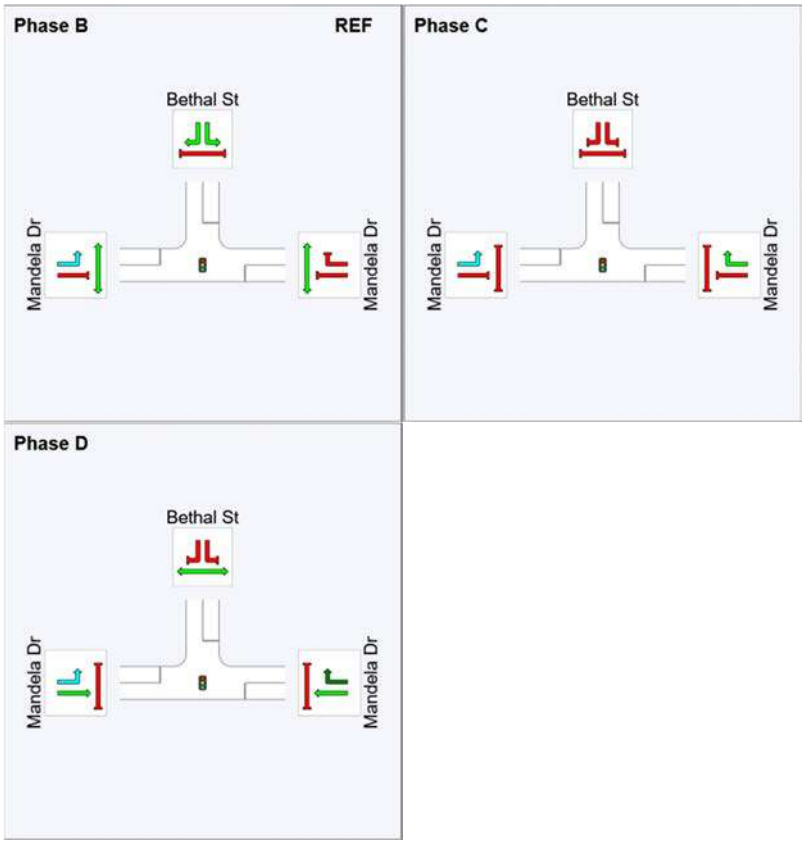
Future 2025 Background + Development Friday PM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Optimum Cycle Time - Minimum Delay)

Phase Timing Summary

Phase	B	C	D
Phase Change Time (sec)	0	25	59
Green Time (sec)	19	28	45
Phase Time (sec)	25	34	51
Phase Split	23%	31%	46%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A4.10

Sidra Output: Mandela Dr & Bethal St

Future 2025 Background + Development Saturday AM Peak Hour Traffic

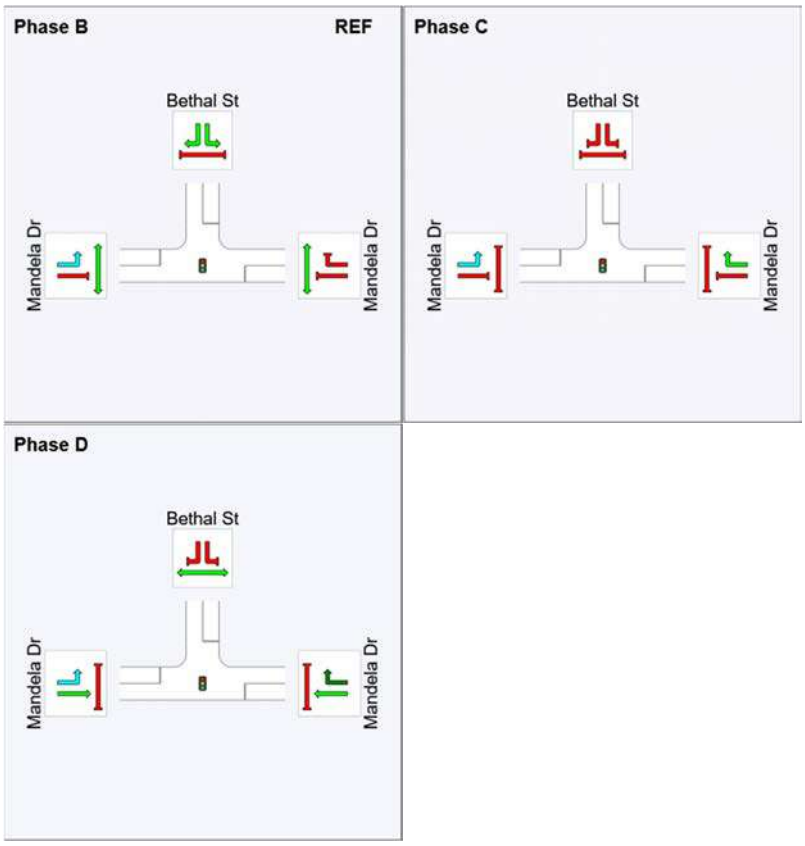
Future 2025 Background + Development Saturday AM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Phase Timing Summary

Phase	B	C	D
Phase Change Time (sec)	0	15	30
Green Time (sec)	9	9	14
Phase Time (sec)	15	15	20
Phase Split	30%	30%	40%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A5:

Mandela Dr & Langa Cres

- A4.1 – Existing 2020 Friday PM Peak Hour Traffic
- A4.2 – Existing 2020 Saturday AM Peak Hour Traffic
- A4.3 – Existing 2020 Plus Development Friday PM Peak Hour Traffic
- A4.4 – Existing 2020 Plus Development Saturday AM Peak Hour Traffic
- A4.5 – Future 2025 Background Friday PM Peak Hour Traffic
- A4.6 – Future 2025 Background Saturday AM Peak Hour Traffic
- A4.7 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic
- A4.8 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic
- A4.9 – Future 2025 Background Plus Development Friday PM Peak Hour Traffic – Signal Timing
- A4.10 – Future 2025 Background Plus Development Saturday AM Peak Hour Traffic – Signal Timing

Annexure A5.1

Sidra Output: Mandela Dr & Langa Cres

Existing 2020 Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	20	5.0	21	5.0	0.012	6.6	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
2	T1	5	5.0	5	5.0	* 0.712	24.2	LOS C	8.3	60.9	0.96	0.89	1.08	40.4
3	R2	536	5.0	564	5.0	0.712	29.9	LOS C	8.3	60.9	0.96	0.89	1.08	39.8
Approach		561	5.0	591	5.0	0.712	29.0	LOS C	8.3	60.9	0.93	0.88	1.04	40.2
East: Mandela Dr														
4	L2	383	5.0	403	5.0	0.225	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	887	5.0	934	5.0	* 0.742	21.4	LOS C	13.2	96.1	0.94	0.88	1.04	44.5
6	R2	42	5.0	44	5.0	0.109	15.4	LOS B	0.7	4.9	0.75	0.70	0.75	47.0
Approach		1312	5.0	1381	5.0	0.742	16.6	LOS B	13.2	96.1	0.66	0.77	0.73	47.1
North: Langa Cres														
7	L2	112	5.0	118	5.0	0.163	10.3	LOS B	1.0	7.5	0.57	0.69	0.57	50.7
8	T1	27	5.0	28	5.0	0.056	17.9	LOS B	0.6	4.6	0.77	0.56	0.77	46.5
9	R2	78	5.0	82	5.0	0.197	24.6	LOS C	1.9	14.0	0.81	0.74	0.81	42.1
Approach		217	5.0	228	5.0	0.197	16.4	LOS B	1.9	14.0	0.68	0.69	0.68	46.7
West: Mandela Dr														
10	L2	63	5.0	66	5.0	0.049	6.3	LOS A	0.2	1.5	0.22	0.60	0.22	53.3
11	T1	614	5.0	646	5.0	0.513	17.8	LOS B	7.8	56.9	0.85	0.72	0.85	46.5
12	R2	139	5.0	146	5.0	* 0.434	18.1	LOS B	2.4	17.4	0.90	0.77	0.90	45.6
Approach		816	5.0	859	5.0	0.513	16.9	LOS B	7.8	56.9	0.81	0.72	0.81	46.8
All Vehicles		2906	5.0	3059	5.0	0.742	19.1	LOS B	13.2	96.1	0.76	0.77	0.81	45.5

Annexure A5.2

Sidra Output: Mandela Dr & Langa Cres

Existing 2020 Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	71	5.0	75	5.0	0.042	6.2	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
2	T1	7	5.0	7	5.0	* 0.688	19.2	LOS B	4.5	33.1	0.99	0.88	1.17	42.8
3	R2	410	5.0	432	5.0	0.688	24.8	LOS C	4.6	33.4	0.99	0.88	1.17	42.1
Approach		488	5.0	514	5.0	0.688	22.1	LOS C	4.6	33.4	0.84	0.83	1.00	43.6
East: Mandela Dr														
4	L2	599	5.0	631	5.0	0.352	5.8	LOS A	0.0	0.0	0.00	0.53	0.00	54.6
5	T1	589	5.0	620	5.0	* 0.730	18.2	LOS B	6.4	46.8	0.98	0.91	1.18	46.2
6	R2	19	5.0	20	5.0	0.042	12.6	LOS B	0.2	1.5	0.78	0.67	0.78	48.7
Approach		1207	5.0	1271	5.0	0.730	12.0	LOS B	6.4	46.8	0.49	0.71	0.59	50.1
North: Langa Cres														
7	L2	24	5.0	25	5.0	0.029	8.8	LOS A	0.1	1.1	0.55	0.64	0.55	51.7
8	T1	12	5.0	13	5.0	0.038	15.4	LOS B	0.2	1.6	0.85	0.58	0.85	48.0
9	R2	32	5.0	34	5.0	0.104	21.5	LOS C	0.6	4.3	0.87	0.70	0.87	43.7
Approach		68	5.0	72	5.0	0.104	15.9	LOS B	0.6	4.3	0.75	0.66	0.75	47.0
West: Mandela Dr														
10	L2	6	5.0	6	5.0	0.005	6.6	LOS A	0.0	0.1	0.31	0.58	0.31	53.0
11	T1	524	5.0	552	5.0	0.649	16.8	LOS B	5.4	39.3	0.96	0.84	1.06	47.0
12	R2	74	5.0	78	5.0	* 0.169	13.4	LOS B	0.8	6.0	0.84	0.72	0.84	48.4
Approach		604	5.0	636	5.0	0.649	16.3	LOS B	5.4	39.3	0.94	0.82	1.02	47.3
All Vehicles		2367	5.0	2492	5.0	0.730	15.3	LOS B	6.4	46.8	0.68	0.76	0.79	47.8

Annexure A5.3

Sidra Output: Mandela Dr & Langa Cres

Existing 2020 + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	30	5.0	32	5.0	0.018	6.8	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
2	T1	5	5.0	5	5.0	* 0.791	28.6	LOS C	9.0	65.9	1.00	0.96	1.26	38.5
3	R2	529	5.0	557	5.0	0.791	34.3	LOS C	9.0	65.9	1.00	0.96	1.26	38.0
Approach		564	5.0	594	5.0	0.791	32.8	LOS C	9.0	65.9	0.94	0.94	1.19	38.6
East: Mandela Dr														
4	L2	378	5.0	398	5.0	0.222	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	1020	5.0	1074	5.0	* 0.775	21.3	LOS C	15.5	113.1	0.95	0.91	1.07	44.5
6	R2	41	5.0	43	5.0	0.108	14.6	LOS B	0.6	4.4	0.73	0.70	0.73	47.4
Approach		1439	5.0	1515	5.0	0.775	17.0	LOS B	15.5	113.1	0.69	0.80	0.78	46.9
North: Langa Cres														
7	L2	111	5.0	117	5.0	0.171	10.6	LOS B	1.0	7.4	0.59	0.70	0.59	50.4
8	T1	27	5.0	28	5.0	0.064	19.6	LOS B	0.7	4.8	0.81	0.59	0.81	45.5
9	R2	91	5.0	96	5.0	0.257	26.7	LOS C	2.4	17.4	0.85	0.76	0.85	41.1
Approach		229	5.0	241	5.0	0.257	18.1	LOS B	2.4	17.4	0.72	0.71	0.72	45.7
West: Mandela Dr														
10	L2	73	5.0	77	5.0	0.057	6.3	LOS A	0.2	1.7	0.22	0.60	0.22	53.3
11	T1	719	5.0	757	5.0	0.546	16.6	LOS B	9.0	65.5	0.84	0.72	0.84	47.2
12	R2	165	5.0	174	5.0	* 0.524	18.1	LOS B	2.7	19.6	0.93	0.79	0.93	45.5
Approach		957	5.0	1007	5.0	0.546	16.1	LOS B	9.0	65.5	0.81	0.73	0.81	47.3
All Vehicles		3189	5.0	3357	5.0	0.791	19.6	LOS B	15.5	113.1	0.77	0.80	0.86	45.2

Annexure A5.4

Sidra Output: Mandela Dr & Langa Cres

Existing 2020 + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	103	5.0	108	5.0	0.060	6.5	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
2	T1	7	5.0	7	5.0	* 0.635	21.7	LOS C	5.2	37.9	0.97	0.85	1.05	41.6
3	R2	397	5.0	418	5.0	0.635	27.3	LOS C	5.2	38.0	0.97	0.85	1.05	40.9
Approach		507	5.0	534	5.0	0.635	23.0	LOS C	5.2	38.0	0.77	0.78	0.84	43.2
East: Mandela Dr														
4	L2	580	5.0	611	5.0	0.340	5.8	LOS A	0.0	0.0	0.00	0.53	0.00	54.6
5	T1	761	5.0	801	5.0	* 0.663	16.9	LOS B	9.0	65.4	0.92	0.81	0.96	47.0
6	R2	18	5.0	19	5.0	0.044	13.5	LOS B	0.2	1.6	0.75	0.67	0.75	48.1
Approach		1359	5.0	1431	5.0	0.663	12.1	LOS B	9.0	65.4	0.52	0.69	0.55	50.0
North: Langa Cres														
7	L2	23	5.0	24	5.0	0.031	9.3	LOS A	0.2	1.3	0.53	0.64	0.53	51.4
8	T1	12	5.0	13	5.0	0.033	17.8	LOS B	0.3	1.9	0.83	0.57	0.83	46.5
9	R2	43	5.0	45	5.0	0.134	24.2	LOS C	1.0	6.9	0.85	0.72	0.85	42.3
Approach		78	5.0	82	5.0	0.134	18.8	LOS B	1.0	6.9	0.75	0.67	0.75	45.3
West: Mandela Dr														
10	L2	7	5.0	7	5.0	0.005	6.4	LOS A	0.0	0.2	0.25	0.58	0.25	53.2
11	T1	700	5.0	737	5.0	0.610	16.0	LOS B	7.9	57.5	0.90	0.76	0.90	47.5
12	R2	112	5.0	118	5.0	* 0.286	14.7	LOS B	1.5	10.8	0.84	0.75	0.84	47.6
Approach		819	5.0	862	5.0	0.610	15.8	LOS B	7.9	57.5	0.88	0.76	0.88	47.6

Annexure A5.5

Sidra Output: Mandela Dr & Langa Cres

Future 2025 Background Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	23	5.0	24	5.0	0.014	6.8	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
2	T1	6	5.0	6	5.0	* 0.837	34.3	LOS C	12.8	93.8	1.00	1.00	1.31	36.4
3	R2	621	5.0	654	5.0	0.837	40.0	LOS D	12.8	93.8	1.00	1.00	1.31	35.9
Approach		650	5.0	684	5.0	0.837	38.7	LOS D	12.8	93.8	0.96	0.98	1.26	36.3
East: Mandela Dr														
4	L2	444	5.0	467	5.0	0.261	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	1028	5.0	1082	5.0	* 0.771	23.6	LOS C	17.7	129.2	0.94	0.89	1.03	43.3
6	R2	49	5.0	52	5.0	0.132	16.0	LOS B	0.9	6.3	0.73	0.70	0.73	46.6
Approach		1521	5.0	1601	5.0	0.771	18.2	LOS B	17.7	129.2	0.66	0.78	0.72	46.2
North: Langa Cres														
7	L2	130	5.0	137	5.0	0.216	11.9	LOS B	1.6	11.6	0.62	0.71	0.62	49.6
8	T1	31	5.0	33	5.0	0.064	20.5	LOS C	0.8	6.1	0.77	0.57	0.77	45.0
9	R2	90	5.0	95	5.0	0.229	27.6	LOS C	2.6	18.9	0.82	0.75	0.82	40.7
Approach		251	5.0	264	5.0	0.229	18.6	LOS B	2.6	18.9	0.71	0.71	0.71	45.5
West: Mandela Dr														
10	L2	73	5.0	77	5.0	0.057	6.3	LOS A	0.3	2.0	0.20	0.60	0.20	53.4
11	T1	712	5.0	749	5.0	0.534	18.8	LOS B	10.2	74.3	0.84	0.72	0.84	45.9
12	R2	161	5.0	169	5.0	* 0.535	19.9	LOS B	3.1	22.4	0.92	0.79	0.92	44.5
Approach		946	5.0	996	5.0	0.535	18.1	LOS B	10.2	74.3	0.80	0.72	0.80	46.1
All		3368	5.0	3545	5.0	0.837	22.1	LOS C	17.7	129.2	0.76	0.80	0.85	43.8

Annexure A5.6

Sidra Output: Mandela Dr & Langa Cres

Future 2025 Background Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	82	5.0	86	5.0	0.048	6.4	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
2	T1	8	5.0	8	5.0	* 0.657	20.4	LOS C	6.1	44.7	0.95	0.86	1.04	42.2
3	R2	475	5.0	500	5.0	0.657	26.0	LOS C	6.1	44.8	0.95	0.86	1.04	41.5
Approach		565	5.0	595	5.0	0.657	23.1	LOS C	6.1	44.8	0.82	0.81	0.89	43.1
East: Mandela Dr														
4	L2	694	5.0	731	5.0	0.407	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
5	T1	683	5.0	719	5.0	* 0.680	18.8	LOS B	8.4	61.5	0.94	0.84	1.02	45.9
6	R2	22	5.0	23	5.0	0.055	14.3	LOS B	0.3	2.1	0.78	0.68	0.78	47.6
Approach		1399	5.0	1473	5.0	0.680	12.3	LOS B	8.4	61.5	0.47	0.68	0.51	49.9
North: Langa Cres														
7	L2	28	5.0	29	5.0	0.038	9.5	LOS A	0.2	1.5	0.55	0.65	0.55	51.2
8	T1	14	5.0	15	5.0	0.033	16.0	LOS B	0.3	2.1	0.79	0.55	0.79	47.6
9	R2	37	5.0	39	5.0	0.099	22.2	LOS C	0.8	5.6	0.81	0.71	0.81	43.3
Approach		79	5.0	83	5.0	0.099	16.6	LOS B	0.8	5.6	0.71	0.66	0.71	46.6
West: Mandela Dr														
10	L2	7	5.0	7	5.0	0.006	6.4	LOS A	0.0	0.2	0.25	0.58	0.25	53.2
11	T1	607	5.0	639	5.0	0.604	17.6	LOS B	7.1	51.6	0.92	0.78	0.92	46.6
12	R2	86	5.0	91	5.0	* 0.226	15.2	LOS B	1.2	8.9	0.84	0.74	0.84	47.2
Approach		700	5.0	737	5.0	0.604	17.2	LOS B	7.1	51.6	0.90	0.77	0.91	46.7
All Vehicles		2743	5.0	2887	5.0	0.680	15.9	LOS B	8.4	61.5	0.66	0.73	0.70	47.4

Annexure A5.7

Sidra Output: Mandela Dr & Langa Cres

Future 2025 Background + Development Friday PM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	33	5.0	35	5.0	0.019	7.0	LOS A	0.0	0.0	0.00	0.53	0.00	54.8
2	T1	6	5.0	6	5.0	* 0.870	38.3	LOS D	13.5	98.3	1.00	1.04	1.40	35.0
3	R2	614	5.0	646	5.0	0.870	43.9	LOS D	13.5	98.3	1.00	1.04	1.40	34.6
Approach		653	5.0	687	5.0	0.870	42.0	LOS D	13.5	98.3	0.95	1.01	1.33	35.2
East: Mandela Dr														
4	L2	439	5.0	462	5.0	0.258	5.7	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
5	T1	1161	5.0	1222	5.0	* 0.871	31.6	LOS C	23.9	174.7	1.00	1.07	1.26	39.6
6	R2	48	5.0	51	5.0	0.131	16.0	LOS B	0.8	5.9	0.74	0.71	0.74	46.6
Approach		1648	5.0	1735	5.0	0.871	24.2	LOS C	23.9	174.7	0.72	0.91	0.91	42.9
North: Langa Cres														
7	L2	129	5.0	136	5.0	0.222	12.2	LOS B	1.5	11.0	0.64	0.72	0.64	49.3
8	T1	31	5.0	33	5.0	0.067	21.4	LOS C	0.9	6.2	0.79	0.58	0.79	44.5
9	R2	103	5.0	108	5.0	0.275	28.7	LOS C	3.1	22.3	0.84	0.76	0.84	40.2
Approach		263	5.0	277	5.0	0.275	19.8	LOS B	3.1	22.3	0.74	0.72	0.74	44.8
West: Mandela Dr														
10	L2	83	5.0	87	5.0	0.064	6.5	LOS A	0.3	2.3	0.22	0.60	0.22	53.3
11	T1	817	5.0	860	5.0	0.613	19.6	LOS B	12.1	88.6	0.87	0.75	0.87	45.5
12	R2	187	5.0	197	5.0	* 0.608	21.4	LOS C	3.5	25.8	0.97	0.81	0.99	43.8
Approach		1087	5.0	1144	5.0	0.613	18.9	LOS B	12.1	88.6	0.84	0.75	0.84	45.7
All Vehicles		3651	5.0	3843	5.0	0.871	25.5	LOS C	23.9	174.7	0.80	0.87	0.95	42.2

Annexure A5.8

Sidra Output: Mandela Dr & Langa Cres

Future 2025 Background + Development Saturday AM Peak Hour Traffic

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Highveld Mall Access														
1	L2	114	5.0	120	5.0	0.067	6.6	LOS A	0.0	0.0	0.00	0.53	0.00	54.7
2	T1	8	5.0	8	5.0	* 0.676	24.8	LOS C	7.2	52.4	0.96	0.87	1.06	40.2
3	R2	462	5.0	486	5.0	0.676	30.4	LOS C	7.2	52.4	0.96	0.87	1.06	39.6
Approach		584	5.0	615	5.0	0.676	25.7	LOS C	7.2	52.4	0.78	0.80	0.85	41.9
East: Mandela Dr														
4	L2	675	5.0	711	5.0	0.396	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
5	T1	855	5.0	900	5.0	* 0.650	17.4	LOS B	11.2	81.9	0.89	0.77	0.89	46.7
6	R2	21	5.0	22	5.0	0.058	14.7	LOS B	0.3	2.2	0.74	0.68	0.74	47.4
Approach		1551	5.0	1633	5.0	0.650	12.3	LOS B	11.2	81.9	0.50	0.66	0.50	49.9
North: Langa Cres														
7	L2	27	5.0	28	5.0	0.041	10.0	LOS A	0.2	1.8	0.53	0.65	0.53	50.9
8	T1	14	5.0	15	5.0	0.033	19.4	LOS B	0.3	2.5	0.80	0.56	0.80	45.6
9	R2	48	5.0	51	5.0	0.137	25.9	LOS C	1.2	8.9	0.83	0.72	0.83	41.5
Approach		89	5.0	94	5.0	0.137	20.1	LOS C	1.2	8.9	0.73	0.68	0.73	44.6
West: Mandela Dr														
10	L2	8	5.0	8	5.0	0.006	6.3	LOS A	0.0	0.2	0.21	0.58	0.21	53.4
11	T1	783	5.0	824	5.0	0.595	16.9	LOS B	10.0	73.0	0.86	0.74	0.86	47.0
12	R2	124	5.0	131	5.0	* 0.359	16.1	LOS B	2.0	14.3	0.83	0.76	0.83	46.7
Approach		915	5.0	963	5.0	0.595	16.7	LOS B	10.0	73.0	0.85	0.75	0.85	47.0
All		3139	5.0	3304	5.0	0.676	16.3	LOS B	11.2	81.9	0.66	0.71	0.67	47.2

Annexure A5.9

Sidra Output: Mandela Dr & Langa Cres – Signal Timing

Future 2025 Background + Development Friday PM Peak Hour Traffic

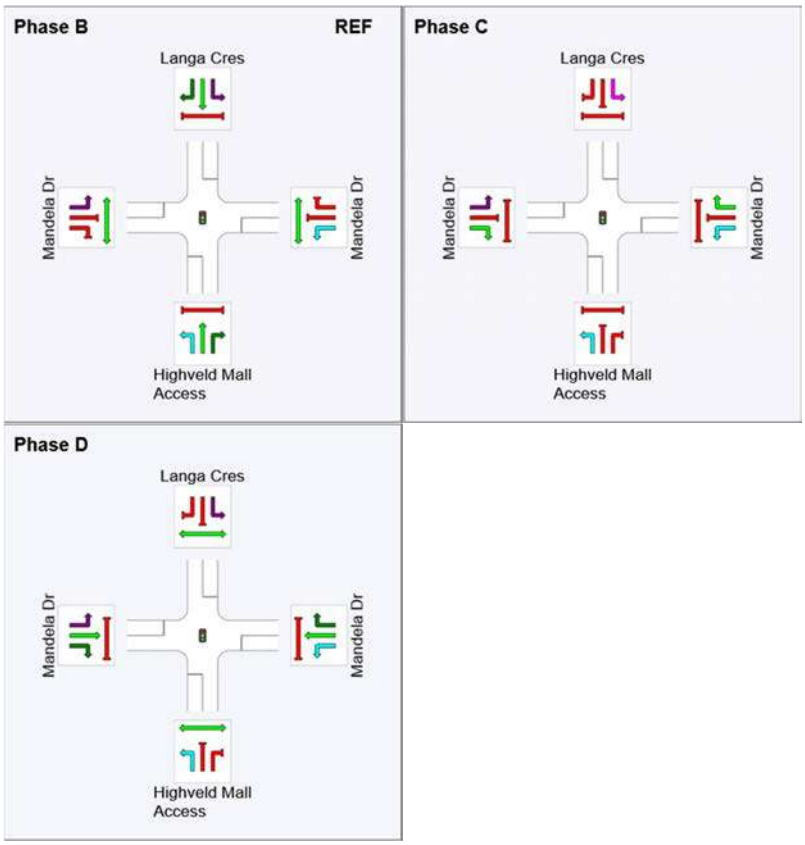
Future 2025 Background + Development Friday PM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

Phase Timing Summary

Phase	B	C	D
Phase Change Time (sec)	0	24	38
Green Time (sec)	18	8	26
Phase Time (sec)	24	14	32
Phase Split	34%	20%	46%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure A5.10

Sidra Output: Mandela Dr & Langa Cres

Future 2025 Background + Development Saturday AM Peak Hour Traffic

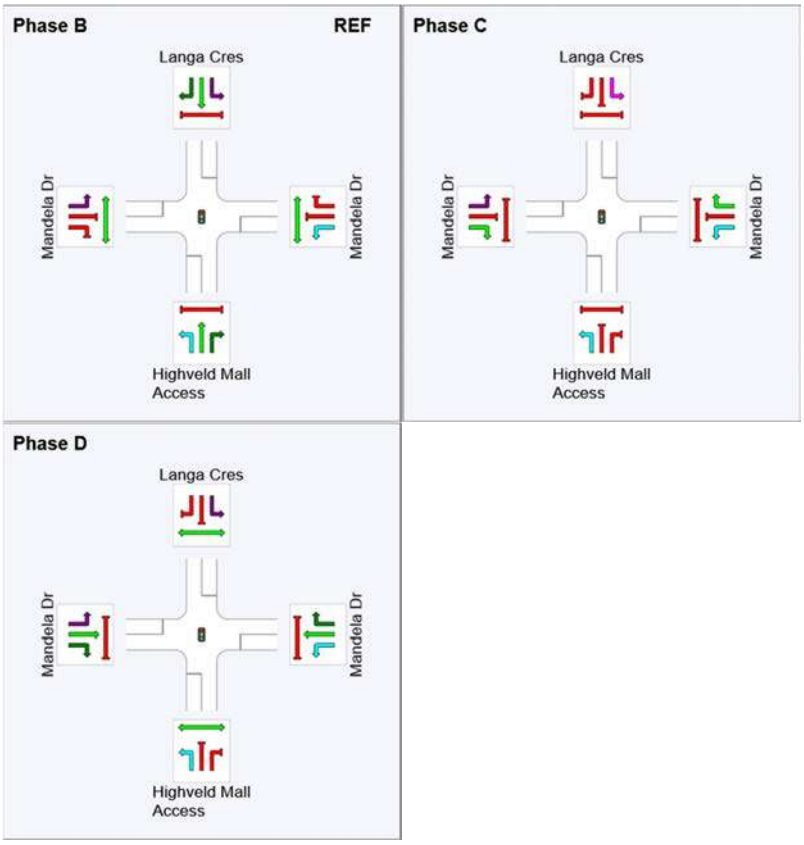
Future 2025 Background + Development Saturday AM Peak Hour Traffic
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)

Phase Timing Summary

Phase	B	C	D
Phase Change Time (sec)	0	20	32
Green Time (sec)	14	6	22
Phase Time (sec)	20	12	28
Phase Split	33%	20%	47%

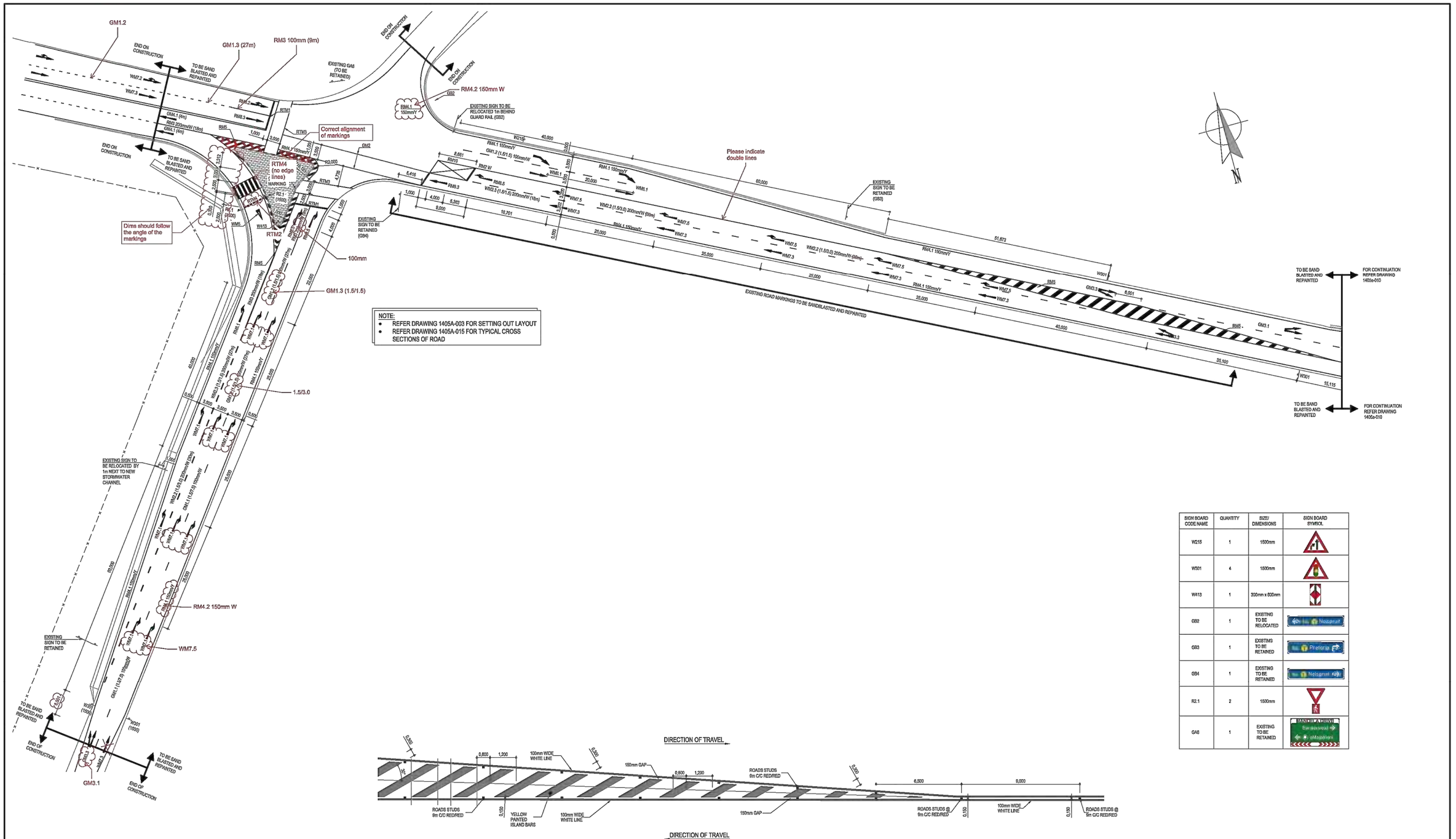
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



Annexure B

Emalahleni Master Road Planning



SIGN BOARD CODE NAME	QUANTITY	SIZE/ DIMENSIONS	SIGN BOARD SYMBOL
W215	1	1500mm	
W301	4	1500mm	
W413	1	300mm x 600mm	
GB2	1	EXISTING TO BE RELOCATED	Nelspruit
GB3	1	EXISTING TO BE RETAINED	Pretoria
GB4	1	EXISTING TO BE RETAINED	Nelspruit
R2.1	2	1500mm	
GA6	1	EXISTING TO BE RETAINED	MANDELA DRIVE Eamaisvaal oMajakaneni

TYPICAL PAINTED ISLAND DETAIL (RM5)
SCALE 1:100

No.	DATE	REVISION	CONSULT. ENG.
C	10-07-2019	UPDATED AS PER COMMENTS RECEIVED	
B	28-04-2019	FOR APPROVAL	
A	08-02-2016	FOR APPROVAL	

CONSTRUCTION RECORD
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

L&S Consulting (Pty) Ltd
Structural & Civil Engineers
Block 2 Bryanston Gate 170 Cnr Bryanston Rd Bryanston 2021
P O Box 1566 Randburg 2125 RSA
Telephone +2711 463 4630 Fax +2711 463 4629
Email mail@lsconsulting.co.za
Web www.lsconsulting.co.za

DESIGNED BY
NAME: J.A. DE BEER
Prof. Reg. No.: 20170131
CHECKED BY
NAME: W.J. BIGO
Prof. Reg. No.: 201170034
DRAWN BY
NAME: S. SENEKAL

CONSULTANT APPROVAL
Name :
Prof. Reg. No. :
Date :

HEAD OFFICE
Building A
66 Regency Drive
Route 21 Corporate Park
Irene
PO Box 10817
Vorna Valley
Gauteng
1686
Tel: (011) 805 8788

TRAC
TRANS AFRICAN CONCESSIONS

HEAD OFFICE
46 Tambotie Avenue
Val de Grace
Pretoria
0184
PO Box 415
Pretoria 0001
South Africa
Tel: (012) 844 8000

THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD

NORTHERN REGION
38 Ida Street
Menlo Park
Pretoria
0081
Private Bag X17
Lynnwood Ridge
0040
Tel: (012) 426 6200

ACCEPTANCE
THIS ACCEPTANCE IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OR LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWEVER ARISING
for CEO: SA NATIONAL ROADS AGENCY SOC LTD.
Date:

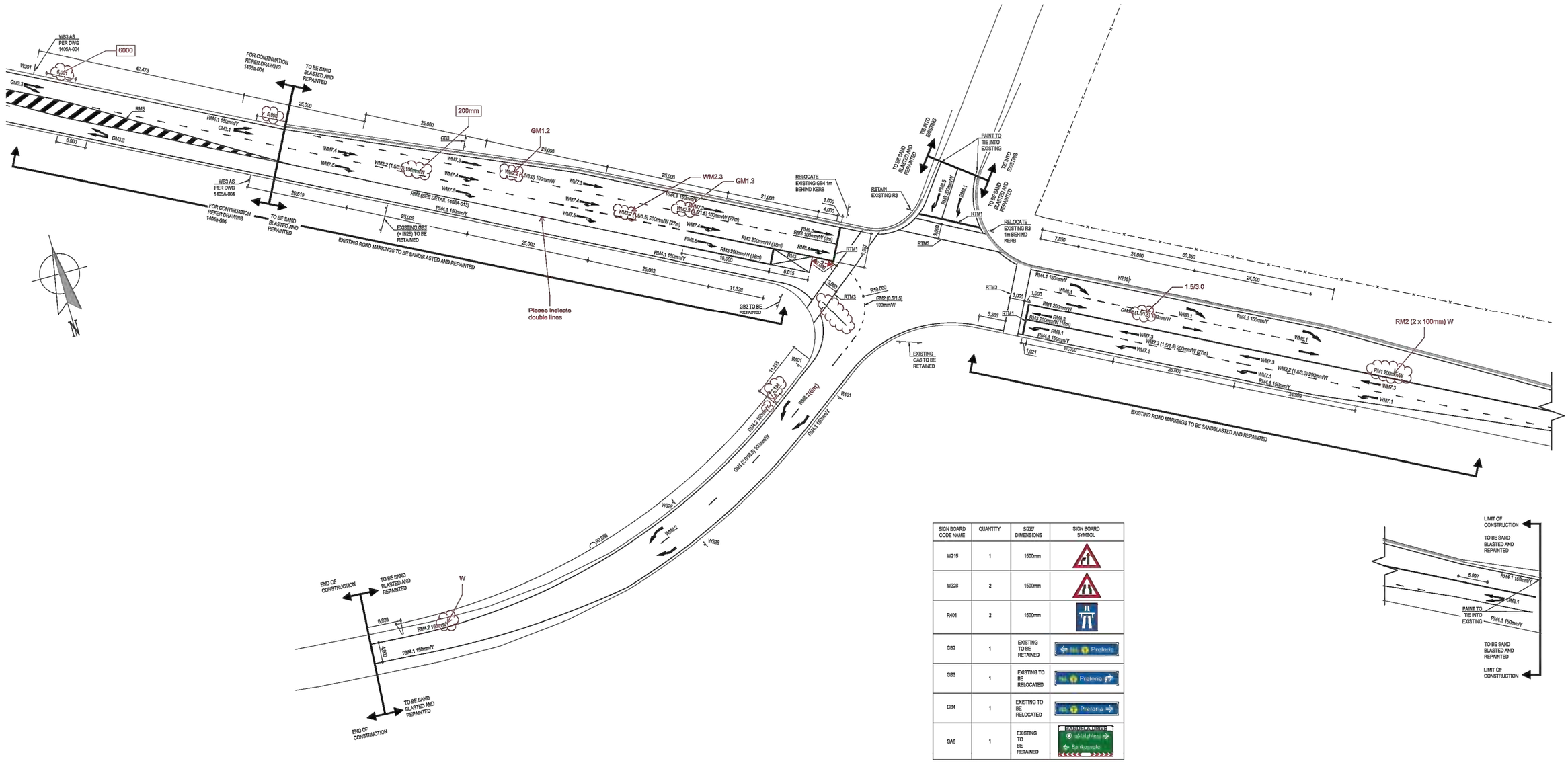
HIGHVELD MALL: EXTERNAL ROAD UPGRADES

INTERSECTION A (MANDELA & N4 RAMP) ROAD MARKING, DETAIL AND SIGNAGE LAYOUT

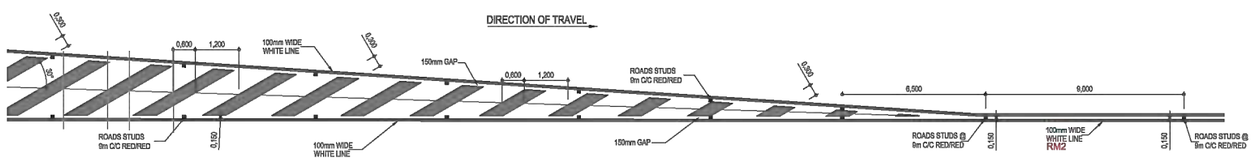
SCALE : 1:300 (A0) SHEET 1 OF 1

PROJECT NUMBER	1405a
DRAWING LOCATION DATA	START / END
ROUTE	
SECTION	
DRAWING km DISTANCE	
DRAWING TYPE	
BRIDGE/STRUCTURE No.	
CONSULTANT DRAWING No.	1405a-004 VER C
SANRAL DOCUMENT #	

SANRAL TITLE BLOCK #1648234(DWG/PDF) VERSION V7



SIGN BOARD CODE NAME	QUANTITY	SIZE/ DIMENSIONS	SIGN BOARD SYMBOL
W215	1	1500mm	
W328	2	1500mm	
R401	2	1500mm	
GB2	1	EXISTING TO BE RETAINED	Pretoria
GB3	1	EXISTING TO BE RELOCATED	Pretoria
GB4	1	EXISTING TO BE RELOCATED	Pretoria
GA6	1	EXISTING TO BE RETAINED	MANDELA DRIVE Midrand Bankenveld



TYPICAL PAINTED ISLAND DETAIL (RM5)
SCALE 1:100

HEAD OFFICE
Building A
69 Regency Drive
Route 21 Corporate Park
Irene
PO Box 10817
Vorna Valley
Gauteng
1686
Tel: (011) 805 8788

TRAC
TRANS AFRICAN CONCESSIONS
N4 TOLL ROUTE

HEAD OFFICE
48 Tambotie Avenue
Val de Grace
Pretoria
0184
PO Box 415
Pretoria 0001
South Africa
Tel: (012) 844 8000

THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC Ltd

NORTHERN REGION
38 Ida Street
Menlo Park
Pretoria
0081
Private Bag X17
Lynnwood Ridge
0040
Tel: (012) 426 6200

ACCEPTANCE

THIS ACCEPTANCE IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OR LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWSOEVER ARISING

for CEO: SA NATIONAL ROADS AGENCY SOC LTD.
Date:

No.	DATE	REVISION	CONSULT. ENG.
C	10-07-2019	UPDATED AS PER COMMENTS RECEIVED	
B	26-04-2019	FOR APPROVAL	
A	18-05-2018	FOR APPROVAL	

CONSTRUCTION RECORD
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

L&S Consulting (Pty) Ltd
Structural & Civil Engineers
Block 2 Bryanston Gate 170 Curzon Rd Bryanston 2021
PO Box 1546 Rosebug 2125 RSA
Telephone +2711 463 4629 Fax +2711 463 4629
Email mail@lsconsulting.co.za
Web www.lsconsulting.co.za

DESIGNED BY	
NAME	J.A. DE BEER
Prof. Reg. No.	20170131
CHECKED BY	
NAME	W.J. RICO
Prof. Reg. No.	20170034
DRAWN BY	
NAME	S. SENEKAL

CONSULTANT APPROVAL
Name :
Prof. Reg. No. :
Date :

HIGHVELD MALL: EXTERNAL ROAD UPGRADES

INTERSECTION B (MANDELA & N4 RAMP)
ROAD MARKING, DETAILS AND SIGNAGE LAYOUT

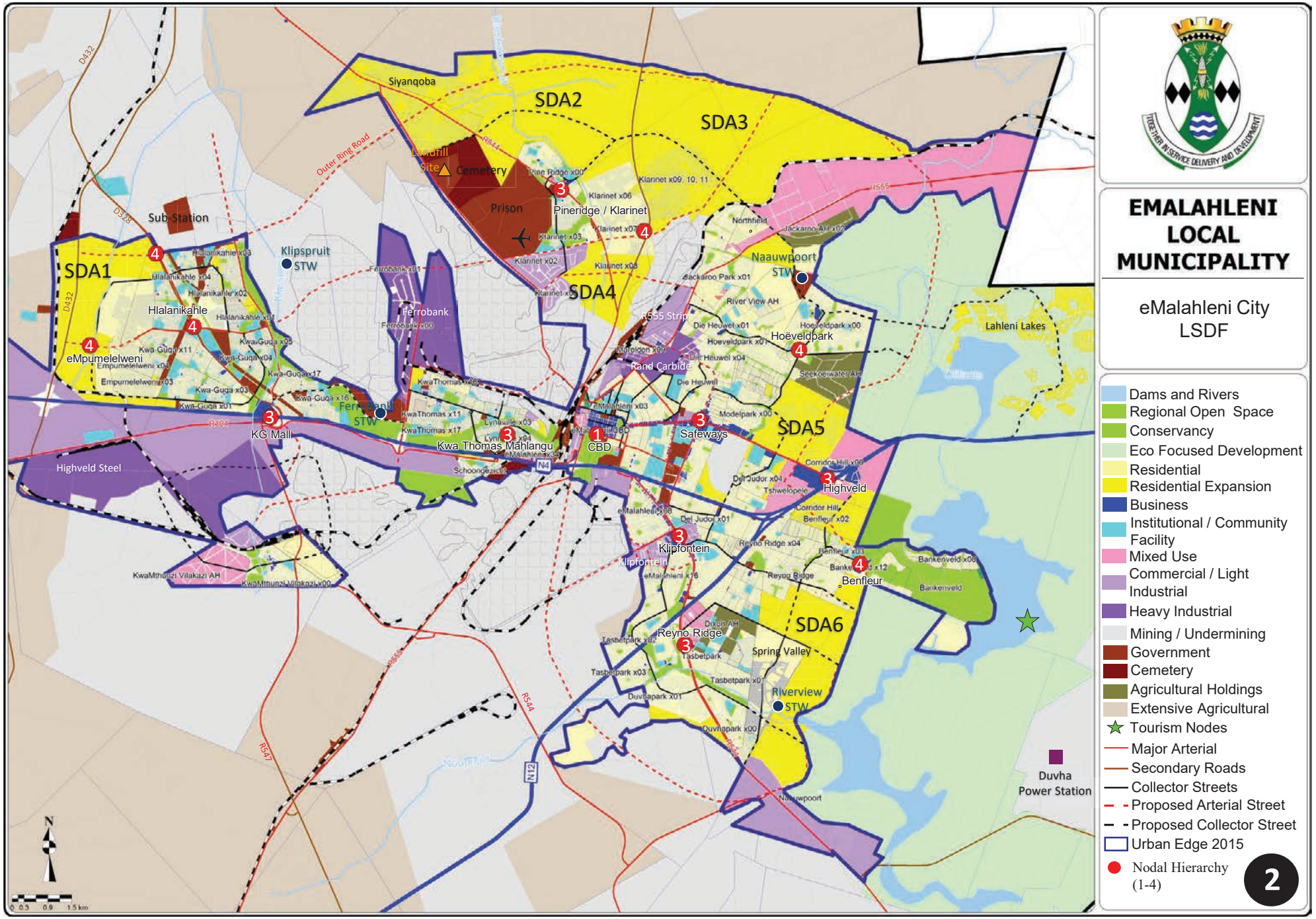
SCALE : 1:300 (A0) | SHEET 1 OF 1

PROJECT NUMBER	1405a
DRAWING LOCATION DATA	START / END
ROUTE	
SECTION	
DRAWING km DISTANCE	
DRAWING TYPE	
BRIDGE/STRUCTURE No.	
CONSULTANT DRAWING No.	1405a-010 VER C
SANRAL DOCUMENT #	

SANRAL TITLE BLOCK #184823#(DWG/PDF) VERSION V7

Annexure C

Proposed Road Upgrades by L&S Consulting



EMALAHLENI LOCAL MUNICIPALITY

eMalahleni City LSDF

- Dams and Rivers
- Regional Open Space
- Conservancy
- Eco Focused Development
- Residential
- Residential Expansion
- Business
- Institutional / Community Facility
- Mixed Use
- Commercial / Light Industrial
- Heavy Industrial
- Mining / Undermining
- Government
- Cemetery
- Agricultural Holdings
- Extensive Agricultural
- Tourism Nodes
- Major Arterial
- Secondary Roads
- Collector Streets
- Proposed Arterial Street
- Proposed Collector Street
- Urban Edge 2015
- Nodal Hierarchy (1-4)

2