ENVIRONMENTAL & ENGINEERING

IN ASSOCIATION WITH

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

REPORT

EXXARO BELFAST EXPANSION PROJECT

TRAFFIC IMPACT ASSESSMENT

REPORT REF: P-257

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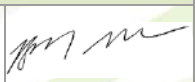
Reviewer	Ryno van Wyk		Traffic Engineer Directo	B.Eng. Honours (Transportation Engineering) Professional Engineer (Pr. Eng.), ECSA Associate Member, SAICE Member, ITE

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EXECUTIVE SUMMARY

Nsovo Environmental Consulting appointed Eco-Elementum (Pty) Ltd, in association with Infratrans (Pty) Ltd, to undertake a Traffic Impact Assessment (TIA) for the proposed expansion of the existing Exxaro Belfast coal mine located just south of Belfast in the Mpumalanga Province, South Africa. The project is referred to as the Belfast Expansion Project (BEP).

The BEP project proposal by Exxaro is expected to expand their current operations at the facility to increase the coal production from 2.7 million tonne per annum (Mtpa) to 4.72 Mtpa.

The project may include the following activities:

- Removal of topsoil and overburden;
- Opencast mining (including drilling, blasting, strip mining and doze-over mining);
- Underground mining (traditional board and pillar mining);
- Material handling, screening and crushing, and
- Product logistics.

The scope of this study includes:

- Conducting a traffic survey to determine current traffic conditions on the surrounding road network (within a defined study area);
- Quantify the impact the proposed project is expected to have on the surrounding road network;
- Determine whether it is necessary to mitigate the expected impact, and
- If required, recommend measures to mitigate such an impact.

SUMMARY OF FINDINGS

Traffic operating conditions were determined and compared for the following scenarios:

- Baseline;
- Project construction phase, and
- Project operational phase

By comparing the operating conditions for the different scenarios, it was concluded that the proposed project will have an insignificant traffic impact on the surrounding road network.

Based on the contents of this report it is concluded that the project can be authorised from a traffic engineering viewpoint provided that the recommendations made in this report are considered.

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PROJECT INFORMATION

Table 1: EAP Details

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1. INTRODUCTION AND STUDY SCOPE

Nsovo Environmental Consulting appointed Eco-Elementum (Pty) Ltd, in association with Infratrans (Pty) Ltd, to undertake a Traffic Impact Assessment (TIA) for the proposed expansion of the existing Exxaro Belfast coal mine located just south of Belfast in the Mpumalanga Province, South Africa. The project is referred to as the Belfast Expansion Project (BEP).

The scope of this TIA includes:

- Conducting a traffic survey to determine current traffic conditions on the surrounding road network (within a defined study area);
- Quantify the impact the proposed project is expected to have on the surrounding road network;
- Determine whether it is necessary to mitigate the expected impact, and
- If required, recommend measures to mitigate such an impact.

2. PROJECT OVERVIEW

2.1 LOCALITY

The Exxaro Belfast coal mine is situated to the south of Belfast and is located within the jurisdiction of the Emakhazeni Local Municipality in the Mpumalanga Province, South Africa. Details of the study site is summarised in **Table 3** below with the location indicated in **Figure 1**.

Table 3: Study Site Details

Site Name:	Exxaro Coal Mine
Local Municipality	Emakhazeni Local Municipality Mpumalanga Province South Africa
Distance and direction from nearest town:	The Project Area is ~ 16.5 km south-west of Belfast

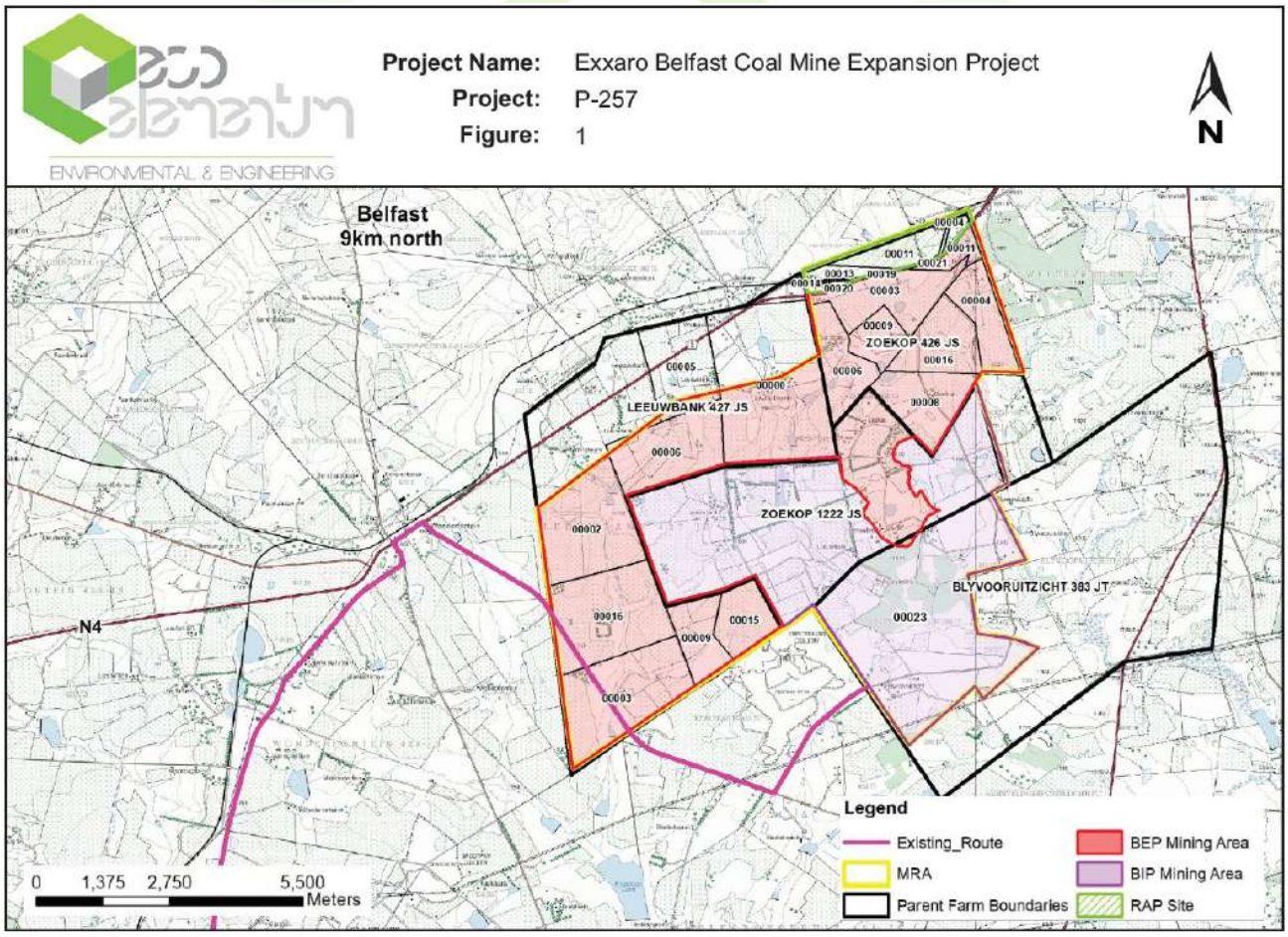


Figure 1: Location of the study site

2.2 PROJECT DESCRIPTION

The BEP project proposal by Exxaro is expected to expand their current operations at the facility to increase the coal production from 2.7 million tonne per annum (Mtpa) to 4.72 Mtpa.

Coal is currently hauled approximately 31.5 km by road from the mine to the Rietkuil Front End Loader (FEL) siding (located just north of Eskom's Arnot power station) where it is then exported via rail to the Richards Bay Coal Terminal. The product logistics will remain the same for the BEP. The existing haul route is indicated in **Diagram 1** attached as **Appendix A**

The project will include the following activities:

- Removal of topsoil and overburden;
- Opencast mining (including drilling, blasting, strip mining and doze-over mining);
- Underground mining (traditional board and pillar mining);
- Material handling, screening and crushing, and
- Product logistics.

Figure 2 below shows the layout of the project site. The site layout drawing is also attached as **Appendix B**, to provide a clear indication of the proposed infrastructure.

As shown on the site layout, there are two infrastructure options for opencast mining, with Option 2 being the preferred option. As long as no new access roads to the mining area are constructed (i.e., only the existing access/haul route is used as per **Diagram 1**), the traffic impact for either option will be the same.

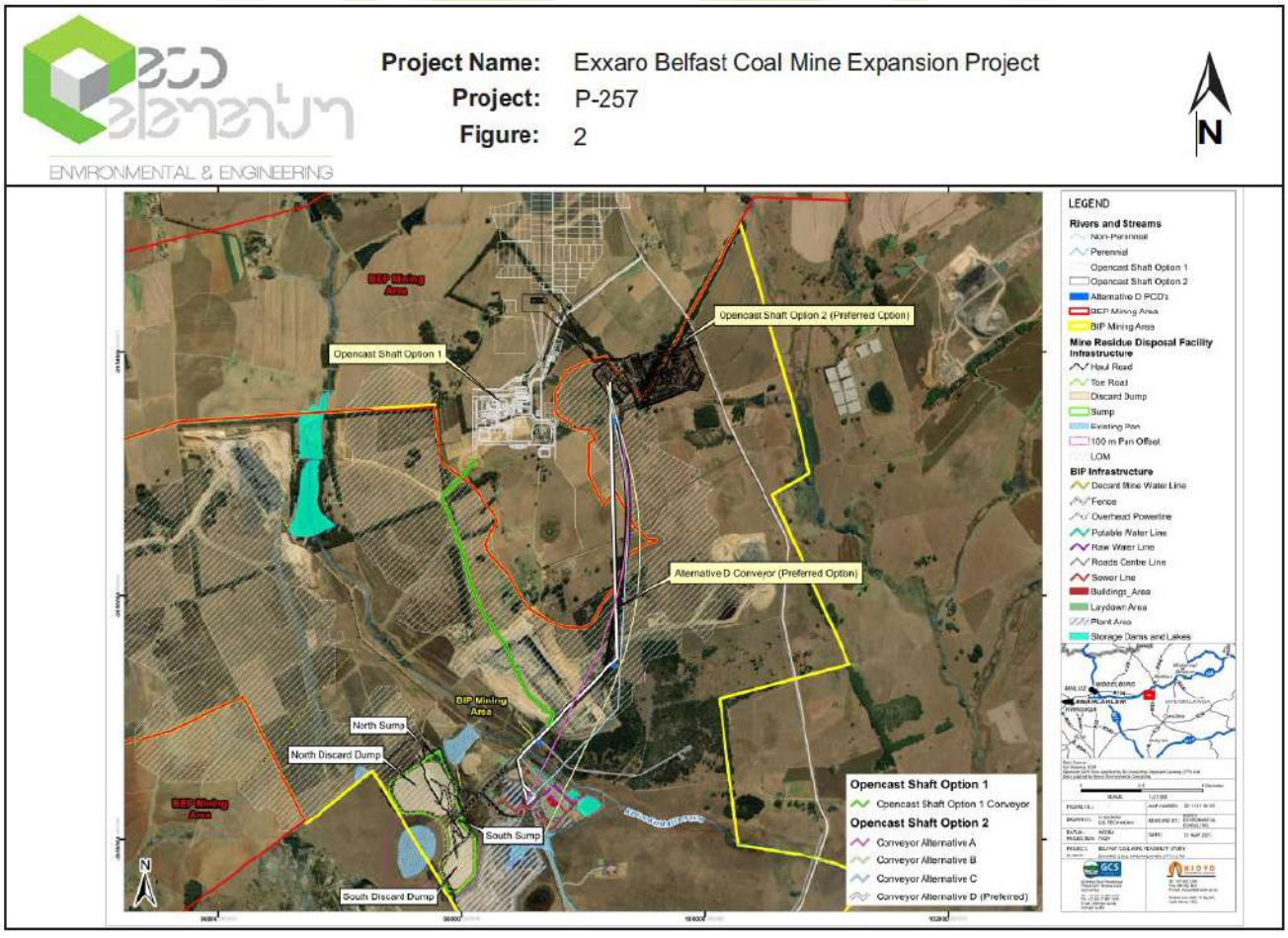


Figure 2: Layout of the project site

3. OVERVIEW OF THE METHOD USED FOR ASSESSMENT

3.1 General Overview

The assessment method used can generally be defined by the following steps:

1. Determining the traffic characteristics of the proposed project;
2. Defining the affected area (study area);
3. Collecting data to define the baseline operating conditions within the study area;
4. Determining the impact the proposed activity will have on the baseline operating conditions, and
5. Based on the expected impact, propose possible mitigation measures if necessary.

These steps are further discussed in the remainder of this chapter.

3.2 Traffic Characteristics

The type, volume and the expected travel paths are determined for the traffic to be generated by the proposed activity. This is done by analysing current traffic volumes and movement patterns in the study area, considering the type of activity and its location in relation to other developments / points of interests and by consulting various guidelines. The traffic characteristics of the proposed activity are further discussed in **Section 4.2**.

3.3 Study Area

The study area is defined based on the extent and type of activity and the characteristics of the traffic expected to be generated as a result of the proposed project. Although the traffic impact will most probably extend beyond a chosen study area, the area to be investigated should be large enough to ensure that the degree of impact outside its boundaries is insignificant and can be ignored. The study area is defined and described in the following subsections.

3.3.1 Site Visit

As per the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*, it is a specific requirement to undertake a site visit when conducting a traffic study. During such a site visit all relevant aspects of the area can be recorded and a better understanding of the study area can be acquired.

A site visit was conducted on Tuesday 16 February 2021. All relevant developments, points of interests, transport facilities, roads and road intersections were visited and recorded.

3.3.2 Surrounding Road Network

Considering the expected number of vehicle trips to be generated as a result of the proposed activities (discussed in **Section 4.2**), as well as the expected distribution of these trips on the surrounding road network, only the following existing roads were deemed relevant for the purpose of this study:

- Road D110: This road can be classified as a Class 3 road (minor arterial road) and falls under the jurisdiction of the Mpumalanga Province Department of Public Works, Roads and Transport. Access to the mine is gained from this road.

- Road N4: The section of this road under consideration can be classified as a Class 2 road (major arterial road) and falls under the jurisdiction of the South African National Roads Agency Limited (SANRAL).
- Road P15/1: This road can also be classified as a Class 2 road (major arterial road) and falls under the jurisdiction of the Mpumalanga Province Department of Public Works, Roads and Transport.
- Road D383: This road can be classified as a Class 3 road (minor arterial road) and falls under the jurisdiction of the Mpumalanga Province Department of Public Works, Roads and Transport.

The classification of this roads is based on the *TRH 26, South African Road Classification and Access Management Manual*.

3.3.3 Intersections Investigated

As per the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*, the study area should include all routes and intersections within a maximum distance of 1.5 km from the access to the site, measured along the shortest routes to the access. At least one intersection with an arterial route should also form part of the study area.

By considering these guidelines, as well as the expected number of vehicle trips to be generated as a result of the proposed activity (discussed in **Section 4.2**), the following intersections were deemed relevant for investigation:

- Road D1110/N4
- N4/Road P15-1
- Road P15-1/Road D383

The boundaries of the study area are therefore limited to the location of this intersection.

3.3.4 Vulnerabilities / Sensitivities

From a traffic engineering and transportation planning perspective, no vulnerabilities or sensitivities have been identified in the study area. Due to a number of mines located in Mpumalanga the provincial and national road network have been designed to cater for heavy vehicles.

3.4 Data Collection

To determine the existing traffic demand on the nearby road network traffic surveys were conducted on Tuesday 16 February 2021 at the study intersections previously discussed. A more detailed discussion follows in **Section 4.2**.

3.5 Impact and Mitigation

By using the data collected, traffic operating conditions were determined by means of traffic engineering software, namely SIDRA INTERSECTION 8. Operating conditions at the study intersections identified in **Section 3.3.3** were determined and compared for the following three scenarios:

1. Existing conditions (baseline);
2. During the implementation of the proposed project (construction phase), and
3. After implementation of the proposed project (operational phase).

The traffic impact extent of the decommissioning phase is expected to be insignificant compared to the construction and operational phases, and was therefore not considered.

Based on the results obtained, the need for mitigation measures is discussed.

4. EXISTING TRAFFIC STATE (ENVIRONMENTAL BASELINE)

4.1 SITE ACCESS

Access to the mine is provided off Road D1110 as indicated in **Diagram 1** attached as **Appendix A**. It can be confirmed that this existing access is in line with the *TRH 26, South African Road Classification and Access Management Manual* and is therefore supported from a traffic engineering and transport planning viewpoint.

4.2 EXISTING TRAFFIC FLOWS

To determine the existing traffic demand on the surrounding road network weekday traffic surveys were conducted on Tuesday 16 February 2021 at the key intersections previously discussed in **Section 3.3.3**.

From this survey it was determined that the common peak traffic hours occurred between 07h15-08h15 for the AM peak hour and between 15h00-16h00 for the PM peak hour. These existing 2021 peak hour traffic volumes are shown in **Figure 3**.

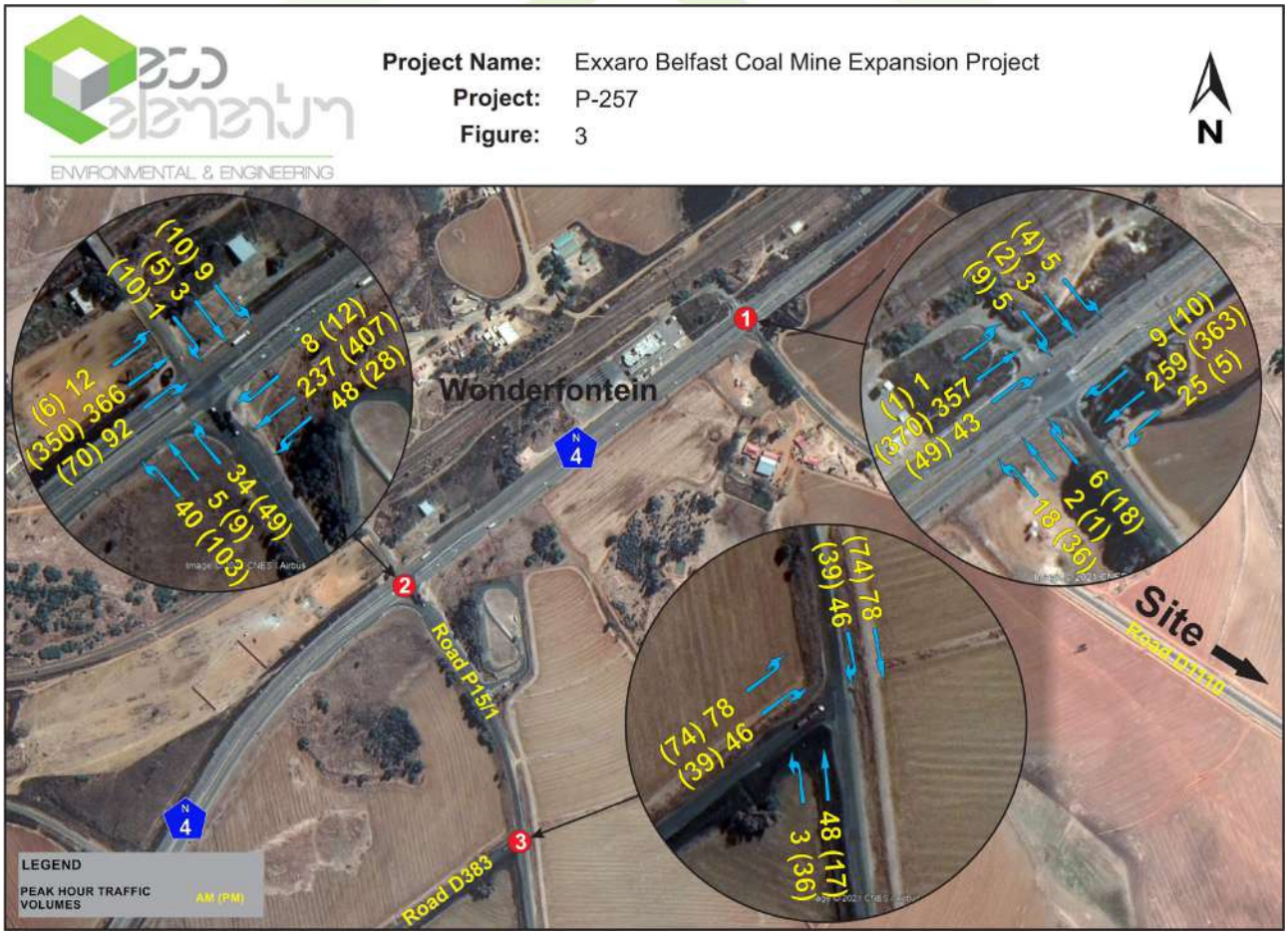


Figure 3: Existing 2021 Peak Hour Traffic Volumes

4.3 Baseline Operating Conditions

The baseline operating conditions for the key intersections are summarised in **Table 4** below, with the detailed SIDRA outputs attached as **Appendix B**. These operation conditions are based on the existing 2021 peak hour traffic volumes as per **Figure 3**, as well as the existing intersection layout and traffic control as per **Drawing D001** attached as **Appendix C**.

The Level of Service (LOS) parameter is determined by the V/C ratio (ratio between the traffic volume and traffic capacity per movement, both measured in veh/h) and delay (time delay experienced, measured in seconds) values. LOS values can vary between "A" and "F", with "F" being the worst operating condition. A LOS of "D" or better is deemed acceptable, with a LOS of "E" acceptable for right-turn traffic movements if adequate lengths of storage lanes are provided.

Table 4: Baseline operating conditions

Intersection & approach definitions	Peak hour	Analysis para-meters	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
N4/Road D1110 App 1: D1110 SE App 2: N4 NE App 3: Garage NW App 4: N4 SW	**Week AM**	**V/C**	0.06	0.06	0.06	0.02	0.07	0.02	0.05	0.05	0.05	0.01	0.10	0.08
		Delay (s)	10	22	22	6	0	9	10	23	22	6	0	9
		LOS	A	C	C	A	A	A	B	C	C	A	A	A
	Week PM	**V/C**	0.16	0.16	0.16	0.01	0.10	0.02	0.08	0.08	0.08	0.01	0.11	0.10
		Delay (s)	10	27	27	6	0	10	10	26	27	6	0	10
		LOS	B	D	D	A	A	A	B	D	D	A	A	A
N4/Road P15-1 App 1: P15-1 SE App 2: N4 NE App 3: P15-1 NW App 4: N4 SW	**Week AM**	**V/C**	0.03	0.17	0.17	0.03	0.07	0.02	0.01	0.02	0.02	0.01	0.10	0.16
		Delay (s)	6	20	19	6	0	10	10	19	19	6	0	9
		LOS	A	C	C	A	A	A	B	C	C	A	A	A
	Week PM	**V/C**	0.07	0.30	0.30	0.02	0.12	0.02	0.02	0.09	0.09	0.01	0.10	0.16
		Delay (s)	6	24	24	6	0	9	10	22	24	6	0	11
		LOS	A	C	C	A	A	A	B	C	C	A	A	B
Road P15-1/Road D383 App 1: Rd P15-1 S App 2: Rd P15-1 N App 3: Rd D383 W	**Week AM**	**V/C**	0.03	0.03	-	-	0.08	0.08	0.13	-	0.13	-	-	-
		Delay (s)	6	0	-	-	1	6	10	-	10	-	-	-
		LOS	A	A	-	-	A	A	A	-	B	-	-	-
	Week PM	**V/C**	0.04	0.04	-	-	0.08	0.08	0.11	-	0.11	-	-	-
		Delay (s)	6	0	-	-	1	6	9	-	10	-	-	-
		LOS	A	A	-	-	A	A	A	-	A	-	-	-

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

The baseline operating conditions tabulated in **Table 4** above indicate that acceptable traffic operating conditions are currently experienced at the key study intersection. These conditions would be influenced by the following variables:

- Traffic volumes;
- Intersection geometry, and
- Intersection traffic control.

4.4 Non-Motorised and Public Transport

A public transportation and non-motorised transport assessment were carried out as part of this study.

Public transport in the study area is mainly provided by minibus taxis and busses. Taxis and busses were observed travelling along the N4, Road D1110, Road P15/1 and Road D383.

The proposed activities are expected to generate a considerable demand for non-motorised and public transport, but due to the remote location of the study site no new facilities are recommended. It is however recommended that transport for staff be provided to and from the site during both the construction and operational phases of the project.

5. TRAFFIC IMPACT DUE TO PROJECT ACTIVITIES

5.1 NATURE OF IMPACT

The impact of the project activities (discussed in **Section 2.2**) is investigated for the following project phases:

- Construction phase, and
- Operational phase.

The proposed project activities will have the following traffic characteristics:

- Construction phase:
  - Construction workers will commute to and from the site on a daily basis by either making use of public transport, transport provided by the contractor or private vehicles, and
  - Construction and delivery vehicles will travel to and from the site on a daily basis as required.
- Operational phase:
  - Employees will commute to and from the mine on a daily basis by either making use of public transport, transport provided by the mine or private vehicles;
  - Heavy vehicles hauling material will travel to and from the mine on a daily basis, and
  - General delivery vehicles will travel to and from the mine on a daily basis.

Based on the traffic characteristics above, and considering **Table 5** below, the nature of the impact during both the project phases can be described as "negative".

Table 5: Listing of the descriptors for the nature of the impact

Impact nature descriptors	Definitions
Positive	A benefit to the receiving environment
Neutral	No determined cost or benefit to the receiving environment
Negative	At cost to the receiving environment

5.2 EXTENT OF IMPACT

Although some of the traffic generated during the construction or operational phases will be destined regionally or even nationally, the impact, as determined by the defined study area, will be concentrated locally. The traffic influence outside the boundaries of the study area would be insignificant. As per **Table 6** below, the extent of the impact can be described as "local" for both the project phases, and a rating of 3 can be adopted.

Table 6: Listing of the descriptors for the extent of the impact

Extent descriptors	Definitions	Rating
Very low	Site Specific – impact is confined within the project site boundary	1
Low	Local – impact is limited to the site boundary and immediate surroundings	2
Medium	Regional – impact extends beyond the immediate surroundings, but is confined within the regional or provincial boundaries	3
High	National – national impact, but is confined within the boundaries of South Africa	4
Very high	International – impact extends beyond the national boundaries and has a global effect	5

5.3 Duration of Impact

The traffic impact due to the construction phase will only last for the duration of the activity which is estimated to be 1-2 years. The traffic impact of the operational phase will however last for the entire operational life span of the project, which is expected to be more than 15 years.

According to **Table 7** below a duration rating of 2 can thus be adopted for the construction phase and 4 for the operational phase.

Table 7: Listing of the descriptors for the duration of the impact

Duration descriptors	Definitions	Rating
Very low	Immediate – impact expected only for the duration of the project or not greater than 1 year	1
Low	Short term – impact expected on a duration timescale of 1 to 5 years	2
Medium	Medium term – impact expected on a duration timescale of 5-15 years	3
High	Long term – impact cease after the operational life span of the project	4
Very high	Permanent – impact expected beyond the operational life span of the project	5

5.4 Magnitude of Impact

5.4.1 Impact during Construction Phase

To determine the traffic impact during construction the following construction activity assumptions are made:

- A maximum of 150 construction workers will be on site;
- 80% of the construction workers will make use of public transport or transport provided by the contractor;
- The remaining 20% will make use of private transport which is assumed to have a vehicle occupancy of 1.5 occupants per vehicle during the peak traffic hours, and
- An in:out traffic split of 80%:20% and 20%:80% is assumed for the AM and PM peak traffic hours respectively.

Based on the assumptions above the construction phase is expected to generate peak hour traffic volumes as per **Table 8** below.

Table 8: Expected traffic to be generated during the construction phase

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
AM	20	5	25
PM	5	20	25

Figure 4 overleaf presents the expected peak hour traffic volumes at the key study intersections during the construction phase. These volumes also include an expected 2% annual growth in background traffic (i.e. existing traffic) over a period of 3 years.

The operating conditions for the key intersections during the construction phase are summarised in **Table 9** overleaf with the detailed SIDRA outputs attached as **Appendix B**. These operating conditions are based on the expected peak hour traffic volumes during construction (as per **Figure 4**) as well as the intersection layout and traffic control as per **Drawing D001**.

The SIDRA analysis results indicate acceptable traffic operating conditions during the construction phase at the key study intersections.

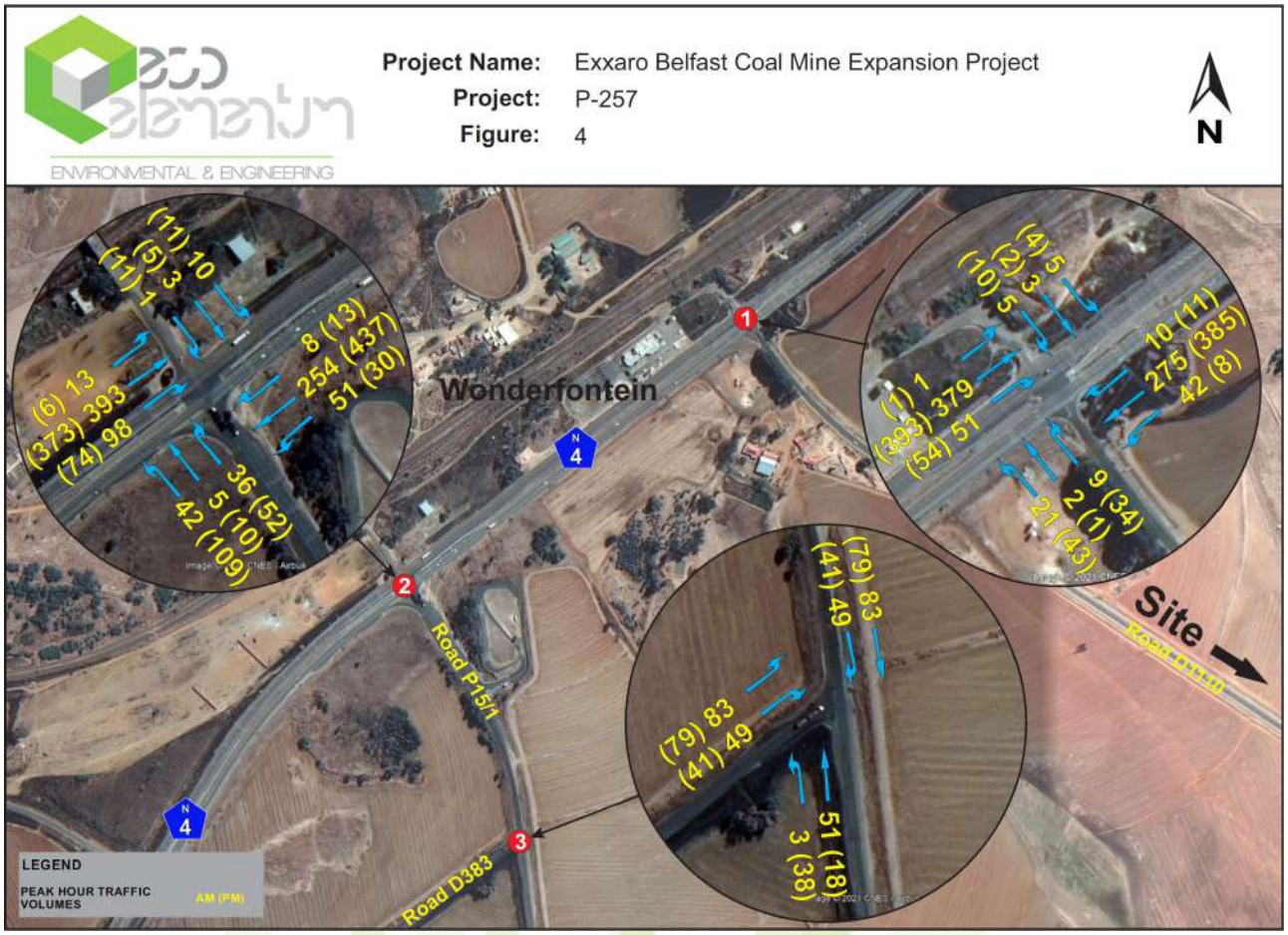


Figure 4: Expected peak hour traffic volumes at the key intersections during the construction phase

Table 9: Construction phase operating conditions

Intersection & approach definitions	Peak hour	Analysis para-meters	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
N4/Road D1110 App 1: D1110 SE App 2: N4 NE App 3: Garage NW App 4: N4 SW	**Week AM**	**V/C**	0.09	0.09	0.09	0.03	0.08	0.02	0.05	0.05	0.05	0.01	0.11	0.10
		Delay (s)	10	25	25	6	0	10	10	25	24	6	0	9
		LOS	A	C	C	A	A	A	B	C	C	A	A	A
	Week PM	**V/C**	0.30	0.30	0.30	0.01	0.11	0.02	0.09	0.09	0.09	0.01	0.11	0.12
		Delay (s)	11	32	32	6	0	10	10	29	30	6	0	10
		LOS	B	D	D	A	A	A	B	D	D	A	A	B
N4/Road P15-1 App 1: P15-1 SE App 2: N4 NE App 3: P15-1 NW App 4: N4 SW	**Week AM**	**V/C**	0.03	0.19	0.19	0.03	0.07	0.02	0.01	0.02	0.02	0.01	0.11	0.18
		Delay (s)	6	22	21	6	0	10	10	21	20	6	0	9
		LOS	A	C	C	A	A	B	B	C	C	A	A	A
	Week PM	**V/C**	0.07	0.35	0.35	0.02	0.12	0.03	0.01	0.10	0.10	0.01	0.11	0.18
		Delay (s)	6	27	26	6	0	10	10	24	26	6	0	12
		LOS	A	D	D	A	A	A	B	C	D	A	A	B
Road P15-1/Road D383 App 1: Rd P15-1 S App 2: Rd P15-1 N App 3: Rd D383 W	**Week AM**	**V/C**	0.04	0.04	-	-	0.09	0.09	0.14	-	0.14	-	-	-
		Delay (s)	6	0	-	-	1	6	10	-	10	-	-	-
		LOS	A	A	-	-	A	A	A	-	B	-	-	-
	Week PM	**V/C**	0.04	0.04	-	-	0.08	0.08	0.12	-	0.12	-	-	-
		Delay (s)	6	0	-	-	1	6	9	-	10	-	-	-
		LOS	A	A	-	-	A	A	A	-	A	-	-	-

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

5.4.2 Impact during Operational Phase

According to the *South African Trip Data Manual* mining activities generate an insignificant number of vehicle trips on the external (i.e. public) road network (a maximum of 1 trip per 100 employees during peak traffic hours).

To determine more site-specific trip generation data, information regarding the future operational characteristics of the mine was obtained and the following assumptions are made:

- The mine expansion project will result in a coal production increase from 2.7 Mtpa to 4.72 Mtpa;
- All of the product will be transported by road;
- Haul trucks with a 30-tonne capacity will be used;
- 5 hauling days per week;
- 12 hauling hours per day;
- 50 employees will be employed on site during the operational phase;
- The number of permanent employees employed by the mine will not increase as a result of the expansion of the mine;
- A peak hour factor of 0.7 is applicable to the critical 15-minute traffic peak, and
- An in:out traffic split of 80%:20% and 20%:80% is assumed for the AM and PM peak traffic hours respectively;

Based on the preceding assumptions the future operational phase is expected to generate peak hour traffic volumes as per **Table 10** below.

Table 10: Expected additional traffic to be generated during the future operational phase

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
AM	25	6	31
PM	6	25	31

Figure 5 presents the expected peak hour traffic volumes at the key study intersections during the future operational phase. These volumes also include an expected 2% annual growth in background traffic (i.e. existing traffic) over a period of 5 years. Although the LoM is expected to be 9 years, national TIA guidelines require a 5-year future traffic horizon to be investigated based on the extent of the subject project.

The operating conditions for the key intersection during the future operational phase are summarised in **Table 11** overleaf with the detailed SIDRA outputs attached as **Appendix B**. These operating conditions are based on the expected peak hour traffic volumes during future operations (as per **Figure 5**) as well as the intersection layout and traffic control as per **Drawing D001**.

The SIDRA analysis results indicate acceptable traffic operating conditions during the operational phase at the key study intersections.

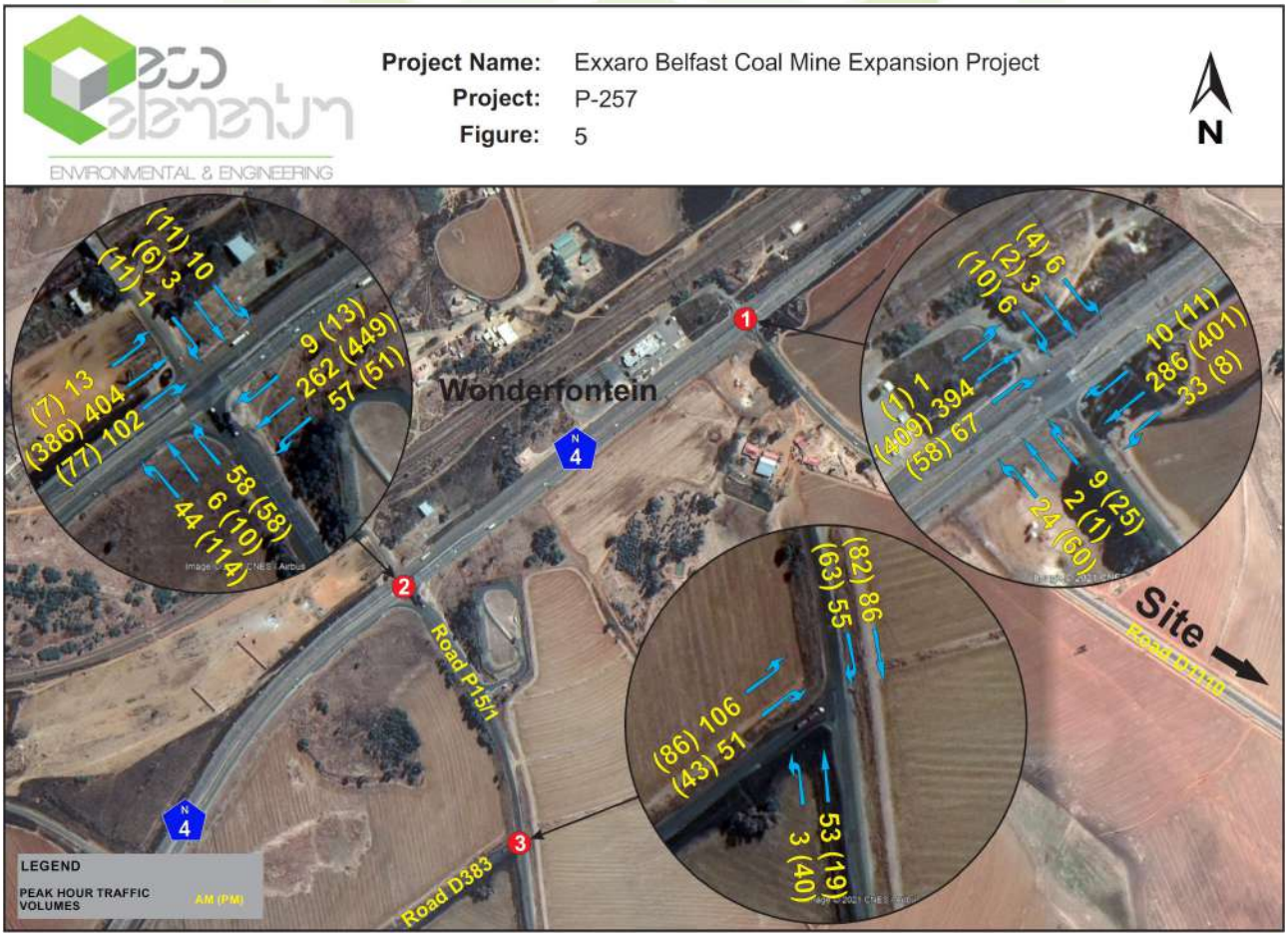


Figure 5: Expected peak hour traffic volumes at the key intersections during the future operational phase

Table 11: Future operational phase operating conditions

Intersection & approach definitions	Peak hour	Analysis para-meters	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
N4/Road D1110 App 1: D1110 SE App 2: N4 NE App 3: Garage NW App 4: N4 SW	**Week AM**	**V/C**	0.10	0.10	0.10	0.02	0.08	0.02	0.06	0.06	0.06	0.01	0.11	0.13
		Delay (s)	10	26	26	6	0	10	10	26	26	6	0	9
		LOS	A	D	D	A	A	A	B	D	D	A	A	A
	Week PM	**V/C**	0.27	0.27	0.27	0.01	0.11	0.02	0.11	0.11	0.11	0.01	0.12	0.13
		Delay (s)	11	33	33	6	0	10	10	30	33	6	0	11
		LOS	B	D	D	A	A	B	B	D	D	A	A	B
N4/Road P15-1 App 1: P15-1 SE App 2: N4 NE App 3: P15-1 NW App 4: N4 SW	**Week AM**	**V/C**	0.03	0.31	0.31	0.04	0.07	0.02	0.01	0.02	0.02	0.01	0.12	0.19
		Delay (s)	6	24	23	6	0	10	10	21	20	6	0	10
		LOS	A	C	C	A	A	B	B	C	C	A	A	A
	Week PM	**V/C**	0.08	0.27	0.27	0.03	0.23	0.03	0.01	0.12	0.12	0.01	0.11	0.20
		Delay (s)	6	27	19	6	0	10	10	26	28	6	0	12
		LOS	A	D	C	A	A	A	B	D	D	A	A	B
Road P15-1/Road D383 App 1: Rd P15-1 S App 2: Rd P15-1 N App 3: Rd D383 W	**Week AM**	**V/C**	0.04	0.04	-	-	0.10	0.10	0.17	-	0.17	-	-	-
		Delay (s)	6	0	-	-	1	6	10	-	10	-	-	-
		LOS	A	A	-	-	A	A	A	-	B	-	-	-
	Week PM	**V/C**	0.04	0.04	-	-	0.10	0.10	0.13	-	0.13	-	-	-
		Delay (s)	6	0	-	-	1	6	9	-	10	-	-	-
		LOS	A	A	-	-	A	A	A	-	B	-	-	-

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

5.4.3 Comparing Operating Conditions with the Baseline

By comparing the expected operating conditions during the project's construction and operational phases with the baseline it can be stated that an insignificant traffic impact on the external road network is expected for both these project phases.

Based on the above and considering **Table 12** below the magnitude of the traffic impact can be described as "minor" for both the project phases and a rating of 0 can thus be adopted.

Table 12: Listing of the descriptors for the magnitude of the impact

Magnitude descriptors	Definitions	Rating
None	Negligible – zero or very low impact	0
Minor	Site specific and short-term impact	2
Low	Local scale and / or short-term impact	4
Moderate	Regional and / or medium-term impact	6
High	National scale and / or long-term environmental change	8
Very High	Global scale and / or permanent environmental change	10

5.5 Probability of Impact Occurring

Considering **Table 13** below a rating of 4 can be allocated to the probability of the traffic impact during both the construction and operational phases.

Table 13: Listing of the descriptors for the probability of the impact

Probability descriptors	Definitions	Rating
None	Absolute certainty that impact will not occur	0
Improbable	Probability very low due to design or experience	1
Low Probability	Unlikely to occur	2
Medium Probability	Distinct probability that the impact will occur	3
High Probability	Impact most likely to occur	4
Definite	Absolute certainty that impact will occur	5

6. MITIGATION MEASURES

A significance rating can be allocated to the expected traffic impact, based on the following equation and the descriptors provided in **Table 14** below:

Significance = (Extent + Duration + Magnitude) x Probability

Table 14: Listing of the descriptors for the significance of the impact

Significance descriptors	Definitions	Rating
Low	The project can be authorised with a low risk to of environmental degradation	< 30
Medium	The project can be authorised, but with required mitigation measures	30 – 60
High	The project can be authorised, but with strict conditions and high levels of compliance and enforcement in respect of the impact in question	> 60

The significant ratings for the development phases are presented in **Table 15** below.

Table 15: Impact assessment for the project phases considered

Project phase	Mitigation	Nature	Impact rating criteria				Significance
			Extent	Duration	Magnitude	Probability	
Construction	No	Negative	3	2	0	4	20
Operations	No	Negative	3	4	0	4	28

Based on the significance scores in **Table 15** above, the project can be authorised in terms of the criteria as per **Table 14** without the need to implement any mitigation measures.

7. LEGAL REQUIREMENTS AND OTHER CONSIDERATIONS

The following comments can be made with regard to legal requirements and other considerations during the proposed project:

- All legal authorisations and permits must be obtained for the transportation of abnormal loads and hazardous materials on public roads;
- Measures should be taken to ensure that all health and safety requirements regarding transportation activities are complied with. This may include dust covers for hauling vehicles and dust control on all gravel roads;
- It is proposed that flagmen and temporary warning signs be placed at all access points where heavy vehicles will access public roads during construction, and
- Controls should be in place to ensure that vehicles exiting the site are not overloaded.

8. SUMMARY AND CONCLUSIONS

In summary and based on the content of this document, the following key conclusions are made with regard to the proposed expansion of the existing Exxaro Belfast coal mine located just south of Belfast in the Mpumalanga Province:

- This report forms part of the environmental authorisations associated with the proposed expansion of the mine;
- The purpose of this report is to investigate the traffic impact that the proposed project will have on the surrounding road network and, if necessary, propose possible measures to mitigate such impact;
- The study area (receiving environment) was defined based on the extent and type of the project activities, and the characteristics of the traffic expected to be generated as a result. Based on this, the boundaries of the study area are limited to the location of the following key intersections:
    - Road D1110/N4
    - N4/Road P15-1
    - Road P15-1/Road D383
- From a traffic engineering and transportation planning perspective, no vulnerabilities or sensitivities currently exists in the defined study area;
- To determine the existing traffic demand on the nearby road network, traffic surveys were conducted on Tuesday 16 February 2021 at the key study intersections;
- By using the data collected, traffic operating conditions were determined by means of traffic engineer software, name SIDRA INERSECTION 8. Operating conditions were determined and compared for the following three scenarios:
    - Baseline;
    - Project construction phase; and
    - Project operational phase
- By comparing the operating conditions for the different scenarios, it was concluded that the proposed project will have an insignificant traffic impact on the surrounding road network, and
- The project's construction and operational phases, respectively, have a significance rating of 20 and 28. Based on this the project can be authorised from a traffic engineering viewpoint provided that current management of traffic be maintained.

9. REFERENCES

- Committee of Transport Officials. TMH 16 Volume 2, ***South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual. Version 1.0***, August 2012.
- Committee of Transport Officials. TMH 17 Volume 1, ***South African Trip Data Manual. Version 1.0***, September 2012.
- Committee of Transport Officials. TRH 26, ***South African Road Classification and Access Management Manual. Version 1.0***, August 2012.

APPENDIX A – DIAGRAM 1

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Exxaro Belfast Expansion Project

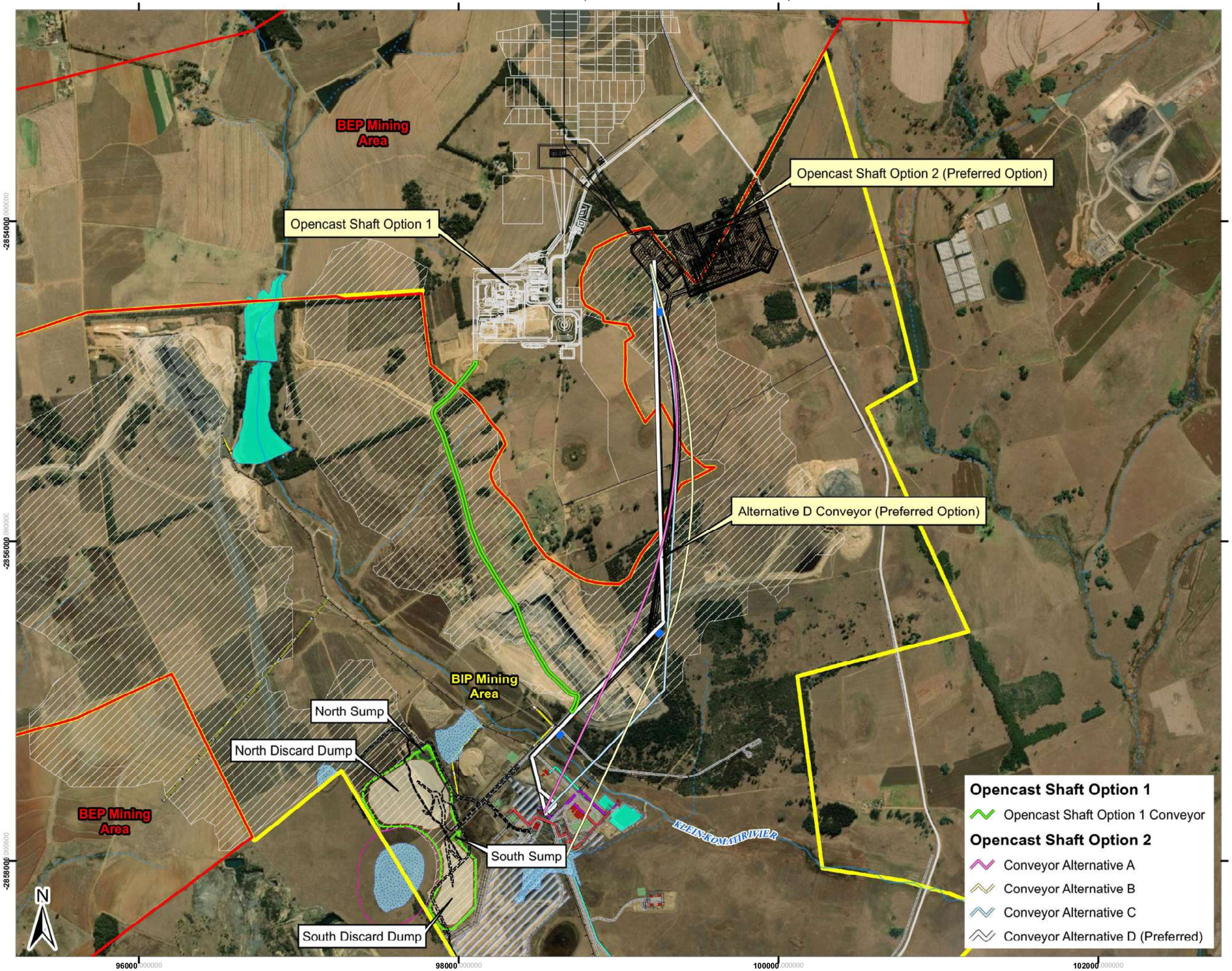
DIAGRAM NAME:
Site Access and Haul Route

PROJECT NO.
P-257

DIAGRAM NO.
1

APPENDIX B – SITE LAYOUT

THE EXXARO BELFAST COAL MINE EXPANSION PROJECT LOCATED WITHIN THE JURISDICTION OF EMAKHAZENI LOCAL MUNICIPALITY (WARDS 1 AND 8) IN THE MPUMALANGA PROVINCE



LEGEND

Rivers and Streams
- Non-Perennial
- Perennial
- Opencast Shaft Option 1
- Opencast Shaft Option 2
- Alternative D PCD's
- BEP Mining Area
- BIP Mining Area

Mine Residue Disposal Facility Infrastructure
- Haul Road
- Toe Road
- Discard Dump
- Sump
- Existing Pan
- 100 m Pan Offset
- LOM

BIP Infrastructure
- Decant Mine Water Line
- Fence
- Overhead Powerline
- Potable Water Line
- Raw Water Line
- Roads Centre Line
- Sewer Line
- Buildings_Area
- Laydown Area
- Plant Area
- Storage Dams and Lakes

Data Sources:
Esri Basemap 2020
Opencast Shaft Data supplied by BVI Consulting Engineers Gauteng (PTY) Ltd
Data supplied by Nsovo Environmental Consulting

0 0.5 1 Kilometer

SCALE: 1:23 000

FIGURE NO.: -	MAP NUMBER: 20-1121-04-V2
DRAWN BY: N NAIDOO GIS TECHNICIAN	REVIEWED BY: NSOVO ENVIRONMENTAL CONSULTING
DATUM: WGS84 PROJECTION: TM29	DATE: 21 MAY 2021
PROJECT: BELFAST COAL MINE FEASIBILITY STUDY	
CLIENT: EXXARO COAL MPUMALANGA (PTY) LTD	

GCS
63 Wessel Road Woodmead
PO Box 2597 Rivonia 2128
South Africa
Tel: +27 (0) 11 803 5726
Fax: +27 (0) 11 803 5745
E-mail: jbb@gcs-sa.biz
www.gcs-sa.biz

NSOVO ENVIRONMENTAL CONSULTING
Tel: 071 602 2369
Fax: 086 602 8821
E-mail: munyadzi@nsovo.co.za
Postnet Suit #697, P/Bag X29,
Gallo Manor, 2052

Opencast Shaft Option 1
- Opencast Shaft Option 1 Conveyor

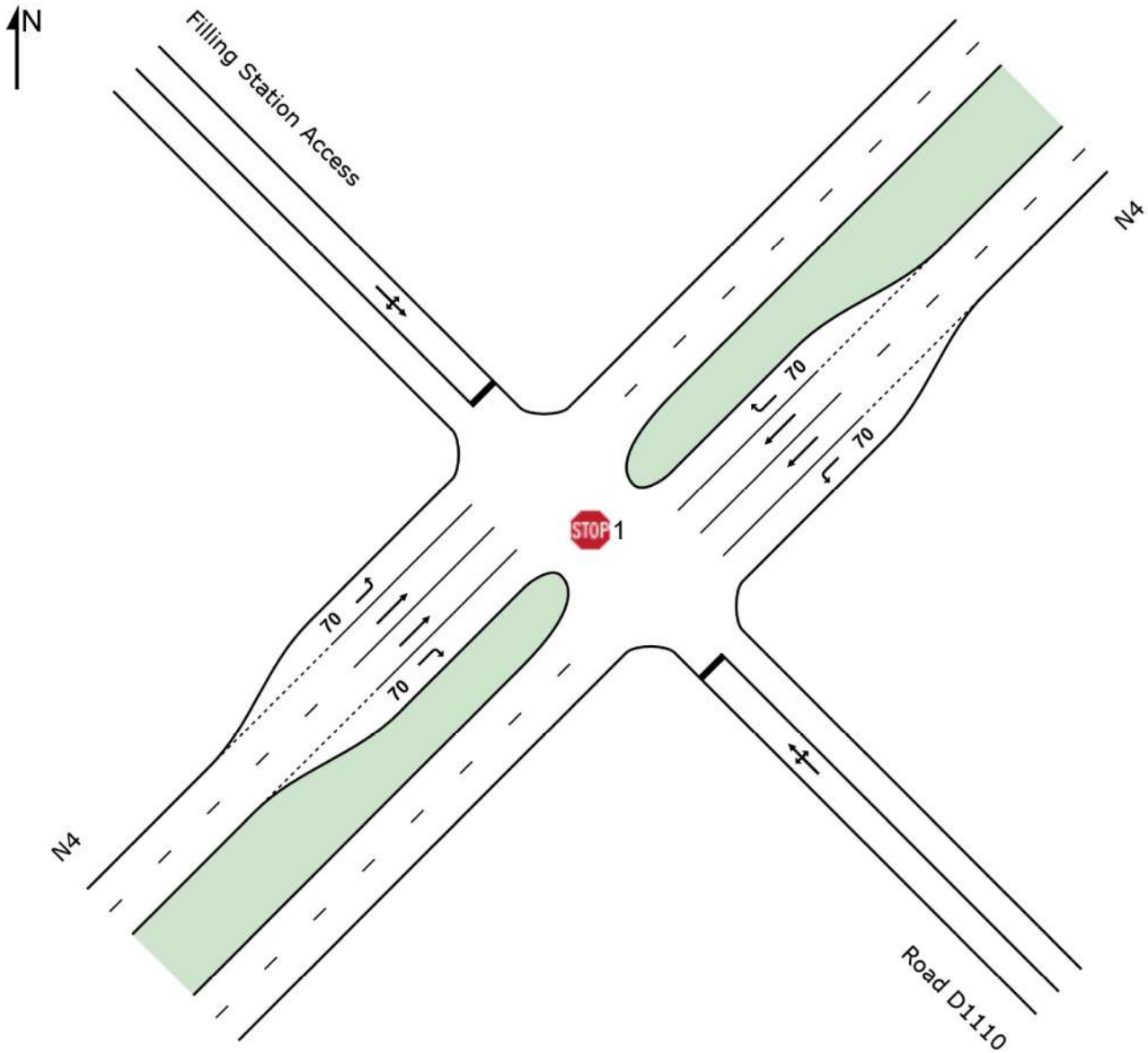
Opencast Shaft Option 2
- Conveyor Alternative A
- Conveyor Alternative B
- Conveyor Alternative C
- Conveyor Alternative D (Preferred)

APPENDIX C – SIDRA OUTPUTS

SITE LAYOUT

Site: 1 [2021 AM]

N4 / Road D1110
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2021 AM]

N4 / Road D1110
Site Category: -
Stop (Two-Way)

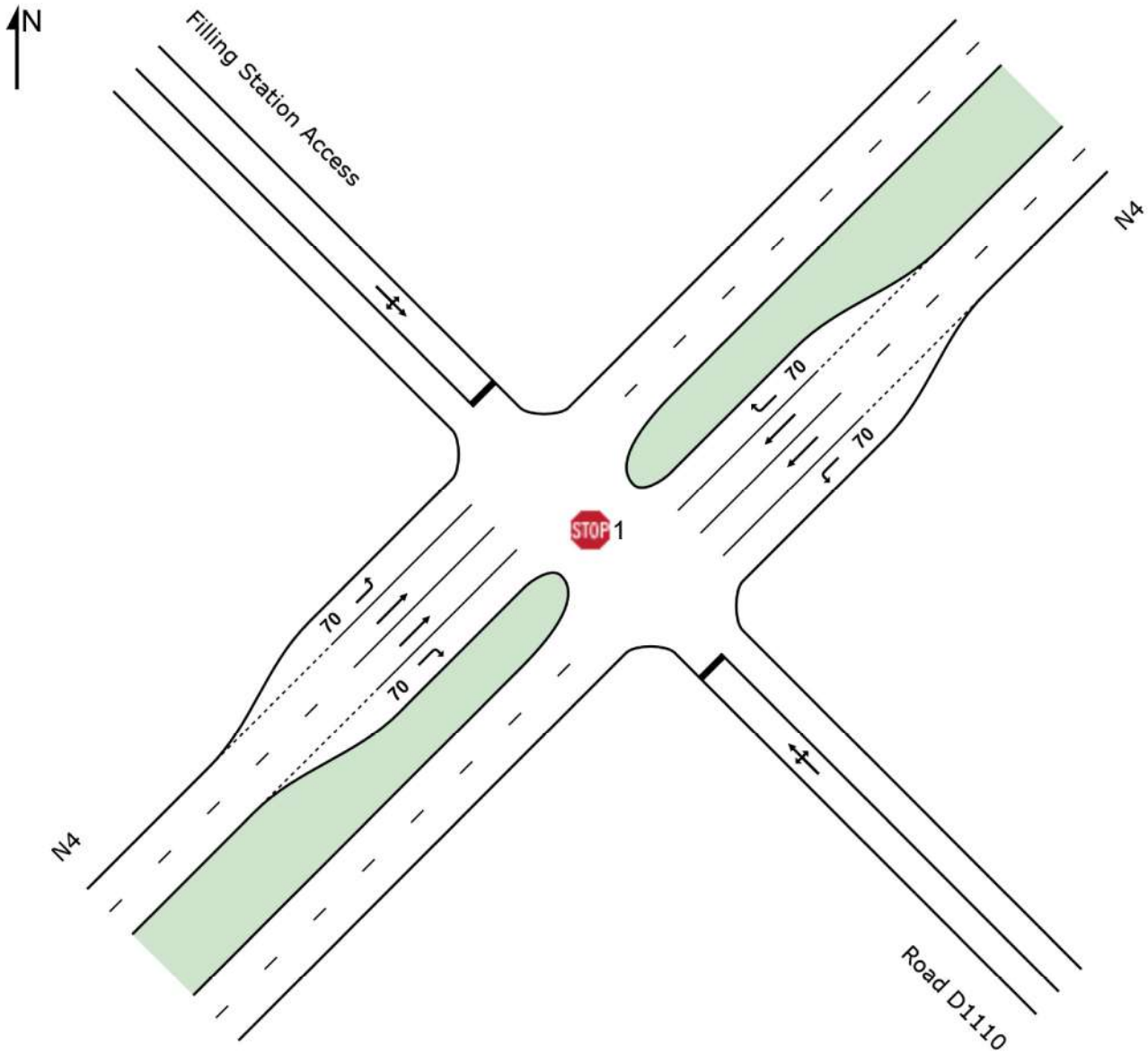
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road D1110												
1	L2	19	30.0	0.061	9.8	LOS A	0.2	1.4	0.30	0.94	0.30	48.1
2	T1	2	30.0	0.061	22.4	LOS C	0.2	1.4	0.30	0.94	0.30	48.5
3	R2	6	30.0	0.061	22.2	LOS C	0.2	1.4	0.30	0.94	0.30	48.6
Approach		27	30.0	0.061	13.7	LOS B	0.2	1.4	0.30	0.94	0.30	48.3
NorthEast: N4												
4	L2	26	30.0	0.017	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	273	10.0	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	9	30.0	0.018	9.3	LOS A	0.1	0.5	0.46	0.66	0.46	49.8
Approach		308	12.3	0.073	0.8	NA	0.1	0.5	0.01	0.07	0.01	58.9
NorthWest: Filling Station Access												
7	L2	5	30.0	0.046	10.1	LOS B	0.1	1.1	0.49	0.95	0.49	46.0
8	T1	3	30.0	0.046	22.5	LOS C	0.1	1.1	0.49	0.95	0.49	46.4
9	R2	5	30.0	0.046	21.9	LOS C	0.1	1.1	0.49	0.95	0.49	46.5
Approach		14	30.0	0.046	17.5	LOS C	0.1	1.1	0.49	0.95	0.49	46.3
SouthWest: N4												
10	L2	1	30.0	0.001	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	376	10.0	0.101	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	45	30.0	0.076	8.7	LOS A	0.3	2.3	0.42	0.67	0.42	50.3
Approach		422	12.2	0.101	1.0	NA	0.3	2.3	0.05	0.07	0.05	58.7
All Vehicles		772	13.2	0.101	1.6	NA	0.3	2.3	0.05	0.12	0.05	58.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 PM]

N4 / Road D1110
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2021 PM]

N4 / Road D1110
Site Category: -
Stop (Two-Way)

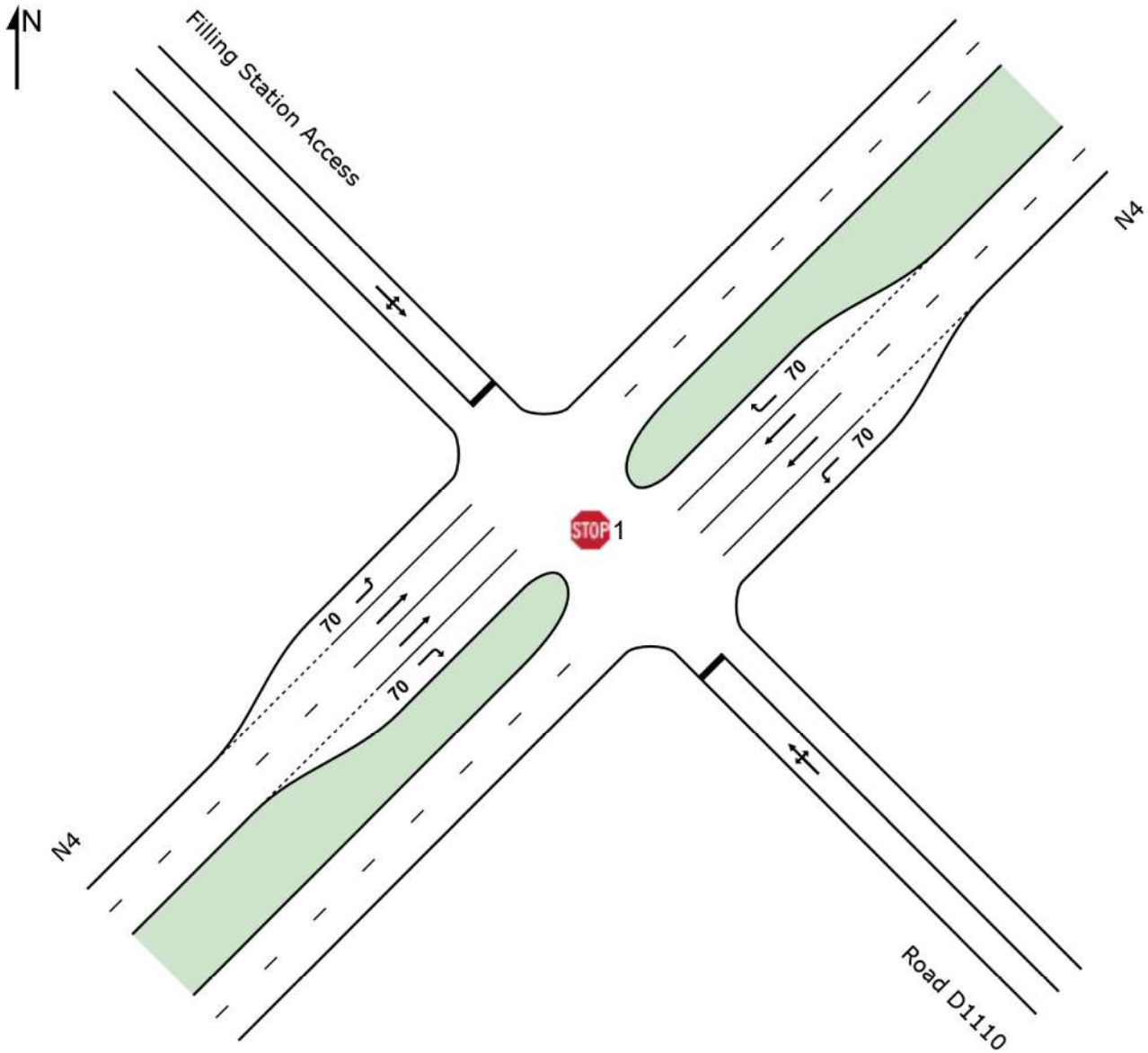
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road D1110												
1	L2	38	30.0	0.162	10.1	LOS B	0.4	3.8	0.42	0.94	0.42	46.8
2	T1	1	30.0	0.162	27.4	LOS D	0.4	3.8	0.42	0.94	0.42	47.1
3	R2	19	30.0	0.162	27.2	LOS D	0.4	3.8	0.42	0.94	0.42	47.3
Approach		58	30.0	0.162	16.0	LOS C	0.4	3.8	0.42	0.94	0.42	47.0
NorthEast: N4												
4	L2	5	30.0	0.003	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	382	10.0	0.102	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	11	30.0	0.020	9.5	LOS A	0.1	0.6	0.47	0.67	0.47	49.7
Approach		398	10.8	0.102	0.3	NA	0.1	0.6	0.01	0.03	0.01	59.5
NorthWest: Filling Station Access												
7	L2	4	30.0	0.077	10.1	LOS B	0.2	1.7	0.62	0.96	0.62	43.5
8	T1	2	30.0	0.077	26.2	LOS D	0.2	1.7	0.62	0.96	0.62	43.8
9	R2	9	30.0	0.077	27.2	LOS D	0.2	1.7	0.62	0.96	0.62	43.9
Approach		16	30.0	0.077	22.5	LOS C	0.2	1.7	0.62	0.96	0.62	43.8
SouthWest: N4												
10	L2	1	30.0	0.001	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	389	10.0	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	52	30.0	0.100	9.8	LOS A	0.3	3.0	0.49	0.73	0.49	49.5
Approach		442	12.4	0.105	1.2	NA	0.3	3.0	0.06	0.09	0.06	58.5
All Vehicles		914	13.1	0.162	2.1	NA	0.4	3.8	0.07	0.13	0.07	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2024 AM + Construction]

N4 / Road D1110
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2024 AM + Construction]

N4 / Road D1110
Site Category: -
Stop (Two-Way)

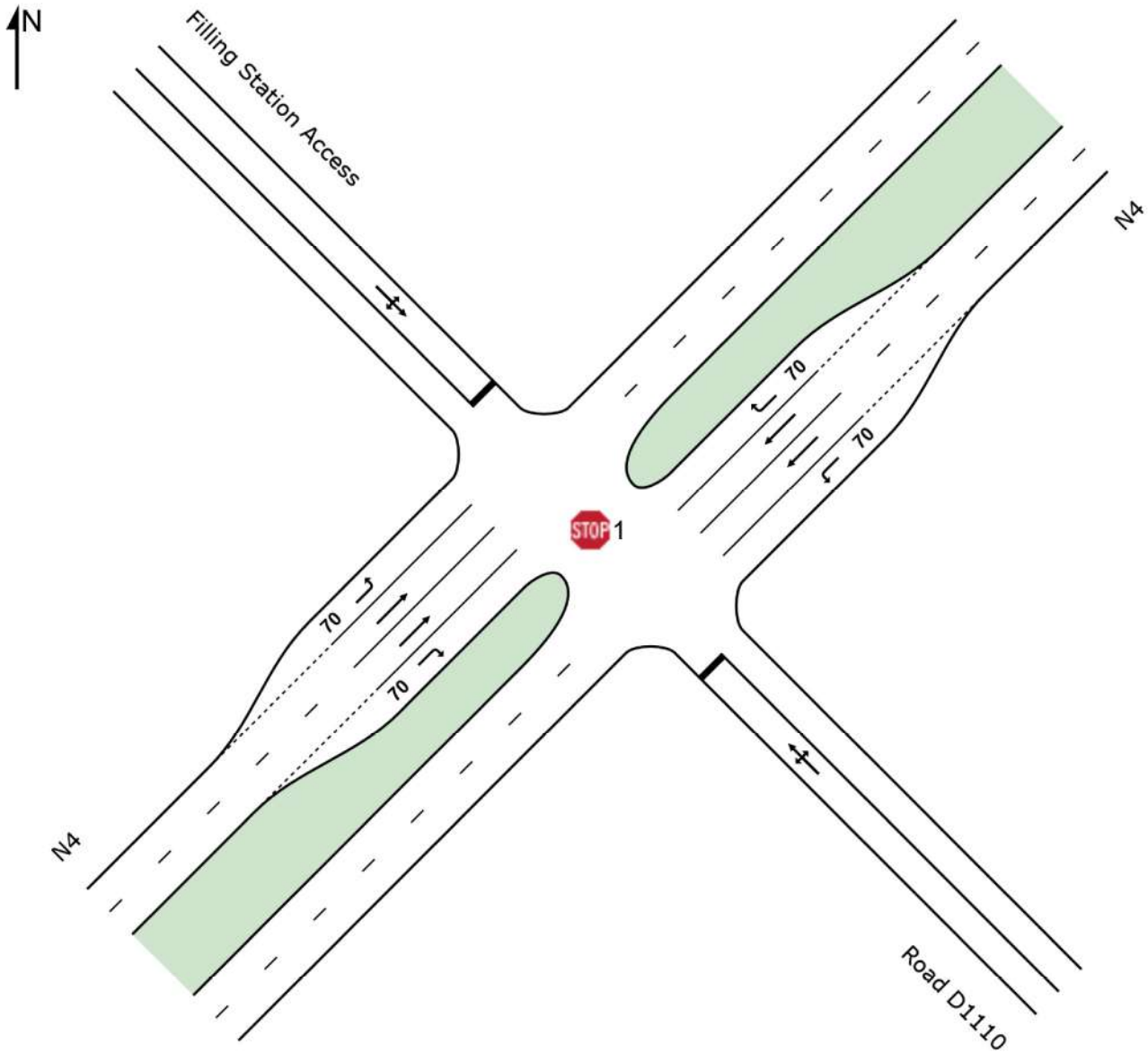
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road D1110												
1	L2	22	30.0	0.086	9.9	LOS A	0.2	2.0	0.34	0.94	0.34	47.4
2	T1	2	30.0	0.086	24.6	LOS C	0.2	2.0	0.34	0.94	0.34	47.7
3	R2	9	30.0	0.086	24.5	LOS C	0.2	2.0	0.34	0.94	0.34	47.9
Approach		34	30.0	0.086	14.9	LOS B	0.2	2.0	0.34	0.94	0.34	47.5
NorthEast: N4												
4	L2	44	30.0	0.028	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	289	10.0	0.077	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	11	30.0	0.021	9.7	LOS A	0.1	0.6	0.47	0.67	0.47	49.6
Approach		344	13.2	0.077	1.1	NA	0.1	0.6	0.01	0.09	0.01	58.5
NorthWest: Filling Station Access												
7	L2	5	30.0	0.051	10.1	LOS B	0.1	1.2	0.53	0.94	0.53	45.4
8	T1	3	30.0	0.051	24.9	LOS C	0.1	1.2	0.53	0.94	0.53	45.7
9	R2	5	30.0	0.051	23.7	LOS C	0.1	1.2	0.53	0.94	0.53	45.8
Approach		14	30.0	0.051	18.7	LOS C	0.1	1.2	0.53	0.94	0.53	45.6
SouthWest: N4												
10	L2	1	30.0	0.001	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	399	10.0	0.108	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	54	30.0	0.096	9.1	LOS A	0.3	2.9	0.45	0.70	0.45	49.9
Approach		454	12.4	0.108	1.1	NA	0.3	2.9	0.05	0.08	0.05	58.6
All Vehicles		845	13.7	0.108	1.9	NA	0.3	2.9	0.06	0.14	0.06	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2024 PM + Construction]

N4 / Road D1110
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2024 PM + Construction]

N4 / Road D1110
Site Category: -
Stop (Two-Way)

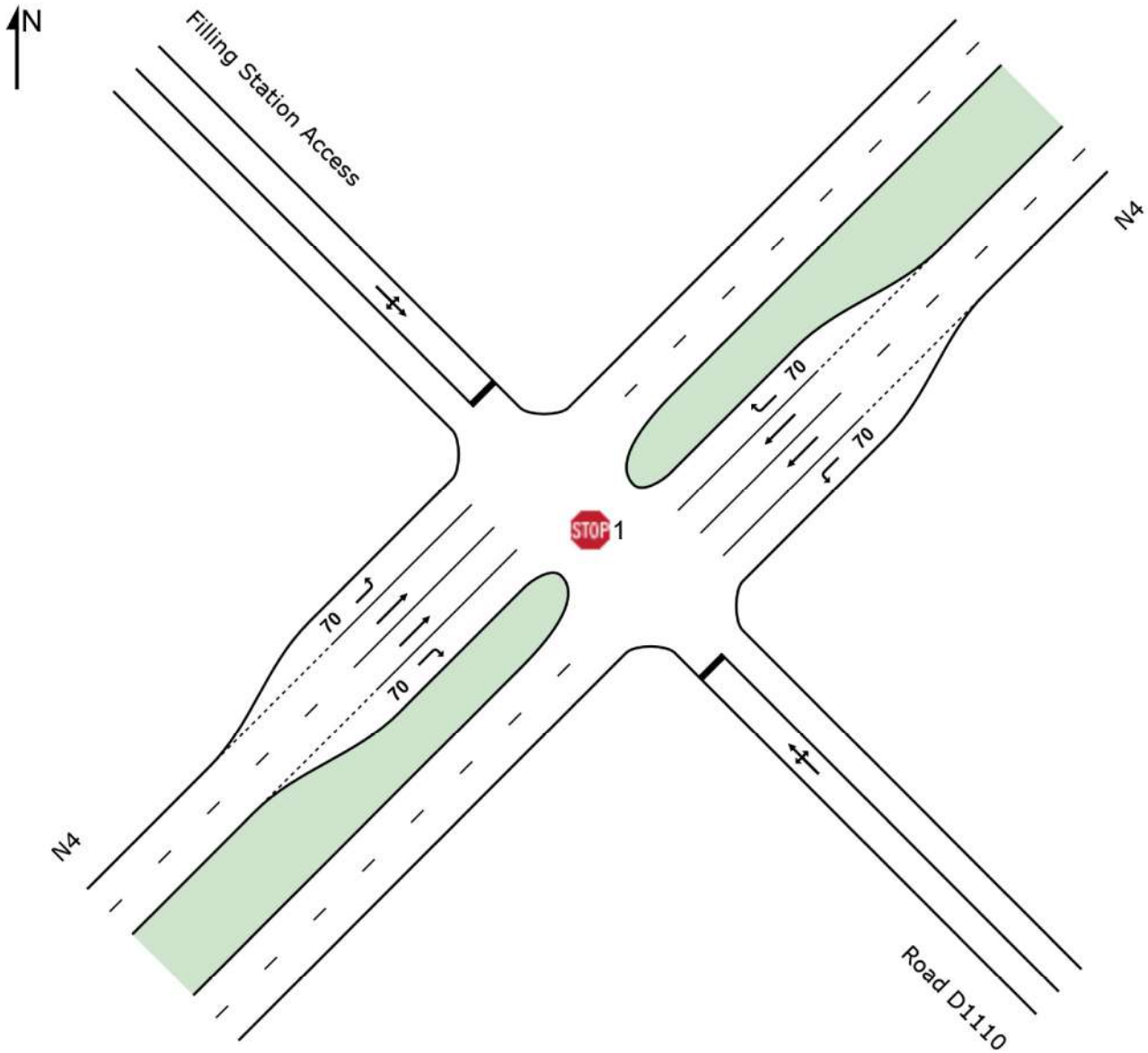
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road D1110												
1	L2	45	30.0	0.298	11.3	LOS B	0.9	8.1	0.52	0.99	0.63	44.4
2	T1	1	30.0	0.298	32.0	LOS D	0.9	8.1	0.52	0.99	0.63	44.7
3	R2	36	30.0	0.298	31.8	LOS D	0.9	8.1	0.52	0.99	0.63	44.9
Approach		82	30.0	0.298	20.5	LOS C	0.9	8.1	0.52	0.99	0.63	44.6
NorthEast: N4												
4	L2	8	30.0	0.005	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	405	10.0	0.108	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	12	30.0	0.023	9.9	LOS A	0.1	0.7	0.48	0.68	0.48	49.5
Approach		425	10.9	0.108	0.4	NA	0.1	0.7	0.01	0.03	0.01	59.5
NorthWest: Filling Station Access												
7	L2	4	30.0	0.094	10.2	LOS B	0.2	2.1	0.67	0.96	0.67	42.3
8	T1	2	30.0	0.094	28.6	LOS D	0.2	2.1	0.67	0.96	0.67	42.6
9	R2	11	30.0	0.094	30.1	LOS D	0.2	2.1	0.67	0.96	0.67	42.8
Approach		17	30.0	0.094	25.0	LOS C	0.2	2.1	0.67	0.96	0.67	42.6
SouthWest: N4												
10	L2	1	30.0	0.001	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	414	10.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	57	30.0	0.115	10.2	LOS B	0.4	3.4	0.50	0.76	0.50	49.2
Approach		472	12.5	0.115	1.3	NA	0.4	3.4	0.06	0.09	0.06	58.4
All Vehicles		996	13.6	0.298	2.9	NA	0.9	8.1	0.09	0.15	0.10	57.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2026 AM + Operations]

N4 / Road D1110
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2026 AM + Operations]

N4 / Road D1110
Site Category: -
Stop (Two-Way)

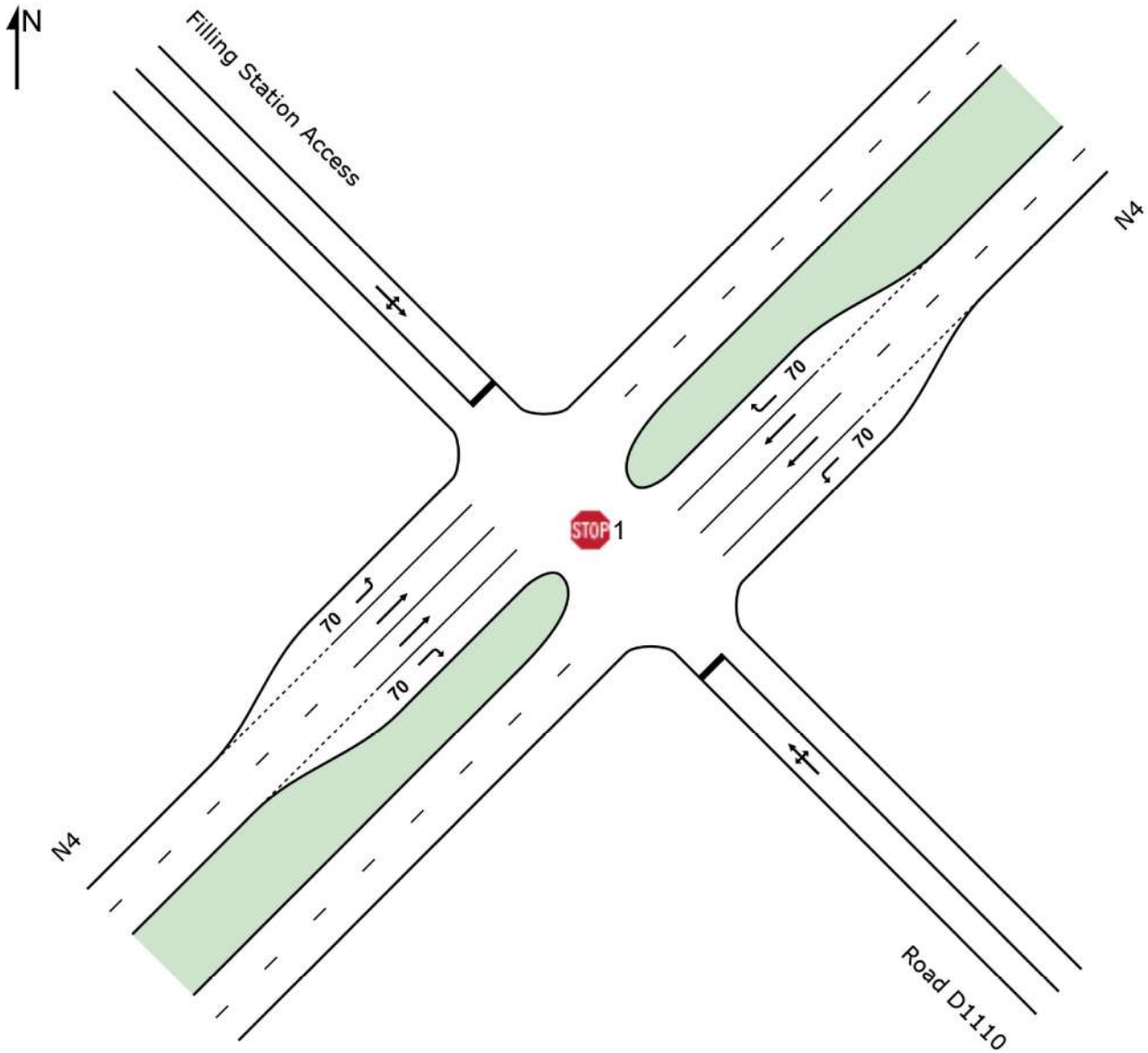
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road D1110												
1	L2	25	30.0	0.095	9.9	LOS A	0.2	2.2	0.35	0.93	0.35	47.3
2	T1	2	30.0	0.095	26.2	LOS D	0.2	2.2	0.35	0.93	0.35	47.7
3	R2	9	30.0	0.095	26.2	LOS D	0.2	2.2	0.35	0.93	0.35	47.8
Approach		37	30.0	0.095	15.0	LOS C	0.2	2.2	0.35	0.93	0.35	47.5
NorthEast: N4												
4	L2	35	30.0	0.022	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	301	10.0	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	11	30.0	0.021	9.9	LOS A	0.1	0.6	0.48	0.68	0.48	49.5
Approach		346	12.6	0.081	0.9	NA	0.1	0.6	0.01	0.08	0.01	58.7
NorthWest: Filling Station Access												
7	L2	6	30.0	0.063	10.2	LOS B	0.2	1.4	0.54	0.94	0.54	45.0
8	T1	3	30.0	0.063	26.3	LOS D	0.2	1.4	0.54	0.94	0.54	45.3
9	R2	6	30.0	0.063	25.6	LOS D	0.2	1.4	0.54	0.94	0.54	45.4
Approach		16	30.0	0.063	19.6	LOS C	0.2	1.4	0.54	0.94	0.54	45.2
SouthWest: N4												
10	L2	1	30.0	0.001	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	415	10.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	71	30.0	0.126	9.2	LOS A	0.4	3.8	0.46	0.72	0.46	49.9
Approach		486	12.9	0.126	1.4	NA	0.4	3.8	0.07	0.11	0.07	58.2
All Vehicles		885	13.8	0.126	2.1	NA	0.4	3.8	0.07	0.14	0.07	57.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2026 PM + Operations]

N4 / Road D1110
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2026 PM + Operations]

N4 / Road D1110
Site Category: -
Stop (Two-Way)

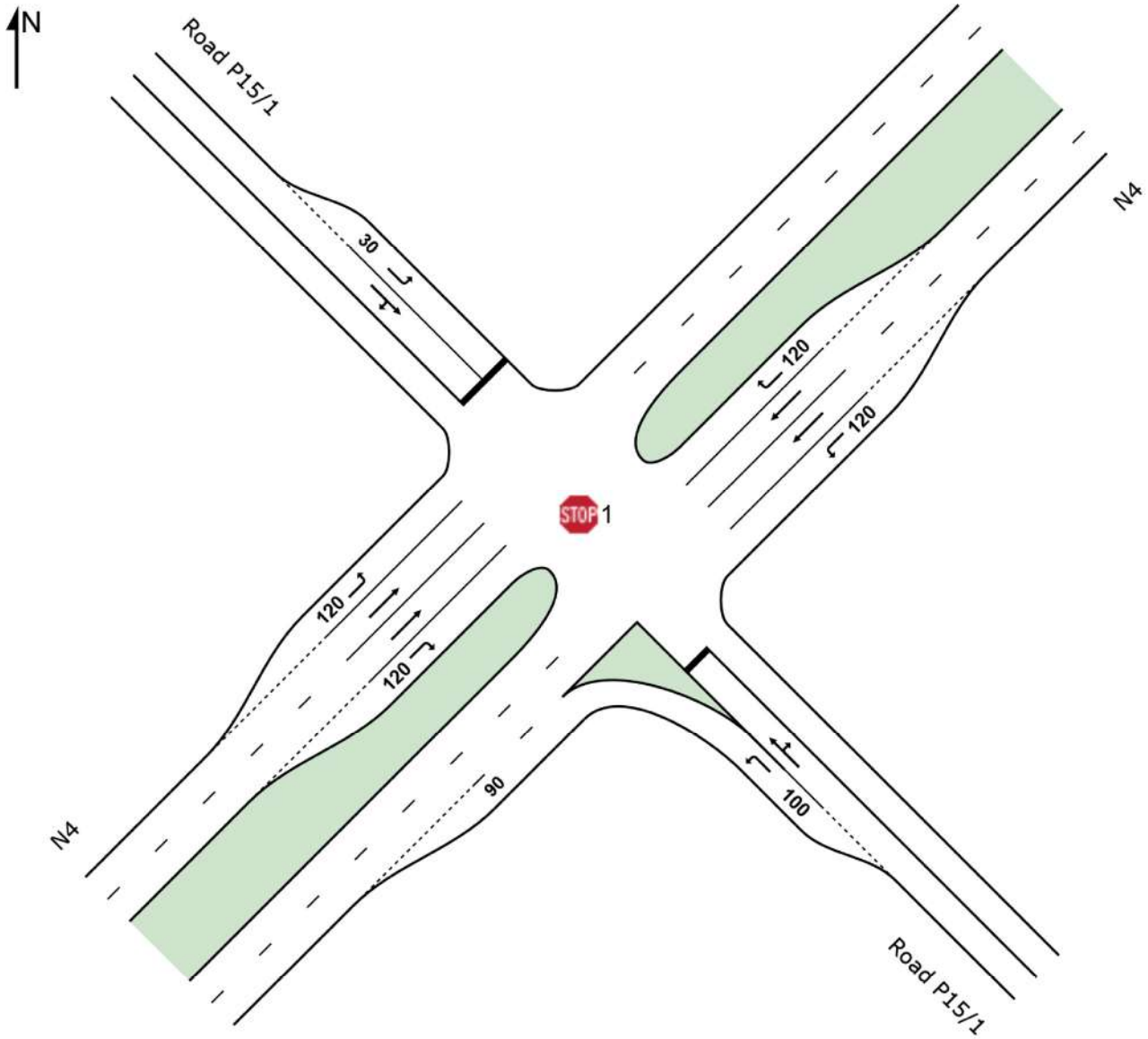
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road D1110												
1	L2	63	30.0	0.270	10.8	LOS B	0.8	7.1	0.46	0.97	0.52	45.9
2	T1	1	30.0	0.270	33.4	LOS D	0.8	7.1	0.46	0.97	0.52	46.3
3	R2	26	30.0	0.270	33.3	LOS D	0.8	7.1	0.46	0.97	0.52	46.4
Approach		91	30.0	0.270	17.6	LOS C	0.8	7.1	0.46	0.97	0.52	46.1
NorthEast: N4												
4	L2	8	30.0	0.005	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	422	10.0	0.113	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	12	30.0	0.024	10.1	LOS B	0.1	0.7	0.49	0.69	0.49	49.3
Approach		442	10.9	0.113	0.4	NA	0.1	0.7	0.01	0.03	0.01	59.5
NorthWest: Filling Station Access												
7	L2	4	30.0	0.105	10.2	LOS B	0.3	2.3	0.70	0.96	0.70	41.4
8	T1	2	30.0	0.105	30.4	LOS D	0.3	2.3	0.70	0.96	0.70	41.6
9	R2	11	30.0	0.105	33.1	LOS D	0.3	2.3	0.70	0.96	0.70	41.8
Approach		17	30.0	0.105	27.1	LOS D	0.3	2.3	0.70	0.96	0.70	41.6
SouthWest: N4												
10	L2	1	30.0	0.001	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	431	10.0	0.116	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	61	30.0	0.126	10.5	LOS B	0.4	3.8	0.52	0.77	0.52	49.0
Approach		493	12.5	0.126	1.3	NA	0.4	3.8	0.06	0.10	0.06	58.3
All Vehicles		1042	13.6	0.270	2.8	NA	0.8	7.1	0.09	0.16	0.09	57.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 AM]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2021 AM]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road P15/1												
1	L2	42	30.0	0.027	5.9	LOS A	0.0	0.0	0.00	0.51	0.00	53.9
2	T1	5	30.0	0.165	20.1	LOS C	0.4	3.3	0.65	1.02	0.66	45.7
3	R2	36	30.0	0.165	19.2	LOS C	0.4	3.3	0.65	1.02	0.66	45.7
Approach		83	30.0	0.165	12.5	LOS B	0.4	3.3	0.32	0.76	0.33	49.6
NorthEast: N4												
4	L2	51	30.0	0.032	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	249	10.0	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	8	30.0	0.017	9.6	LOS A	0.1	0.5	0.47	0.66	0.47	49.9
Approach		308	13.8	0.067	1.2	NA	0.1	0.5	0.01	0.11	0.01	58.3
NorthWest: Road P15/1												
7	L2	9	30.0	0.011	10.1	LOS B	0.0	0.2	0.24	0.93	0.24	50.4
8	T1	3	30.0	0.017	19.4	LOS C	0.0	0.3	0.63	1.01	0.63	45.7
9	R2	1	30.0	0.017	18.5	LOS C	0.0	0.3	0.63	1.01	0.63	45.7
Approach		14	30.0	0.017	12.9	LOS B	0.0	0.3	0.36	0.95	0.36	48.8
SouthWest: N4												
10	L2	13	30.0	0.008	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	385	10.0	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	97	30.0	0.164	9.0	LOS A	0.6	5.2	0.45	0.69	0.45	50.6
Approach		495	14.4	0.164	1.9	NA	0.6	5.2	0.09	0.15	0.09	57.7
All Vehicles		900	15.9	0.165	2.8	NA	0.6	5.2	0.09	0.21	0.09	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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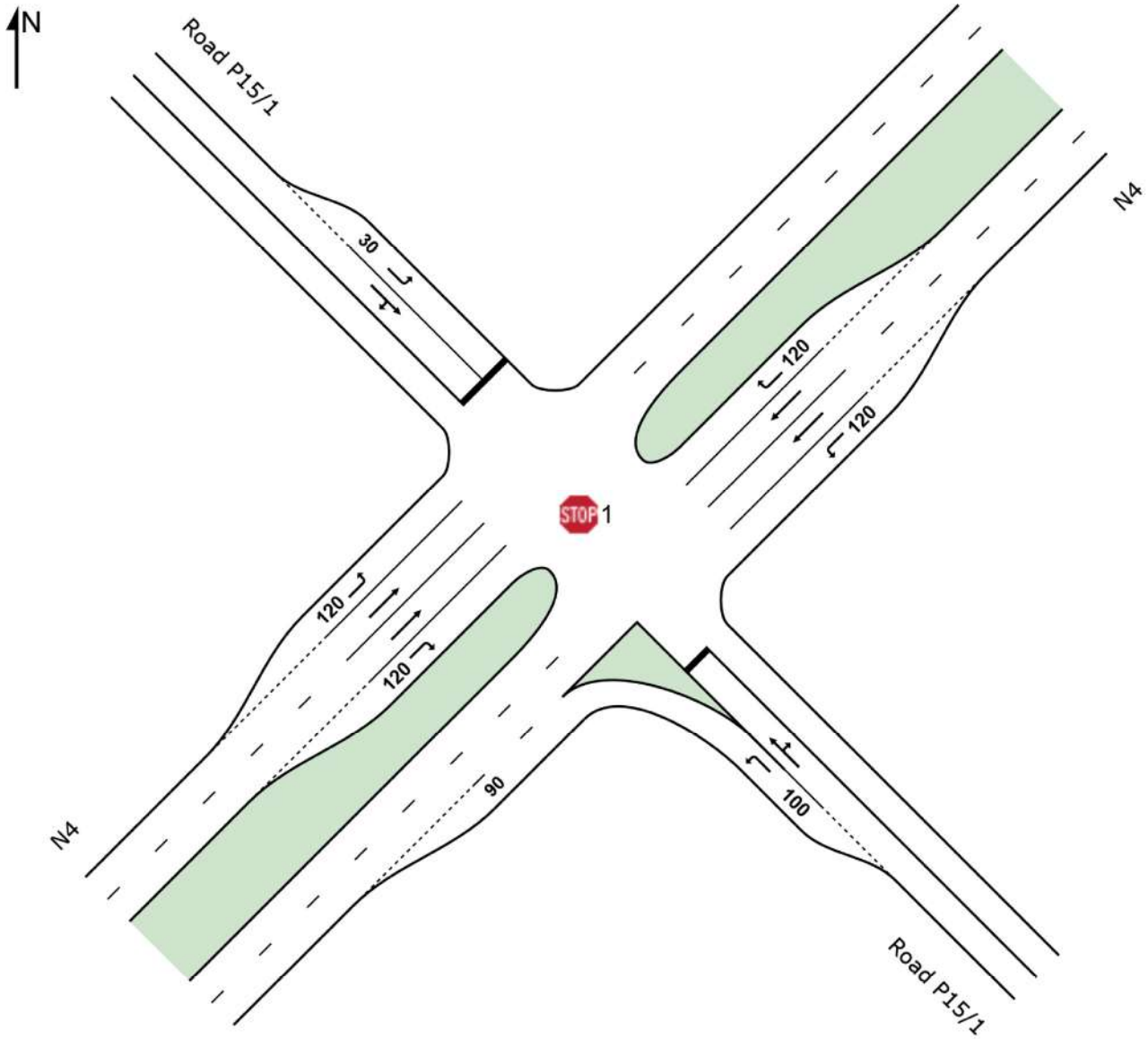
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 PM]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2021 PM]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road P15/1												
1	L2	108	30.0	0.069	5.9	LOS A	0.0	0.0	0.00	0.51	0.00	53.9
2	T1	9	30.0	0.296	24.4	LOS C	0.8	6.8	0.75	1.04	0.89	43.4
3	R2	52	30.0	0.296	23.8	LOS C	0.8	6.8	0.75	1.04	0.89	43.4
Approach		169	30.0	0.296	12.4	LOS B	0.8	6.8	0.27	0.70	0.32	49.6
NorthEast: N4												
4	L2	29	30.0	0.019	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	428	10.0	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	13	30.0	0.024	9.4	LOS A	0.1	0.7	0.46	0.66	0.46	50.0
Approach		471	11.8	0.115	0.6	NA	0.1	0.7	0.01	0.05	0.01	59.1
NorthWest: Road P15/1												
7	L2	11	30.0	0.012	10.0	LOS B	0.0	0.3	0.23	0.93	0.23	50.4
8	T1	5	30.0	0.085	22.3	LOS C	0.2	1.7	0.73	1.01	0.73	43.6
9	R2	11	30.0	0.085	24.1	LOS C	0.2	1.7	0.73	1.01	0.73	43.6
Approach		26	30.0	0.085	18.1	LOS C	0.2	1.7	0.53	0.98	0.53	46.0
SouthWest: N4												
10	L2	6	30.0	0.004	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	368	10.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	74	30.0	0.160	11.1	LOS B	0.6	4.8	0.54	0.79	0.54	49.2
Approach		448	13.6	0.160	1.9	NA	0.6	4.8	0.09	0.14	0.09	57.8
All Vehicles		1115	15.7	0.296	3.3	NA	0.8	6.8	0.09	0.21	0.10	56.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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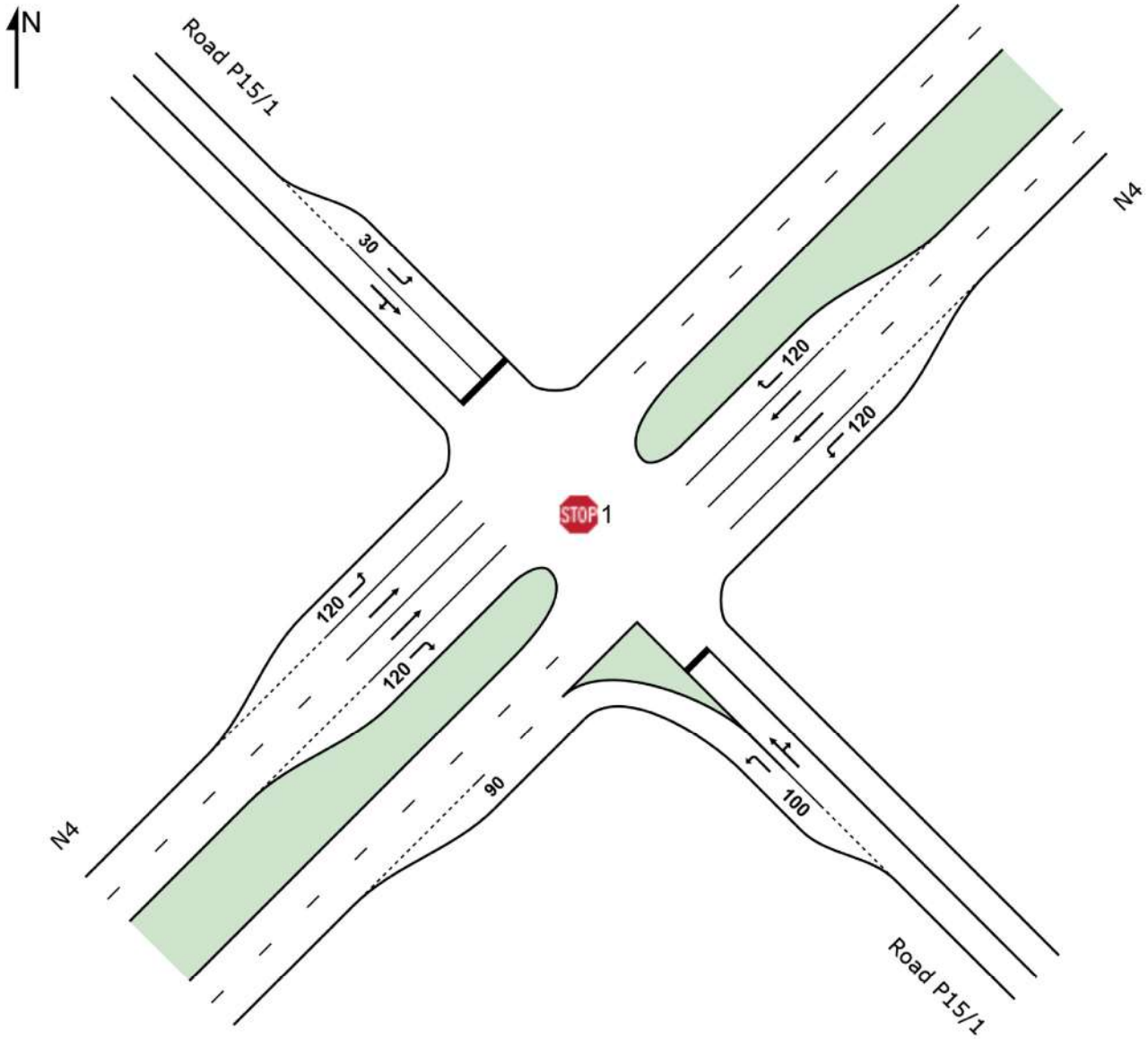
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2024 AM + Construction]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2024 AM + Construction]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road P15/1												
1	L2	44	30.0	0.028	5.9	LOS A	0.0	0.0	0.00	0.51	0.00	53.9
2	T1	5	30.0	0.189	21.6	LOS C	0.4	3.9	0.69	1.02	0.73	44.9
3	R2	38	30.0	0.189	20.7	LOS C	0.4	3.9	0.69	1.02	0.73	45.0
Approach		87	30.0	0.189	13.3	LOS B	0.4	3.9	0.34	0.76	0.36	49.1
NorthEast: N4												
4	L2	54	30.0	0.034	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	267	10.0	0.072	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	8	30.0	0.017	10.0	LOS B	0.1	0.5	0.49	0.67	0.49	49.6
Approach		329	13.8	0.072	1.2	NA	0.1	0.5	0.01	0.11	0.01	58.3
NorthWest: Road P15/1												
7	L2	11	30.0	0.012	10.1	LOS B	0.0	0.3	0.25	0.93	0.25	50.3
8	T1	3	30.0	0.018	20.6	LOS C	0.0	0.4	0.66	1.00	0.66	45.1
9	R2	1	30.0	0.018	19.6	LOS C	0.0	0.4	0.66	1.00	0.66	45.1
Approach		15	30.0	0.018	13.1	LOS B	0.0	0.4	0.37	0.95	0.37	48.7
SouthWest: N4												
10	L2	14	30.0	0.009	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	414	10.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	103	30.0	0.181	9.3	LOS A	0.7	5.7	0.47	0.71	0.47	50.4
Approach		531	14.4	0.181	2.0	NA	0.7	5.7	0.09	0.15	0.09	57.6
All Vehicles		962	15.8	0.189	2.9	NA	0.7	5.7	0.09	0.21	0.09	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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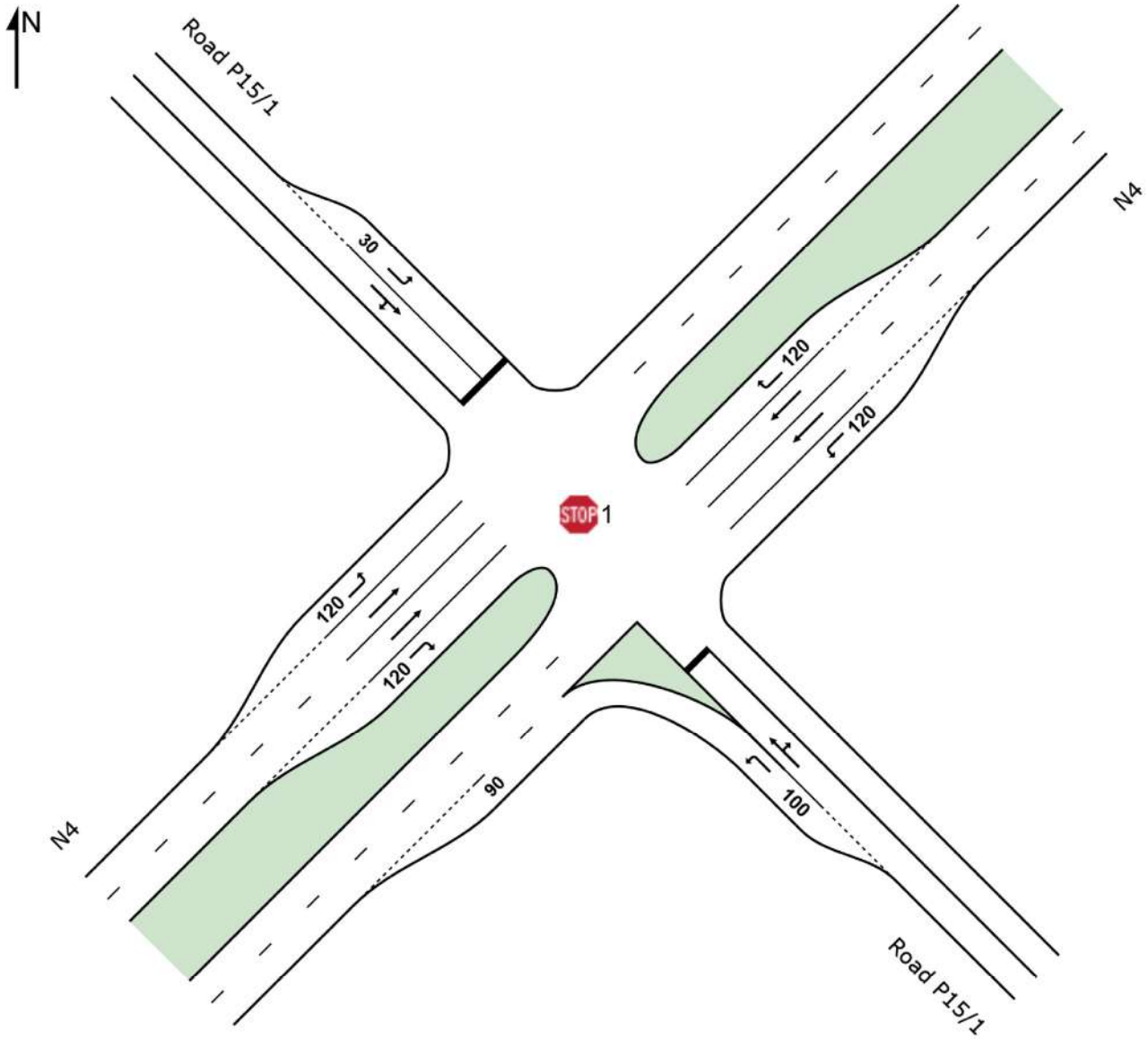
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2024 PM + Construction]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2024 PM + Construction]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)

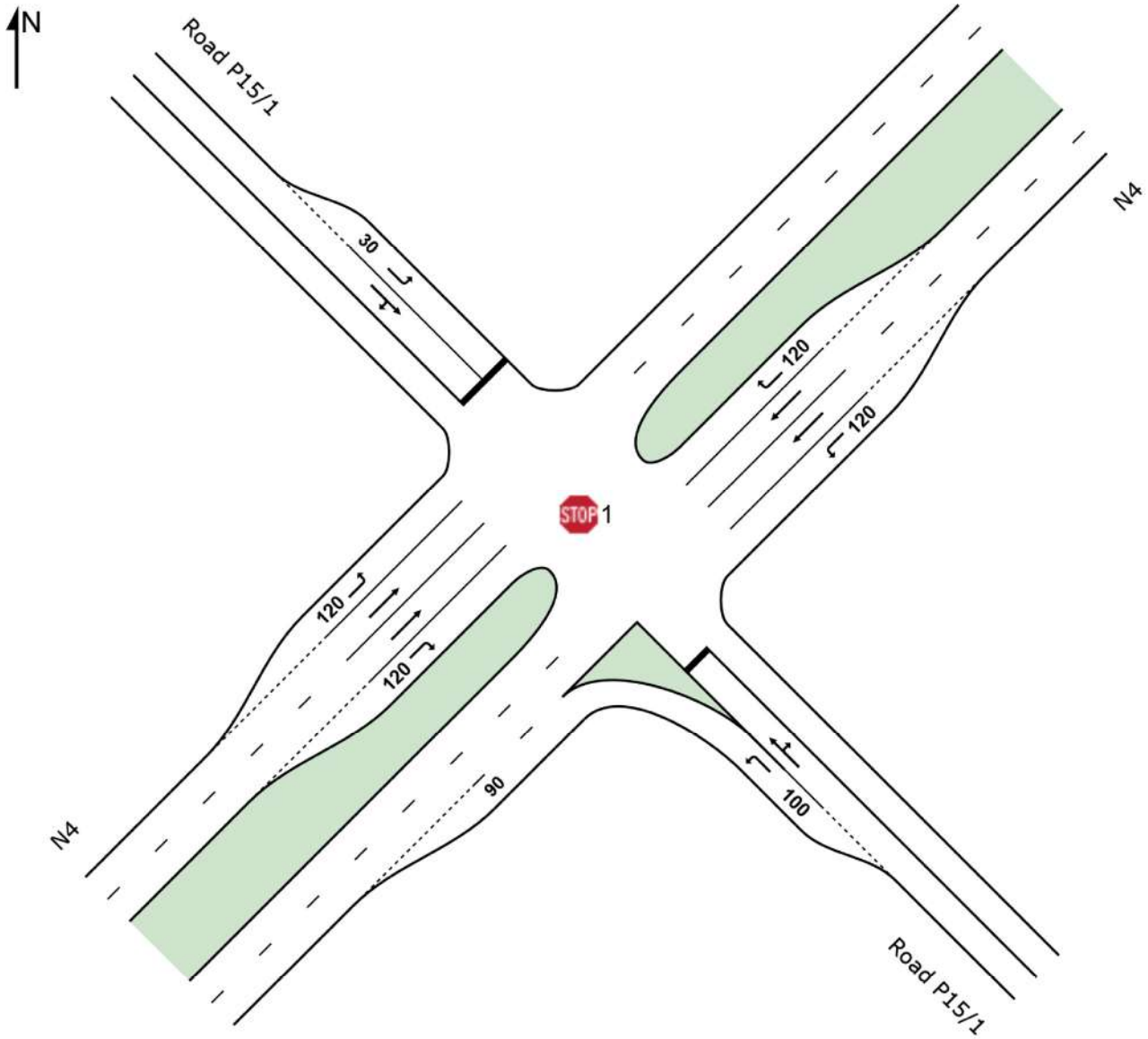
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road P15/1												
1	L2	115	30.0	0.073	5.9	LOS A	0.0	0.0	0.00	0.51	0.00	53.9
2	T1	11	30.0	0.350	26.9	LOS D	0.9	8.2	0.79	1.05	0.97	42.1
3	R2	55	30.0	0.350	26.4	LOS D	0.9	8.2	0.79	1.05	0.97	42.2
Approach		180	30.0	0.350	13.4	LOS B	0.9	8.2	0.29	0.71	0.35	49.0
NorthEast: N4												
4	L2	32	30.0	0.020	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	460	10.0	0.123	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	14	30.0	0.027	9.7	LOS A	0.1	0.8	0.47	0.67	0.47	49.8
Approach		505	11.8	0.123	0.6	NA	0.1	0.8	0.01	0.05	0.01	59.1
NorthWest: Road P15/1												
7	L2	12	30.0	0.013	10.1	LOS B	0.0	0.3	0.24	0.93	0.24	50.4
8	T1	5	30.0	0.102	24.0	LOS C	0.2	2.0	0.76	1.01	0.76	42.5
9	R2	12	30.0	0.102	26.4	LOS D	0.2	2.0	0.76	1.01	0.76	42.5
Approach		28	30.0	0.102	19.3	LOS C	0.2	2.0	0.55	0.97	0.55	45.4
SouthWest: N4												
10	L2	6	30.0	0.004	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	393	10.0	0.106	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	78	30.0	0.178	11.7	LOS B	0.6	5.4	0.56	0.80	0.56	48.8
Approach		477	13.5	0.178	2.0	NA	0.6	5.4	0.09	0.14	0.09	57.7
All Vehicles		1191	15.7	0.350	3.6	NA	0.9	8.2	0.10	0.21	0.11	56.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2026 AM + Operations]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2026 AM + Operations]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)

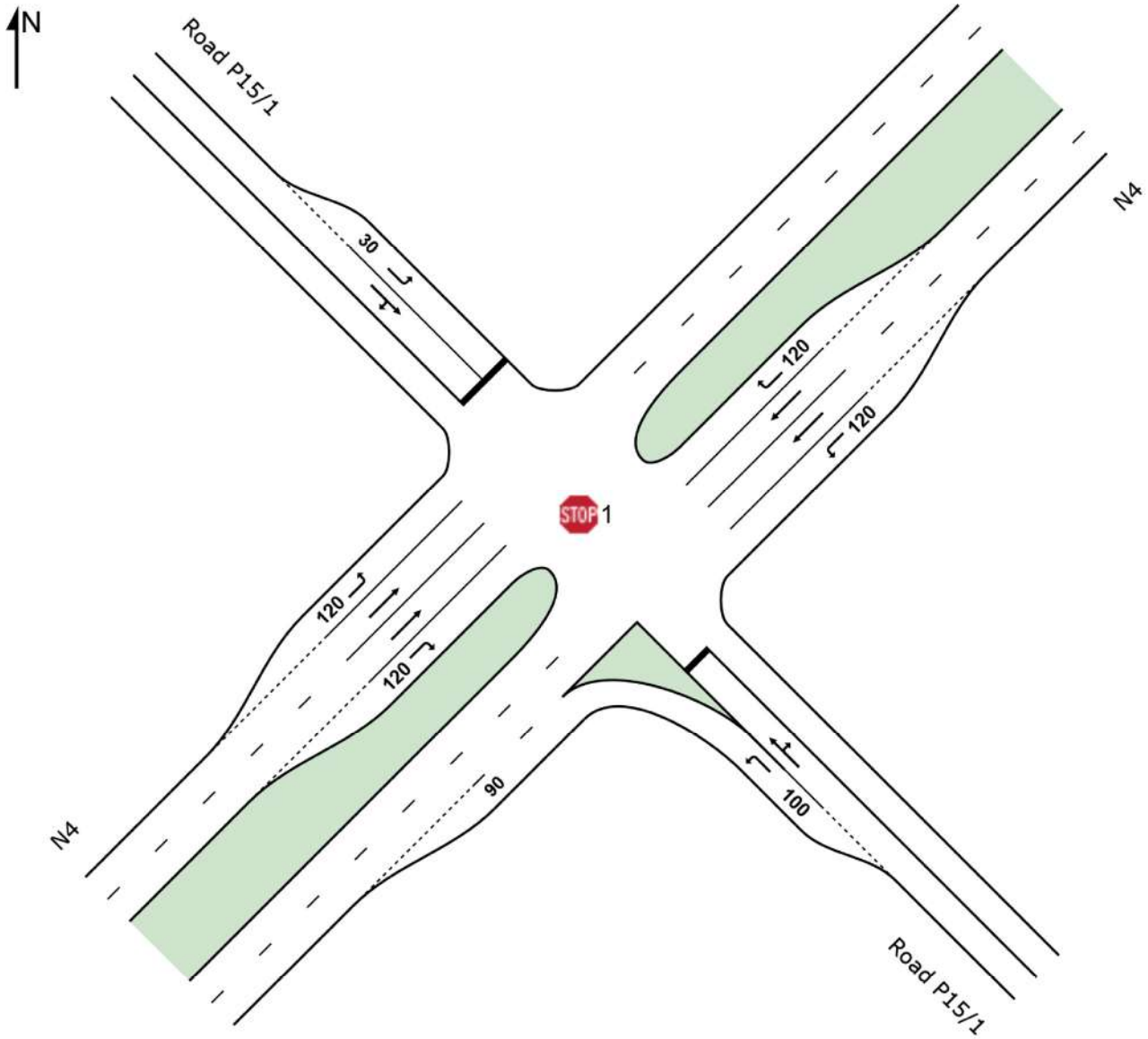
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road P15/1												
1	L2	46	30.0	0.030	5.9	LOS A	0.0	0.0	0.00	0.51	0.00	53.9
2	T1	6	30.0	0.309	23.8	LOS C	0.8	7.1	0.73	1.05	0.88	43.9
3	R2	61	30.0	0.309	22.9	LOS C	0.8	7.1	0.73	1.05	0.88	43.9
Approach		114	30.0	0.309	16.0	LOS C	0.8	7.1	0.43	0.83	0.52	47.5
NorthEast: N4												
4	L2	60	30.0	0.038	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	276	10.0	0.074	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	9	30.0	0.020	10.2	LOS B	0.1	0.6	0.49	0.68	0.49	49.5
Approach		345	14.0	0.074	1.3	NA	0.1	0.6	0.01	0.12	0.01	58.2
NorthWest: Road P15/1												
7	L2	11	30.0	0.012	10.2	LOS B	0.0	0.3	0.26	0.93	0.26	50.3
8	T1	3	30.0	0.019	21.4	LOS C	0.0	0.4	0.68	1.00	0.68	44.7
9	R2	1	30.0	0.019	20.3	LOS C	0.0	0.4	0.68	1.00	0.68	44.7
Approach		15	30.0	0.019	13.3	LOS B	0.0	0.4	0.38	0.95	0.38	48.6
SouthWest: N4												
10	L2	14	30.0	0.009	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	425	10.0	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	107	30.0	0.192	9.5	LOS A	0.7	6.1	0.48	0.73	0.48	50.2
Approach		546	14.4	0.192	2.0	NA	0.7	6.1	0.09	0.16	0.09	57.6
All Vehicles		1020	16.3	0.309	3.5	NA	0.8	7.1	0.11	0.23	0.12	56.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2026 PM + Operations]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2026 PM + Operations]

N4 / Road P15_1
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Road P15/1												
1	L2	120	30.0	0.077	5.9	LOS A	0.0	0.0	0.00	0.51	0.00	53.9
2	T1	11	30.0	0.269	27.1	LOS D	0.7	6.0	0.72	1.04	0.83	45.3
3	R2	61	30.0	0.269	19.1	LOS C	0.7	6.0	0.72	1.04	0.83	45.3
Approach		192	30.0	0.269	11.3	LOS B	0.7	6.0	0.27	0.71	0.31	50.3
NorthEast: N4												
4	L2	54	30.0	0.034	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
5	T1	473	10.0	0.126	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	14	30.0	0.028	9.9	LOS A	0.1	0.8	0.48	0.68	0.48	49.7
Approach		540	12.5	0.126	0.8	NA	0.1	0.8	0.01	0.07	0.01	58.8
NorthWest: Road P15/1												
7	L2	12	30.0	0.013	10.1	LOS B	0.0	0.3	0.25	0.93	0.25	50.3
8	T1	6	30.0	0.115	25.7	LOS D	0.3	2.3	0.78	1.01	0.78	41.8
9	R2	12	30.0	0.115	27.8	LOS D	0.3	2.3	0.78	1.01	0.78	41.9
Approach		29	30.0	0.115	20.4	LOS C	0.3	2.3	0.57	0.98	0.57	44.8
SouthWest: N4												
10	L2	7	30.0	0.005	5.9	LOS A	0.0	0.0	0.00	0.57	0.00	52.4
11	T1	406	10.0	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	81	30.0	0.197	12.4	LOS B	0.7	6.0	0.59	0.82	0.59	48.3
Approach		495	13.6	0.197	2.1	NA	0.7	6.0	0.10	0.14	0.10	57.6
All Vehicles		1256	16.0	0.269	3.4	NA	0.7	6.0	0.10	0.22	0.10	56.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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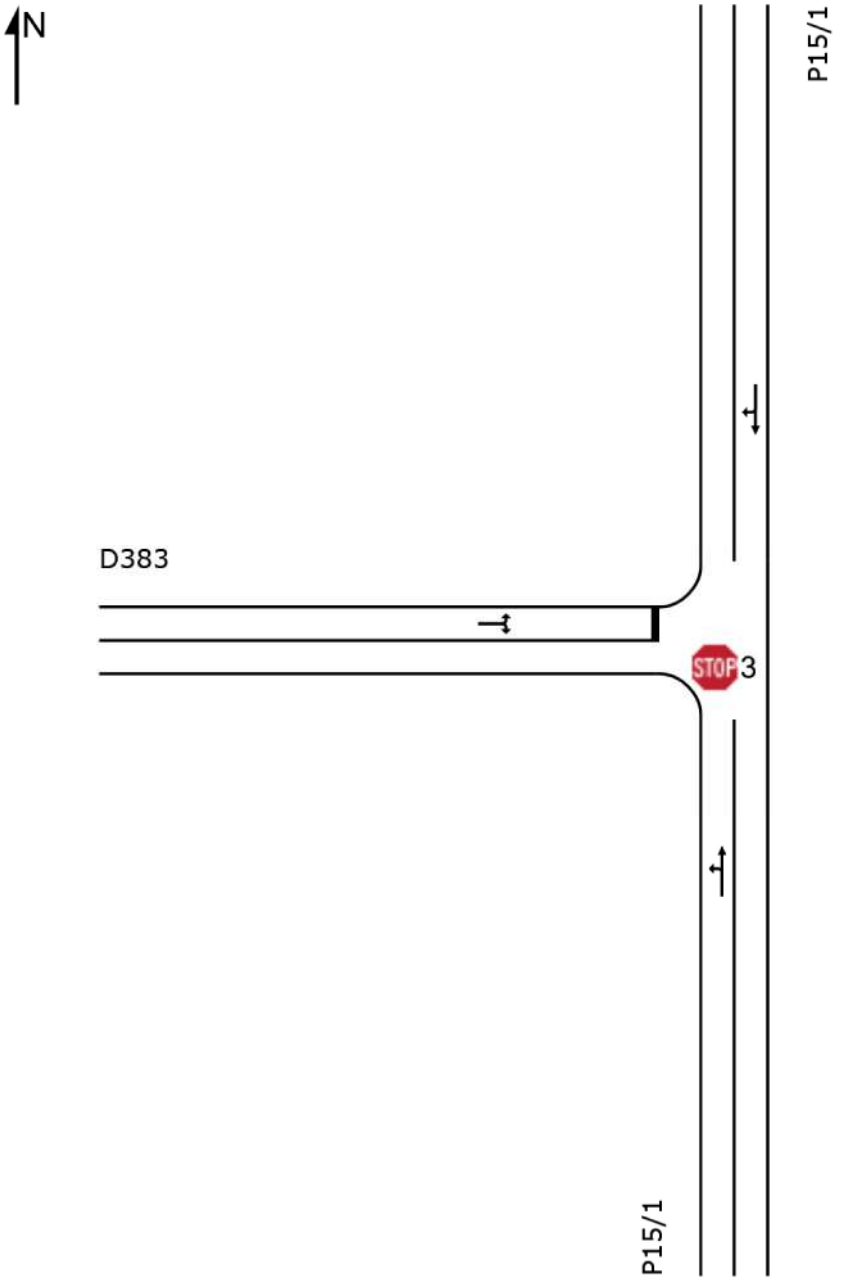
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 3 [2021 AM]

P15_1 / D383
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 3 [2021 AM]

P15_1 / D383
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: P15/1												
1	L2	3	30.0	0.033	5.9	LOS A	0.0	0.0	0.00	0.03	0.00	56.6
2	T1	51	30.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		54	30.0	0.033	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.5
North: P15/1												
8	T1	82	30.0	0.084	0.1	LOS A	0.3	2.7	0.12	0.22	0.12	57.6
9	R2	48	30.0	0.084	6.1	LOS A	0.3	2.7	0.12	0.22	0.12	54.0
Approach		131	30.0	0.084	2.3	NA	0.3	2.7	0.12	0.22	0.12	56.2
West: D383												
10	L2	82	30.0	0.130	9.6	LOS A	0.5	4.5	0.18	0.96	0.18	50.5
12	R2	48	30.0	0.130	10.1	LOS B	0.5	4.5	0.18	0.96	0.18	49.9
Approach		131	30.0	0.130	9.8	LOS A	0.5	4.5	0.18	0.96	0.18	50.2
All Vehicles		315	30.0	0.130	5.1	NA	0.5	4.5	0.12	0.49	0.12	54.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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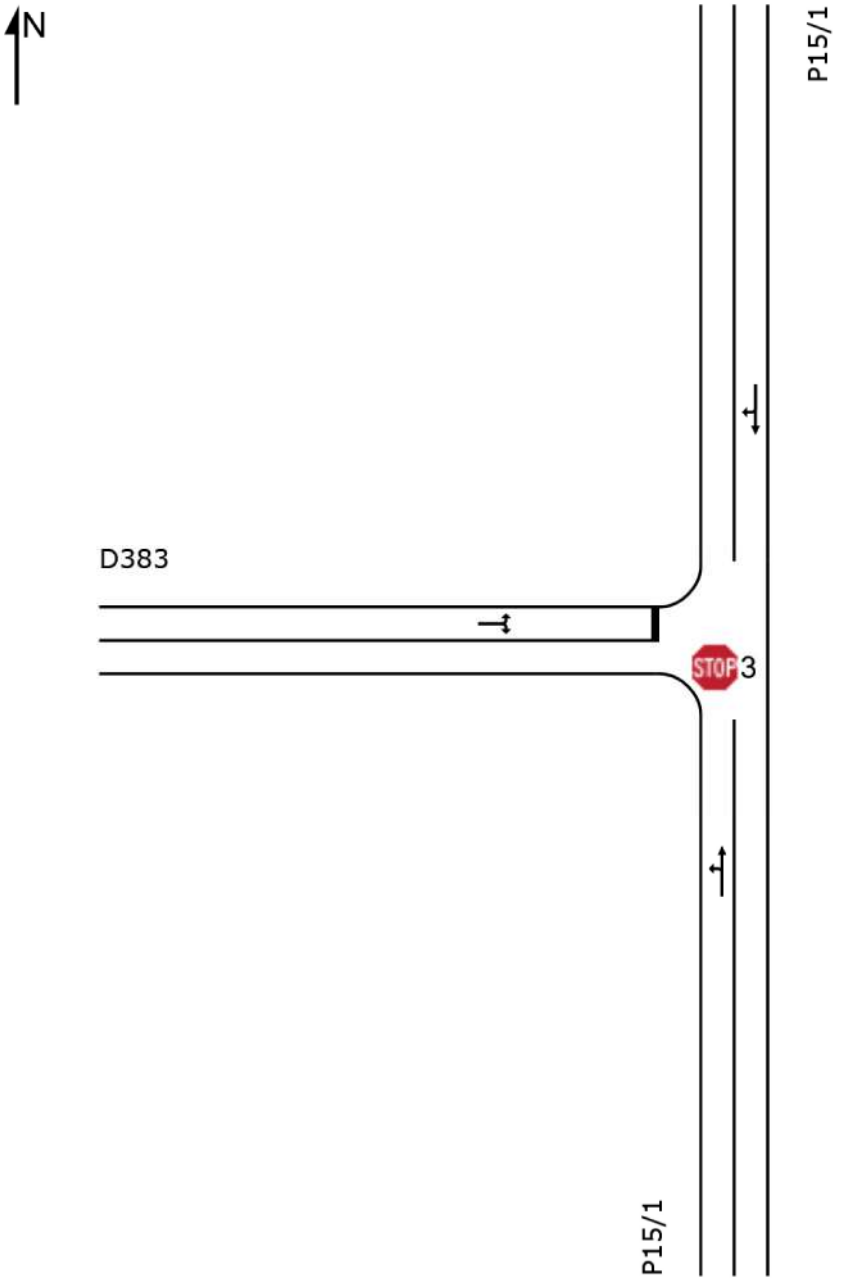
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 3 [2021 PM]

P15_1 / D383
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 3 [2021 PM]

P15_1 / D383
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: P15/1												
1	L2	38	30.0	0.036	5.9	LOS A	0.0	0.0	0.00	0.39	0.00	53.7
2	T1	18	30.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.39	0.00	56.5
Approach		56	30.0	0.036	4.0	NA	0.0	0.0	0.00	0.39	0.00	54.6
North: P15/1												
8	T1	78	30.0	0.077	0.1	LOS A	0.3	2.3	0.12	0.20	0.12	57.7
9	R2	41	30.0	0.077	6.1	LOS A	0.3	2.3	0.12	0.20	0.12	54.2
Approach		119	30.0	0.077	2.2	NA	0.3	2.3	0.12	0.20	0.12	56.5
West: D383												
10	L2	78	30.0	0.113	9.4	LOS A	0.4	3.9	0.08	1.00	0.08	50.5
12	R2	41	30.0	0.113	9.8	LOS A	0.4	3.9	0.08	1.00	0.08	49.9
Approach		119	30.0	0.113	9.5	LOS A	0.4	3.9	0.08	1.00	0.08	50.3
All Vehicles		294	30.0	0.113	5.5	NA	0.4	3.9	0.08	0.56	0.08	53.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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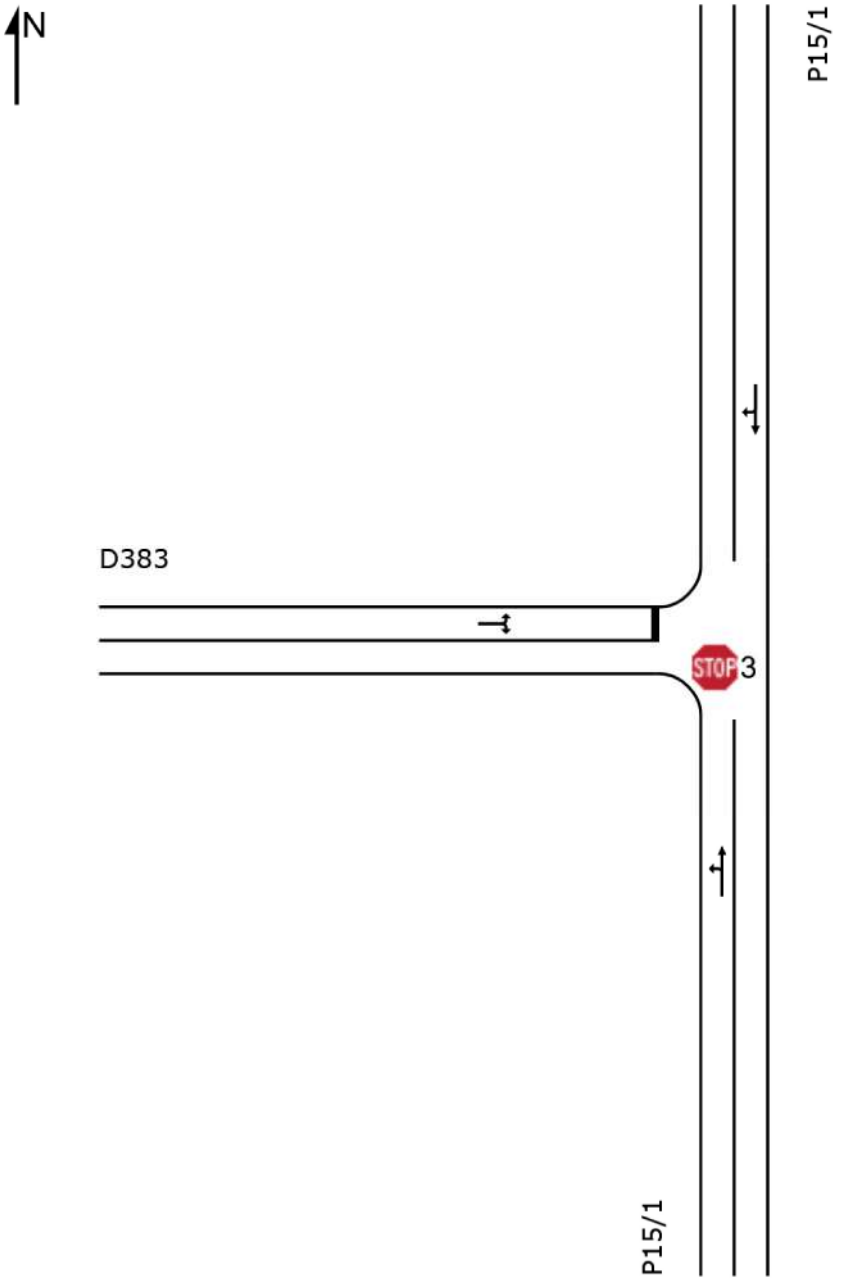
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 3 [2024 AM + Construction]

P15_1 / D383
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 3 [2024 AM + Construction]

P15_1 / D383
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: P15/1												
1	L2	3	30.0	0.035	5.9	LOS A	0.0	0.0	0.00	0.03	0.00	56.6
2	T1	54	30.0	0.035	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		57	30.0	0.035	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.5
North: P15/1												
8	T1	87	30.0	0.090	0.1	LOS A	0.3	2.8	0.13	0.22	0.13	57.6
9	R2	52	30.0	0.090	6.1	LOS A	0.3	2.8	0.13	0.22	0.13	54.0
Approach		139	30.0	0.090	2.3	NA	0.3	2.8	0.13	0.22	0.13	56.2
West: D383												
10	L2	87	30.0	0.140	9.6	LOS A	0.6	4.9	0.19	0.95	0.19	50.4
12	R2	52	30.0	0.140	10.2	LOS B	0.6	4.9	0.19	0.95	0.19	49.9
Approach		139	30.0	0.140	9.8	LOS A	0.6	4.9	0.19	0.95	0.19	50.2
All Vehicles		335	30.0	0.140	5.1	NA	0.6	4.9	0.13	0.49	0.13	54.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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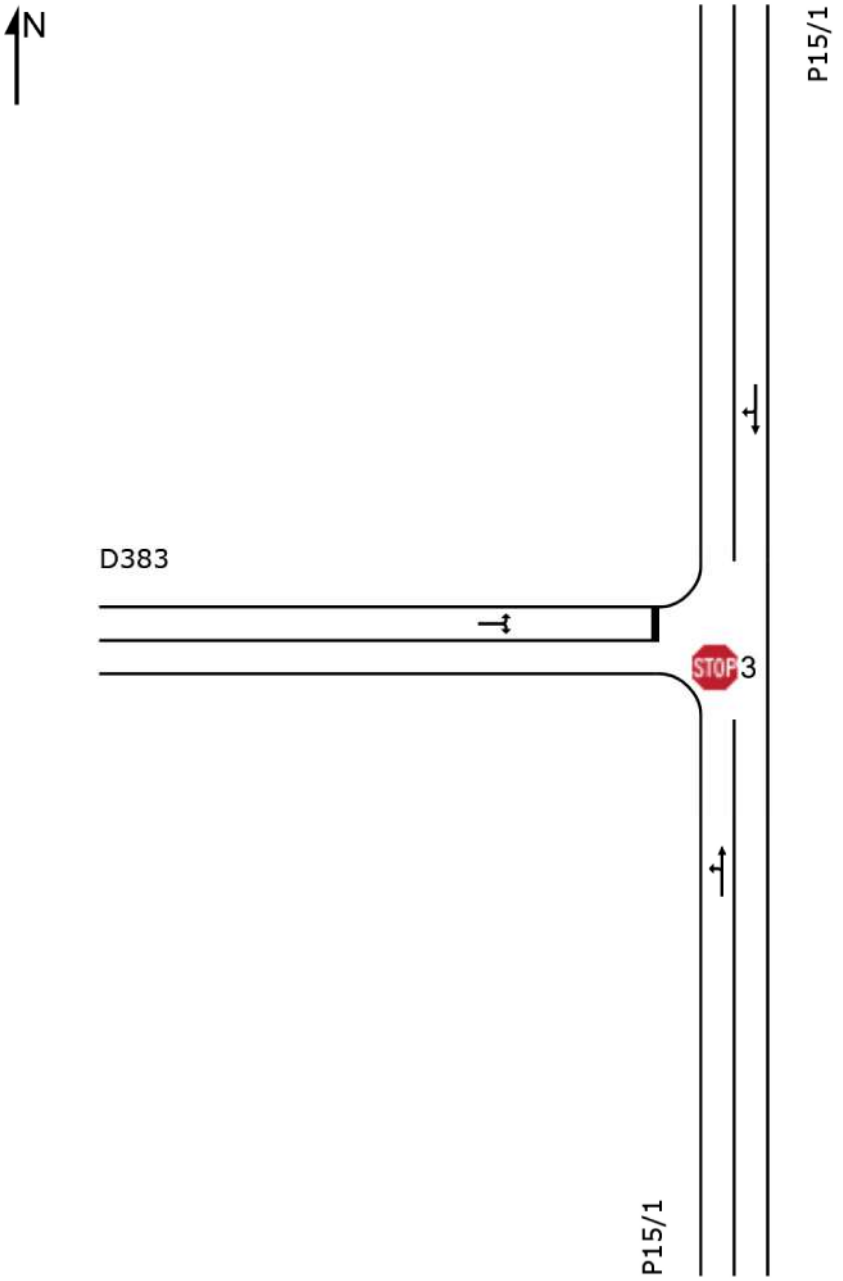
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 3 [2024 PM + Construction]

P15_1 / D383
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 3 [2024 PM + Construction]

P15_1 / D383
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: P15/1												
1	L2	40	30.0	0.038	5.9	LOS A	0.0	0.0	0.00	0.39	0.00	53.7
2	T1	19	30.0	0.038	0.0	LOS A	0.0	0.0	0.00	0.39	0.00	56.5
Approach		59	30.0	0.038	4.0	NA	0.0	0.0	0.00	0.39	0.00	54.6
North: P15/1												
8	T1	83	30.0	0.082	0.1	LOS A	0.3	2.4	0.12	0.20	0.12	57.7
9	R2	43	30.0	0.082	6.1	LOS A	0.3	2.4	0.12	0.20	0.12	54.2
Approach		126	30.0	0.082	2.2	NA	0.3	2.4	0.12	0.20	0.12	56.5
West: D383												
10	L2	83	30.0	0.121	9.4	LOS A	0.5	4.2	0.08	1.00	0.08	50.5
12	R2	43	30.0	0.121	9.9	LOS A	0.5	4.2	0.08	1.00	0.08	49.9
Approach		126	30.0	0.121	9.6	LOS A	0.5	4.2	0.08	1.00	0.08	50.3
All Vehicles		312	30.0	0.121	5.5	NA	0.5	4.2	0.08	0.56	0.08	53.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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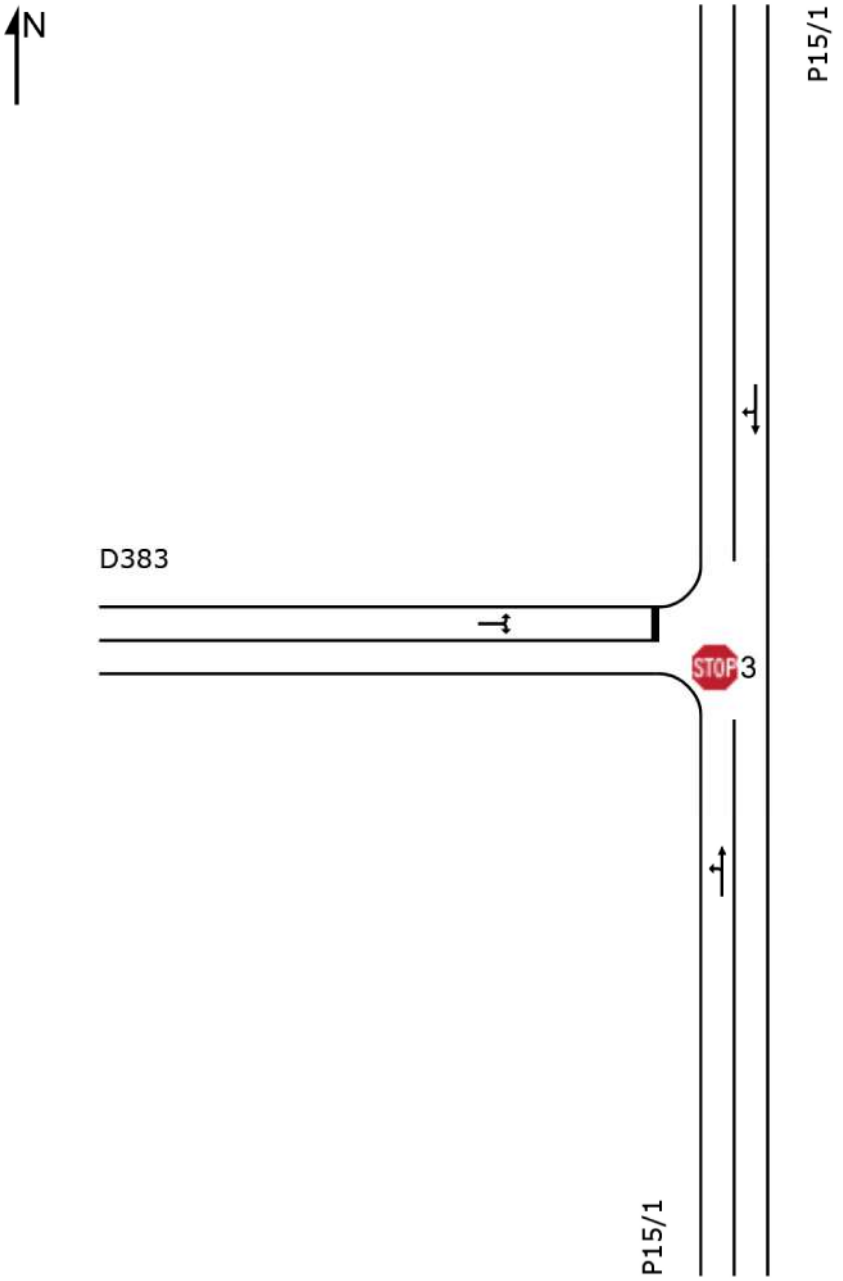
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 3 [2026 AM + Operations]

P15_1 / D383
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 3 [2026 AM + Operations]

P15_1 / D383
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: P15/1												
1	L2	3	30.0	0.036	5.9	LOS A	0.0	0.0	0.00	0.03	0.00	56.6
2	T1	56	30.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		59	30.0	0.036	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.5
North: P15/1												
8	T1	91	30.0	0.096	0.2	LOS A	0.4	3.2	0.14	0.23	0.14	57.5
9	R2	58	30.0	0.096	6.1	LOS A	0.4	3.2	0.14	0.23	0.14	53.9
Approach		148	30.0	0.096	2.5	NA	0.4	3.2	0.14	0.23	0.14	56.0
West: D383												
10	L2	112	30.0	0.165	9.6	LOS A	0.7	5.9	0.19	0.95	0.19	50.4
12	R2	54	30.0	0.165	10.4	LOS B	0.7	5.9	0.19	0.95	0.19	49.8
Approach		165	30.0	0.165	9.9	LOS A	0.7	5.9	0.19	0.95	0.19	50.2
All Vehicles		373	30.0	0.165	5.4	NA	0.7	5.9	0.14	0.52	0.14	53.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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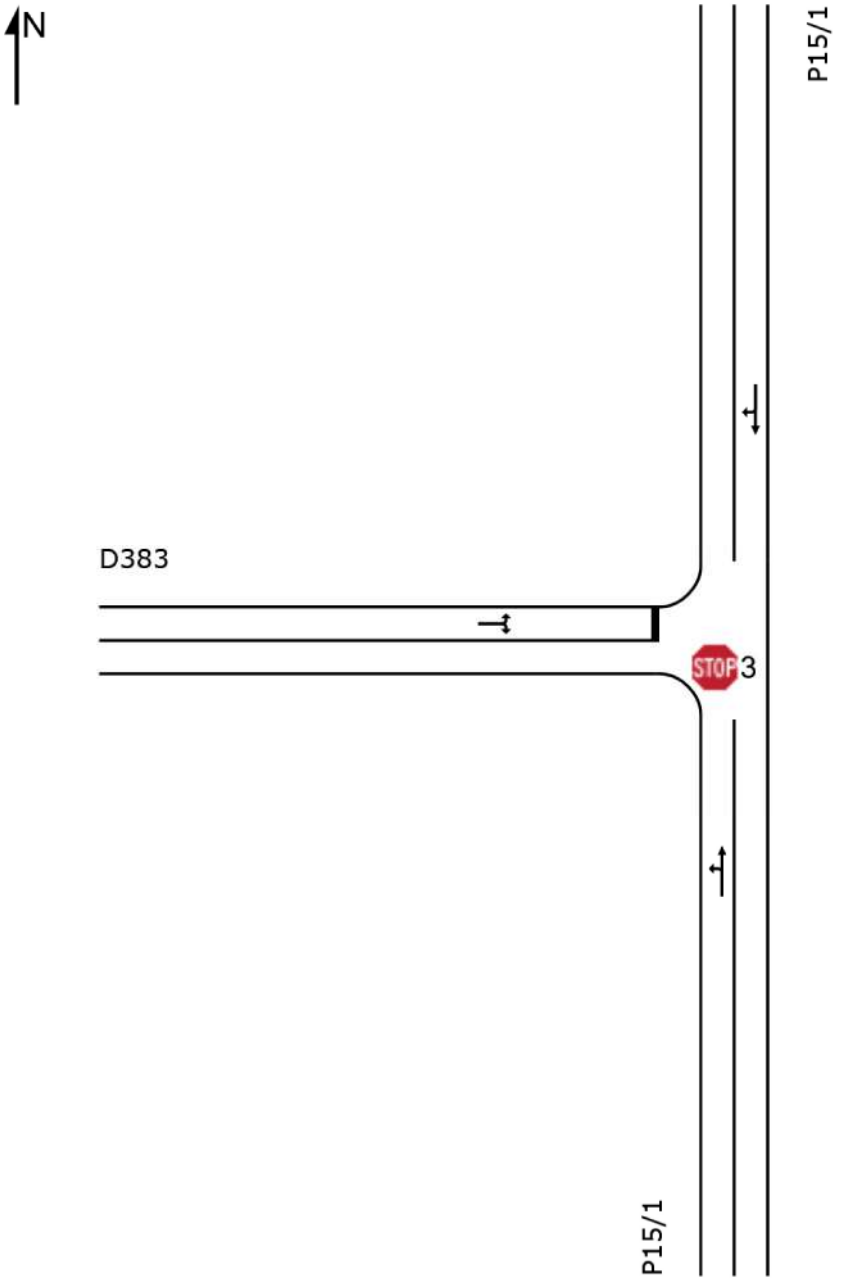
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 3 [2026 PM + Operations]

P15_1 / D383
Site Category: -
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 3 [2026 PM + Operations]

P15_1 / D383
Site Category: -
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: P15/1												
1	L2	42	30.0	0.040	5.9	LOS A	0.0	0.0	0.00	0.39	0.00	53.7
2	T1	20	30.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.39	0.00	56.5
Approach		62	30.0	0.040	4.0	NA	0.0	0.0	0.00	0.39	0.00	54.6
North: P15/1												
8	T1	86	30.0	0.100	0.2	LOS A	0.4	3.5	0.15	0.25	0.15	57.2
9	R2	66	30.0	0.100	6.1	LOS A	0.4	3.5	0.15	0.25	0.15	53.7
Approach		153	30.0	0.100	2.8	NA	0.4	3.5	0.15	0.25	0.15	55.6
West: D383												
10	L2	91	30.0	0.132	9.4	LOS A	0.5	4.6	0.08	1.00	0.08	50.4
12	R2	45	30.0	0.132	10.2	LOS B	0.5	4.6	0.08	1.00	0.08	49.8
Approach		136	30.0	0.132	9.7	LOS A	0.5	4.6	0.08	1.00	0.08	50.2
All Vehicles		351	30.0	0.132	5.7	NA	0.5	4.6	0.10	0.57	0.10	53.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX D – DRAWING D001

REV	DATE	BY	DESCRIPTION	CHK	APD
A	2021-02-13	RvW	FOR APPROVAL	RvW	RvW

ARCHITECT: -

CLIENT:

DRAWING STATUS: CONCEPTUAL

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT: EXXARO BELFAST COAL MINE EXPANSION

TITLE: EXISTING INTERSECTION LAYOUTS

SCALE @ A3:	CHECKED:	APPROVED:
1:2500	PJ	PJ
DESIGN: PJ	DRAWN: PJ	DATE: 27/02/2021
PROJECT No: P-257	DRAWING No: D001	REV: A