

Appendix C.8

Traffic Impact Study

**Crawford Nickel Project:
Traffic Impact Study**

September 30, 2024

Prepared for:

Canada Nickel Company



Prepared by:

Stantec Consulting Ltd



Limitations and Sign-off

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Acronyms and Abbreviations

AADT	Average Annual Daily Traffic
CFDC	Community Futures Development Corporation
CVS	Commercial Vehicle Survey
DHV	design hourly volume, for roadway geometric design
HCM	Highway Capacity Manual
ICA	intersection capacity analysis
ISD	intersection site distance
kt/d	kilotonnes per day
LOS	life of service
MTO	Ministry of Transportation
NOC	National Occupational Classification
PA	Project Area
PHV	peak hour volume
SADT	Summer Annual Daily Traffic
TAC	Transportation Association of Canada
TIS Guidelines	Tailored Impact Statement Guidelines
v/c	volume to capacity

1 Introduction

Canada Nickel Company (Canada Nickel) proposes to develop, operate, and progressively reclaim the Crawford Nickel Project ('the Project'), a new open pit nickel mine and processing facility approximately 42 kilometres (km) north of Timmins, Ontario along Highway 655. The Project is being assessed in accordance with the *Impact Assessment Act, 2019*.

Stantec Consulting Ltd. (Stantec) has been retained by Canada Nickel to conduct a Traffic Impact Study based on the information currently on the proposed Project design and corresponding activities proposed during construction, operations, and decommissioning of the Project.

This Traffic Impact Study has been completed to inform the Impact Statement. It has been prepared pursuant to the *Impact Assessment Act, 2019* and in consideration of the Tailored Impact Statement Guidelines: Crawford Nickel Project (Impact Assessment Agency of Canada [IAAC] 2023) (TIS Guidelines). As per the TIS Guidelines, the effect to services and infrastructure is intended to include a description of the potential effects related to road infrastructure and traffic safety. The Traffic Impact Study was submitted to the MTO for review and discussion and will be further refined in consultation with MTO as part of the Class EA for Provincial Transportation Facilities and Municipal Expressways process to address comments raised regarding design details of the road infrastructure.

This report is outlined with the following sections:

- **Section 1** provides an introduction and discusses the study scope, the study area including study corridors and intersections, study scenarios, study horizon, and traffic volume growth rate applied.
- **Section 2** discusses the existing transportation network and existing traffic volumes in the study area.
- **Section 3** reviews the anticipated site trip generation, distribution and assignment.
- **Section 4** details the future transportation network, projected traffic volumes, and projected traffic operations at study area intersections for each horizon year.
- **Section 5** covers the sightline analysis of the existing site access and the proposed new site access.
- **Section 6** summarizes the study and provides study recommendations based on the preceding sections.

1.1 Study Objectives

The Traffic Impact Study will inform the Impact Statement for the Project. The objectives of this study are to examine the potential impacts of the proposed Project development on the surrounding transportation network.

The scope of the Traffic Impact Study is as follows:

- Collect and review background information from the Ministry of Transportation (MTO) including the most recently available traffic volume data, TIS Guidelines, and other related documents.
- Review the existing (2024) transportation conditions including existing infrastructure, road classifications, and speed limits.
- Establish the existing and future traffic volumes in the selected future horizon years in the study intersections, based on the traffic volume data acquired from MTO. Estimate the peak hour inbound and outbound site-generated traffic volumes for the 2028 (full build-out), 2033 (full build-out + 5 years), and 2038 (full build-out + 10 years) future horizon years.
- Conduct intersection capacity analysis for the site access intersection during the inbound and outbound peak hours, based on the existing, future background, and future total projected traffic volumes in the selected future horizon years.
- Conduct sightline analysis at the existing site access and the proposed new site access.
- Recommend potential mitigation measures to any identified transportation issues, as applicable.

1.2 Project Overview

Canada Nickel proposes to develop, construct, operate, and progressively reclaim a new open pit nickel mine and processing facility, collectively known as the Project. The Project includes the development of an open pit, stockpiles, two ore processing plants, and other mine related infrastructure, as well as a new rail spur line and the relocation of Highway 655 and an existing 500 kilovolt (kV) transmission line. Ore will be extracted from a single open pit that will be divided into an east zone and main zone. The Project has a mineral reserve estimate of 1,715 million tonnes (Mt) and an expected Project life of 41 years.

The Project is located approximately 42 km north of the City of Timmins, Ontario, in the geographic townships of Crawford, Carnegie, Kidd, Lucas, Beck, Nesbitt, Wark, and Prosser. A small portion of the Project extent within the geographic townships of Kidd and Wark also lies within the municipal boundary of the City of Timmins.

As the proposed site is partially located in the Highway 655 right-of-way, approximately 24.6 km of the highway is proposed to be realigned to the west from 5.9 km north of Kidd Creek Mine Road northerly to 25.3 km south of Highway 11. Access to the site is proposed via a new three-way intersection along the realigned Highway 655, with the east leg being the proposed new access road to the Project site. A new rail spur line is also proposed to provide access for fuel supplies to the Project site. The work on the realignment of Highway 655 is anticipated to complete in 2030, in Year 3 of the proposed mine's operations. The existing access to the mining site via Lower Sturgeon Generating Dam Road will remain active until the Highway 655 realignment is completed.

Based on the current Project design, the maximum rate of ore extraction will be up to 240,000 tonnes per day (tpd) during year 5 of operations and an average rate of 160,000 tpd over the life of mine. The two ore processing plants and associated service facilities will process run of mine ore delivered to primary

crushers to produce nickel concentrate, iron concentrate, and tailings at a rate of approximately 60,000 tpd at the start of mine life, ramping up to a maximum of 120,000 tpd. In addition to nickel and iron, other metals such as cobalt, chromium, palladium and platinum are expected to be recovered from concentrate streams.

Based on the proposed processing rate and current information regarding the ore body, the current life of the proposed Project is expected to be approximately 41 years. Mining would be completed at a faster pace than milling, thus mining of ore would occur for about 30 years, then milling alone for the last 11 years.

Concentrate from the processing plants will be loaded onto rail cars and shipped via the rail spur line for refinement offsite.

1.3 Key Project Activities

The timing of activities and installation of Project components will occur in sequence to allow for the efficient extraction of materials. Various construction, operations, and decommissioning activities are proposed throughout the life of the mine. For the purposes of the assessment, these Project activities are anticipated to be advanced in three phases:

- Construction (Year -3 to Year -1)
- Operations
 - Operations phase 1 (Year 1 to Year 5): 60 kilotonnes per day (kt/d) milling capacity with ore extraction
 - Operations phase 2 (Year 5 to Year 30): 120 kt/d milling capacity with ore extraction
 - Operations phase 3 (Year 30 to Year 41): 120 kt/d milling capacity with no ore extraction
- Decommissioning and closure
 - Active closure (Year 41 to Year 46)
 - Passive closure (Year 46+)

1.3.1 Construction Phase

The construction phase will include the preparation of the site up to the point at which the first process plant has been commissioned and is ready to commence operations. This phase will include site preparation, physical construction, pre-production, and commissioning activities. Construction is anticipated to begin in the Main Zone and East Zone, and rock extracted at this time may be crushed into aggregate using a mobile aggregate crusher for use during the construction of roads and other infrastructure, as necessary.

It is noted that additional construction will occur through the operations phase of the Project, and that this phase is defined by the start of ore processing.

1.3.2 Operations Phase

The operations phase is focused on the active processing of ore and generation of concentrate for delivery to market, specifically operation of the process plant(s). Due to the sequential nature of the mine operations, the operations phase of the Project has been divided into 3 sub-phases based on the open pit extraction schedule and sequential operation of the two process plants.

The three sub-phases of the operations phase include:

- Operations phase 1 – This phase includes the operation of the first of two process plants that will be operating at an ore processing capacity of approximately 60 kt/d (or 21.9Mt/a). IPT carbonation within the process plant may also commence if a CO₂ source is available. Mining operations during this phase will produce more ore than the process plant can process, with surplus material to be stockpiled in the East Stockpile location for future processing. Construction will continue during the phase to expand and construct the second process plant and other supporting mine infrastructure, including the Highway 655 realignment. Material will begin to be stored within the West Stockpile at the end of this phase.
- Operations phase 2 – This phase includes the operation of both process plants that will be operating at an ore processing capacity of approximately 120 kt/d (or 43.8 Mt/a), including IPT carbonation. Mining operations during this phase will produce approximately 240 kt/d, which is more ore than the process plants can process. Low grade ore will continue to be stockpiled in the East and / or the West Ore Stockpiles.
- Operations phase 3 – This phase includes continuation of the operation of both process plants at an ore processing capacity of approximately 120 kt/d (or 43.8 Mt/a) following completion of mining operations (e.g., no further extraction of ore from the pits). The process plants, including IPT carbonation, will continue to operate by processing the ore stockpiled during operations phase 1 and 2. As mine operations cease, there will be an opportunity for progressive reclamation of the pits, haul routes, and other no longer used areas of the Project site.

1.3.3 Decommissioning and Closure Phase

Following the completion of ore processing, all Project operations will cease, and active closure will commence. Active closure includes the removal of buildings, structures, and other infrastructure, as well as reclamation and site stabilization activities. Once complete, the Project will then enter a passive closure phase as the pit lake fills. During this time, closure monitoring and adaptive mitigation will occur. Following pit lake filling, the Project site will be permanently closed.

Activities completed during the decommissioning and closure phase of the Project are focused on reclaiming the environments, establishing physical, chemical, and biological stability at the site, and to meet desired end land functions and uses. The Conceptual Mine Closure Plan (Appendix F of the Impact Statement) will be updated throughout the life of the Project as necessary to reflect the environmental requirements in place at the time of closure. The Conceptual Mine Closure Plan will be prepared, refined, and implemented in accordance with the Ontario *Mining Act* and Ontario Regulation 35/24.

Progressive reclamation throughout the course of the mine life will occur, but the majority of the closure activities will commence at the cessation of mining activities and will be completed five years after ore processing ceases. Ongoing closure monitoring and maintenance activities will be carried out throughout active and passive closure phases until the closure objectives have been satisfied and the Project has been moved to a closed out and abandoned status.

1.4 Study Area

The Project comprises approximately 11,785 hectares along Highway 655 approximately 42 km north of the City of Timmins, Ontario. The Project is located mostly within the geographic townships of Crawford, Carnegie, Kidd, Lucas, Beck, Nesbitt, Wark, and Prosser. A small portion of the Project extent within the geographic townships of Kidd and Wark also lies within the municipal boundary of the City of Timmins.

The **Project Area (PA)** encompasses the Project footprint and is the anticipated area of physical disturbance associated with the construction, operations, and decommissioning and closure of the Project. The PA includes the existing Project access intersection at Highway 655 and Lower Sturgeon Dam Road, and the future Project access intersection located along the realigned Highway 655. The PA and Project access intersections are shown on Figure A.2.

1.5 Study Scenarios, Horizons, and Analysis Periods

The Project is expected to be completed in three phases as outlined in Table 1.1 below¹. The relocation of Highway 655 and the rail spur is proposed to be completed during the third year of operations phase 1, scheduled for the year 2030.

Table 1.1 Preliminary Project Schedule

Project Phase	Timing
Construction phase	2025 to 2028
Operations phase	
Operations phase 1	2028 to 2032
Operations phase 2	2033 to 2057
Operations phase 3	2058 to 2068
Decommissioning and closure phase	
Decommissioning and active closure	2069 to 2074
Post-closure and monitoring	2074+

The existing conditions, future build-out year, and future build-out +5 and +10 year horizons will be analyzed for the background and future total conditions scenarios. The following scenarios are evaluated in this study:

- Existing Peak Hour (2024)
- Future Background and Total Build-Out Year Peak Hour Inbound/Outbound (2028)
- Future Background and Total Build-Out +5-Years Peak Hour Inbound/Outbound (2033)
- Future Background and Total Build-Out +10-Years Peak Hour Inbound/Outbound (2038)

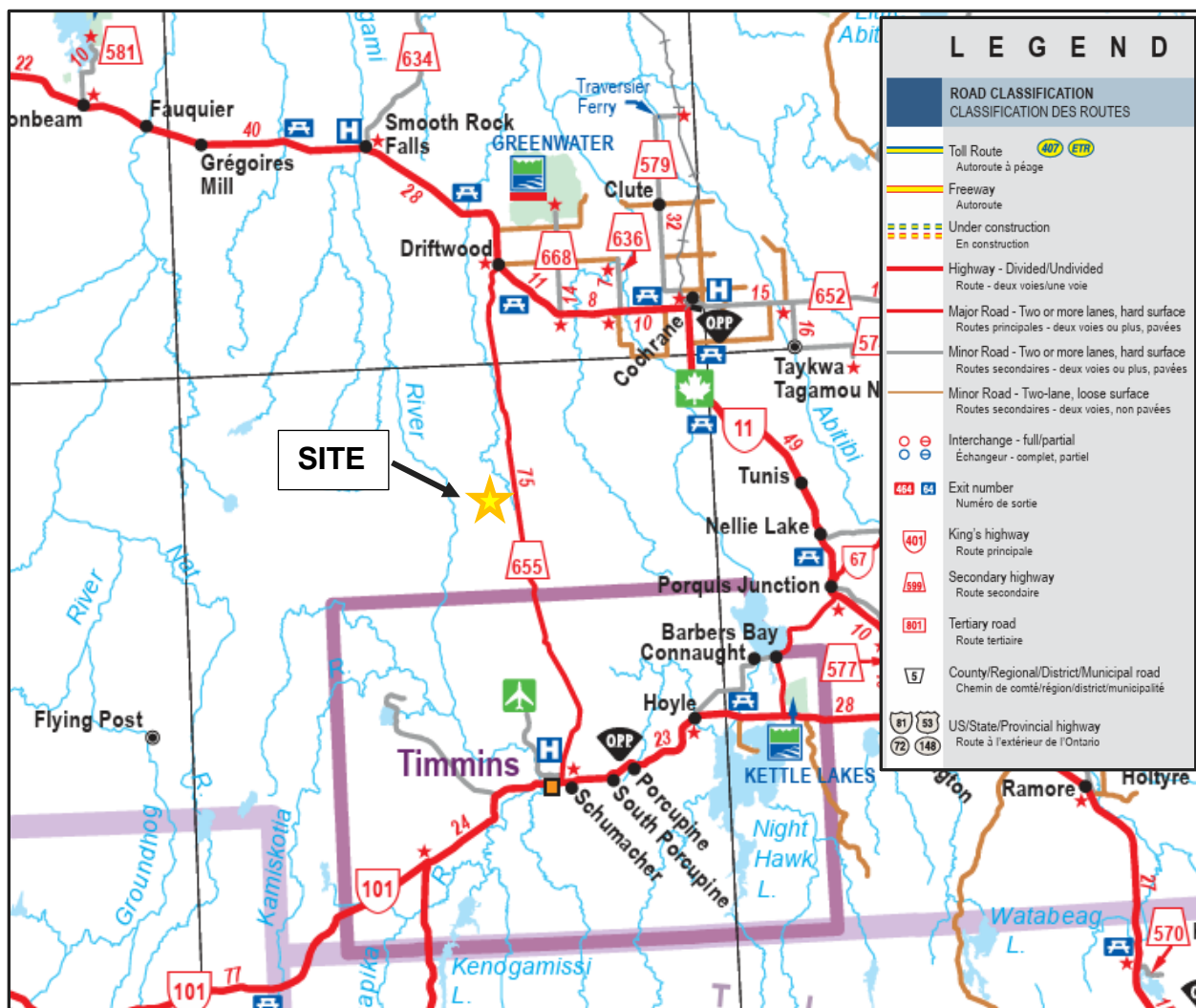
¹ Note that the commencement of Project activities is dependent on several factors, including timelines for Impact Assessment approval, EA approvals and receipt of all applicable permits and approvals.

2 Background

2.1 Road Network

Figure 2.1 below shows the road classification of the road network surrounding the PA, included as part of the 2022-2023 Official Road Map of Ontario (Government of Ontario 2023).

Figure 2.1 Study Area Road Classification

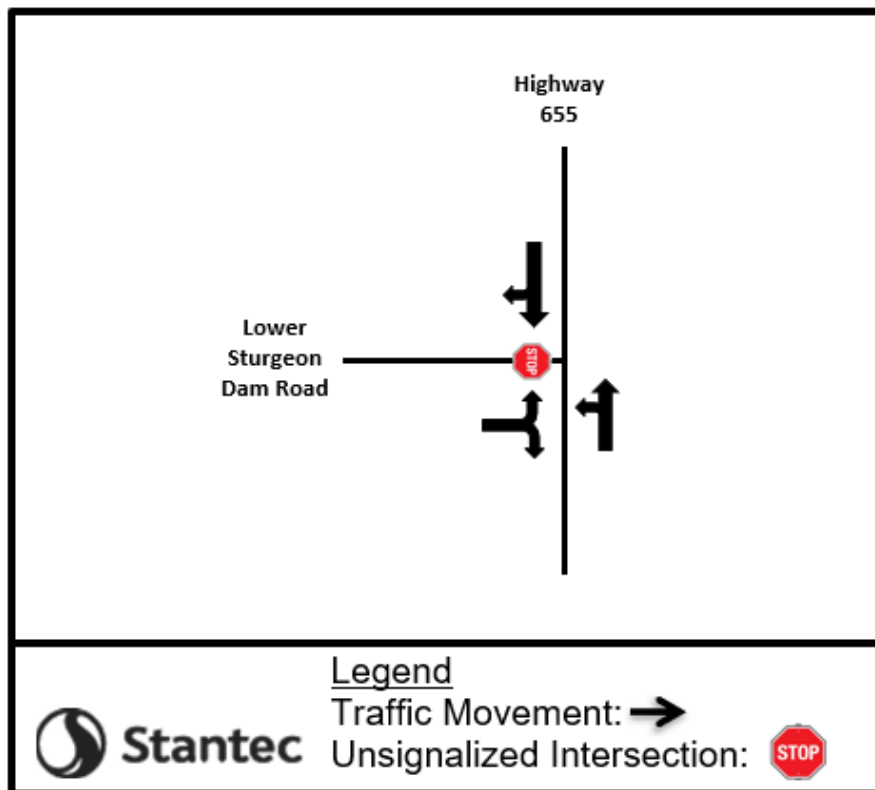


Source: Government of Ontario 2023

Highway 655 is a two-lane north-south secondary highway under the jurisdiction of MTO. There is no sidewalk provided on either side of the road. Through the PA, the posted speed limit is 90 km/h.

The Project site access intersection of Highway 655 and Lower Sturgeon Dam Road is controlled by a stop sign at the minor approach shown on Figure 2.2.

Figure 2.2 Existing Lane Configuration and Intersection Control



2.2 Traffic Data Inputs and Peak Hour Adjustments

Traffic volume data for the year 2020 and projected traffic volume data for the year 2030 were provided by MTO for Highway 655, between Kidd Creek Mine Road and Highway 11, and are summarized in Table 2.1.

Table 2.1 Traffic Volume Data – Highway 655, between Kidd Creek Mine Road and Highway 11

Year	AADT ¹	SADT ²	DHV ³	PHV ⁴	PHV/AADT	% CV ⁵
2020	1,200	1,400	104	170	0.142	22.3
2030	1,300	1,500	110	190	0.146	

¹ AADT = Average Annual Daily Traffic

² SADT = Summer Average Daily Traffic

³ DHV = Design hourly volume, for roadway geometric design

⁴ PHV = Peak hour volume

⁵ % CV = Percentage of commercial vehicles

The existing 2024 peak hour volumes (PHV) along Highway 655 – 178 vehicles – were generated through linear interpolation using the data from the table above.

To estimate the directional split along Highway 655 during the peak hour, traffic counts collected as part of MTO’s 2012 Commercial Vehicle Survey (CVS) (MTO 2023a) were reviewed; the Timmins Eastbound and Westbound CVS locations – located approximately 21 km west of Timmins along Highway 101 – provides directional travel behaviour of vehicles entering and exiting the largest population centre of the region, the City of Timmins. Both Highway 101 and Highway 655 connect Timmins with various industrial sites outside of Timmins, and mainly serve the associated employee traffic demand during the weekday peak hour. Hence, the traffic counts at the Timmins CVS locations are deemed representative of the peak hour directional travel behaviour of vehicles entering and exiting the City of Timmins, and thus used as proxies for estimating the directional split of peak hour traffic volumes along Highway 655. The weekday peak hour traffic count data from these two survey locations are presented in Table 2.2.

Table 2.2 Weekday Peak Hour Traffic Count Data from 2012 Commercial Vehicle Survey, at Timmins Eastbound and Timmins Westbound Locations

Vehicle Counts	Eastbound (Peak Direction)	Westbound (Non-peak Direction)	Total
Weekday Peak Hour (5 – 6 PM)	132	85	217
Directional Split (%)	61%	39%	100%

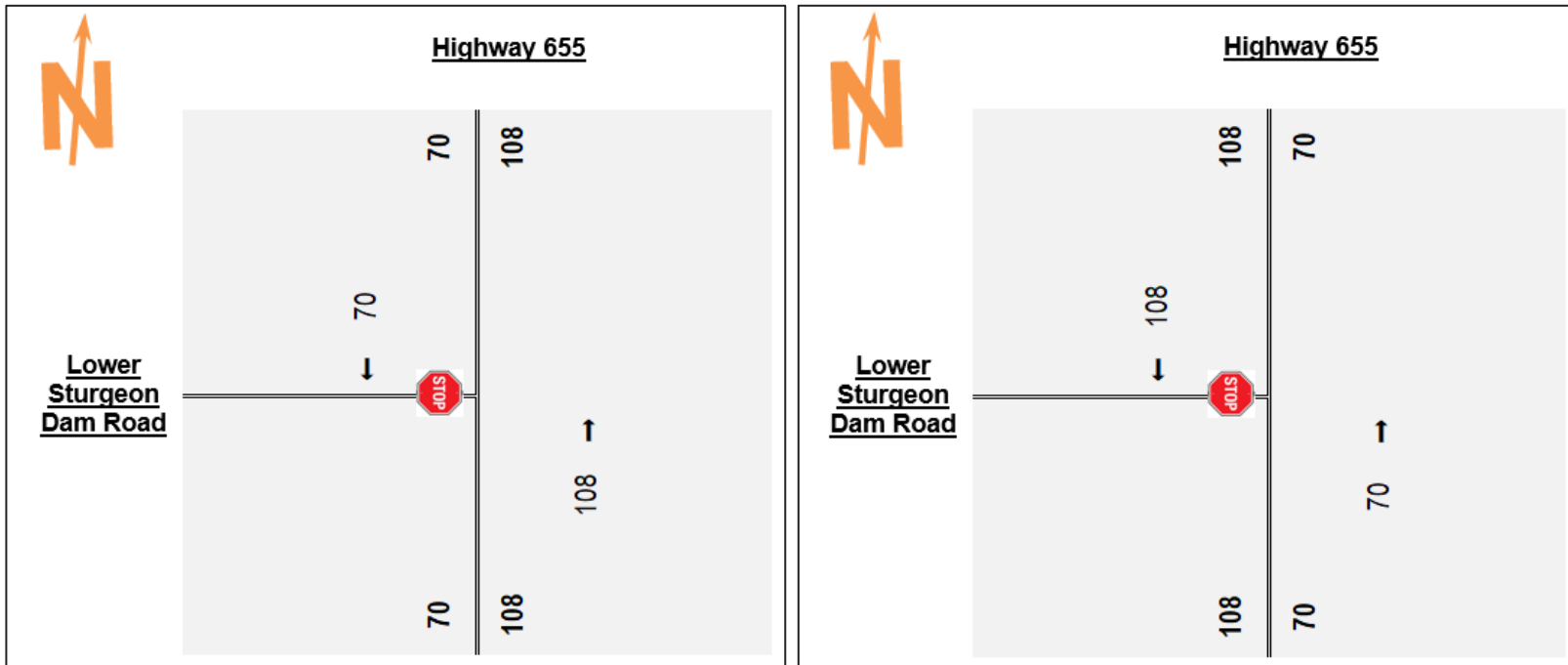
The directional split presented – 61% peak direction (i.e., exiting Timmins for inbound peak hour, entering Timmins for outbound peak hour), and 39% non-peak direction – was applied to the interpolated 2024 PHV to generate the existing inbound and outbound peak hour volumes.

2.3 Traffic Volumes

The balanced existing traffic volumes are illustrated in Figure 2.3 for the inbound and outbound peak hours.

In the existing conditions, Lower Sturgeon Dam Road serves the Lower Sturgeon Generating Station which is located west of the Project. For the purpose of this study, no traffic volume is assigned to the road movements to and from Lower Sturgeon Dam Road, as it is assumed that the trips generated by the Lower Sturgeon Generating Station is negligible. Traffic operations analysis is therefore not applicable in the existing conditions scenario.

Figure 2.3 Existing Weekday Inbound (Left) and Outbound (Right) Peak Hour Traffic Volumes



2.4 Land Use

The nearest communities to the PA are the Town of Cochrane (35 km to the northeast), the City of Timmins (42 km to the south), the Town of Smooth Rock Falls (50 km to the northwest), and the Town of Iroquois Falls (50 km to the east).

Existing land uses in the area include mineral exploration, logging, recreation, and historical mining. These land uses are located on a mix of surface and mining patents and Crown lands with a mix of private land ownership. There are no federal parks near the PA and the closest provincial parks are Mahaffy Township Ground Moraine Conservation Reserve, located approximately 15 km to the northwest; Greenwater Provincial Park (non-operating, natural environment park with no facilities), located approximately 49 km to the north; and Kettle Lakes Provincial Park (day use and overnight camping facilities), located approximately 80 km east of the PA.

Today, the most extensive land uses within the PA are forestry operations and consumptive recreation such as hunting (i.e., moose, waterfowl) and fishing. There are no residential properties near the PA. A hydroelectric facility, Lower Sturgeon Generating Station, is present approximately 10 kilometres west of the site.

There are no First Nation Reserve lands proximal to the PA although the PA is anticipated to be within proximity to the traditional or operating regions of several Indigenous nations that have expressed interest in the Project.

3 Site Trips

3.1 Site Trip Generation

An estimate of trips expected to be generated by the Project for the duration of its construction and operations phases was provided by Canada Nickel. Table 3.1 provides a summary of the estimated average and maximum weekly car and bus return trips generated by the Project.

Table 3.1 Expected Weekly Car and Bus Return Trips at Project Site, provided by Canada Nickel

Trip Type	Average	Build-out Year (2028)	Build-out Year + 5 (2033)	Operations Year 6 (2034)	Build-out Year + 10 (2038)
Weekly Car Return Trips	353	415	525	570	500
Weekly Bus Return Trips	94	125	145	162	121

The maximum number of trips generated is anticipated to occur during Year 6 of operations, in 2034. To provide a conservative analysis, the number of trips generated in Year 6 of operations will be used as the trips generated in the future build-out year, future build-out +5 year, and future build-out +10 year horizons.

In addition, given that the hourly shift plan for the Project operations is not defined yet, conservatively, it is assumed that the peak hour background traffic volumes coincide with the peak inbound and peak outbound site-generated volumes, respectively. It is also assumed that there will be no outbound trips during the inbound peak hour, and vice versa.

The weekly site-generated car and bus trips would then be converted to daily trips using a factor of 0.2, which assumes that vehicles access the site for 5 days in a week in a uniform distribution. The daily trips are further converted to peak hour trips using the PHV/AADT ratios as depicted in Table 2.1. The results are presented in Table 3.2.

Table 3.2 Site Generated Trips by Mode and by Time Duration

Mode	Weekly	Daily	Peak Hour
Car	570	114	16
Bus	162	32	5
Total	732	146	21

3.2 Trip Distribution and Assignment

Canada Nickel anticipates that staff will commute daily from communities located within a reasonable commuting proximity of the Project. The following methodology is used to infer the distribution of site-generated trips:

- An employment catchment area was established that included communities identified in the Social and Economic Conditions Baseline Report (Appendix B.9 of the Impact Statement) within an approximate one-way free-flow travel time of 90 minutes from the Project, by private vehicle. The shortest path by free-flow travel time was used to identify the direction of travel to each community.
- The latest available population data of communities that meet the travel time criterion was retrieved from the 2021 Census, conducted by Statistics Canada (2023).
- The employment propensity index of each community was estimated based on the following equation:

$$\text{Employment Propensity Index} = \text{Population} \times \frac{1}{\text{Approx. Travel Time}}$$

- The distribution of employment propensity index is used to infer the distribution of site-generated trips to the communities within the employment catchment area.

Table 3.3 below summarizes the statistics for the Project employment catchment area and the generated employment propensity index values.

Table 3.3 Population, Travel Time, and Employment Propensity of Site Employment Catchment Area

Communities in Employment Catchment Area	Population (Statistics Canada, 2021)	Approx. Travel Time (min)	Employment Propensity Index	% of Total Employment Propensity Index
To/From the North	24,148	-	362.9	23.5
Town of Cochrane	5,390	45	119.8	7.8
Town of Iroquois Falls	4,418	80	55.2	3.6
Township of Fauquier-Strickland	467	65	7.2	0.5
Town of Kapuskasing	8,057	85	94.8	6.1
Township of Moonbeam	1,157	70	16.5	1.1
Town of Smooth Rock Falls	1,200	45	26.7	1.7
Township of Val Rita-Harty	757	90	8.4	0.5
Township of Black River- Matheson	2,572	80	32.2	2.1
Taykwa Tagamou First Nation	130	60	2.2	0.1
To/From the South	41,667	-	1,180.8	76.5
City of Timmins	41,145	35	1,175.6	76.2
Mattagami First Nation (2023)	43	95	0.5	0.0
Matachewan First Nation (2023)	66	135	0.5	0.0
Apitipi Anicinapek Nation	155	100	1.6	0.1
Flying Post First Nation (2023)	258	95	2.7	0.2
TOTAL	65,815	-	1,543.7	100

Using the generated employment propensity index in Table 3.3 above, approximately 76.5% of site-generated trips were assigned to communities south of the Project, and the remaining 23.5% were assigned to communities north of the Project. The results are presented in Table 3.4.

Table 3.4 Project Vehicle Trip Distribution

Modes	To/From North of the Site	To/From South of the Site	Total
Car	4	12	16
Bus	1	4	5
Total	5	16	21

The Local Labour Market Forecast, 2016-2036, published by the Far Northeast Training Board (2018), was used to validate the Project trip distribution estimate; local labour force values in 2016, by National Occupational Classification (NOC) categories and by Community Futures Development Corporation (CFDC) area, were extracted from this document. The distribution of CFDC area is presented in Figure 3.1. Table 3.5 illustrates the breakdown of labour force for NOC 8, Natural Resources, Agriculture and Related Production Occupations, in relevant CFDC areas.

The labour force distribution between the two relevant CFDC areas – 76.8% from Venture Centre and 23.2% from North Claybelt – aligns with the results from the estimates via employment propensity index, and validates the Project trip distribution outlined in Table 3.4.

Figure 3.1 Distribution of CFDC Areas

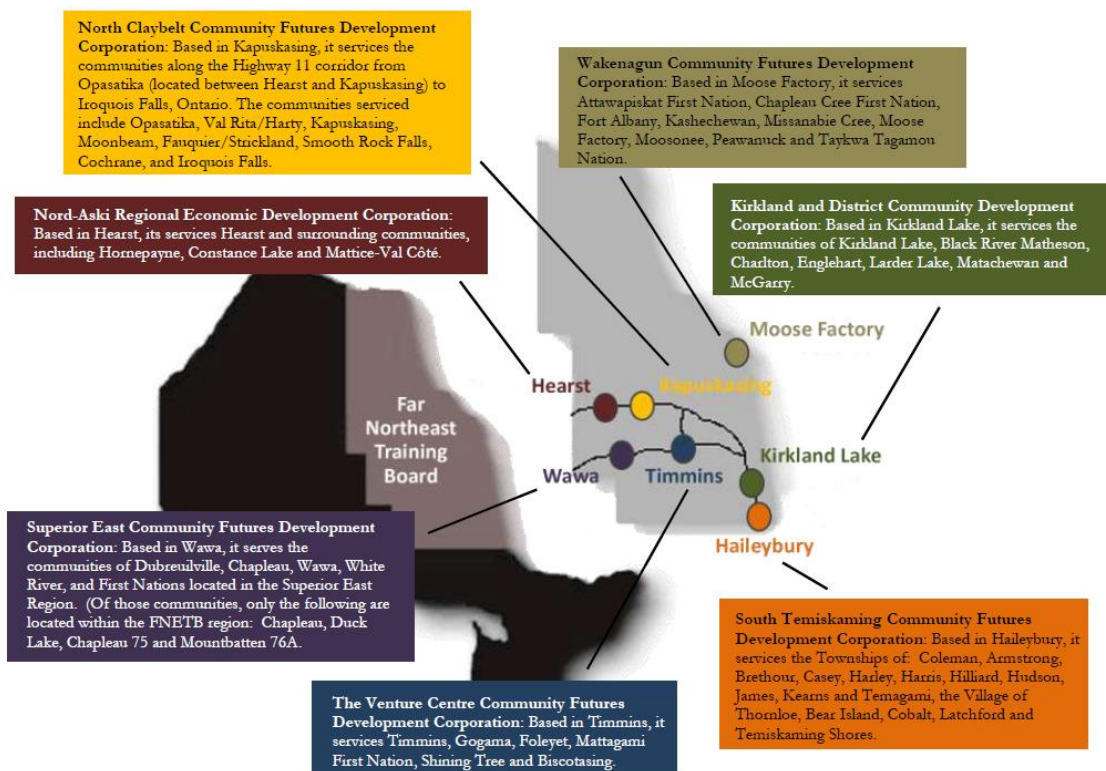


Table 3.5 Local Labour Force for NOC 8, by CFDC Area, in 2016

CFDC Area	Total	Distribution
Venture Centre	1,790	76.8%
North Claybelt	540	23.2%
Source: Far Northeast Training Board 2018		

4 Traffic Operations Analysis

4.1 Methodology

The traffic operations analysis for the PA intersections was conducted for inbound and outbound peak hours. The existing and future scenario traffic volumes, and the existing and future scenario planned road layouts were used as the main inputs to the analysis.

The operation of the PA intersections was evaluated in terms of level of service (LOS) and volume to capacity (v/c) as defined by the Highway Capacity Manual (HCM). The 95th percentile queue lengths at intersection movements were also evaluated as compared to the available turning lane storage capacity.

LOS is evaluated based on average control delay per vehicle and includes deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Capacity is evaluated in terms of ratio of demand flow to capacity with an at-capacity condition represented by a v/c ratio of 1.00 (i.e. volume demand equals capacity). The LOS criteria are defined in Table 4.1.

Table 4.1 Level of Service Criteria

LOS	Delay (seconds/vehicle)	
	Signalized Intersection	Unsignalized Intersection
A	≤10s	≤10s
B	>10s and ≤20s	>10s and ≤15s
C	>20s and ≤35s	>15s and ≤25s
D	>35s and ≤55s	>25s and ≤35s
E	>55s and ≤80s	>35s and ≤50s
F	>80s	>50s

To assess the traffic conditions for existing and future scenarios, a LOS analysis was undertaken for the PA intersections using Trafficware’s Synchro 11 Software and the HCM 2000 methodology. The key parameters used in the analysis include:

- Heavy vehicle percentage of 22.3% for Highway 655 through movements, as provided by MTO and presented in Table 2.1. For site access movements, heavy vehicle percentage of 28.4%, as generated by the distribution between car and bus trips described in Section 2.4
- Default peak hour factor of 0.92
- Ideal saturation flow rate of 1,900 vehicles per hour per lane
- Synchro default values for all other inputs

Critical movements were identified if one or more of the following criteria is satisfied:

- v/c ratio over 0.85 for through movements, shared through/turning movements, or exclusive turning movements in signalized intersections (based on MTO's General Guidelines for the Preparation of Traffic Impact Studies [MTO 2023b])
- 95th percentile queue length exceeds the storage lane capacity

4.2 Existing Conditions Scenario

As discussed in Section 2.3, the traffic volumes for the existing Lower Surgeon Dam Road are negligible, and therefore traffic operations analysis is not applicable for the existing conditions scenario.

4.3 Build-out Scenario (2028)

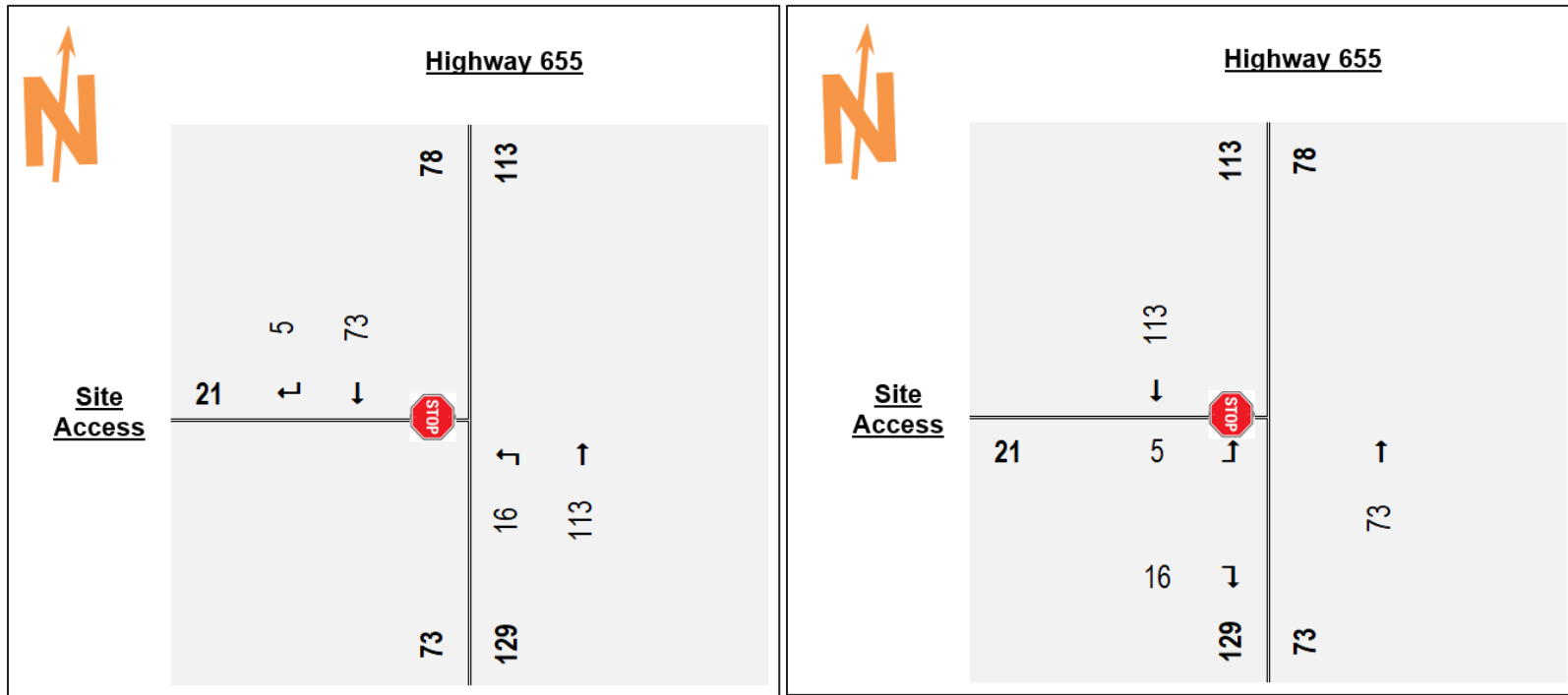
The realignment of Highway 655 is proposed to be completed in the year 2030. At the build-out horizon (i.e., the end of the construction phase), the site will be accessed through the existing Lower Sturgeon Dam Road, with stop control at the minor approach.

The roadway lane configuration and intersection control type under this scenario is illustrated in Figure 2.2. No adjustment to the road configuration, and intersection control is applied in this scenario.

4.3.1 Traffic Volume

The traffic volume distributions for this scenario were generated for the inbound and outbound peak hours in the 2028 study horizon year. The volume distributions are illustrated in Figure 4.1.

Figure 4.1 Build-out Scenario (2028) Weekday Inbound (Left) and Outbound (Right) Peak Hour Traffic Volumes



4.3.2 Traffic Operations Analysis

The intersection of Highway 655 and Lower Sturgeon Dam Road was analyzed during the inbound and outbound peak hours for the build-out scenario (2028).

The results of the HCM intersection capacity analysis (ICA) for the unsignalized study area intersection is presented in Table 4.2. Synchro outputs for this scenario is included in Appendix B.

The unsignalized 3-legged intersection of Highway 655 and the site access is anticipated to operate well, with each movement performing at LOS A during the inbound and outbound peak hours.

Table 4.2 ICA Results (Build-out Scenario, 2028)

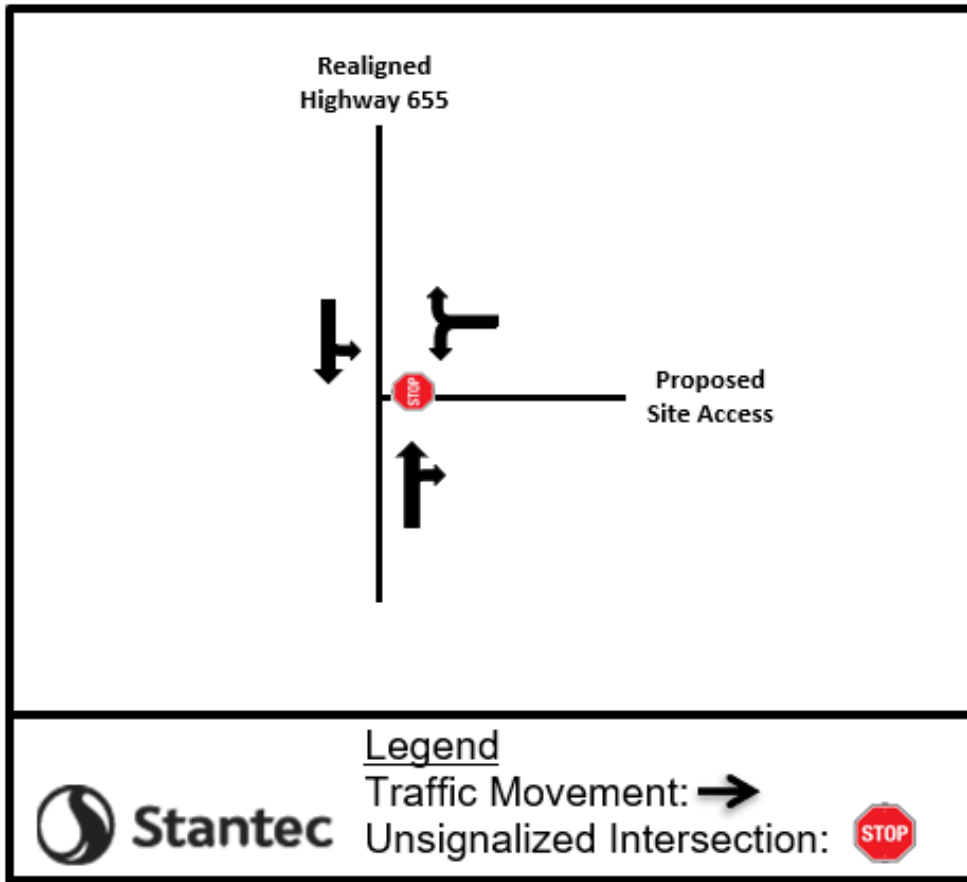
Intersection	Intersection Delay (s)	Lane	LOS	Delay (s)	v/c Ratio	95th % Percentile Queue (m)
Inbound Peak Hour						
Highway 655 & Site Access	0.6	EBLR	A	0.0	0.00	0
		NBTR	A	1.0	0.01	0
Outbound Peak Hour						
Highway 655 & Site Access	0.9	EBLR	A	9.5	0.03	1

4.4 Build-out + 5 Years Scenario (2033)

For the build-out + 5 Years Scenario (2033) it is assumed that the site will be accessed through a proposed 3-legged intersection of the realigned Highway 655 and the new site access, with stop control at the minor approach.

The new roadway lane configuration and intersection control type is illustrated in Figure 4.2.

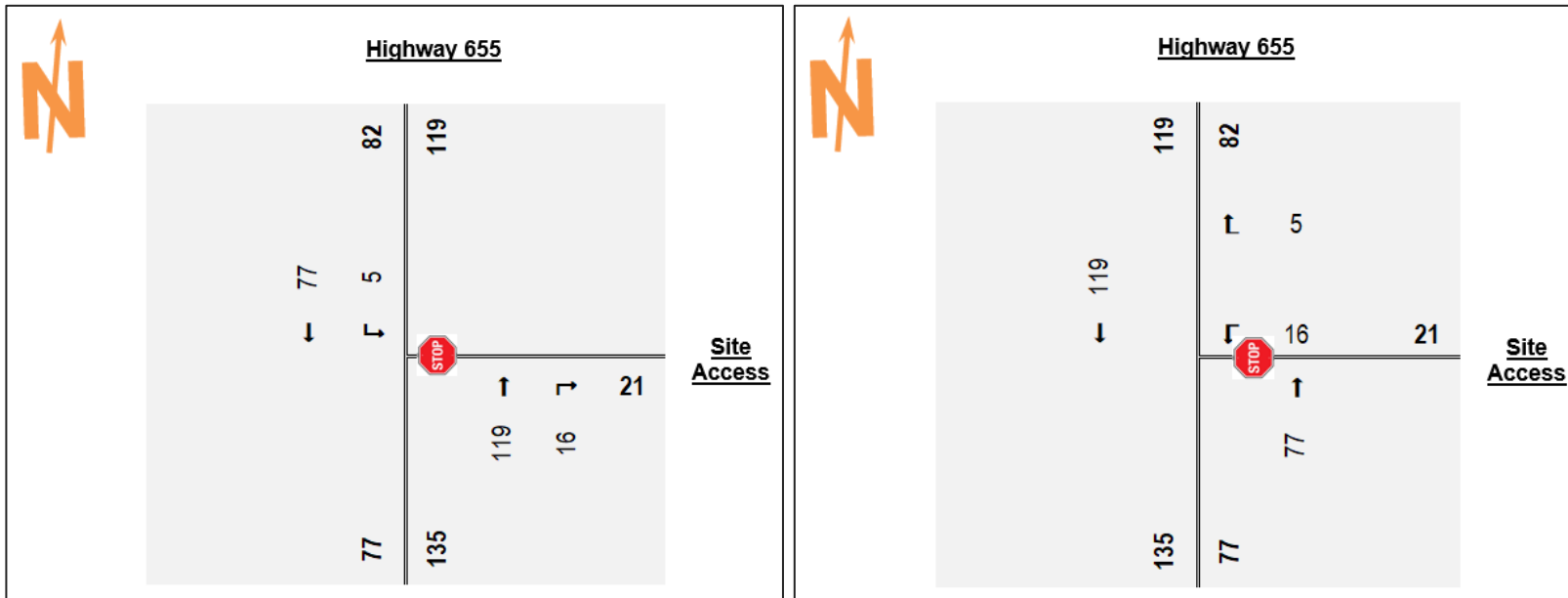
Figure 4.2 Proposed Lane Configuration and Intersection Control



4.4.1 Traffic Volume

The traffic volume distributions for this scenario were generated for the inbound and outbound peak hours in the 2033 study horizon year. The volume distributions are illustrated in Figure 4.3.

Figure 4.3 Build-out + 5 Years Scenario (2033) – Weekday Inbound (Left) and Outbound (Right) Peak Hour Traffic Volumes



4.4.2 Traffic Operations Analysis

The study intersection was analyzed during the inbound and outbound peak hours for the Build-out + 5 Years scenario (2033).

The results of the HCM ICA for the unsignalized study area intersection is presented in Table 4.3. Synchro outputs for this scenario is included in Appendix C.

The unsignalized 3-legged intersection of the realigned Highway 655 and the proposed site access is anticipated to operate well, with each movement performing at LOS A during the inbound and outbound peak hours.

Table 4.3 ICA Results (Build-out + 5 years Scenario, 2033)

Intersection	Intersection Delay (s)	Lane	LOS	Delay (s)	v/c Ratio	95th % Percentile Queue (m)
Inbound Peak Hour						
Realigned Highway 655 & New Site Access	0.2	WBLR	A	0.0	0.00	0
		SBLT	A	0.5	0.00	0
Outbound Peak Hour						
Realigned Highway 655 & New Site Access	0.9	WBLR	A	9.9	0.03	1

4.5 Build-out + 10 Years Scenario (2038)

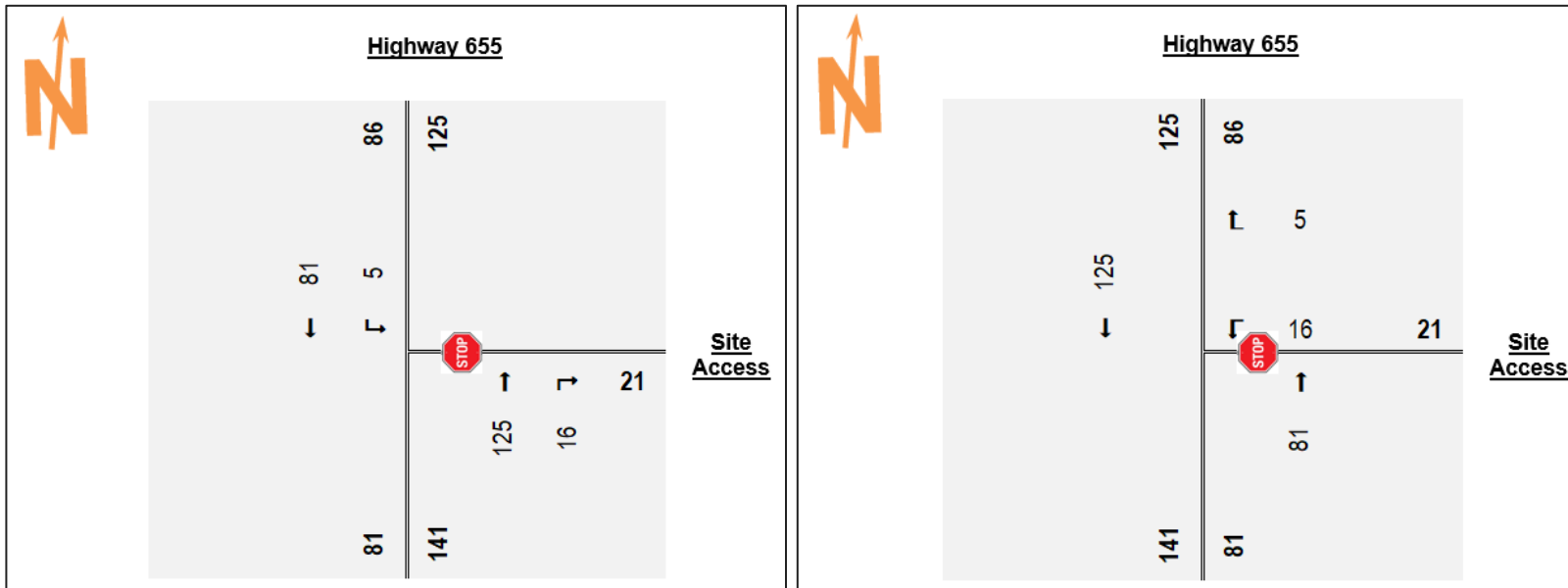
For the build-out + 10 Years Scenario (2038) it was assumed that the site will be accessed through a proposed 3-legged intersection of the realigned Highway 655 and the new site access, with stop control at the minor approach (i.e., the same access as during the Build-out + 5 Years Scenario).

The roadway lane configuration and intersection control type is illustrated in Figure 4.2.

4.5.1 Traffic Volume

The traffic volume distributions for this scenario were generated for the inbound and outbound peak hours in the 2038 study horizon year. The volume distributions are illustrated in Figure 4.4.

Figure 4.4 Build-out + 10 Year Scenario (2038) – Weekday Inbound (Left) and Outbound (Right) Peak Hour Traffic Volumes



4.5.2 Traffic Operations Analysis

The study intersection was analyzed during the inbound and outbound peak hours for the Build-out + 10 Years scenario (2038).

The results of the HCM ICA for the unsignalized study area intersection is presented in Table 4.4. Synchro outputs for this scenario is included in Appendix D.

The unsignalized 3-legged intersection of the realigned Highway 655 and the site access is anticipated to operate within capacity with each movement performing at LOS A the inbound and outbound peak hours.

Table 4.4 ICA Results (Build-out + 10 Year Scenario, 2038)

Intersection	Intersection Delay (s)	Lane	LOS	Delay (s)	v/c Ratio	95th % Percentile Queue (m)
Inbound Peak Hour						
Realigned Highway 655 & New Site Access	0.2	WBLR	A	0.0	0.04	0
		SBLT	A	0.5	0.00	0
Outbound Peak Hour						
Realigned Highway 655 & New Site Access	0.9	WBLR	A	10.0	0.03	1

5 Sightline Analysis

A desktop review was performed by utilizing Google's aerial site imagery and Street View feature to identify sightline deficiencies in the vicinity of the existing site access (Lower Sturgeon Dam Road) and the proposed Project access intersections. Using equation 9.9.1 of the Transportation Association of Canada's (TAC) Geometric Design Guide for Canadian Roads (TAC 2017), Chapter 9 – Intersections, the following was used to calculate intersection sight distance (ISD):

$$ISD = 0.278 V_{Major} t_g$$

Where:

ISD is the intersection required sight distance in metres;

V_{Major} is the major roadway's design speed in km/h; and

t_g is the minor roadway time gap in seconds.

The intersection sight distance was calculated using the following parameters:

- 110 km/h design speed for Highway 655
- A time gap of 11.5 seconds for left turns from a stop and 10.5 seconds for right turns from a stop was utilized to represent a worst-case scenario of a combination truck attempting to perform a turning maneuver from the site access
- A time gap of 7.5 seconds for left turns from Highway 655 into the site access

The calculation results are summarized in Table 5.1. Based on TAC Section 9.9.2.3, the applicable cases are as follows:

- Case B1 – left turn movement from the minor road
- Case B2 – right turn movement from the minor road
- Case F – left turn movement from the major road

Table 5.1 ISD Calculation Results for Combination Trucks

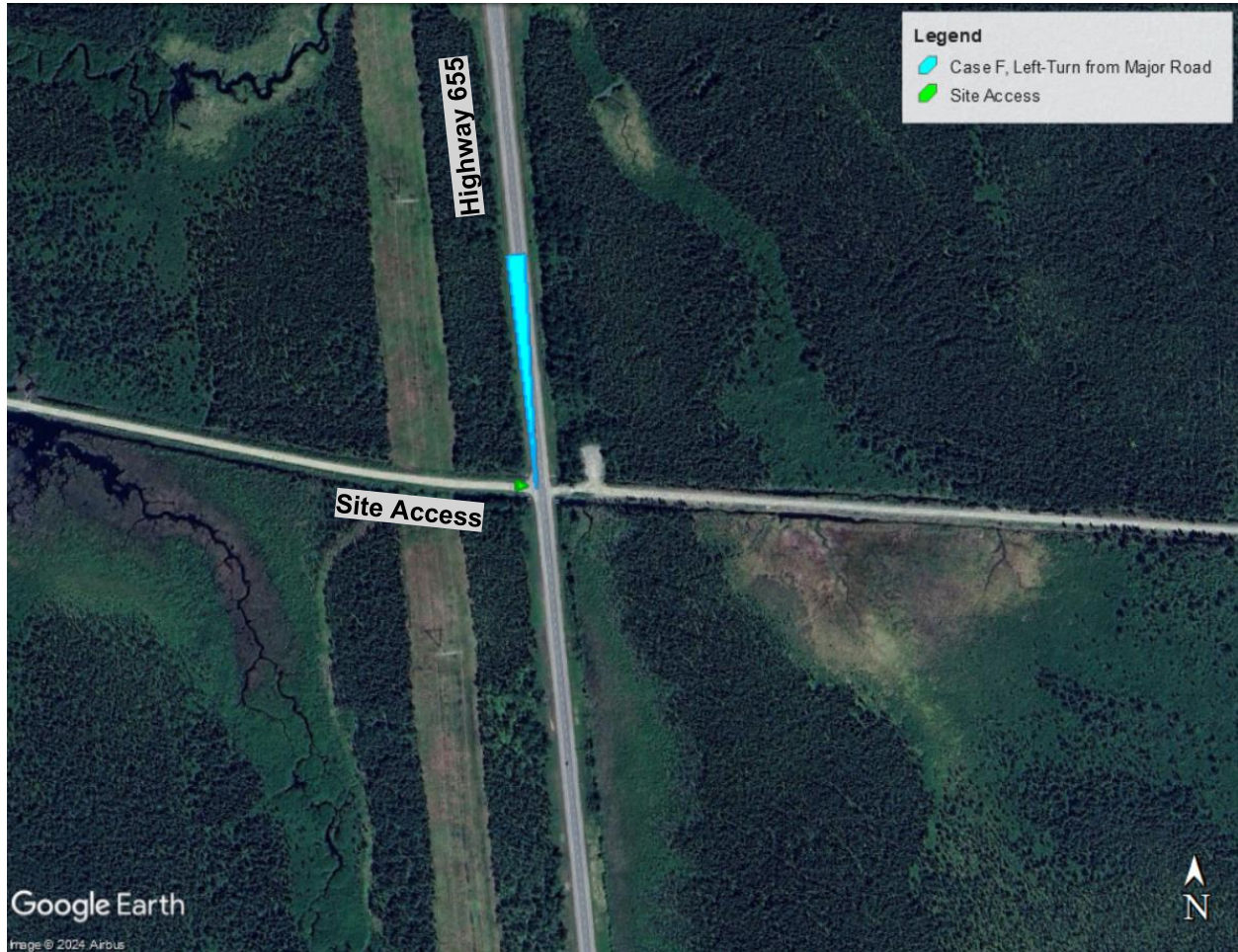
Intersection	Case	Design Speed (km/h)	Stopping Sight Distance (m)	Required Intersection Sight Distance (m)	Available Sight Distance
Highway 655 and Existing Project Access (stop sign on the minor road)	B1	110	220	350	>400m
	B2	110	220	320	>400m
	F	110	220	230	>400m
Highway 655 and New Project Access (stop sign on the minor road)	B1	110	220	350	N/A
	B2	110	220	320	N/A
	F	110	220	230	N/A

Figure 5.1 illustrates the sight distance requirements for left/right turns out of the existing site access. Figure 5.2 illustrates the sight distance requirements for left turns into the existing Project access.

Figure 5.1 Intersection Sight Distance Requirements for Left/Right Turns Out of the Existing Project Access



Figure 5.2 Intersection Sight Distance Requirements for Left/Right Turns Out of the Existing Project Access



According to the existing aerial map, the required sight distance is available looking north and south of Lower Sturgeon Dam Road along Highway 655. The Street View imagery from those perspectives, shown on Figure 5.3 and Figure 5.4, were also reviewed to confirm there are no vertical profile sight constraints.

Figure 5.3 Street View along Highway 655 Looking North from Lower Sturgeon Dam Road



Figure 5.4 Street View along Highway 655 Looking South from Lower Sturgeon Dam Road



Crawford Nickel Project: Traffic Impact Study

5 Sightline Analysis

September 30, 2024

In the study horizon years of 2033 (build-out + 5 years) and 2038 (build-out + 10 years) where Highway 655 is to be realigned, the precise location of the new Project access has not been confirmed and therefore cannot be verified. Instead, the required sight distance for the proposed new site access is summarized in Table 5.1.

In addition to intersection sight distance requirements, stopping sight distances were also evaluated to determine whether approaching vehicles along the major roadway have sufficient sight distance to perceive a conflict and decelerate to a stop in order to avoid a collision. Stopping sight distance is the sum of the distance travelled during the perception and reaction time, and the braking distance. To determine the minimum stopping sight distance relative to the design speed, TAC Table 2.5.2 is used. For a design speed of 110 km/h, the safe stopping distance requirement is 220 m, which was determined to be available.

6 Conclusions

The key findings of this Traffic Impact Study include:

- Five site generated trips were assigned to come from/head towards communities north of the Project, and 16 site generated trips were assigned to come from/head towards communities south of the Project.
- In the Project build-out scenario (2028), the intersection of Highway 655 and existing Project access is expected to operate with LOS A and within capacity.
- In the build-out + 5 years (2033) scenario and build-out + 10 years (2038) scenario, the intersection of the realigned Highway 655 and the new Project access is also expected to operate with LOS A and within capacity.
- The sightline for the existing Project access is adequate according to the TAC intersection sight distance and stopping sight distance guidelines. As the precise location of the proposed new Project access has not been confirmed, the sightline for the proposed new Project access cannot yet be evaluated.

7 References

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
TAC (Transportation Association of Canada). 2017. Geometric Design Guide for Canadian Roads, Chapter 9 – Intersections.

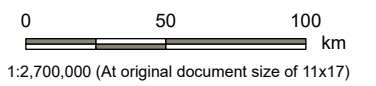
Appendices

Appendix A Figures



Legend

-  Project Location
-  Major Road
-  Waterbody



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 17N
 2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.



Project Location: Timmins, Ontario
Prepared by: tcoghlan on 2024-09-10
REVA

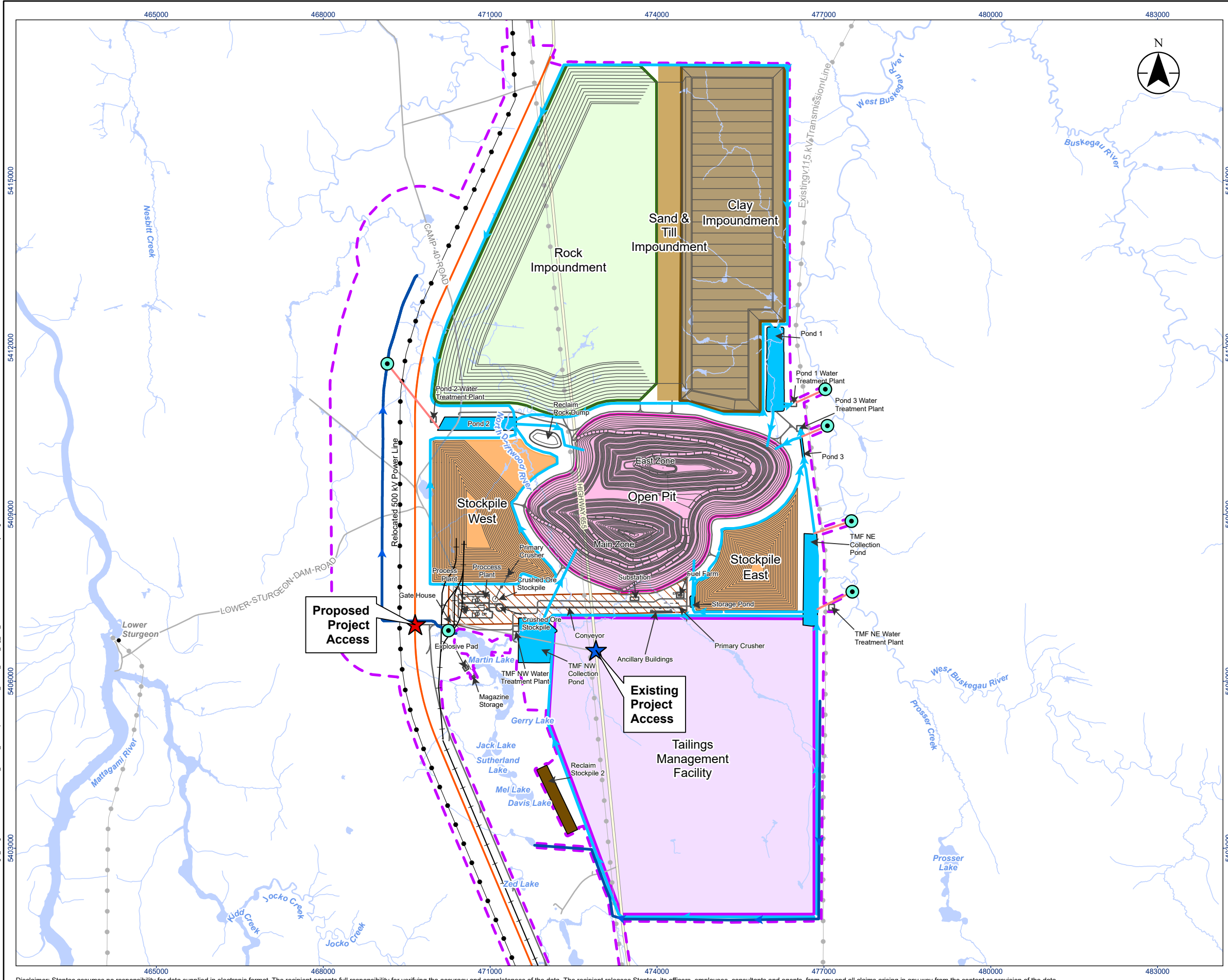
Client/Project: Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.: **A.1**

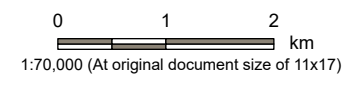
Title: **Project Location**

\\s11004-10101099active\16090456\16090456\gis_cad\gis\mxd\16090456\IS-TDR_Traffic\Fig_A.1_ProjLoc_Revision_2024-09-10_By:tcoghlan

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- Legend**
- Project Area:** Dashed purple line
 - Existing Project Access:** Blue star
 - Proposed Project Access:** Red star
 - Base Features:**
 - Existing Major Road: Solid grey line
 - Existing Minor Road: Dashed grey line
 - Existing Transmission Line: Dotted grey line
 - Watercourse: Blue line
 - Waterbody: Blue area
 - Anicilliary Infrastructure:**
 - Relocated Hwy 656: Solid orange line
 - Rail Spur Line: Solid black line with cross-ticks
 - Transmission Line: Dotted black line
 - Proposed Project Components:**
 - Discharge Route: Solid red line
 - Non-Contact Water Channel: Blue line with arrow
 - Contact Water Channel: Blue line with arrow and blue fill
 - Site Road: Solid black line
 - Discharge Location: Green circle with dot
 - Ore Stockpile: Orange area
 - Open Pit: Pink area
 - Clay Impoundment: Brown area
 - Pond: Blue area
 - Tailings Management Facility: Purple area
 - Rock Impoundment: Green area
 - Reclaim Stockpile: Brown area
 - Sand & Till Impoundment: Brown area
 - Process Plant Area: Hatched area



- Notes**
- Coordinate System: NAD 1983 UTM Zone 17N
 - Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.
 - The Project Components and baseline information on this figure are considered preliminary and may be further refined through the development of the Impact Statement based on feedback received from agencies, Indigenous peoples, the public, and project stakeholders.



Project Location: Timmins, Ontario
 160930456 REVA
 Prepared by toghlan on 2024-09-10

Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No.: **A.2**
 Title: **Project Site Plan and Study Intersections**

V:\1004-10\1009\active\160930456\gis_cad\gis\mxd\160930456\IS-TDR_Traffic_Fig_A.2_SitePlan
 Revised: 2024-09-10 By: toghlan

Appendix B Synchro Outputs – Build-Out Scenario (2028)

HCM Unsignalized Intersection Capacity Analysis
 1: Highway 655 & Site Access

B.O. (2028) - Inbound Peak Hour
 Crawford Nickel Project



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	16	113	73	5
Future Volume (Veh/h)	0	0	16	113	73	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	17	123	79	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	238	82	84			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	238	82	84			
tC, single (s)	6.7	6.5	4.4			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.5			
p0 queue free %	100	100	99			
cM capacity (veh/h)	687	911	1364			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	0	140	84			
Volume Left	0	17	0			
Volume Right	0	0	5			
cSH	1700	1364	1700			
Volume to Capacity	0.00	0.01	0.05			
Queue Length 95th (m)	0.0	0.3	0.0			
Control Delay (s)	0.0	1.0	0.0			
Lane LOS	A	A				
Approach Delay (s)	0.0	1.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			16.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Highway 655 & Site Access

B.O. (2028) - Outbound Peak Hour
 Crawford Nickel Project



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	16	0	73	113	0
Future Volume (Veh/h)	5	16	0	73	113	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	17	0	79	123	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	202	123	123			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	202	123	123			
tC, single (s)	6.7	6.5	4.4			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.5			
p0 queue free %	99	98	100			
cM capacity (veh/h)	731	863	1318			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	22	79	123			
Volume Left	5	0	0			
Volume Right	17	0	0			
cSH	829	1318	1700			
Volume to Capacity	0.03	0.00	0.07			
Queue Length 95th (m)	0.6	0.0	0.0			
Control Delay (s)	9.5	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.5	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			15.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Appendix C Synchro Outputs – Build-Out + 5 years (2033)

HCM Unsignalized Intersection Capacity Analysis B.O. + 5 Years (2033) - Inbound Peak Hour
 1: Re-aligned Highway 655 & New Site Access Crawford Nickel Project



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	119	16	5	77
Future Volume (Veh/h)	0	0	119	16	5	77
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	129	17	5	84
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	232	138			146	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	232	138			146	
tC, single (s)	6.7	6.5			4.4	
tC, 2 stage (s)						
tF (s)	3.8	3.6			2.5	
p0 queue free %	100	100			100	
cM capacity (veh/h)	700	846			1291	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	0	146	89			
Volume Left	0	0	5			
Volume Right	0	17	0			
cSH	1700	1700	1291			
Volume to Capacity	0.04	0.09	0.00			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	0.5			
Lane LOS	A		A			
Approach Delay (s)	0.0	0.0	0.5			
Approach LOS	A					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			11.5%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Re-aligned Highway 655 & New Site Access

08/12/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	16	5	77	0	0	119
Future Volume (Veh/h)	16	5	77	0	0	119
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	5	84	0	0	129
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	213	84			84	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	213	84			84	
tC, single (s)	6.7	6.5			4.4	
tC, 2 stage (s)						
tF (s)	3.8	3.6			2.5	
p0 queue free %	98	99			100	
cM capacity (veh/h)	721	908			1364	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	22	84	129			
Volume Left	17	0	0			
Volume Right	5	0	0			
cSH	756	1700	1364			
Volume to Capacity	0.03	0.05	0.00			
Queue Length 95th (m)	0.7	0.0	0.0			
Control Delay (s)	9.9	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.9	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			16.3%	ICU Level of Service	A	
Analysis Period (min)			15			

Appendix D Synchro Outputs – Build-Out +10 years (2038)

HCM Unsignalized Intersection Capacity Analysis B.O. + 10 Years (2038) - Inbound Peak Hour
 1: Re-aligned Highway 655 & New Site Access Crawford Nickel Project



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	125	16	5	81
Future Volume (Veh/h)	0	0	125	16	5	81
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	136	17	5	88
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	242	144			153	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	242	144			153	
tC, single (s)	6.7	6.5			4.4	
tC, 2 stage (s)						
tF (s)	3.8	3.6			2.5	
p0 queue free %	100	100			100	
cM capacity (veh/h)	690	838			1283	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	0	153	93			
Volume Left	0	0	5			
Volume Right	0	17	0			
cSH	1700	1700	1283			
Volume to Capacity	0.00	0.09	0.00			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	0.5			
Lane LOS	A		A			
Approach Delay (s)	0.0	0.0	0.5			
Approach LOS	A					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			11.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis B.O. + 10 Years (2038) - Outbound Peak Hour
 1: Re-aligned Highway 655 & New Site Access Crawford Nickel Project



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	16	5	81	0	0	125
Future Volume (Veh/h)	16	5	81	0	0	125
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	5	88	0	0	136
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	224	88			88	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	224	88			88	
tC, single (s)	6.7	6.5			4.4	
tC, 2 stage (s)						
tF (s)	3.8	3.6			2.5	
p0 queue free %	98	99			100	
cM capacity (veh/h)	710	903			1359	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	22	88	136			
Volume Left	17	0	0			
Volume Right	5	0	0			
cSH	746	1700	1359			
Volume to Capacity	0.03	0.05	0.00			
Queue Length 95th (m)	0.7	0.0	0.0			
Control Delay (s)	10.0	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	10.0	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			16.6%	ICU Level of Service	A	
Analysis Period (min)			15			