Rockridge Quarry

110 County Road 507

County of Peterborough

Municipality of Trent Lakes, Ontario

Traffic Impact Study

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Prepared for:
2329059 Ontario Inc.

March, 2017

March 3, 2017

2329059 Ontario Inc.
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Dear Sir:

RE: Traffic Impact Study Report for the proposed Rockridge Quarry To Be Located at 110 Peterborough County Road 507, Municipality of Trent Lakes, County of Peterborough

Tranplan Associates is pleased to present this Traffic Study Report in support of the development of the proposed *Rockridge Quarry* to be located at 110 Peterborough County Road 507 in the Municipality of Trent Lakes, Ontario. This study has been prepared to evaluate the potential traffic impacts of the new quarry on adjacent roads and intersections. The traffic assessment has been based on a quarry annual peak extraction rate of 1.5 million tonnes per year.

The traffic study evaluated two development options; all quarry production shipped via a north entrance to County Road (CR) 507 and all quarry production shipped via a south entrance to CR 36. The study analyses determined that future site traffic utilizing either site entrance option will have an acceptable impact on adjacent roads and intersections. There will be residual capacity on these roads to accommodate future growth in both site and background traffic. The proposed two site entrance options will have sufficient "sight distance" to provide for safe entry and exit from the new quarry. There will be no specific requirement for new road infrastructure improvements to support this development.

Tranplan Associates is pleased to have had the opportunity to work with your study team to prepare this traffic report in support of the proposed *Rockridge Quarry*. If you should require any further information on the study analyses or reporting, please contact me at your convenience

Yours truly,

REGISTERED PROFESSIONAL ENGINEER
W. J. COPELAND
PROVINCE OF ONTARIO

William Copeland, P.Eng.

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1. INTRODUCTION

1.1 Background

Tranplan Associates is pleased to present the results of a traffic impact study prepared as part of the planning approval process for the proposed *Rockridge Quarry.* The quarry will be located on Lot 21, Concession 8 in the former Township of Harvey now part of the *Municipality of Trent Lakes* (see *Exhibit 1 - Key Map* following report text). The study site with the layout of the quarry operations and the two site entrance options are illustrated in *Exhibit 2 – Preliminary Site Plan*. Additional details of the study site and the surrounding area are described in related planning documentation that is being submitted with this licence application. This report has been prepared for the approving agencies that will include the *Municipality of Trent Lakes*, the *County of Peterborough* and the *Ministry of Natural Resources and Forestry* (MNRF).

The present license application for the *Rockridge Quarry* is for a *Category 4 - Class A License* for *Extraction Above The Water Table*. The applicant is choosing to self-impose a maximum annual tonnage limit of 1.5 million tonnes. The actual extraction rate will depend on market demand during any given year. The traffic study examined two potential options for access to the quarry. The first, a north access option that would provide direct access to County Road (CR) 507 just north the intersection with CR 36 at Flynn's Corners. The second option would be a direct access to CR 36 south of the intersection of CR 36 and CR 507. Each access option will provide direct access to a County Road. The present locations of the two access options are illustrated in *Exhibit 3 – Site Access Options*. It is noted that access to the quarry will not require the use of local Township roads as part of a quarry haul route. Future site traffic will the travel via the County Road network to deliver product. Some of this traffic will connect to the Provincial Highway network including Highway 28 and Highway 7. The focus of this traffic study is the evaluation of the two entrance options and the impact of future site traffic on the adjacent CR 36/CR 507 intersection.

Four site visits were carried out to examine the study site and review/assess each of the site entrance options. The visits also included a review of the CR 36/CR 507 intersection. Data was collected on sight lines, existing geometrics and current traffic operations. A set of 2016 traffic turning movement (TM) volumes were collected at the CR 36/CR 507 intersection for representative weekday AM and PM peak hour periods. One of the site visits included a tour with the proponent of the site entrance options and the existing *Stonescape* quarry operation.

To allow time for planning approvals and full development of the quarry's future market, a 10 year planning horizon to 2026 was selected for the traffic analyses. The traffic analyses have assessed the impact of site development for each site entrance option and the traffic impacts on the CR 36/CR 507 intersection for each option. Intersection capacity analyses and auxiliary lane warrant analyses were also carried out to assess the need for auxiliary lanes and adjacent road improvements.

1.2 Principal Findings

The principal findings derived from the study analyses and site visits include:

- The present (2016) access routes and the CR 36/CR 507 intersection operate at a good Level of Service[1] (LoS) with considerable residual capacity to allow for future growth in traffic.
- The future *Rockridge Quarry* is forecast to generate a total of 87 peak hour trips at full production. During the PM peak hour this will be comprised of 34 inbound trips and 53 outbound trips from the quarry site.
- During 2026 summer weekday peak hour periods, the site entrances, the access routes and the study intersection will have the capacity to accommodate future forecast site and background traffic. They will continue to operate at good LoS for either site entrance option.
- There will be considerable amounts of residual capacity for future growth in traffic beyond the 2026 planning horizon.
- Available sight distances at the two site entrance options for the new quarry meet/exceed current County standards.
- The selected site entrance should be constructed to meet current County standards. The Ministry of Transportation Ontario (MTO) commercial site entrance design *CSAS-23 Truck Access* can be used as a guide for the design of the selected entrance.
- Based on Ministry of Transportation (MTO) criteria, no auxiliary turning lanes will be required for either of the two site entrance options. No left turn lane warrants are met at these entrances.
- Truck entrance related signage should be posted/installed at appropriate locations along the access route to the selected site entrance.

The following sections of the study report detail the field observations, the traffic forecasts and the study analyses in support of the study conclusions and recommendations as summarized above.

[1] See *Technical Appendix - Intersection Capacity Analyses* for definitions of Levels of Service.

2. EXISTING CONDITIONS

This Section describes the roadway network, traffic volumes, operational analysis results and other notable characteristics under the baseline conditions.

2.1 The Study Site

The immediate study area lies along the east side of the CR 36/CR 507 corridor at Flynn's Corners in the *Municipality of Trent Lakes* as illustrated in *Exhibit 4 – Site Context*. The study site is located on Lot 21, Concession 8 in the geographic Township of Harvey now part of the *Municipality of Trent Lakes*. The site is presently a "green-field" site. At one time it appears to have supported some limited agricultural uses. However such uses are no longer active. Present development on the site includes a rural residence on a lot at the north end of the site fronting on CR 507 and a cell phone tower with a related maintenance building. Remaining portions of the site are a mix of wooded areas and wetlands.

Further background information on the study site will be included in related planning documentation that will be submitted to the approving agencies for the necessary site development planning approvals.

2.2 Adjacent Land Use

Lands to the north and east of the study site along the CR 36 corridor are a mix of wetlands and wood lots with a scattering or rural residences and recreational properties. Most lands surrounding the study site are undeveloped. There is some limited agricultural use but most of the adjacent areas are a mix of grass lands, wooded areas and wetlands characteristic of this part of Peterborough County. There are some rural residences located along both the CR 36 and CR 507 corridors. The hamlet of Buckhorn lies about 10 km south of the site on the CR 36 corridor.

Development immediately adjacent to the study site includes *Flynn's Store* now an *Ultramar Gas Station* with convenience store. The gas station is located immediately across from the study site on CR 507. There are four active quarries in the vicinity of the study site. Additional details on these quarries is included in *Section 2.3* following.

2.3 Adjacent Quarries

There are five licensed quarries in the immediate vicinity of the study site. Four of them are presently active. Their relative location with respect to the study site is illustrated in a sketch included in the *Technical Appendix – Adjacent Quarries*. Each of the quarries has direct access to CR 36. The quarries and their annual licensed capacity is summarized following:

- Stonescape – 1.5 million tonnes
- Dufferin – 1.0 million tonnes and aggregate permit for 1.0 million tonnes
- Pluard 1 – 20,000 tonnes
- Pluard 2 – unlimited
- Ormell – 400,000 tonnes
- Milkhouse – future extraction of 1.5 million tonnes

The *Stonescape* quarry is located along the south boundary of the study site east of CR 36 as illustrated in *Exhibit 4.* It ships construction aggregate as well as finished and dimension stone for landscaping and shoreline reclamation. *Dufferin Aggregates* has an active quarry/pit operation located south of the *Stonescape* quarry on the east side of CR 36. A third active quarry is licenced to *Ormell Sand and Gravel Ltd.* It is located opposite the *Dufferin Aggregates* quarry on the west side of CR 36. Based on information supplied by the proponent this pit/quarry appears to be nearing completion. The fourth quarry, *Pluard and Sons Quarry Ltd.* is located about 1 km west of the CR 36/CR507 intersection on the north side of CR 36. All four quarries have direct access to CR 36. Traffic from all these quarries that were active at the time of the study field program is included in the traffic count data collected by the study team. The fifth quarry *Milkhouse Quarry* is not presently active. While it can be activated at any time, it is presently a reserve for the future extraction of construction aggregate and dimension stone.

2.4 Access to the Study Site

2.4.1 Overview

There are a number of existing and potential entrances to the study site. These include access from CR 507 to an admin building and old farm house at the north end of the site as well as other site access points to CR 507. These entrances could provide access for some future site traffic. In addition, some of the future product from the *Rockridge* quarry could be sent via internal site access roads to the manufacturing area on the *Stonescape* quarry site. Some of the resulting product from the *Rockridge* quarry would then be shipped out of the present *Stonescape* quarry entrance to CR 36. For the purposes of this traffic study, two site access options were developed for traffic analyses. As a worst case scenario, the traffic analyses assumed that all *Rockridge* site traffic will access the quarry via one of these two site entrance options.

The first access option is a north entrance option that will providing direct access to CR 507. The second entrance option is a south entrance providing direct access to CR 36. Both entrance options are illustrated on *Exhibit 3 – Site Access Options*. With either option, the site will have direct access to a County Road for shipping product from the new quarry. No local roads will be required or used for quarry deliveries other than deliveries to specific local destinations.

2.4.2 Peterborough County Road 36

The South Entrance option will provide direct access to the study site via CR 36. CR 36, formerly the Kings Highway 36 it is now under the jurisdiction of the *County of Peterborough*. CR 36 will provide the study site with both local and regional access as illustrated in *Exhibit 1*. CR 36 carries local commuter and commercial traffic travelling through this part of County. CR 36 also carries local recreational traffic and traffic from the GTA accessing recreational properties located in this portion of the Kawartha Lakes as well other lakes in the north-central part of the County.

To the south, CR 36 runs easterly from the Hamlet of Buckhorn to connect to Highway 28 about 11 km east of Buckhorn. This corridor provides access to Highway 28 corridor and its linkages to Burleigh Falls, Young's Point and recreational areas in the eastern Kawartha Lakes. To the west CR

36 provides connectivity to the Town of Bobcaygeon and the eastern areas of the City of Kawartha Lakes.

In the vicinity of the study site CR 36 has a two lane rural open ditch cross-section with a 7.0 m asphalt platform with 2.7-3.0 m gravel shoulders. Adjacent to the study site it has a posted speed of 80 kph.

2.4.3 Peterborough County Road 507

The North Entrance option will have direct access to CR 507. This road was formerly under the jurisdiction of the MTO as Highway 507. The road is now part of the County of Peterborough road network. CR 507 runs north from CR 36 (Flynn's Corner) for about 40 km to the hamlet of Gooderham where it connects to Haliburton CR 503. CR 507 carries traffic between CR 36 and CR 503. This traffic is a mix of local, recreational and commercial traffic. It also provides direct access to local rural residences, cottages and recreational homes on the lakes along the corridor.

In the immediate vicinity of the study site CR 507 has a 6.5 m asphalt platform with 2.6-2.7 m gravel shoulders with a rural open ditch cross-section. It has a posted speed of 80 kph.

2.5 The County Road 36/507 Intersection

The intersection of CR 507 and CR 36 will be the principal intersection affected by the proposed quarry operation. The present intersection is illustrated in *Exhibit 5 – Intersection of CR 36 & CR 507.* It is a T-intersection with an eastbound left turn lane on CR 36 to CR 507 north. This left turn lane has 95 m of parallel lane and a 120 m approach taper for a total length of 215 m. This is just under the minimum TAC standard of 220 m for an 80 kph design speed. It is noted that under 2026 total peak hour traffic conditions and MTO criteria there is no warrant for this left turn lane. There is also a westbound right turn taper (60 m) with a 55 m parallel lane for a total length of 115 m on the CR 36 south approach. This is within 5 m of the 120 m current minimum TAC standard for an 80 kph design speed. Southbound CR 507 has a single lane approach with no auxiliary lanes. CR 507 as the minor road, is STOP-controlled. It is noted that the design of the intersection and its construction would have been completed to meet the MTO standards of the day.

The existing CR 36 alignment through the study intersection is a horizontal curve. Combination *Curve Ahead/Intersection Ahead* warning signs with a 70 kph *Speed Advisory Tab* are posted about 200 m before the horizontal curve on both of the CR 36 approaches to the intersection. It is assumed that the 70 kph postings have been established through standard field procedures such as the use of a "ball-bank" indicator. It is noted (see *Section 2.6*) that the 85th percentile speed on this section of CR 36 through the horizontal curve is 90 kph.

As part of the field work, Tranplan Associates field-checked sight distances from CR 507 along CR 36 to the west and to the south. To the west along CR 36, available *Turning sight distance* (TSD) as defined by Ministry of Transportation Ontario (MTO) field procedures[1], is 208 – 211 m. Based

1 See Section "Visibility", pg. 2, Commercial Site Access Policy and Standard Designs, MTO pub. 1992.

on the *Transportation Association of Canada* (TAC) criteria, this will provide the minimum TSD for a speed of 95 kph. To the south TSD exceeds 230 m. This will exceed the minimum TAC TSD for a design speed of 100 kph.

Available *stopping sight distance* (SSD) for through traffic on CR 36 was also measured as part of the study field work. The criteria used for the measurement was a driver eye height of 1.05 m for CR 36 through traffic and a stationary object height of 0.38 m. For eastbound drivers from the west, available SSD is 185 m measured from the CR 507 centreline to the west. This will meet minimum TAC SSD for a design speed of 100 kph. For northbound drivers travelling to the west SSD exceeds 230 m. This exceeds minimum TAC requirements for a design speed of 100 kph. No particular traffic intersection operational issues were observed during the field work and traffic count program.

2.6 Spot Speed Studies

An initial spot speed study was carried out by Tranplan Associates staff on Friday August 28, 2016. The data was collected at two locations; on CR 36 in the vicinity of the proposed South Site Entrance and on CR 507 at the vicinity of *Flynn's Store* site entrance location. The data was collected using a *Traffic Advisor - Pocket Radar* speed detector. Calibration of the unit was checked before and after collecting the speed data. The observations were done between 4:20 – 5:00 PM. Speed measurements were taken on individual vehicles or lead vehicles of a queue. The 85th percentile speeds recorded were as follows:

- CR 36: Northbound/Westbound - 102 kph,
- CR 36: Eastbound/Southbound - 106 kph
- CR 507: Northbound – 51 kph,
- CR 507: Southbound - 85 kph

It will be noted that the CR 507 northbound speed is relatively low. This low speed is a result of vehicles accelerating from a low speed turn or stopped-condition at the CR 36/CR 507 intersection.

A second spot speed study was carried out at the CR 36/CR 507 intersection to observe the free-flow speed of through traffic on CR 36. This data was collected on Monday November 7, 2016. The observed free-flow speeds of through traffic on CR 36 were observed to be:

- Eastbound/Southbound - 89 kph
- Northbound/Westbound - 90 kph

A copy of the spot speed data is contained in the *Technical Appendix – Traffic Data*.

2.7 Collision Analysis

County Peterborough staff provided the study team with the collision records for CR 36/CR 507 intersection as well as CR 36 and CR 507 in the vicinity of the study intersection. The records covered the years from 2009 to 2013 inclusive (five years). During this five year period there were

8 collisions. Five of the collisions involved only a single vehicle on the CR 36 horizontal curve. Three of these were weather related. The 3 remaining collisions of the 8 collisions that were related to intersection operations, involved 2 vehicles. All 3 collisions involved property damage only (PDO). The intersection collision rate was computed to be 0.41 collisions per million vehicle entries. This is generally considered to be a low collision rate. Further details on the collision analysis are contained in the *Technical Appendix – Traffic Data*.

2.8 Existing Traffic Volumes

Along with the future site entrance, the CR 36/CR 507 intersection is the main study intersection. Tranplan Associates carried out weekday AM and PM peak period turning movement counts at the CR 36/CR 507 intersection and the *Flynn's Store* site entrance intersection with CR 507. The counts were done on Friday August 26, 2016 to capture representative summer weekday traffic volumes. County of Peterborough staff were able to supply the study team with automatic traffic recorder (ATR) count data for CR 36 to the south and west of the intersection with CR 507 and for CR 507 just north of the intersection. In comparing the observed August, 2016 counts to the County ATR data, it was found that there was good agreement for the AM peak hour period. The August, 2016 AM volumes were applied directly to the study analyses.

The observed Tranplan Associates PM volumes were found to be lower than the County ATR volumes. An adjustment factor of 1.30 was applied the August, 2016 volumes to match the County peak volumes. These adjusted PM volumes were applied to the study analyses. These design hour volumes (DHV) are summarized in *Exhibit 6 - 2016 Peak Hour Volumes*. This exhibit includes the observed August, 2016 volumes and the County ATR data. It also includes the turning volumes to/from the *Flynn's Store* gas station/c-store.

2.9 Impact of Existing Traffic

Intersection capacity analyses were carried out to assess the current operations of the CR 36/507 intersection and the site entrance intersection for *Flynn's Store* and CR 507. The analyses were based on the 2016 DHV (see *Exhibit 6*). The capacity analyses applied the current *Highway Capacity Manual (HCM)* procedures using *Trafficware's Synchro 8* intersection capacity analyses software. The results of the analysis of existing 2016 conditions for the two weekday peak hour periods are provided in *Table 1* following.

Table 1: 2016 Intersection Capacity Analysis

Study Intersections						
	AM Peak Hr – Critical Movement			**PM Peak Hour – Critical Movement**		
	LoS (Delay)	**V/C**	**Queue[A]**	**LoS (Delay)**	**V/C**	**Queue[A]**
CR 36/CR 507	SB L-R: **A/B** (10.2s)	0.09	0.3 veh	SB L-R: **A/B** (10.9s)	0.13	0.4 veh
Gas Sta/CR 507	EB Lt: **A/B** (9.4s)	0.01	0 veh	EB Lt: **A/B** (10.0s)	0.03	0.1 veh

A – Queue is the 95th percentile vehicle queue length measured in vehicles.

The gas station/c-store entrance to CR 507 was included in this initial analyses because of its proximity to the quarry's proposed North Entrance option on CR 507. In reviewing *Table 1* it will be noted that the critical intersection movements at both study intersections operate at the boundary of LoS "A/B" with an average delay of 9 - 11 seconds. The maximum 95% queue at the intersection during peak period conditions will be about less than 1 vehicle during the both weekday peak periods. Drivers accessing the main road at both intersections face little delay. In reviewing the parameters of the critical southbound and eastbound movements it can be seen that there is considerable residual capacity at both intersections for future growth in traffic. More detailed summary printouts of the 2016 capacity analyses are contained in the *Technical Appendix - Intersection Capacity Analyses.*

3. THE ROCKRIDGE QUARRY

This Section describes the development and distribution of the site generated traffic.

3.1 Site Background

The proposed quarry will be located on part of Lot 21, Concession 8 in the geographic Township of Harvey now part of the amalgamated *Municipality of Trent Lakes* (see *Exhibit 1*). The area proposed to be licenced is approximately 95.5 ha. The study site is presently a mix of wooded areas, wet lands and rock outcrops. It appears that some of the lands have been in some form of agricultural use in the past. These uses are no longer in operation. The proposed quarry and its two access options are illustrated in *Exhibit 2 - Preliminary Site Plan.*

The present license application for the future quarry is for a *Category 4 - Class A License* for *Extraction Above The Water Table*. The applicant is choosing to self-impose a maximum annual tonnage limit of 1.5 million tonnes. The actual extraction rate will depend on market demand during any given year. The traffic study analyses have been based on the maximum extraction rate allowed by the licence.

3.2 Future Site Operations

The proponent's plans for the quarry operation include the extraction of both construction aggregate and dimension stone, some of which will be manufactured into more finished landscaping and masonry product. The requested licence will allow an annual quarry production of 1.5 million tonnes. About 90% of the extraction or 1.35 million tonnes will be construction aggregate. The remaining 150,000 tonnes will be dimension stone and related product. The dimension stone will be transported from the site on flat-bed trailers. The aggregate will be transported from the site in a range of truck sizes from dual axle dump trucks to larger tractor trailers.

For traffic analyses purposes, it has been assumed that the main pit operations will be:

- Site preparation
- Extraction
- Processing
- Loading
- Rehabilitation

These operations can occur Monday to Saturday during a normal summer construction day. Most of the site activity will occur during the normal Monday to Friday work week. Timing of actual site operations will be as follows:

- Site preparation and rehabilitation – 6 AM to 7 PM
- Excavation and processing – 7 AM to 7 PM
- Loading and shipping may be scheduled at any time – unlimited shipping

Normally most Saturday operations will be limited and would run from 9 AM until about 1 PM. These operations would include maintenance and sales to the general public. Because of the early weekday start time, site employee traffic and truck traffic will arrive on-site before the normal weekday AM peak hour and depart after the usual PM peak hour. However, as a worst case it has been assumed that peak period of site traffic will occur during the normal background peak hour periods on the adjacent County roads.

3.2.1 Assumptions – Construction Aggregate Operations

The following are the assumed logistics of the construction aggregate operations:

- Peak production occurs during a 150 day construction season running from mid-April to mid-November.
- Extraction will occur Monday through Friday during an 11 hour working day
- There will be 150 days x 11 hours = 1,650 working hours per season
- It is assumed that about 1.33 million T of aggregate will be shipped during the main weekday construction season. The residual amount will be shipped on the occasional Saturday and during the winter months.
- Hourly shipping rate will be 1,330,000/1650 = 806 T/hour
- The typical loader used in the aggregate operation can load 200 T per hour
- There will be 806/200 ~ 4 loaders operating on-site plus 1 loader to maintain the stockpile.
- Truck capacity delivering aggregate will range from about 20 T to 40 T. The assumed average truck load is 30 T.
- There will be 806/30 =27 trucks per hour exiting the quarry during peak production.
- There will be 10 employees working the aggregate operation to man the loaders, the crusher, support maintenance operations and staff 1 administrative position.
- It is assumed that all employees will arrive/depart the site in their own vehicles.

3.2.2 Assumptions - Dimension Stone Operations

The dimension stone and related product will be mostly shipped on flat bed trailers. The stone must be carefully lifted and placed on the trailer to minimize damage to the stone's surface. It generally takes from 1.5 to 2 hours to load and secure the stone on the larger flat-bed trailers. Sorted dimension stone and manufactured stone product are shipped on pallets. These pallets can generally be loaded more quickly. Load times for this material, depending on truck size usually take about half an hour.

The following assumptions have been made about the logistics of the dimension stone operations:

- Since the dimension stone product is used mostly for landscaping, it is assumed that all production occurs during a 150 day construction season from mid-April to mid-November.
- Extraction will occur Monday through Friday for an 11 hour working day
- There will be 150 x 11 = 1,650 working hours per season
- There will be 150,000 T of dimension stone and product shipped from the site
- This will amount to 150,000/1650 = 91 T per hour

- 80% of production or 73 T will be shipped on 40 T flatbed trucks, i.e., 2 trucks per hour
- 20% of production or 18 T will be shipped on 15 T landscaper trailers, i.e., 1 truck per hour
- 6 employees assist/prepare material for the loading of trucks
- 4 employees work in the processing component of the dimension stone product

3.3 Future Site Trip Generation

Based on a proposed 1.5 million T annual quarry production and the site trip generation assumptions described above, a set of AM and PM peak hour site trip future forecasts were prepared for the traffic analyses. The forecast future site trip generation for each peak hour period is summarized in *Table 2* following.

Table 2 – Forecast Site Trip Generation (vph)

	AM Peak Hr			PM Peak Hr		
Source	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Aggregate Trucks	27	25	52	25	27	52
Dimension Stone Trucks	3	2	5	2	3	5
Aggregate Employees	10	2	12	2	10	12
Dimension Stone Emps	10	2	12	2	10	12
Service/Maint Vehicles	2	2	4	2	2	4
Local Customer	1	1	2	1	1	2
Total Trips	***53***	***34***	***87***	***34***	***53***	***87***

3.4 Site Trip Distribution

There are three principal gateways for traffic to arrive to/from the study site. They are:

- A north gateway via CR 507 to serve destinations in the northern part of the County
- A west gateway via CR 36 west to destinations in the western part of the County and the City of Kawartha Lakes
- A south gateway via CR 36 south to access the southern and eastern part of the County.

This distribution is summarized in *Table 3* following:

Table 3 – Site Trip Distribution (%)

Gateway	% Distribution
North Gateway – CR 507	5%
South Gateway – CR 36	75%
West Gateway – CR 36	20%
Total	100%

The distribution of future site traffic was developed from information provided by the proponent. This information was derived from a survey of site traffic from the present *Stonescape* quarry collected for a representative 2016 weekday. Since the future *Rockridge* quarry will be shipping product similar to that shipped by the *Stonescape* quarry, it was assumed that future *Rockridge* traffic will have the same overall distribution patterns as the *Stonescape* quarry.

4. FUTURE CONDITIONS

This Section summarizes the assumptions used to develop future year traffic volumes for the total traffic scenario, the operational analysis results and associated impacts to the transportation infrastructure.

4.1 Future Background Traffic Volumes

Future background traffic forecasts were developed for a 10 year planning horizon to 2026. The 10 year planning horizon will allow for planning approvals, development of the quarry facilities and time for additional growth in background traffic. The rate of growth in future background traffic has been assumed to be 2.0% per year (compounded). This rate was applied to the 2016 design hour volumes (see *Exhibit 6*) to produce forecasts of 2026 background peak hour traffic on CR 36 and CR 507. This 2.0% annual growth rate is normally applied to forecast background traffic in Peterborough County. While it can overstate growth in some County road corridors, this growth rate is acceptable to the County.

Traffic generated by adjacent quarries (see *Section 2.3*) was captured in the 2016 peak period traffic counts carried out by the study team. Future traffic generated by these pits and quarries was expanded at the rate of 2% per year to the 2026 planning horizon as part of the expansion of the observed background traffic. The volume of future traffic generated by these quarries will be determined by future market demand for aggregate and related quarry products, not by the total volumes allowed by the licences. These pits and quarries are now meeting current market demand which can be expected to increase at the rate of over-all County and Provincial growth. Individual quarries on occasion, may obtain construction contracts that will utilize the capacity of their individual licence. However, there is currently no economic scenario that would require all these adjacent pits and quarries to operate simultaneously at full licenced capacity to meet market demand.

There is a limit to the amount of available material in each pit and quarry. What will most likely happen is that over time, product will be shipped from these pits and quarries at something like the current rates until all aggregate sources have been exhausted. This is why there is a rehabilitation program for each licenced pit and quarry.

4.2 Future Total Traffic

The 2026 total weekday peak hour volumes were computed for each of the two site entrance options as well as CR 36/CR 507 intersection for each option. The future volumes were computed by adding the *Rockridge Quarry* site traffic to the 2026 background traffic. The future site traffic volumes as summarized in *Table 2* were distributed to the study road network based on the distribution assumptions summarized in *Table 3*. The resulting total AM and PM peak hour volumes are illustrated in *Exhibit 7 - 2026 Peak Hour Volumes – South Site Entrance Option* and *Exhibit 8 - 2026 Peak Hour Volumes – North Site Entrance Option.*

It is noted that the total future traffic forecasts include the normal future background traffic volumes that in turn include traffic from the adjacent active pits and quarries. Study total traffic will also include traffic generated by full production of the *Rockridge* quarry. These future traffic forecasts represent a conservative assumption. They will require a significant increase in the current market demand for local quarry product since the market will have to absorb existing quarry production plus new production from full operation of the *Rockridge* quarry.

4.3 Site Traffic Impacts

Detailed intersection capacity analyses were carried out to assess the impact of future site traffic at the site entrance intersections with CR 36 (south entrance option) and CR 507 (north entrance option). Capacity analyses were also completed for the CR 36/CR 507 intersection for each entrance option. These capacity analyses were done using current 2010 HCM procedures as contained in the *Synchro 8* software. The analyses were based on the 2026 total weekday peak hour volumes as illustrated in *Exhibits 7* and *8*. The results are summarized in *Table 4* following.

Table 4: 2026 Intersection Capacity Analyses

		Critical Intersection Movement					
		AM Peak Hour			PM Peak Hour		
Option	**Intersection**	**LoS**	**vol/cap**	**95% Q**	**LoS**	**vol/cap**	**95% Q**
Existing Conditions	**2016 CR 36/CR 507**	**SB L-R A/B 10.2s**	**0.09**	**0.3**	**SB L-R A/B 10.9s**	**0.13**	**0.4**
South Site Entrance	**2026 CR 36/CR 507**	**SB L-R A/B 10.8s**	**0.12**	**0.4**	**SB L-R B 11.9s**	**0.17**	**0.6**
	2026 Site Ent/CR 36	**WB L-R B 12.3s**	**0.07**	**0.2**	**WB L-R B/C 14.3s**	**0.13**	**0.5**
North Site Entrance	**2026 CR 36/CR 507**	**SB L-R B 11.8s**	**0.18**	**0.7**	**SB L-R B 13.5s**	**0.28**	**1.1**
	2026 Site E/CR 507	**WB L-R A/B 10.8s**	**0.06**	**0.2**	**WB L-R B 11.2s**	**0.09**	**0.3**

A – Queue is the 95th percentile vehicle queue length measured in vehicles

In reviewing *Table 4* it will be noted that average vehicle delay at either of the two proposed site entrance options will be 15 seconds or less during 2026 summer peak period conditions. Little change in average delay is forecast to occur at the CR 36/CR 507 intersection between the present 2016 peak hour periods and the forecast 2026 peak hour conditions. Vehicles passing through the study intersections will face acceptable levels of delay. A maximum site entrance volume/capacity (v/c) ratio of 0.28 indicates that there will be sufficient gaps in the CR 36 and CR 507 traffic streams to accept site traffic during future 2026 peak traffic conditions. Site traffic will have an acceptable traffic impact on both the CR 36 and CR 507 corridors. There will be considerable residual capacity with either site entrance option for growth in traffic beyond the 2026 study planning horizon. Detailed printouts of the 2026 capacity analyses are included in the *Technical Appendix - Intersection Capacity Analyses*.

4.4 Auxiliary Lane Warrant Analyses

Left turn lane warrant analyses were carried out to assess the need for a left turn lane on the adjacent county road for each of the two site entrance options. The analyses were based on 2026 total summer peak hour volumes (see *Exhibits 7* and *8*). The analyses also included the CR 36/CR 507 intersection for each site entrance option. The warrant calculations applied current Ministry of Transportation Ontario (MTO) procedures and standards to assess left turn lane requirements. Based on these analyses, no warrant was found a left turn lane at either site entrance option. It was also determined that based on 2026 volumes, there was no warrant a left turn lane at the CR

36/CR 507 for either option. A copy of the warrant calculations is contained in the *Technical Appendix – Auxiliary Lane Warrant Analyses*.

A right turn taper/lane warrant analysis was also carried out to assess the need for a right turn lane/taper for each of the site entrance options. At present neither TAC nor the MTO have any specific design warrants for right turn lanes. Tranplan Associates often applies the right turn warrant/standards developed by the *State of Virginia Department of Transportation* (VDOT). These warrants have been used for studies in the County of Peterborough and other municipalities to assess the need for various right turn treatments at entrances to commercial and residential developments.

The VDOT standards are detailed in a nomograph that considers total approach volumes, right turn volumes and speed in assessing the need for a right turn taper or lane. Based on the 2026 total peak hour volumes and VDOT standards, only a fixed radius "rounding" will be required to accommodate right turns for either site entrance option. Details of the analysis for each entrance option using the VDOT warrant nomograph are contained in the T*echnical Appendix – Auxiliary Lane Warrant Analyses*.

In reviewing the VDOT nomographs it will be noted that site entrance volumes are approaching a warrant for a right turn taper. Given that a significant percentage of the site traffic will be trucks, it is recommended that the selected future site entrance option include a right turn taper. This right turn taper will provide more room for trucks to decelerate and exit the adjacent County road as they enter the study site. It is also noted that the entrance to the adjacent *Stonescape Quarry* has a northbound right turn taper from CR 36 to the site entrance. A right turn taper would also provide a design consistency with the adjacent *Stonescape* entrance.

4.5 Future Site Access

The proposed locations for each of the two site entrance options were field-checked to assure that there would be sufficient sight distance along each of the two respective County roads. In the case of the North Entrance option to CR 507 (see *Exhibit 3*), there will be at least 230 m of Turning Sight Distance (TSD) and stopping sight distance (SSD) to the north and to the south along CR 507. This meets current TAC and County standards for a design speed of 100 kph. There is a residential/farm entrance located on CR 507 about 100 m south of the proposed North Entrance. There will be no overlapping left turns on CR 507 into either entrance. The spacing between the entrances is sufficient that there should be no interference between the turning movements at either entrance.

TSD and SSD were also checked at the proposed location for the South Site Entrance option to CR 36. Based on the proposed location of the entrance as illustrated in *Exhibit 3,* there will be no restriction in sight distance to the south along CR 36. To the north, towards the CR 36/CR507 intersection, there will be at least 230 m of sight distance.

The future site entrance design must accommodate a range of truck traffic. The MTO commercial entrance design *CSAS – 23, Truck Access – All Design Vehicles* can be used as a guide to design the future selected site entrance. A copy of this design is included in the *Technical Appendix – Site Entrance Guidelines*. The optional right turn taper included in *CSAS – 23* design should be included in the entrance design. Also included in the appendix is MTO entrance design *CSAS – PROF*. This will provide guidance in designing the centreline profile of the future quarry entrance.

Based on the site entrance capacity analyses, a site entrance with a single inbound lane and a single outbound lane will provide good access to the study site. As noted in *Section 4.4,* no left turn lane will be required on adjacent County Roads for either site entrance option.

5. CONCLUSIONS AND RECOMMENDATIONS

This Section summarizes the salient findings of the analyses and identifies any necessary changes to the transportation infrastructure.

5.1 Conclusions

The following conclusions have been drawn from the site visits and traffic impact analyses completed for the *Rockridge Quarry*:

- The present adjacent road network including the CR 36/CR 507 intersection operates at good LoS during 2016 summer weekday peak periods of travel demand. There is considerable residual capacity for future growth in traffic.
- During future 2026 summer total peak hour conditions, all traffic movements at either of the two site entrance options to the adjacent County road are forecast to operate at the boundary of LoS "B/C" or better. This is considered a good LoS for peak hour traffic conditions.
- There will considerable residual capacity in the study road network for additional growth in traffic beyond the 2026 planning horizon used in the study analyses.
- There will be sufficient gaps in the CR 36 and CR 507 traffic stream to accept all future traffic from the study site from either site entrance option. Vehicles accessing the adjacent County road will face acceptable levels of delay.
- There will be no warrant for a future southbound left turn lane on CR 36 to serve a South Entrance option.
- There will be no warrant for a future southbound left turn lane on CR 507 to serve the North Entrance option.
- The existing CR 36/CR 507 intersection will support future site traffic for either of the two site entrance options.
- There is over 230 m of TSD and SSD for both site entrance options at their locations along the adjacent County road. This will provide sufficient sight distance for drivers to select appropriate gaps in the adjacent traffic stream to safety enter the County road corridor.
- In summary, either of the two site entrance options will provide acceptable access to the County road network.

5.2 Recommendations

The following recommendations have been developed from the study analyses and conclusions:

- A site entrance design based on MTO commercial entrance design *CSAS-23 Truck Access* will provide good access to the study site.
- The optional right turn taper included in the CSAS-23 design should be included in the design of the new site entrance.
- Truck-Turning signage should be used for the selected entrance in appropriate locations on the adjacent County Road. An example signage is *Truck Entrance Sign* (Wc-8L).

- All signage and pavement markings should be constructed in accordance with the guidance provided in the *Ontario Traffic Manual* (OTM) and the *Manual of Uniform Traffic Control Devices of Canada* (MUTCDC).

In summary, the future traffic generated by the *Rockridge Quarry* can be accommodated by the existing road network. No improvements will be required to adjacent roads and intersections to support this new site traffic. Additional background information on the field work and traffic analyses is available in study working papers. Tranplan Associates is pleased to have the opportunity to work with the *Rockridge Quarry* study team to complete this project.

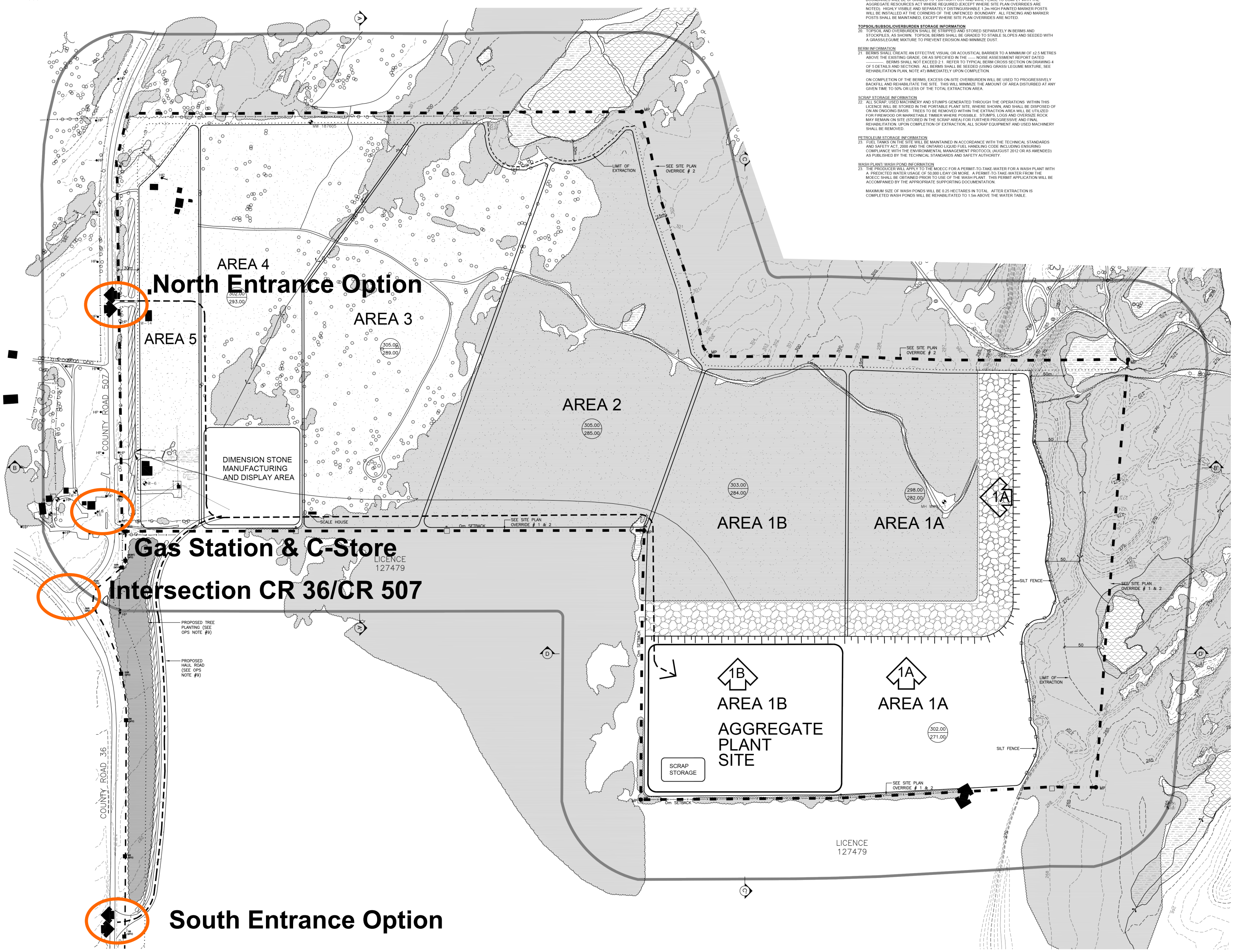
REPORT EXHIBITS

Exhibit 1
Key Map

Exhibit 2
Preliminary Site Plan

PHASE A

1. ESTABLISH MAIN COMMERCIAL ENTRANCE/EXIT TO COUNTY ROAD 36 AND SECONDARY ENTRANCE TO COUNTY ROAD 507 ACCORDING TO APPROPRIATE MUNICIPAL STANDARDS, ESTABLISH SCALES, SCALEHOUSE, AS SHOWN ON THE SITE PLAN AND HAUL ROAD INTO THE SITE.
2. PRIOR TO EXTRACTION COMMENCING IN AREA 1A AND 1B, CONSTRUCT OR UPGRADE THE FENCING ALONG THE WEST AND PART OF THE NORTH PERIMETER OF THE SITE TO THE STANDARDS OF THE ACT, AS REQUIRED.
3. STRIP TOPSOIL AND OVERBURDEN SEPARATELY FROM AREA 1A AND 1B AND CONSTRUCT WEST PERIMETER BERM AS SHOWN.
4. PRIOR TO DIMENSION STONE EXTRACTION BEGINNING IN AREA 1, INSTALL SILT FENCE AT DRIPLINE OF TREES ALONG EXISTING EAST BOUNDARY. SILT FENCE WILL BE INSTALLED PROGRESSIVELY AS STRIPPING MOVES IN A NORTHERLY DIRECTION. BEGIN DIMENSION STONE EXTRACTION IN AREA 1A AND 1B IN DIRECTION SHOWN. TRANSPORT WASTE ROCK TO PROCESSING PLANT FOR PROCESSING.
5. BEGIN EXTRACTION IN AREA 1A AND 1B IN DIRECTION SHOWN USING A SINKING CUT TO ESTABLISH THE QUARRY FLOOR AND FACE, AND PROCESS THE ROCK IN ORDER TO PRODUCE A VARIETY OF MATERIALS TO MEET MARKET DEMANDS. PORTABLE PROCESSING PLANT AND STOCKPILING AREA WILL BE LOCATED IN AREA 1B.
6. CONTINUE EXTRACTION OF AREA 1A IN THE DIRECTIONS SHOWN AND PROCESS AND STOCKPILE MATERIALS ON THE QUARRY FLOOR.
7. AREAS 2, 3, 4, AND 5 REMAIN UNDISTURBED EXCEPT FOR THE MANUFACTURING AREA.



OPERATIONS NOTES CONTINUED

HYDROGEOLOGICAL INFORMATION

12. HYDROGEOLOGICAL INFORMATION INCLUDING GROUNDWATER ELEVATION WAS OBTAINED FROM REPORT BY ---. DATED --- 201-.
13. THE WATER TABLE ELEVATION WITHIN THESE PROPERTIES IS ESTIMATED TO BE BETWEEN ±---.-- AND ±---.--m ABOVE SEA LEVEL (A.S.L.) BASED ON THE HYDROGEOLOGICAL REPORT (SEE ABOVE).
14. SURFACE DRAINAGE ON THE QUARRY FLOOR WILL BE DIRECTED TO LOW AREAS FOR WATER TO INFILTRATE INTO EXISTING WETLANDS.

NOISE MITIGATION INFORMATION

15. ACOUSTICAL INFORMATION WAS OBTAINED FROM NOISE REPORT BY -------------------, DATED ------------- (REFER TO SHEET 4 FOR TECHNICAL RECOMMENDATIONS).
16. HOURS OF OPERATION:

SITE PREPARATION AND REHABILITATION:	07:00-19:00 WEEKDAYS; 09:00-15:00 SATURDAYS
EXCAVATION AND PROCESSING:	07:00-19:00 WEEKDAYS; 09:00-15:00 SATURDAYS
SHIPPING TO MARKET:	NO RESTRICTIONS

EXTRACTION AND PROCESSING ACTIVITIES ON SITE ON SATURDAYS AND SUNDAYS SHALL BE LIMITED TO MAINTENANCE ONLY.

AIR QUALITY INFORMATION

17. WATER OR CALCIUM CHLORIDE WILL BE APPLIED TO INTERNAL HAUL ROADS AND PROCESSING AREAS AS OFTEN AS REQUIRED TO MITIGATE DUST.

SITE MANAGEMENT INFORMATION

MAINTENANCE/ PROTECTION OF VEGETATION INFORMATION

18. EXISTING VEGETATION WITHIN THE LICENCED AREA SHALL BE MAINTAINED IN A HEALTHY VIGOROUS GROWING CONDITION UNTIL SEQUENTIAL STRIPPING BEGINS OR UNTIL THE REHABILITATION IS COMPLETE. ANY VEGETATION PLANTED AS PART OF SITE IMPROVEMENTS OR PROGRESSIVE AND FINAL REHABILITATION WILL ALSO BE MAINTAINED IN A HEALTHY, VIGOROUS GROWING CONDITION.

FENCING INFORMATION

19. BOUNDARIES OF THE AREA TO BE LICENCED THAT ARE PRESENTLY FENCED ARE SHOWN ON DRAWING 1 OF 5 EXISTING FEATURES. PRIOR TO ANY STRIPPING OR PREPARATION, FENCING ON THE LICENCED BOUNDARIES WILL BE UPGRADED TO 1.2m HIGH POST AND WIRE FENCE TO COMPLY WITH THE AGGREGATE RESOURCES ACT WHERE REQUIRED (EXCEPT WHERE SITE PLAN OVERRIDES ARE NOTED). HIGHLY VISIBLE AND SEPARATELY DISTINGUISHABLE 1.2m HIGH PAINTED MARKER POSTS WILL BE INSTALLED AT THE CORNERS OF THE UNFENCED BOUNDARY. ALL FENCING AND MARKER POSTS SHALL BE MAINTAINED, EXCEPT WHERE SITE PLAN OVERRIDES ARE NOTED.

TOPSOIL/SUBSOIL/OVERBURDEN STORAGE INFORMATION

20. TOPSOIL AND OVERBURDEN SHALL BE STRIPPED AND STORED SEPARATELY IN BERMS AND STOCKPILES, AS SHOWN. TOPSOIL BERMS SHALL BE GRADED TO STABLE SLOPES AND SEEDED WITH A GRASS/LEGUME MIXTURE TO PREVENT EROSION AND MINIMIZE DUST.

BERM INFORMATION

21. BERMS SHALL CREATE AN EFFECTIVE VISUAL OR ACOUSTICAL BARRIER TO A MINIMUM OF ±2.5 METRES ABOVE THE EXISTING GRADE, OR AS SPECIFIED IN THE ------ NOISE ASSESSMENT REPORT DATED --------------. BERMS SHALL NOT EXCEED 2:1. REFER TO TYPICAL BERM CROSS SECTION ON DRAWING 4 OF 5 DETAILS AND SECTIONS. ALL BERMS SHALL BE SEEDED (USING GRASS/ LEGUME MIXTURE, SEE REHABILITATION PLAN, NOTE #7) IMMEDIATELY UPON COMPLETION.

ON COMPLETION OF THE BERMS, EXCESS ON-SITE OVERBURDEN WILL BE USED TO PROGRESSIVELY BACKFILL AND REHABILITATE THE SITE. THIS WILL MINIMIZE THE AMOUNT OF AREA DISTURBED AT ANY GIVEN TIME TO 50% OR LESS OF THE TOTAL EXTRACTION AREA.

SCRAP STORAGE INFORMATION

22. ALL SCRAP, USED MACHINERY AND STUMPS GENERATED THROUGH THE OPERATIONS WITHIN THIS LICENCE WILL BE STORED IN THE PORTABLE PLANT SITE, WHERE SHOWN, AND SHALL BE DISPOSED OF ON AN ONGOING BASIS. TREES TO BE REMOVED WITHIN THE EXTRACTION AREA WILL BE UTILIZED FOR FIREWOOD OR MARKETABLE TIMBER WHERE POSSIBLE. STUMPS, LOGS AND OVERSIZE ROCK MAY REMAIN ON SITE (STORED IN THE SCRAP AREA) FOR FURTHER PROGRESSIVE AND FINAL REHABILITATION. UPON COMPLETION OF EXTRACTION, ALL SCRAP EQUIPMENT AND USED MACHINERY SHALL BE REMOVED.

PETROLEUM STORAGE INFORMATION

23. FUEL TANKS ON THE SITE WILL BE MAINTAINED IN ACCORDANCE WITH THE TECHNICAL STANDARDS AND SAFETY ACT, 2000 AND THE ONTARIO LIQUID FUEL HANDLING CODE INCLUDING ENSURING COMPLIANCE WITH THE ENVIRONMENTAL MANAGEMENT PROTOCOL (AUGUST 2012 OR AS AMENDED) AS PUBLISHED BY THE TECHNICAL STANDARDS AND SAFETY AUTHORITY.

WASH PLANT/ WASH POND INFORMATION

23. THE PRODUCER WILL APPLY TO THE MOECC FOR A PERMIT-TO-TAKE-WATER FOR A WASH PLANT WITH A PREDICTED WATER USAGE OF 50,000 L/DAY OR MORE. A PERMIT-TO-TAKE-WATER FROM THE MOECC SHALL BE OBTAINED PRIOR TO USE OF THE WASH PLANT. THIS PERMIT APPLICATION WILL BE ACCOMPANIED BY THE APPROPRIATE SUPPORTING DOCUMENTATION.

MAXIMUM SIZE OF WASH PONDS WILL BE 0.25 HECTARES IN TOTAL. AFTER EXTRACTION IS COMPLETED WASH PONDS WILL BE REHABILITATED TO 1.5m ABOVE THE WATER TABLE.

IMPORTATION OF TOPSOIL INFORMATION

25. IN ORDER TO MAXIMIZE RESOURCE RECOVERY, IMPORTATION OF CLEAN INERT FILL (EG. TOPSOIL AND/OR OVERBURDEN) MAY BE IMPORTED TO FACILITATE 3:1 SIDESLOPE REHABILITATION (ABOVE WATER TABLE SIDESLOPES). ONLY NATIVE ON SITE OVERBURDEN AND/OR OFF-SPEC MATERIALS WILL BE USED FOR BELOW WATER REHABILITATION. ONLY SUFFICIENT MATERIAL TO CREATE FINAL GRADES AS SHOWN MAY BE IMPORTED.

IMPORTED MATERIAL SHALL MEET THE MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE'S PARAMETERS UNDER TABLE "1" OF MOECC'S "SOIL, GROUND WATER AND SEDIMENT STANDARDS FOR USE UNDER PART XV.1 OF THE ENVIRONMENTAL PROTECTION ACT".

SAMPLING AND TESTING OF ALL IMPORTED MATERIAL SHALL BE PERFORMED AT SOURCE PRIOR TO THE IMPORTATION OF MATERIAL ONTO THE LICENSED SITE BY A QP UNDER EPA. QP WILL ALSO DESIGN FILL MONITORING PROGRAM (PER L3 NOTES). RANDOM SAMPLING OF ALL IMPORTED MATERIAL SHALL BE CONDUCTED AT THE REQUEST OF MNRF.

THE LICENSEE SHALL KEEP DETAILED RECORDS OF THE AMOUNT OF MATERIAL BROUGHT ON SITE FOR REHABILITATION AND THE TESTING RESULTS OF ALL SAMPLES. ALL RECORDS AND TESTING RESULTS SHALL BE AVAILABLE UPON REQUEST BY MNRF OR MOECC.

NATURAL ENVIRONMENT INFORMATION

26.

REFER TO DRAWING 4 OF 5 FOR TECHNICAL RECOMMENDATIONS

LEGEND

- 120m INFORMATION BOUNDARY
- BOUNDARY OF AREA TO BE LICENCED
- BOUNDARY OF EXISTING ADJACENT LICENCE
- REGULATORY SETBACK LINE
- LOT/CONCESSION LINE
- LIMIT OF EXTRACTION
- EXISTING FENCE
- EXISTING WATERCOURSE
- EXISTING VEGETATION
- EXISTING WETLAND
- EXISTING OPEN WATER
- 285 EXISTING 5m CONTOUR LINE
- 284 EXISTING 1m CONTOUR LINE
- EXTRACTION FACE
- BERM (MIN. HEIGHT AS SHOWN)
- AREA STRIPPED OF TOPSOIL AND OVERBURDEN
- PROPOSED BUFFER ZONE REFORESTATION
- UNDISTURBED AREA
- SILT FENCE
- EXISTING BUILDING
- HP EXISTING HYDRO POLE
- ENTRANCE/ EXIT
- DIRECTION OF EXTRACTION
- DIRECTION OF TOPSOIL AND OVERBURDEN MOVEMENT
- PRODUCT TRANSPORTATION VIA HAUL ROAD
- R3 LOCATION OF NOISE RECEPTOR
- 296.00 / 286.00 EXISTING ELEVATION / PROPOSED ELEVATION
- MP PROPOSED MARKER POST

OPERATIONS NOTES

GENERAL INFORMATION

1. THIS PLAN DEPICTS A SCHEMATIC OPERATIONS AND REHABILITATION SEQUENCE FOR THIS PROPERTY BASED ON THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. PHASES SHOWN ARE SCHEMATIC AND MAY VARY WITH MATERIAL QUALITY, SITE HYDROLOGY AND HYDROGEOLOGY OR MARKET DEMAND. PHASES DO NOT REPRESENT ANY SPECIFIC OR EQUAL TIME PERIOD.

   EXTRACTION SHALL GENERALLY FOLLOW THE SEQUENCE SHOWN. WHEN PARTIAL REHABILITATION OF A PHASE IS POSSIBLE IT SHALL BE CARRIED OUT. NOT WITHSTANDING THE EXTRACTION AND REHABILITATION PROCESS ABOVE, DEMAND FOR CERTAIN PRODUCTS OR BLENDING OF MATERIALS MAY REQUIRE SOME DEVIATION IN THE EXTRACTION AND REHABILITATION PHASING. ANY MAJOR DEVIATIONS FROM THE OPERATIONS SEQUENCE SHOWN WILL REQUIRED APPROVAL FROM MNRF.
2. REFER TO DRAWING 1 OF 5, EXISTING FEATURES, FOR A DESCRIPTION OF EXISTING VEGETATION AND BUILDINGS WITHIN THE 120 METRE BOUNDARY AND ON SITE.
3. SITE PLAN OVERRIDES ARE LISTED IN THE SITE PLAN OVERRIDE TABLE SHOWN ON THIS PAGE.

RESOURCE INFORMATION

4. RESOURCE INFORMATION IS OBTAINED FROM ARIP MAPPING, GEOLOGICAL MAPPING, AND BOREHOLES DRILLED BY APPLICANT FEBRUARY 27, 2016.

EXTRACTION/PROCESSING/HAULING INFORMATION

5. TOTAL AREA TO BE EXTRACTED IS 84.2 HECTARES.
6. MAXIMUM NUMBER OF TONNES OF AGGREGATE TO BE REMOVED FROM THE SITE IN ANY CALENDAR YEAR IS 1,500,000 TONNES.
7. EXTRACTION OF THE BOBCAYGEON FORMATION WILL TAKE PLACE IN ONE ±6.5-7.0m BENCH. THE EXTRACTION OF THE UNDERLYING GULL RIVER FORMATION WILL TAKE PLACE IN TWO OR THREE BENCHES OF ±7.0 TO 10.0M (BENCHES MAY BE COMBINED BUT WILL NOT EXCEED 25M IN HEIGHT) TO A MAXIMUM DEPTH OF ±270.00 TO 293m A.S.L. (2M ABOVE THE WATER TABLE) AND WILL INCLUDE DRILLING AND BLASTING OF BEDROCK, LOADING WITH FRONT END LOADERS AND TRANSPORTING BY TRUCK OR CONVEYOR TO THE PLANT FOR FURTHER PROCESSING. REFER TO SECTIONS ON DRAWING 4 OF 5, FOR FURTHER DETAILS.

   DUE TO THE QUALITY, JOINT THICKNESS, OR THE MARKET DEMANDS ON THE LIMESTONE PRODUCTS (I.E. DIMENSION STONE), EXTRACTION OPERATIONS MAY EXIST WITHIN MORE THAN ONE AREA. THE EXTRACTION PRIORITY WILL BE TO SEQUENTIALLY DEPLETE RESOURCES WITHIN EACH AREA BY EXTRACTING THE DIMENSION STONE WITH MECHANICAL EQUIPMENT, ASSISTED PERIODICALLY BY LOW LEVEL BLASTING METHODS.

   PORTABLE PROCESSING EQUIPMENT FOR WASHING, SCREENING, AND CRUSHING FOR RECYCLING WILL BE USED ON SITE AND WILL BE LOCATED ON THE QUARRY FLOOR. OTHER EQUIPMENT TO BE USED IN THE OPERATION OF THE QUARRY MAY INCLUDE TRUCKS, LOADERS, EXCAVATORS, BULLDOZERS, SCRAPERS, CONVEYORS AND OTHER RELATED EQUIPMENT.

   TEMPORARY STOCKPILES MAY BE LOCATED NEAR THE QUARRY FACE. PROCESSING EQUIPMENT, STACKERS AND PRODUCT STOCKPILES WILL NOT EXCEED ±15 METRES IN HEIGHT AND WILL BE LOCATED IN THE PLANT SITE AND/OR CLOSE TO QUARRY FACES.

   MATERIAL FROM OTHER LICENCED PROPERTIES (EG. SAND) MAY BE IMPORTED INTO THE SITE FOR BLENDING AND CUSTOM PRODUCTS.
8. PROPOSED SCALE AND SCALE HOUSE WILL BE CONSTRUCTED IN AREA 3, GREATER THAN 30m FROM LICENCE BOUNDARY.
9. ACCESS TO PUBLIC ROADS
   TWO ENTRANCES FOR AGGREGATE EXTRACTION ARE PROPOSED:

   1) UTILIZING A SERVICE ROAD THROUGH QUARRY LICENCE No. 127479 AS PER AGREEMENT WITH ADJACENT LICENSEE, ACCESS SHALL BE VIA AN ENTRANCE OFF COUNTY ROAD 36 (SUBJECT TO SITE PLAN AMENDMENT APPROVAL FOR LICENCE No. 127479). TWO GATES WILL BE MAINTAINED: ONE AT COUNTY ROAD 36 ENTRANCE AND ONE INTERNAL GATE AT THE SCALE HOUSE TO FACILITATE PARKING IF NECESSARY AND REDUCE THE NEED TO PARK ON THE SHOULDER OF COUNTY ROAD 36.

   2) A SECONDARY ENTRANCE OFF COUNTY ROAD 507 WILL BE USED IF THE COUNTY ROAD 36 ENTRANCE IS NO LONGER AVAILABLE. THIS ENTRANCE WILL BE USED FOR MAINTENANCE, DELIVERY, AND LOGGING ACCESS IN THE MEANTIME AND WILL BE MAINTAINED AND GATED.
10. THERE MAY BE RECYCLING OF MATERIAL (ASPHALT AND CONCRETE) ON THIS SITE. MATERIAL IMPORTED FOR RECYCLING WILL BE STORED IN SEGREGATED STOCKPILES WITHIN THE PLANT SITE AREA. RECYCLABLE ASPHALT MATERIALS WILL NOT BE STOCKPILED WITHIN 30m OF ANY WATER BODY OR MAN-MADE POND; OR 2m OF THE SURFACE OF THE ESTABLISHED WATER TABLE. ANY REBAR AND OTHER STRUCTURAL METAL MUST BE REMOVED FROM THE RECYCLED MATERIAL DURING PROCESSING AND PLACED IN A DESIGNATED SCRAP PILE ON SITE WHICH WILL BE REMOVED ON AN ON-GOING BASIS. REMOVAL OF RECYCLED AGGREGATE IS TO BE ONGOING. ONCE THE AGGREGATE ON SITE HAS BEEN DEPLETED THERE WILL BE NO FURTHER IMPORTATION OF RECYCLABLE MATERIALS PERMITTED. ONCE FINAL REHABILITATION HAS BEEN COMPLETED AND APPROVED IN ACCORDANCE WITH THE SITE PLAN, ALL RECYCLING OPERATIONS MUST CEASE.
11. EQUIPMENT, SCRAP AND MACHINERY ASSOCIATED WITH THE EXTRACTION OPERATIONS WILL BE REMOVED UPON COMPLETION OF EXTRACTION.

SITE PLAN OVERRIDE (VARIANCE)

THE FOLLOWING CONDITIONS ILLUSTRATED ON THESE PLANS VARY FROM THE OF THE PROVINCIAL STANDARDS MADE UNDER THE AGGREGATE RESOURCES ACT

ITEM	SECTION
1. SETBACK ALONG SOUTH BOUNDARY IS REDUCED TO 0m AS PER AGREEMENT WITH ADJACENT LICENSEE. SETBACK ALONG EAST BOUNDARY IS REDUCED TO 0m. LICENSEE OWNS ADJACENT LAND.	5.10.1
2. FENCING OMITTED ALONG SOUTH BOUNDARY AS PER AGREEMENT WITH ADJACENT LICENSEE, ALONG NORTHEAST BOUNDARY FROM WETLAND TO NORTHEAST CORNER AND EAST BOUNDARY DUE TO TOPOGRAPHICAL CONDITIONS.	5.1

Pre Licence Review

NO.	DATE	REVISIONS	OWNER	HM	MNR

Site Plan Amendments

NO.	DATE	REVISIONS	OWNER	HM	MNR

Harrington McAvan Ltd
6882 14th Avenue
Markham, Ontario L6B 1A8
Tel: 905-294-8282 Fax: 905-294-7623
www.harringtonmcavan.com
Offices in Markham & Cambridge

Project Name

ROCKRIDGE QUARRY

LICENCE No.__________

APPLICANT'S SIGNATURE________________

LOT 21, CONCESSION 8, (FORMERLY GALWAY-CAVENDISH & HARVEY TOWNSHIP) MUNICIPALITY OF TRENT LAKES, COUNTY OF PETERBOROUGH

Scale 1:2000 (0 10 50 80m)

North

Stamp

Drawing Status PRELIMINARY FOR DISCUSSION

Drawn A.C./S.B. **Checked** G.D.H./ M.H. **Issue Date**

Drawing Title OPERATIONAL PLAN PHASE A

Project Number 16-01

Drawing Number 2 OF 5

FILE NAME:16-01/COMP/1601-2.DWG
PLOT DATE: DECEMBER 8, 2016

Exhibit 3
Site Access Options

South Entrance Option
Looking North along CR 36
Towards Fiynn's Corners

ff

North Entrance Option
Looking South along CR 507
Towards Fiynn's Corners

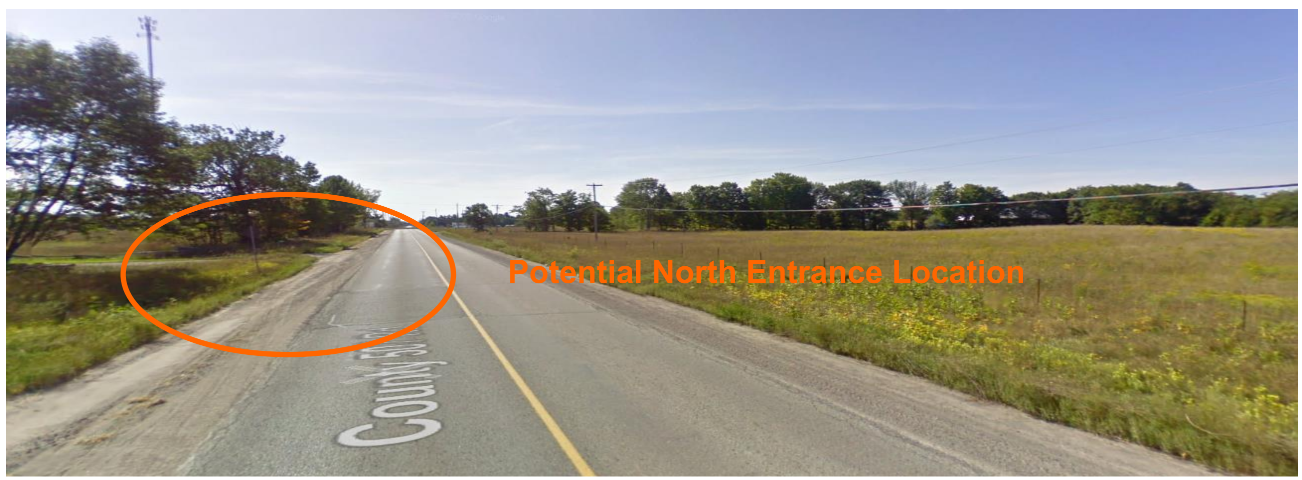


Exhibit 4
Site Context

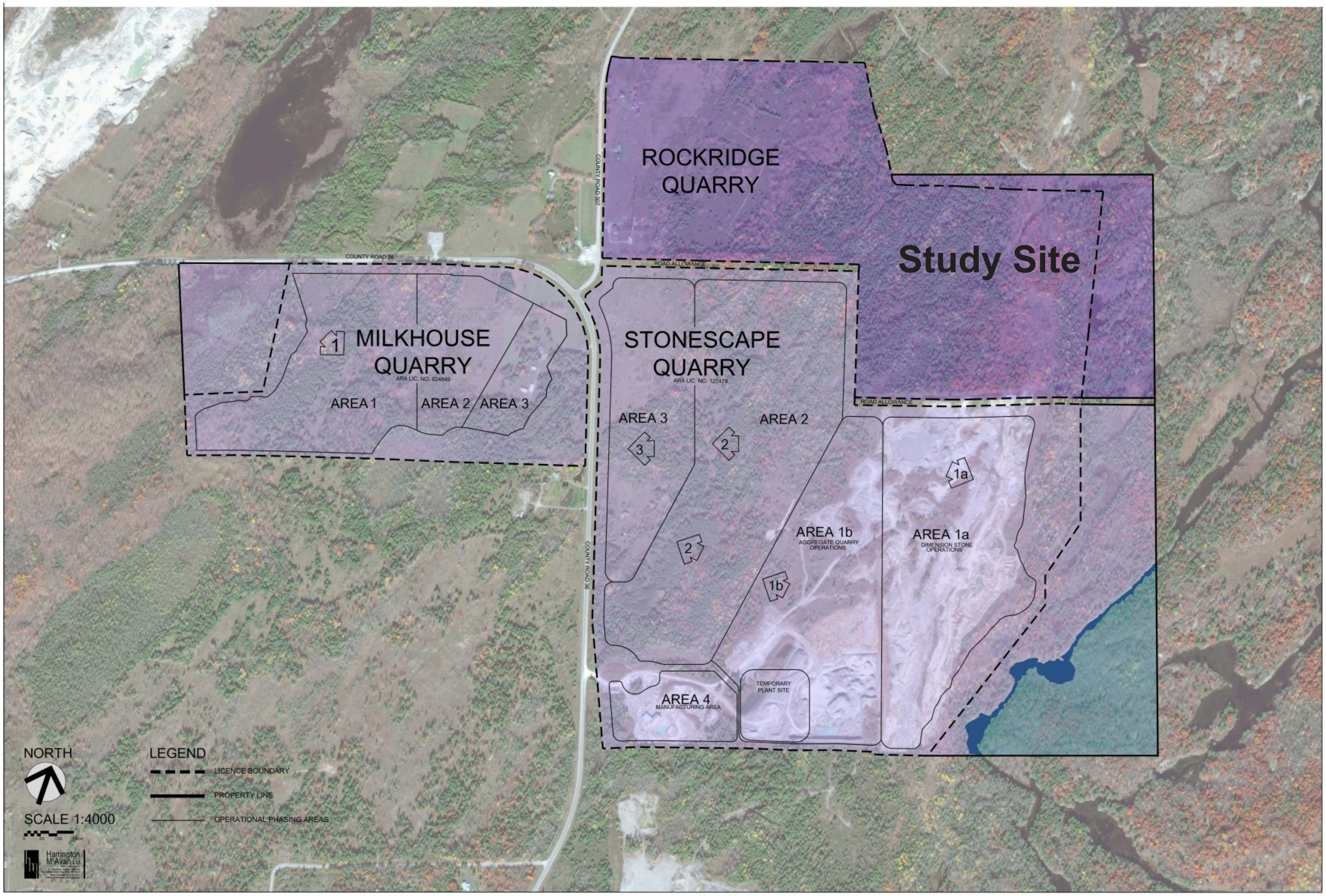
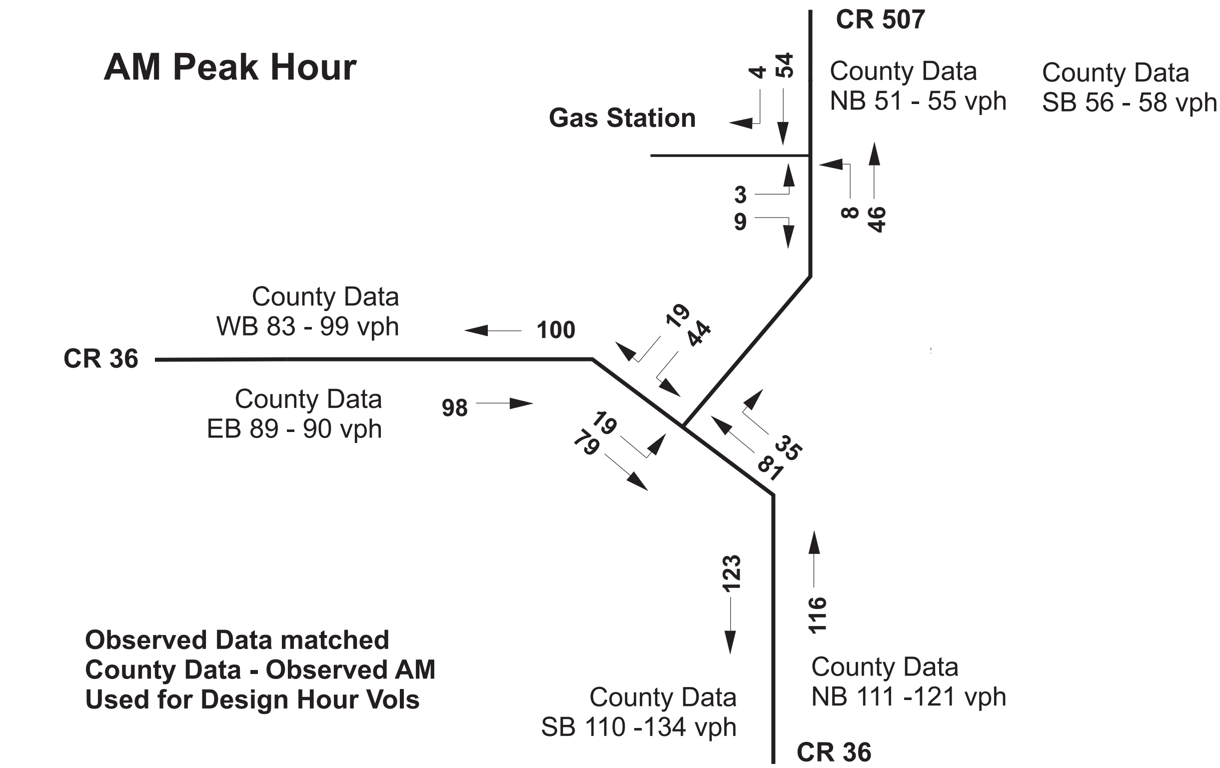


Exhibit 5
Intersection of CR 36 & CR 507

CR 36 Looking North & West

CR 507 Looking South

Exhibit 6
2016 Peak Hour Volumes



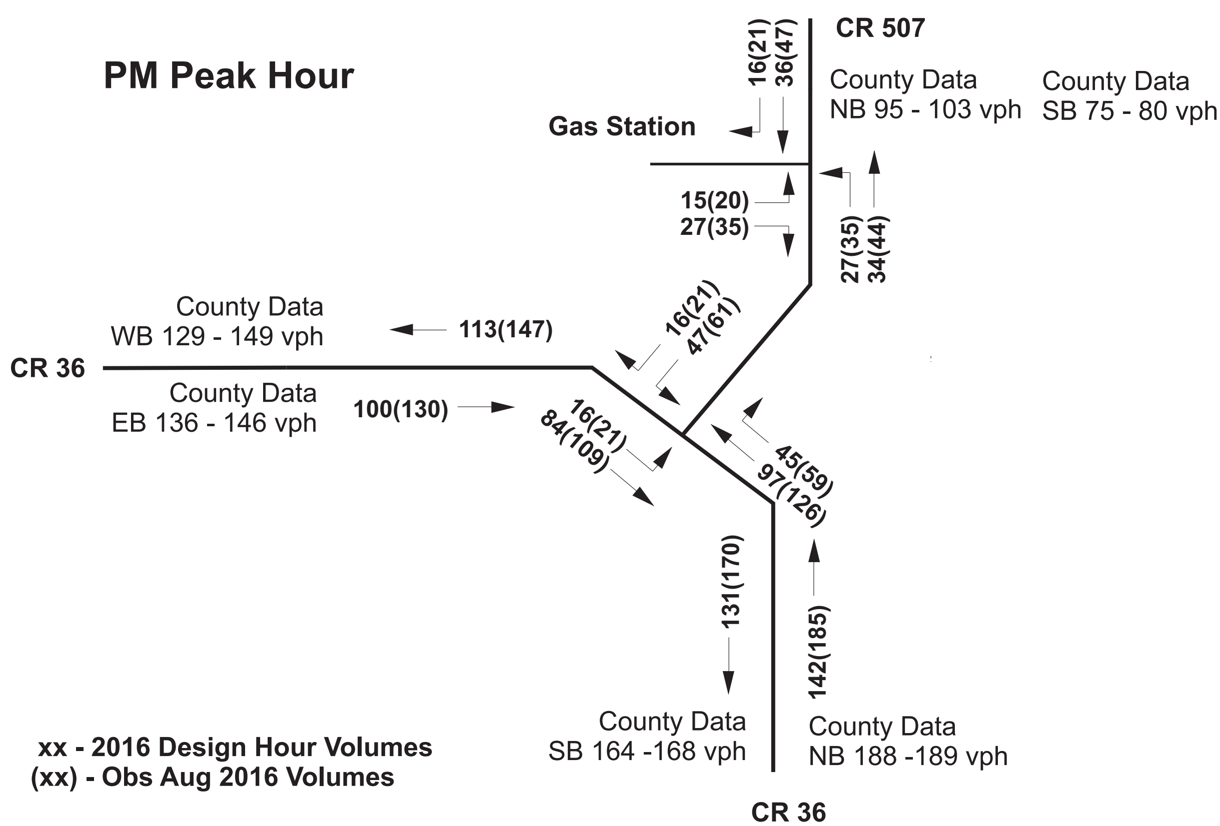
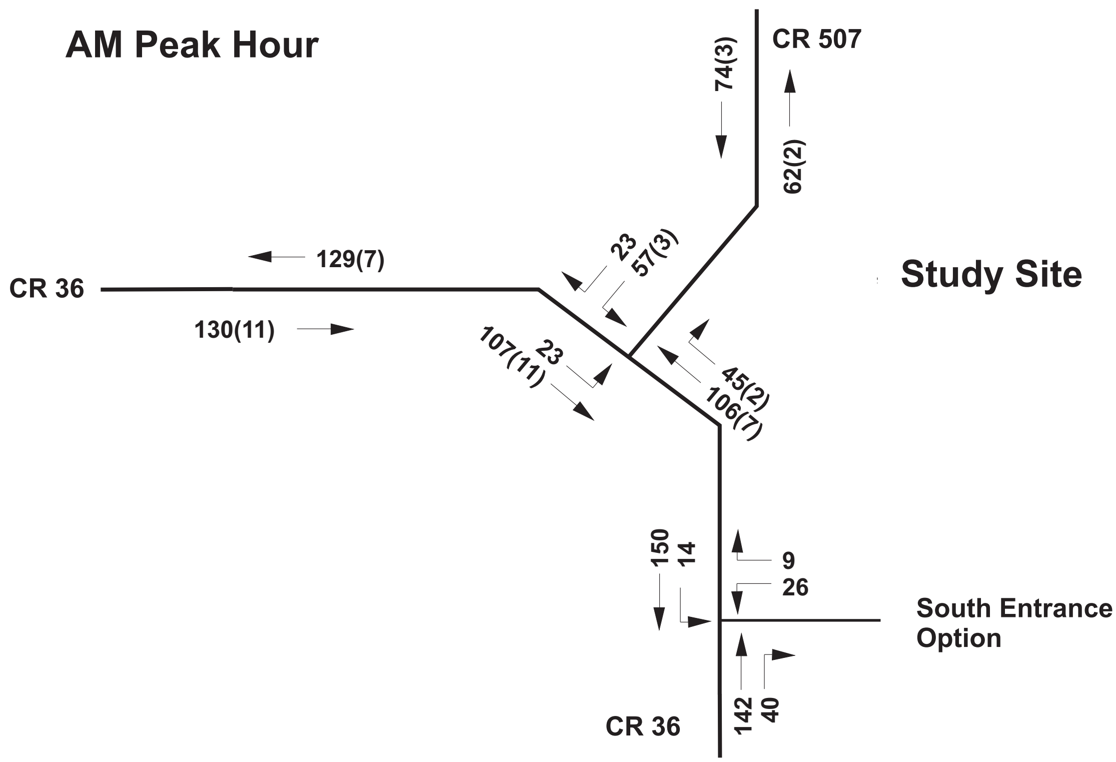
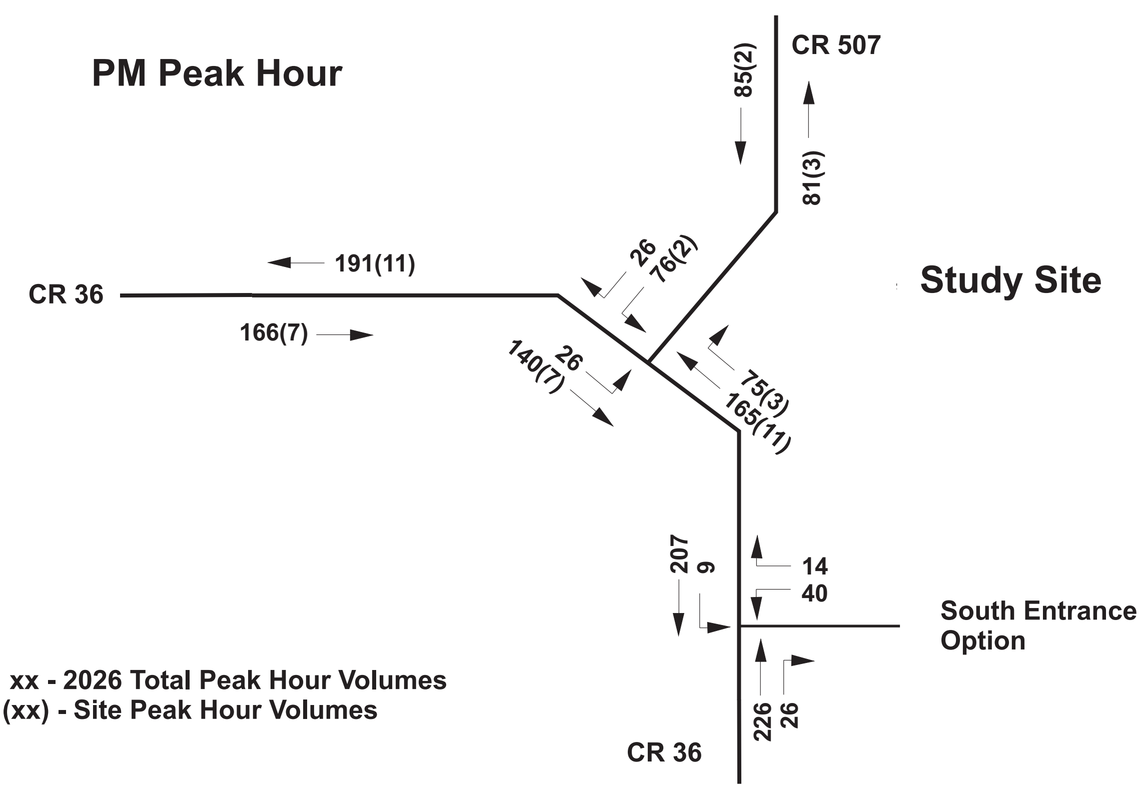


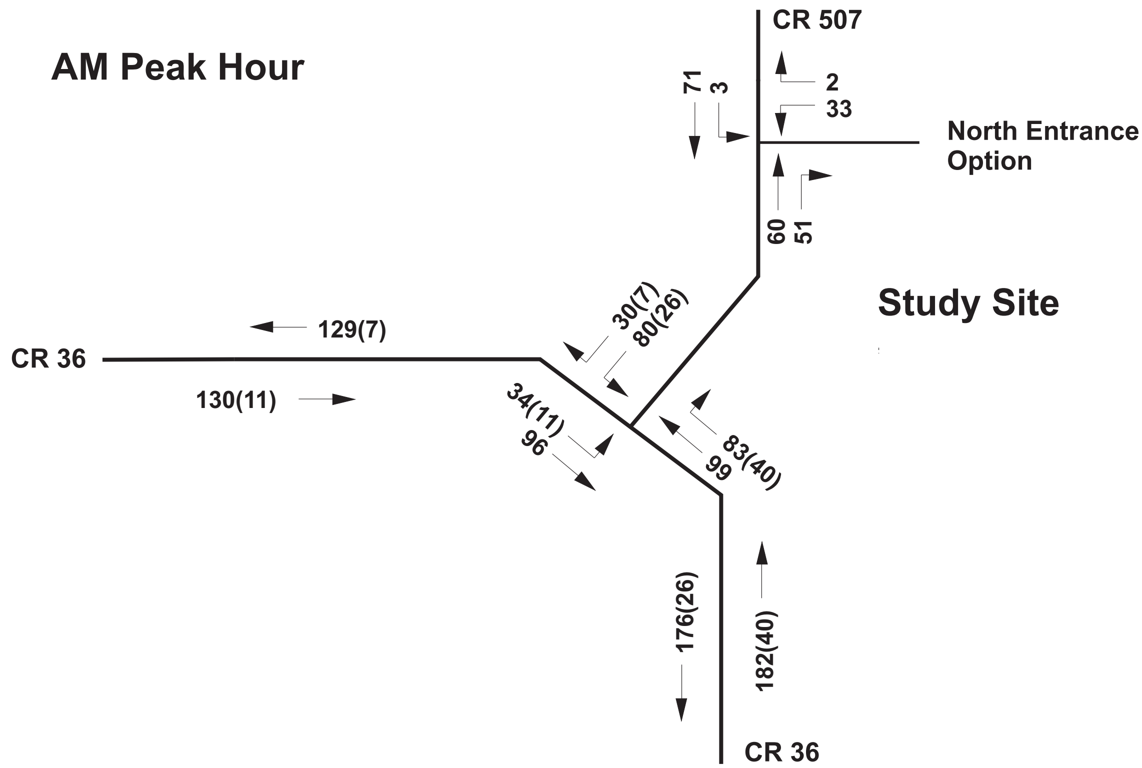
Exhibit 7
2026 Peak Hour Volumes
South Site Entrance Option

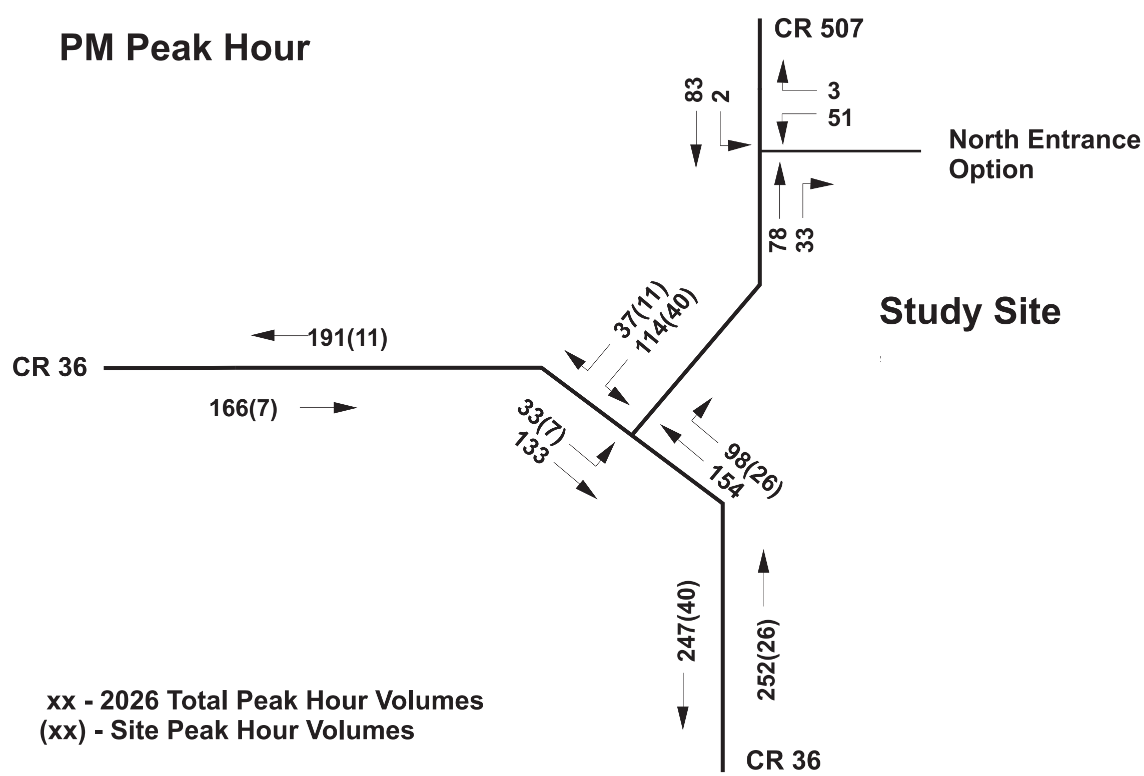




xx - 2026 Total Peak Hour Volumes
(xx) - Site Peak Hour Volumes

Exhibit 8
2026 Peak Hour Volumes
North Site Entrance Option





xx - 2026 Total Peak Hour Volumes
(xx) - Site Peak Hour Volumes

TECHNICAL APPENDIX

Intersection Capacity Analyses

DEFINITION OF LEVELS OF SERVICE
Automobile Mode

UNSIGNALIZED INTERSECTIONS

Analysis of the Level of Service for unsignalized intersections is based on the ***Highway Capacity Manual*** *(HCM 2010)* procedures using current software for unsignalized intersections. The Level of Service for intersections is based on *Control Delay*. At two way stop controlled intersections (TWSC), *Control Delay* is the total elapsed time from a vehicle joining the queue until its departure from the stopped position at the head of the queue. The *Control Delay* also includes the time required to decelerate from a stop and to accelerate to the free-flow speed.

The analysis of individual movements at TWSC intersections can also include the estimate of the ratio of volume or demand to available capacity for the movements. This is commonly know as the (v/c) ratio. The v/c ratio provides some indication of how well these individual intersection movements will function during peak hour periods.

Level of Service definitions for unsignalized intersections as defined by the ***Highway Capacity Manual*** are summarized in the table below.

Definition of Level of Service for Unsignalized Intersections
(see Exhibit 19-1, Highway Capacity Manual 2010)

Level of Service	Average Delay (seconds)
A	0 - 10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	More than 50s and/or v/c > 1

Level of Service (LoS) for a TWSC intersection is determined by the computed or measured *Control Delay* and is defined for each minor movement at the intersection. LoS is not defined for the major street approaches or the intersection as a whole. LoS “F” is considered to be undesirable for design or planning purposes. However, many individual turning movements at TWSC intersections and commercial entrances along urban arterial corridors operate at LoS “F” during peak hour periods.

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	19	79	81	35	44	19
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	21	86	88	38	48	21

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	128	0	-	0	236	111
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	127	-
Critical Hdwy	4.25	-	-	-	6.55	6.35
Critical Hdwy Stg 1	-	-	-	-	5.55	-
Critical Hdwy Stg 2	-	-	-	-	5.55	-
Follow-up Hdwy	2.335	-	-	-	3.635	3.435
Pot Cap-1 Maneuver	1381	-	-	-	724	908
Stage 1	-	-	-	-	884	-
Stage 2	-	-	-	-	868	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1379	-	-	-	711	905
Mov Cap-2 Maneuver	-	-	-	-	720	-
Stage 1	-	-	-	-	883	-
Stage 2	-	-	-	-	853	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1379	-	-	-	767
HCM Lane V/C Ratio	0.015	-	-	-	0.089
HCM Control Delay (s)	7.7	-	-	-	10.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	21	109	126	59	61	21
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	23	118	137	64	66	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	203	0	-	0	335	173
Stage 1	-	-	-	-	171	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	4.25	-	-	-	6.55	6.35
Critical Hdwy Stg 1	-	-	-	-	5.55	-
Critical Hdwy Stg 2	-	-	-	-	5.55	-
Follow-up Hdwy	2.335	-	-	-	3.635	3.435
Pot Cap-1 Maneuver	1295	-	-	-	635	838
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	835	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1293	-	-	-	622	835
Mov Cap-2 Maneuver	-	-	-	-	659	-
Stage 1	-	-	-	-	827	-
Stage 2	-	-	-	-	819	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1293	-	-	-	697
HCM Lane V/C Ratio	0.018	-	-	-	0.128
HCM Control Delay (s)	7.8	-	-	-	10.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	3	9	8	46	54	4
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	3	10	9	50	59	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	133	71	68	0	-	0
Stage 1	66	-	-	-	-	-
Stage 2	67	-	-	-	-	-
Critical Hdwy	6.55	6.35	4.25	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.435	2.335	-	-	-
Pot Cap-1 Maneuver	831	956	1454	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	924	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	819	948	1448	-	-	-
Mov Cap-2 Maneuver	819	-	-	-	-	-
Stage 1	921	-	-	-	-	-
Stage 2	915	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	1.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1448	-	819	948	-	-
HCM Lane V/C Ratio	0.006	-	0.004	0.01	-	-
HCM Control Delay (s)	7.5	0	9.4	8.8	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	35	35	44	47	21
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	22	38	38	48	51	23

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	192	73	79	0	-	0
Stage 1	68	-	-	-	-	-
Stage 2	124	-	-	-	-	-
Critical Hdwy	6.55	6.35	4.25	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.435	2.335	-	-	-
Pot Cap-1 Maneuver	768	954	1441	-	-	-
Stage 1	923	-	-	-	-	-
Stage 2	870	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	741	946	1435	-	-	-
Mov Cap-2 Maneuver	741	-	-	-	-	-
Stage 1	919	-	-	-	-	-
Stage 2	843	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	3.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1435	-	741	946	-	-
HCM Lane V/C Ratio	0.027	-	0.029	0.04	-	-
HCM Control Delay (s)	7.6	0	10	9	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	0.1	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	34	96	99	83	80	30
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	40	18	18	60	40	40
Mvmt Flow	37	104	108	90	87	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	200	0	-	0	333	157
Stage 1	-	-	-	-	155	-
Stage 2	-	-	-	-	178	-
Critical Hdwy	4.5	-	-	-	6.8	6.6
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	2.56	-	-	-	3.86	3.66
Pot Cap-1 Maneuver	1175	-	-	-	591	798
Stage 1	-	-	-	-	789	-
Stage 2	-	-	-	-	769	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1173	-	-	-	570	795
Mov Cap-2 Maneuver	-	-	-	-	608	-
Stage 1	-	-	-	-	788	-
Stage 2	-	-	-	-	743	-

Approach	EB	WB	SB
HCM Control Delay, s	2.1	0	11.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1173	-	-	-	650
HCM Lane V/C Ratio	0.032	-	-	-	0.184
HCM Control Delay (s)	8.2	-	-	-	11.8
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	33	133	154	98	114	37
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	40	18	18	60	40	40
Mvmt Flow	36	145	167	107	124	40

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	276	0	-	0	439	225
Stage 1	-	-	-	-	223	-
Stage 2	-	-	-	-	216	-
Critical Hdwy	4.5	-	-	-	6.8	6.6
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	2.56	-	-	-	3.86	3.66
Pot Cap-1 Maneuver	1097	-	-	-	510	728
Stage 1	-	-	-	-	732	-
Stage 2	-	-	-	-	738	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1095	-	-	-	492	726
Mov Cap-2 Maneuver	-	-	-	-	554	-
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	713	-

Approach	EB	WB	SB
HCM Control Delay, s	1.7	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1095	-	-	-	588
HCM Lane V/C Ratio	0.033	-	-	-	0.279
HCM Control Delay (s)	8.4	-	-	-	13.5
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1.1

Intersection						
Int Delay, s/veh	1.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	33	2	60	51	3	71
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	80	80	15	80	80	15
Mvmt Flow	36	2	65	55	3	77

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	179	97	0	0	123	0
Stage 1	95	-	-	-	-	-
Stage 2	84	-	-	-	-	-
Critical Hdwy	7.2	7	-	-	4.9	-
Critical Hdwy Stg 1	6.2	-	-	-	-	-
Critical Hdwy Stg 2	6.2	-	-	-	-	-
Follow-up Hdwy	4.22	4.02	-	-	2.92	-
Pot Cap-1 Maneuver	661	782	-	-	1096	-
Stage 1	765	-	-	-	-	-
Stage 2	775	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	657	779	-	-	1094	-
Mov Cap-2 Maneuver	657	-	-	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	771	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	663	1094	-
HCM Lane V/C Ratio	-	-	0.057	0.003	-
HCM Control Delay (s)	-	-	10.8	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	51	3	78	33	2	83
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	80	80	15	80	80	15
Mvmt Flow	55	3	85	36	2	90

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	200	107	0	0	123	0
Stage 1	105	-	-	-	-	-
Stage 2	95	-	-	-	-	-
Critical Hdwy	7.2	7	-	-	4.9	-
Critical Hdwy Stg 1	6.2	-	-	-	-	-
Critical Hdwy Stg 2	6.2	-	-	-	-	-
Follow-up Hdwy	4.22	4.02	-	-	2.92	-
Pot Cap-1 Maneuver	641	772	-	-	1096	-
Stage 1	757	-	-	-	-	-
Stage 2	765	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	638	769	-	-	1094	-
Mov Cap-2 Maneuver	638	-	-	-	-	-
Stage 1	756	-	-	-	-	-
Stage 2	762	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	644	1094	-
HCM Lane V/C Ratio	-	-	0.091	0.002	-
HCM Control Delay (s)	-	-	11.2	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	26	140	165	75	76	26
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	15	18	18	18	18	18
Mvmt Flow	28	152	179	82	83	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	263	0	-	0	431	224
Stage 1	-	-	-	-	222	-
Stage 2	-	-	-	-	209	-
Critical Hdwy	4.25	-	-	-	6.58	6.38
Critical Hdwy Stg 1	-	-	-	-	5.58	-
Critical Hdwy Stg 2	-	-	-	-	5.58	-
Follow-up Hdwy	2.335	-	-	-	3.662	3.462
Pot Cap-1 Maneuver	1229	-	-	-	552	777
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	789	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1227	-	-	-	538	774
Mov Cap-2 Maneuver	-	-	-	-	599	-
Stage 1	-	-	-	-	777	-
Stage 2	-	-	-	-	770	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1227	-	-	-	636
HCM Lane V/C Ratio	0.023	-	-	-	0.174
HCM Control Delay (s)	8	-	-	-	11.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.6

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	26	140	165	75	76	26
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	15	18	18	18	18	18
Mvmt Flow	28	152	179	82	83	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	263	0	-	0	431	224
Stage 1	-	-	-	-	222	-
Stage 2	-	-	-	-	209	-
Critical Hdwy	4.25	-	-	-	6.58	6.38
Critical Hdwy Stg 1	-	-	-	-	5.58	-
Critical Hdwy Stg 2	-	-	-	-	5.58	-
Follow-up Hdwy	2.335	-	-	-	3.662	3.462
Pot Cap-1 Maneuver	1229	-	-	-	552	777
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	789	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1227	-	-	-	538	774
Mov Cap-2 Maneuver	-	-	-	-	599	-
Stage 1	-	-	-	-	777	-
Stage 2	-	-	-	-	770	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1227	-	-	-	636
HCM Lane V/C Ratio	0.023	-	-	-	0.174
HCM Control Delay (s)	8	-	-	-	11.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.6

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	14	150	142	40	26	9
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	80	15	15	80	80	80
Mvmt Flow	15	163	154	43	28	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	200	0	-	0	371	180
Stage 1	-	-	-	-	178	-
Stage 2	-	-	-	-	193	-
Critical Hdwy	4.9	-	-	-	7.2	7
Critical Hdwy Stg 1	-	-	-	-	6.2	-
Critical Hdwy Stg 2	-	-	-	-	6.2	-
Follow-up Hdwy	2.92	-	-	-	4.22	4.02
Pot Cap-1 Maneuver	1017	-	-	-	501	697
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	684	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1015	-	-	-	491	695
Mov Cap-2 Maneuver	-	-	-	-	491	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	672	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	12.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1015	-	-	-	531
HCM Lane V/C Ratio	0.015	-	-	-	0.072
HCM Control Delay (s)	8.6	0	-	-	12.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	9	207	226	26	40	14
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	80	15	15	80	80	80
Mvmt Flow	10	225	246	28	43	15

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	276	0	-	0	507	264
Stage 1	-	-	-	-	262	-
Stage 2	-	-	-	-	245	-
Critical Hdwy	4.9	-	-	-	7.2	7
Critical Hdwy Stg 1	-	-	-	-	6.2	-
Critical Hdwy Stg 2	-	-	-	-	6.2	-
Follow-up Hdwy	2.92	-	-	-	4.22	4.02
Pot Cap-1 Maneuver	945	-	-	-	410	619
Stage 1	-	-	-	-	631	-
Stage 2	-	-	-	-	644	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	943	-	-	-	404	617
Mov Cap-2 Maneuver	-	-	-	-	404	-
Stage 1	-	-	-	-	630	-
Stage 2	-	-	-	-	635	-

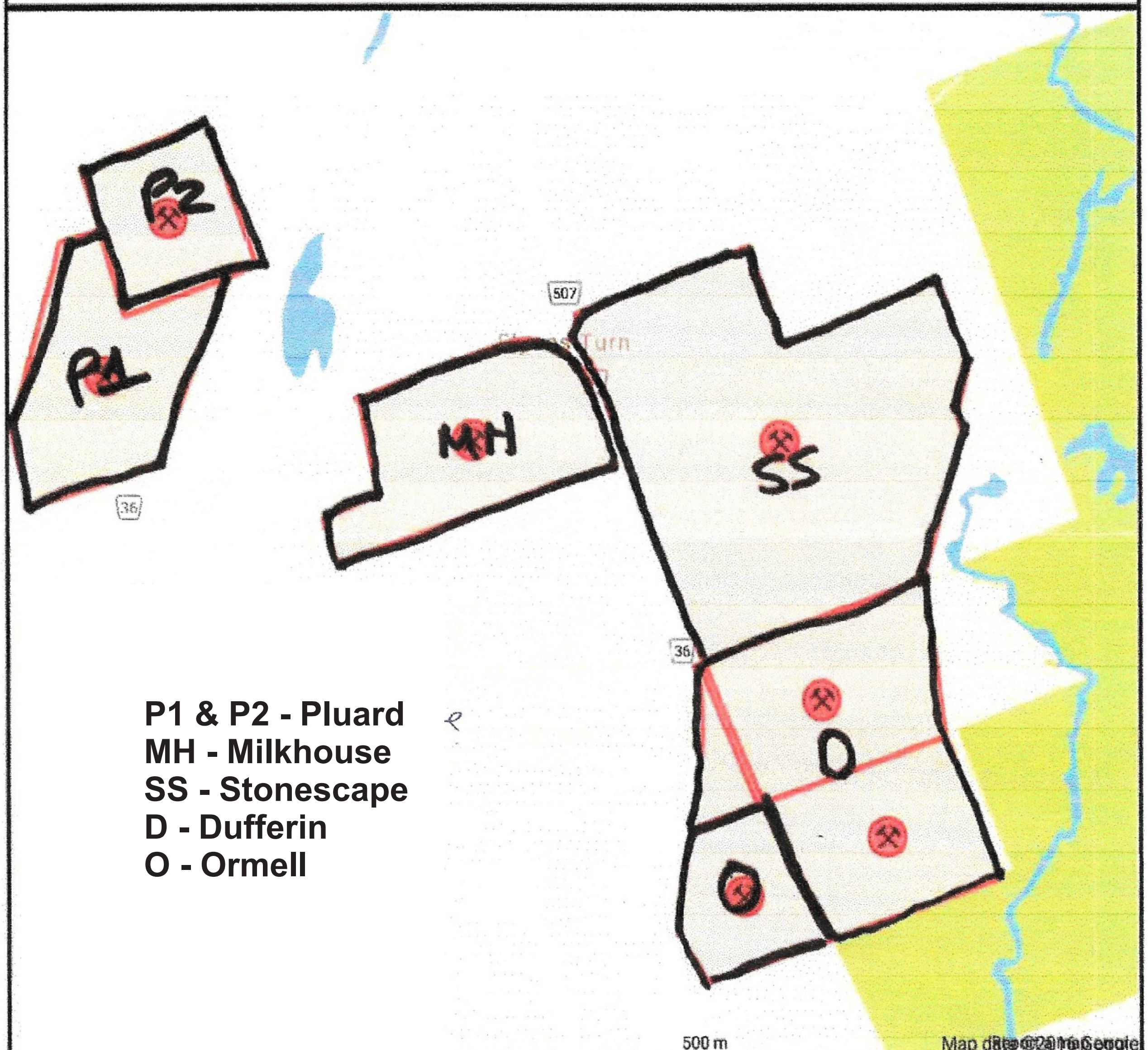
Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	943	-	-	-	444
HCM Lane V/C Ratio	0.01	-	-	-	0.132
HCM Control Delay (s)	8.9	0	-	-	14.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Adjacent Quarries

Ontario

Flynn's Turn Quarry Map



Map Legend

Site boundary and Location

Pit

Quarry

Both

Group of several sites

Group of many sites

Currently selected sites

Currently listed site(s)

Traffic Data

Rockridge Quarry TIS
Spot Speed Studies

August 26, 2016 - 4:20 - 4:50 PM

CR 507 - Vicinity Flynn's Store Entrance

	Observed		Sorted		
No	NB	SB	NB	SB	
1	43	69	35	56	
2	41	72	40	66	
3	40	73	40	68	
4	35	77	41	69	
5	42	74	42	69	
6	40	66	42	72	
7	51	75	42	72	
8	42	76	42	72	
9	51	87	43	73	
10	47	68	43	74	
11	45	85	45	74	
12	48	74	45	75	
13	42	77	47	76	
14	60	95	48	77	
15	43	79	50	77	
16	50	69	51	79	
17	51	56	51	85	85th Percentile
18	42	72	51	85	
19	45	85	60	87	
20	61	72	61	95	

CR 36 - Vicinity South Site Entrance

	Observed		Sorted		
No	NB	SB	NB	SB	
1	95	84	89	72	
2	90	93	89	80	
3	89	87	89	82	
4	111	97	90	84	
5	101	80	90	87	
6	89	101	90	89	
7	103	100	91	90	
8	102	119	92	93	
9	97	113	93	93	
10	95	109	95	97	
11	98	82	95	97	
12	113	72	95	97	
13	93	93	97	97	
14	90	106	98	100	
15	95	100	98	100	
16	90	97	101	101	
17	91	97	102	106	85 th Percentile
18	89	90	103	109	
19	92	89	111	113	
20	98	97	113	119	

November 7, 2016 - 10:15 AM to 11:15 AM

CR 36 @ Study Intersection

	Observed		Sorted		
No	NB/WB	EB/SB	NB/WB	EB/SB	
1	71	74	63	72	
2	85	84	69	74	
3	80	82	71	76	
4	84	77	76	76	
5	87	84	79	77	
6	82	85	80	79	
7	63	89	80	80	
8	92	79	82	80	
9	90	72	82	80	
10	76	76	82	82	
11	69	80	84	82	
12	103	89	85	82	
13	92	82	85	84	
14	85	93	85	84	
15	90	89	87	84	
16	90	89	89	85	
17	89	82	90	89	
18	79	76	90	89	
19	90	89	90	89	85th Percentile
20	82	90	90	89	
21	80	84	92	89	
22	85	80	92	90	
23	82	80	103	93	

Rockridge Quarry Traffic Study
Collision Analysis Summary

No	Year	Month	Time	Weather	No of veh	Severity	Cause
1	2009	March	12:30 PM	Clear	2	PDO	SB LT hit SB LT on 507
2	2010	April	9:10 AM	Clear	2	PDO	SB LT hits NB thru on 36 RT block view
3	2010	September	3:10 PM	Clear	1	PDO	WB 36 veh lost control on curve
4	2011	March	6:15 PM	Snowy	1	PDO	WB 36 veh lost control on curve in slush
5	2011	November	10:10 PM	Clear	2	PDO	WB 36 veh strikes WB RT veh on curve
6	2012	December	8:12 PM	Icy	1	PI	NB 36 veh loses control on icy road
7	2013	June	4:15 PM	Raining	1	PDO	NB 36 veh loses control on curve wet road
8	2013	June	2:30 PM	NA	1	PDO	NA

Summary

1. 8 collisions in and around the intersection in 5 years
2. 5 of collisions single vehicle on CR 36 horizontal curve
3. 3 collisions actual intersection collisions involving more than 1 veh
4. 3 of 5 single vehicles collisions involve weather

Collision Rate

Annual collision rate is 3 collsions/5 years = 0.6 collisions per year
Total daily entry volumes = 1850+1300+820 = 3970 vpd

Collision Rate = (1,000,000 x 0.6)/(365x3,970) = 0.414 collisions per million vehicle entrys

Auxiliary Lane Warrant Analysis

Rockridge Quarry Left Turn lane Warrant Analyses

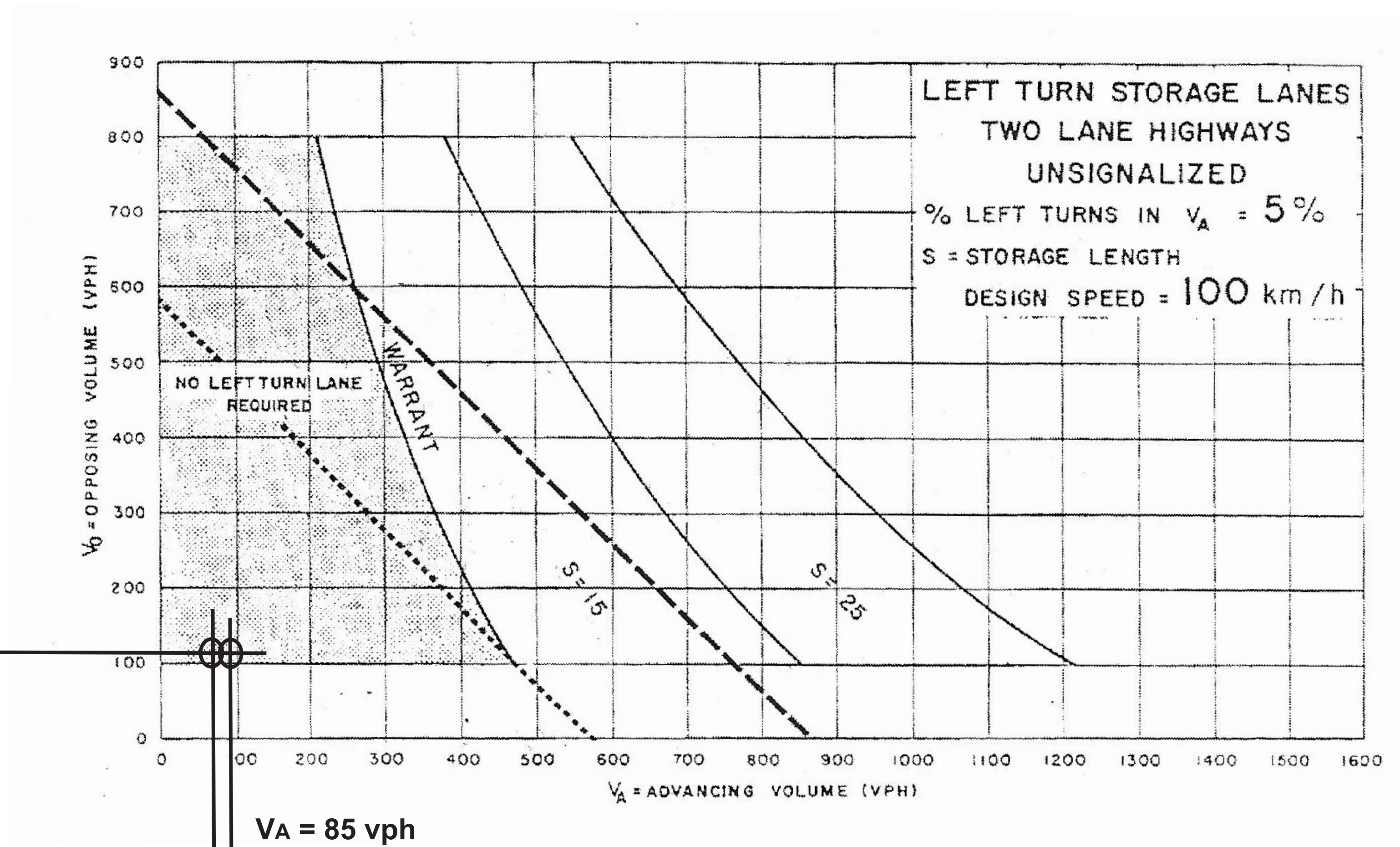
North Entrance Option – Access to CR 507

MTO Left Turn Lane Warrants – Design Speed 100 kph

Peak Hour	North Entrance	CR 36/CR 507 Intersection
AM Peak Hour	V_A = 74 vph	V_A = 130 vph
	V_L = 3 ~ 4%	V_L = 34 ~ 26%
	V_O = 111 vph	V_O = 182 vph
PM Peak Hour	V_A = 85 vph	V_A = 166 vph
	V_L = 2 ~ 2.4%	V_L = 33 ~ 20%
	V_O = 111 vph	V_O = 252 vph

No Warrant for these peak hour scenarios – See MTO Left Turn Nomographs Over

North Entrance Option - Southbound Left Turn Lane on CR 507
2026 Total Peak Hour Volumes



V_O = 111 vph

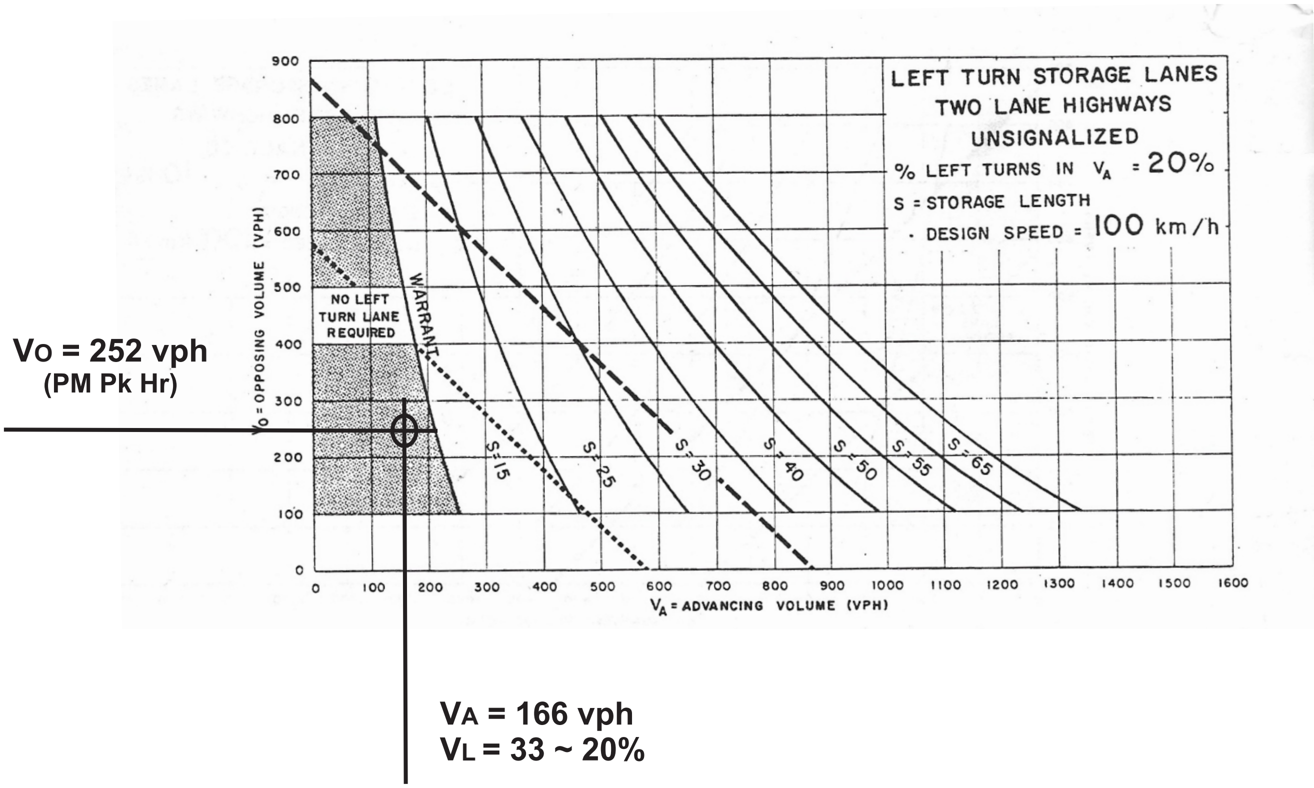
V_A = 74 vph
V_L = 3 ~ 4%
(AM Pk Hr)

V_A = 85 vph
V_L = 2 ~ 2.4%
(PM Pk Hr)

No Warrant for a Left Turn Lane

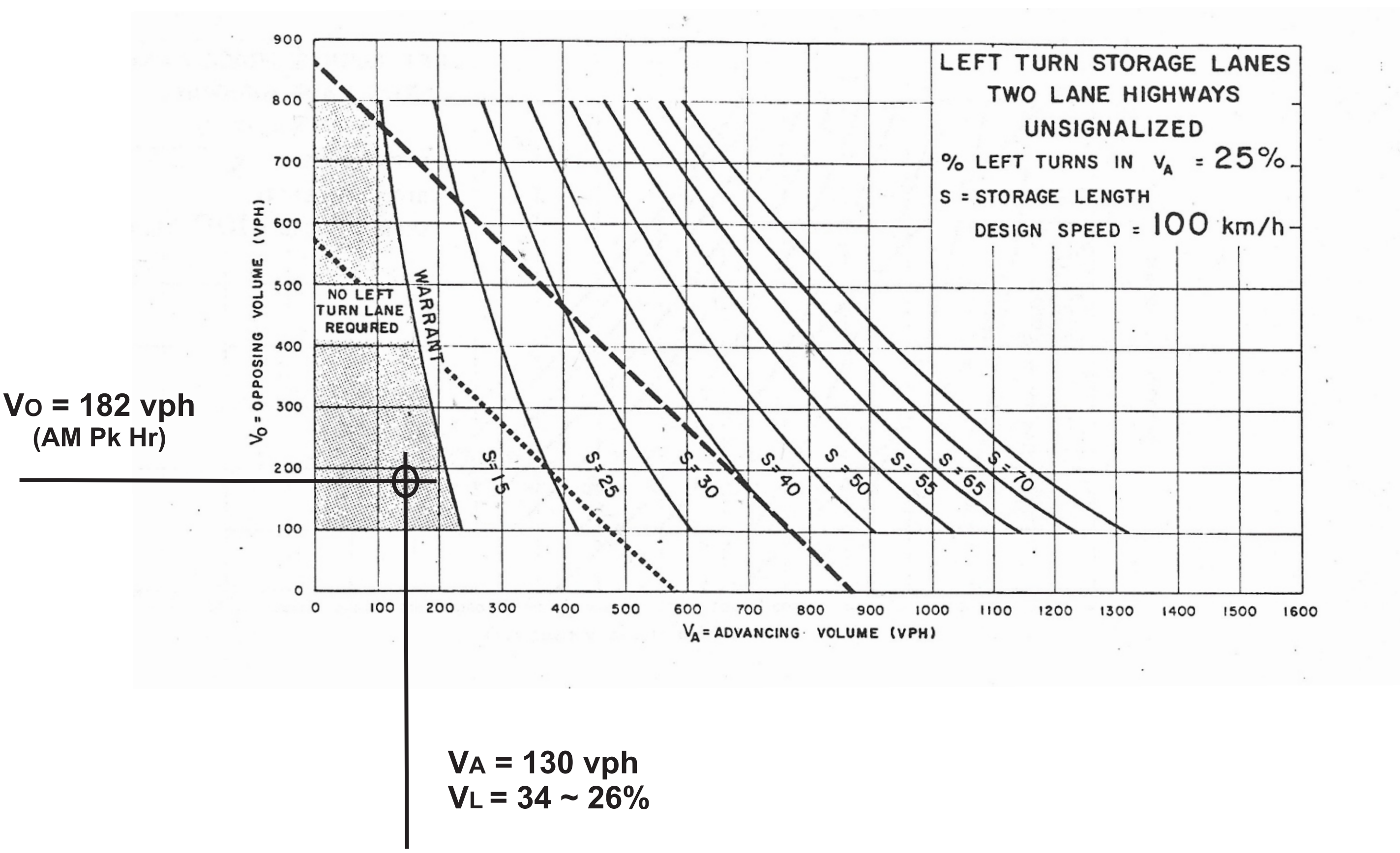
North Site Entrance Option - Intersection of CR 36 & CR 507
2026 Total Peak Hour Volumes

VO = 252 vph
(PM Pk Hr)



VA = 166 vph
VL = 33 ~ 20%

VO = 182 vph
(AM Pk Hr)



VA = 130 vph
VL = 34 ~ 26%

No Warrant for a Left Turn lane on Eastbound CR 36

Rockridge Quarry Left Turn lane Warrant Analyses

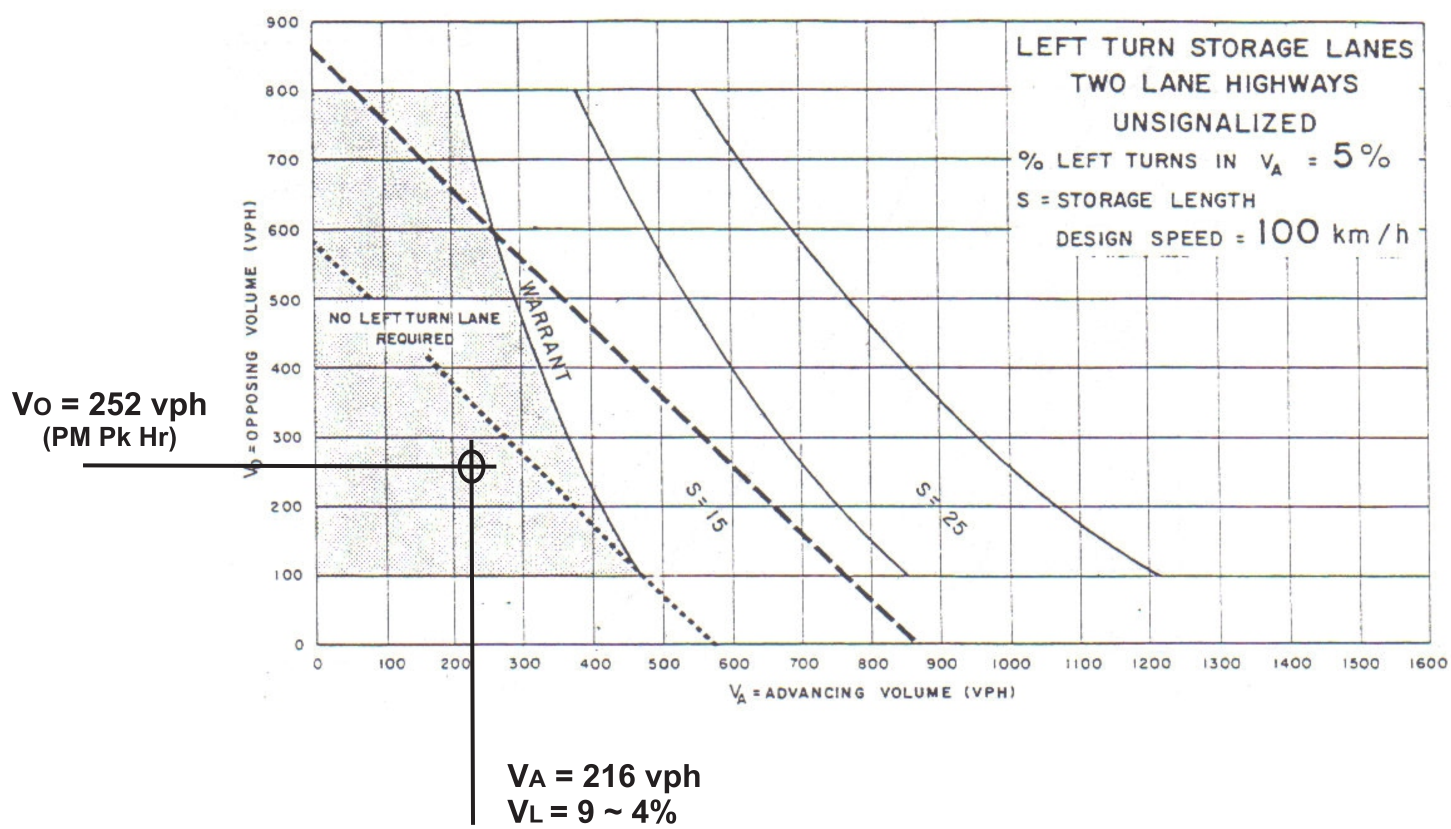
South Entrance Option – Access to CR 36

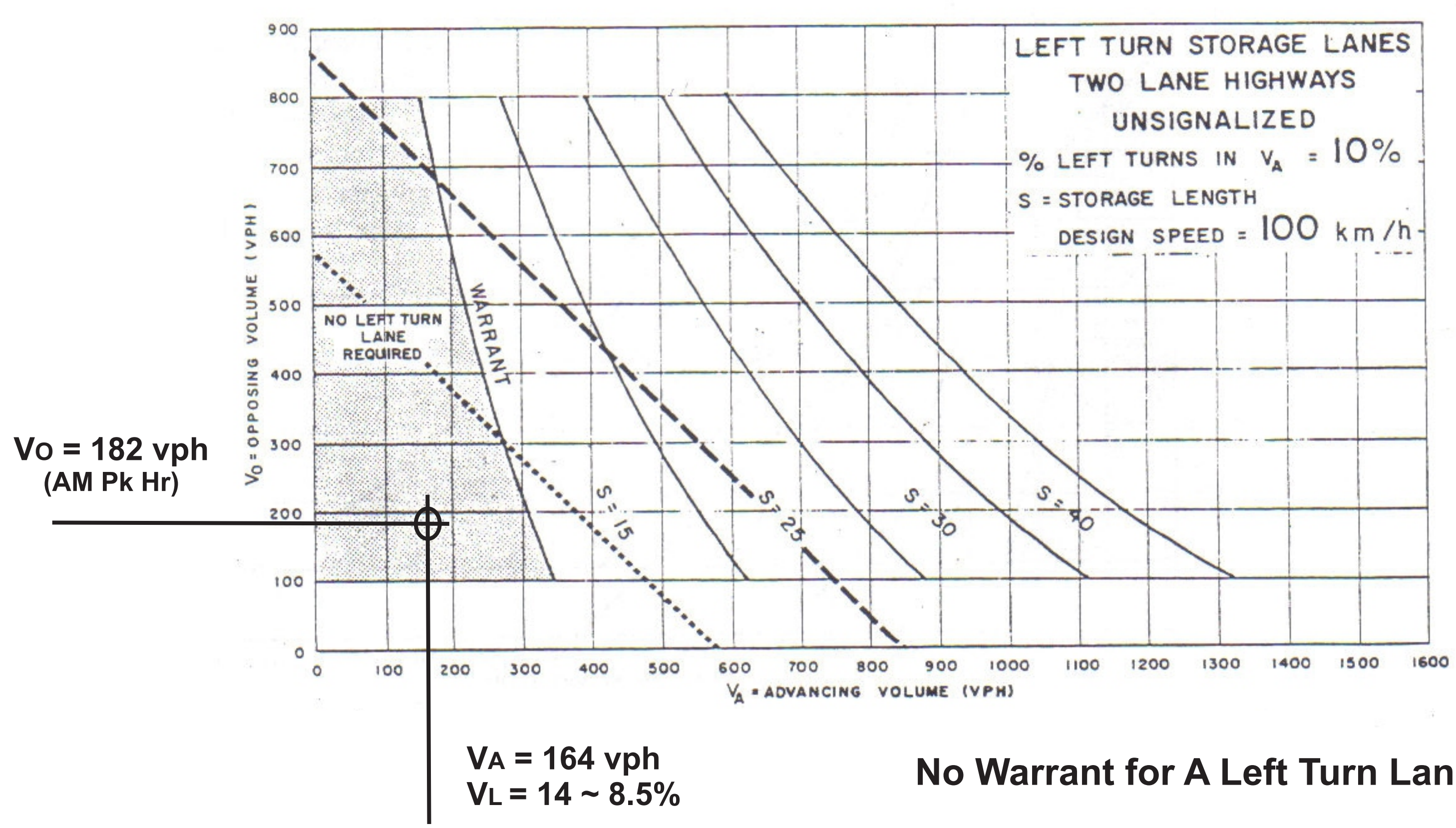
MTO Left Turn Lane Warrants – Design Speed 100 kph

Peak Hour	South Entrance	CR 36/CR 507 Intersection
AM Peak Hour	V_A = 164 vph	V_A = 130 vph
	V_L = 14 ~ 8.5%	V_L = 23 ~ 17.6%
	V_O = 182 vph	V_O = 151 vph
PM Peak Hour	V_A = 216 vph	V_A = 166 vph
	V_L = 9 ~ 4%	V_L = 26 ~ 16%
	V_O = 252 vph	V_O = 240 vph

No Warrant for these peak hour scenarios – See MTO Left Turn Nomographs Over

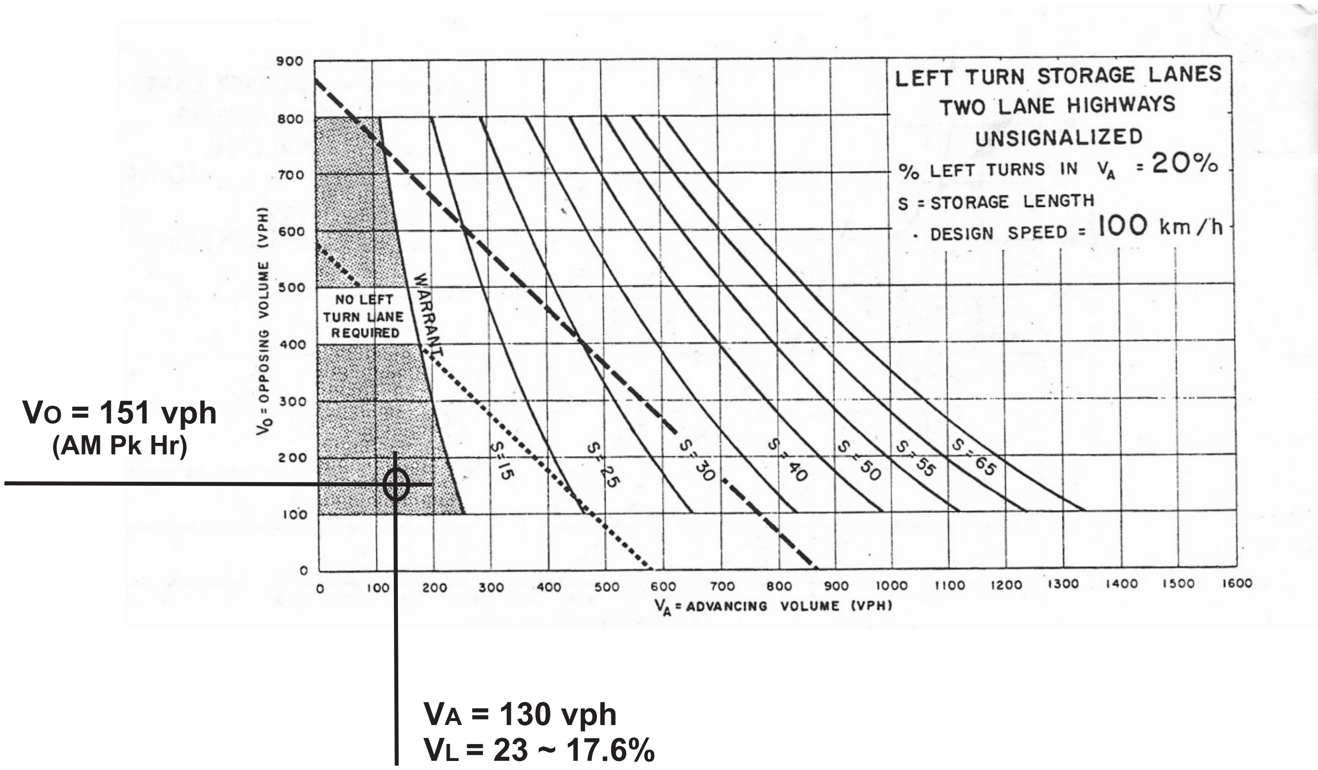
South Entrance Option - Southbound Left Turn Lane on CR 36
2026 Total Peak Hour Volumes

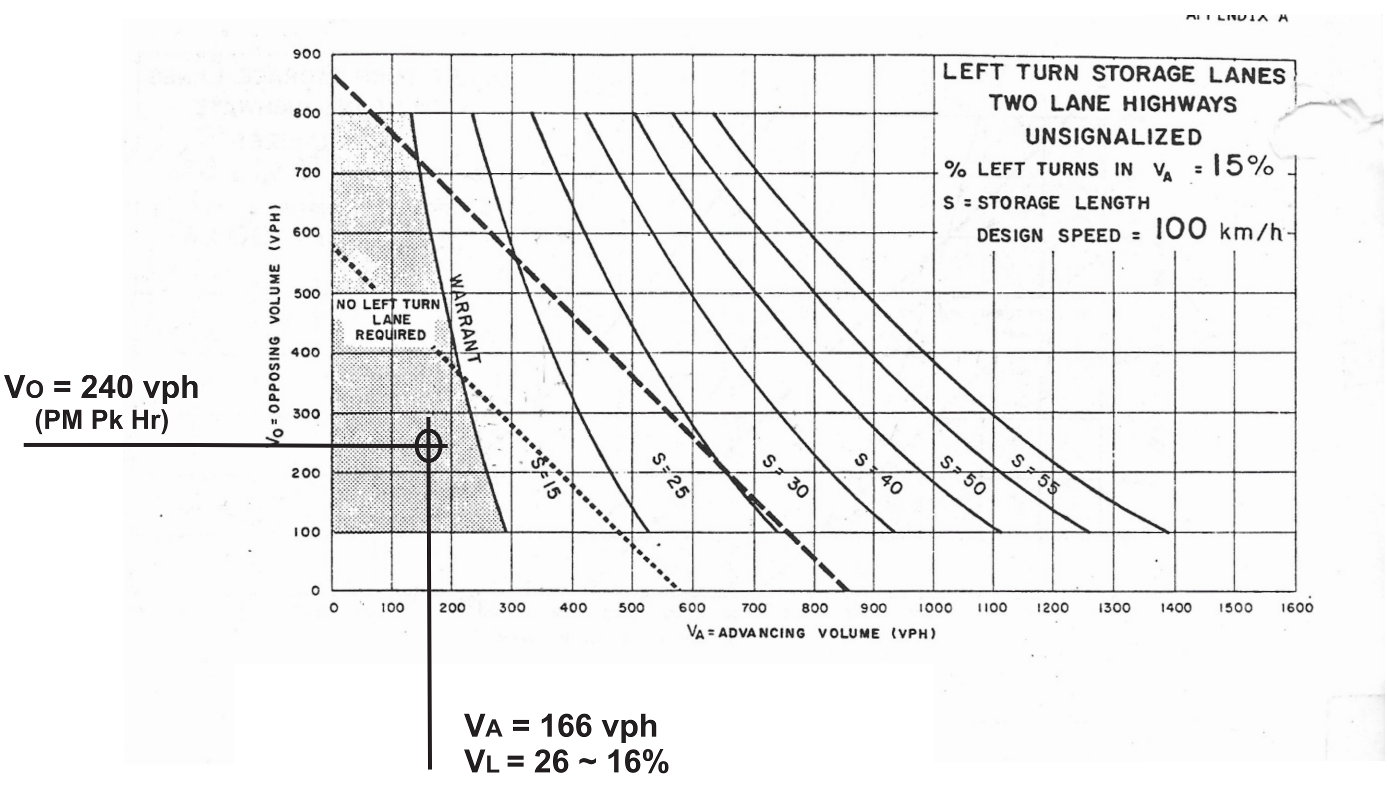




No Warrant for A Left Turn Lane

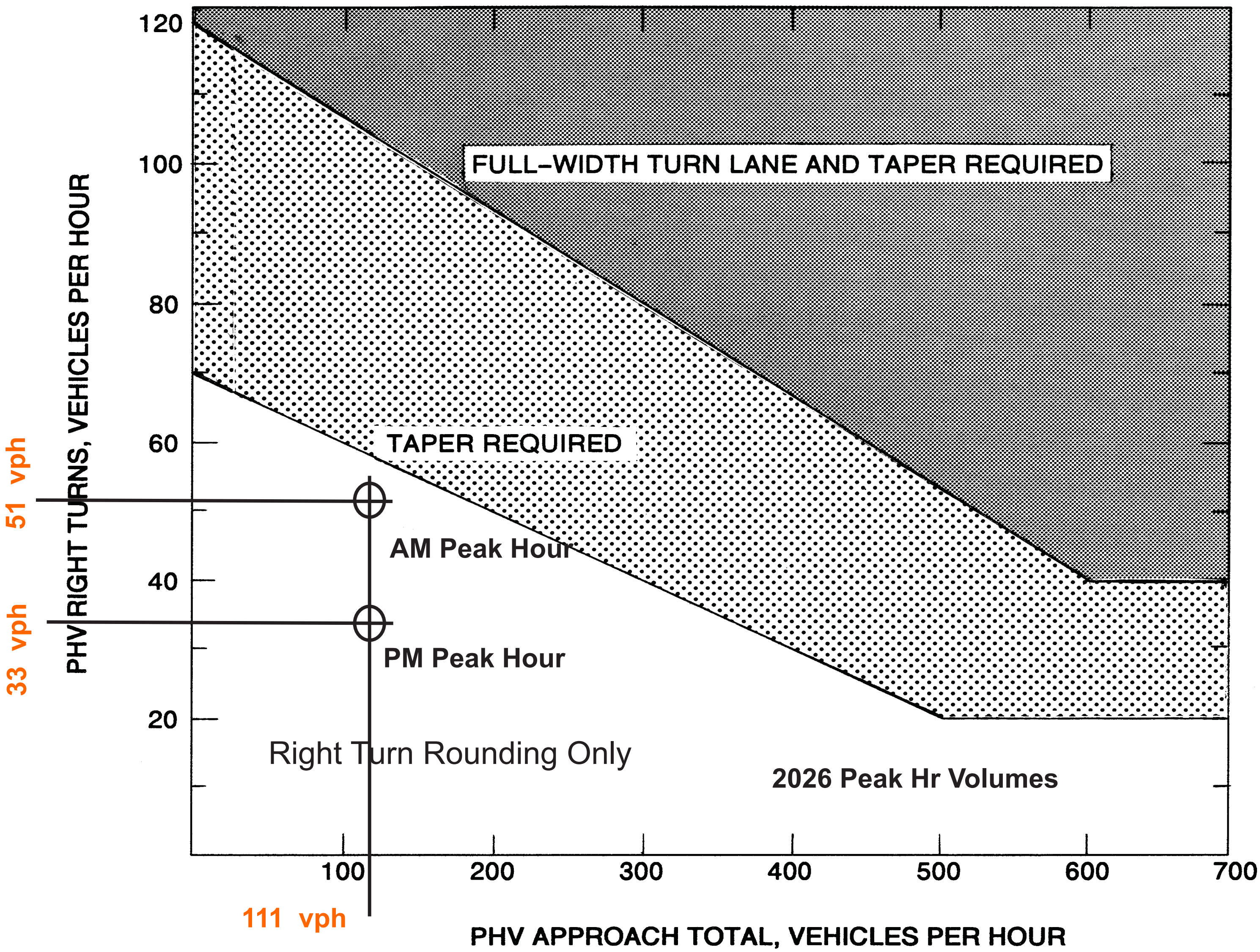
South Site Entrance Option - Intersection of CR 36 & CR 507
2026 Total Peak Hour Volumes





No Warrant for a Left Turn lane on Eastbound CR 36

VDOT Guidelines for Right Turn Treatment
North Site Entrance to CR 507



Appropriate Radius required at all Intersections and Entrances (Commercial or Private).

LEGEND

PHV - Peak Hour Volume (also Design Hourly Volume equivalent)

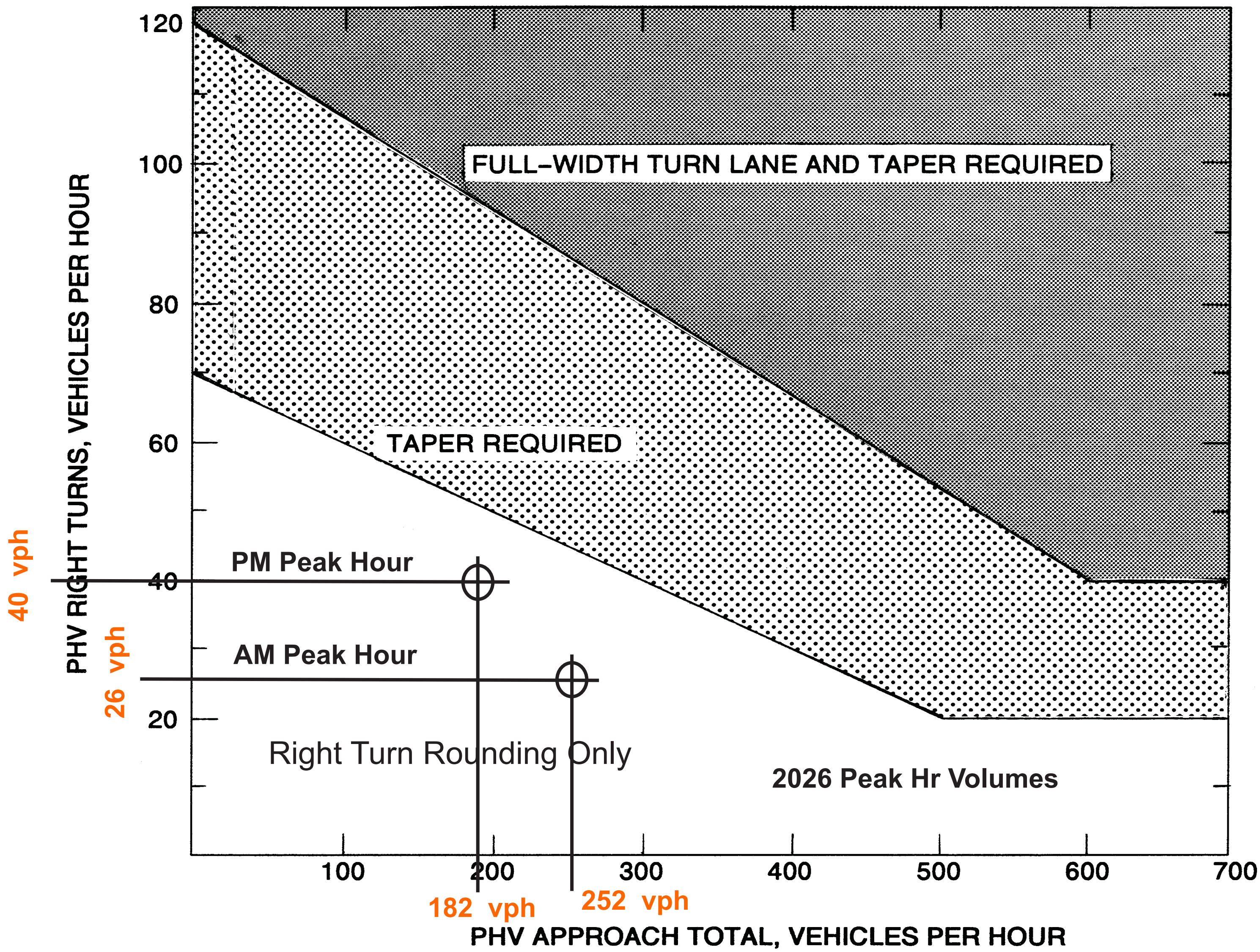
Adjustment for Right Turns

For posted speeds at or under 70 kph, PHV right turns > 40, and PHV total < 300.
Adjusted right turns = PHV Right Turns - 20
If PHV is not known use formula: PHV = ADT x K x D

K = the percent of AADT occurring in the peak hour
D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

VDOT Guidelines for Right Turn Treatment
South Site Entrance to CR 36



Appropriate Radius required at all Intersections and Entrances (Commercial or Private).

LEGEND

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K = the percent of AADT occurring in the peak hour
D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

Site Entrance Guidelines

MINISTRY OF TRANSPORTATION
ONTARIO

CSAS – 23

TRUCK ACCESS

ALL TRUCK DESIGN VEHICLES

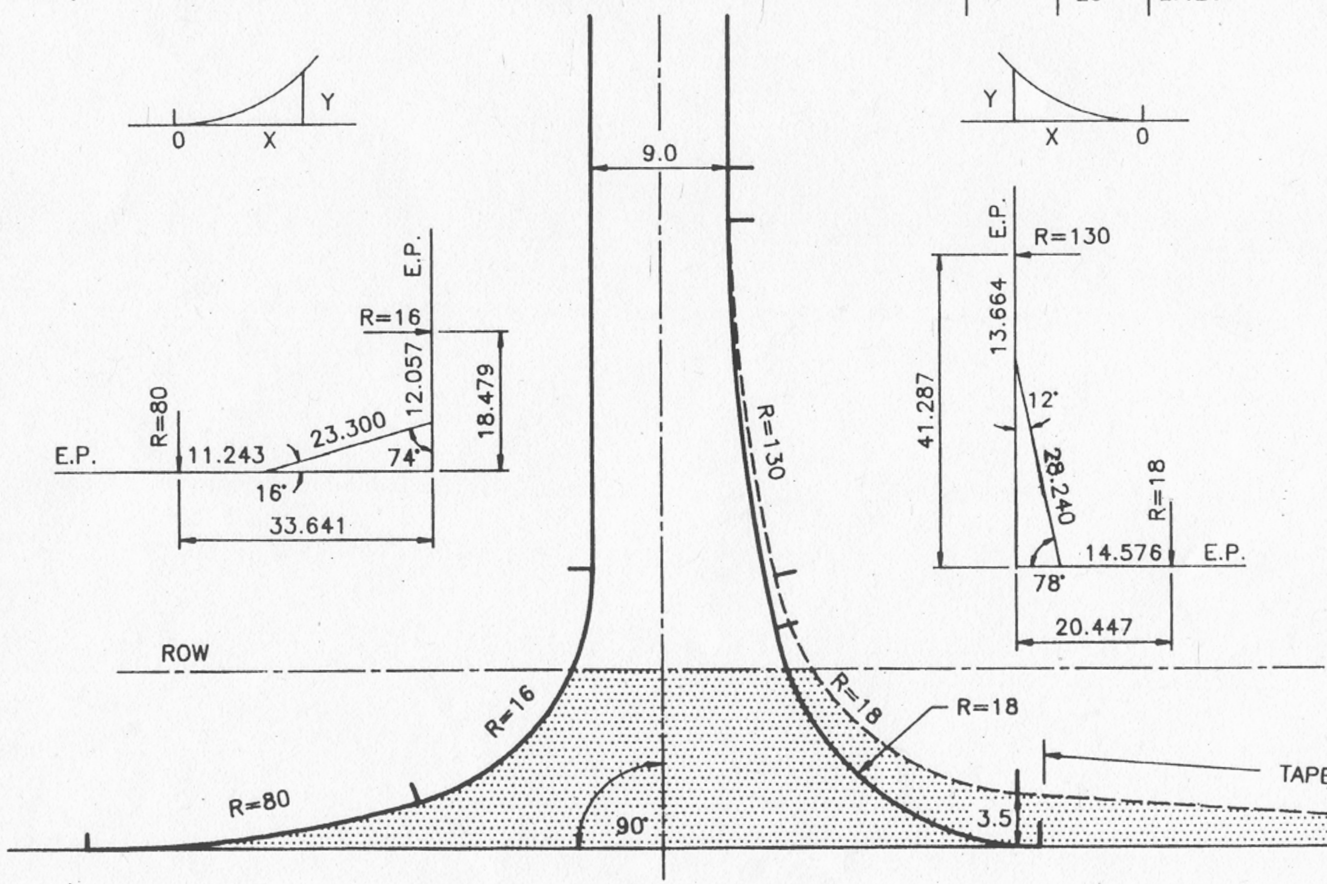
DATE: 1994–01 | REV:

CURVE OFFSETS

R=80		R=16	
X	Y	X	Y
0	0	0	0
5	0.156	5	0.801
10	0.627	10	3.510
15	1.419	15	10.432
20	2.540		

CURVE OFFSETS

R=18		R=130	
X	Y	X	Y
0	0	0	0
5	0.708	5	0.096
10	3.033	10	0.385
15	8.050	15	0.868
		20	1.548
		25	2.426



AREA TO BE PAVED

NOTES:

Layout and curve offsets shown represent design without taper.
For design with taper these values have to be calculated.

The compound curve is based on the manoeuvre of a WB–15 design vehicle. However the entrance will accommodate all larger design vehicles.

TAPER LENGTH Based on Lane Change Criterium					
Design Speed km/h	60	70	80	90	100
Taper, m	50	60	70	75	80

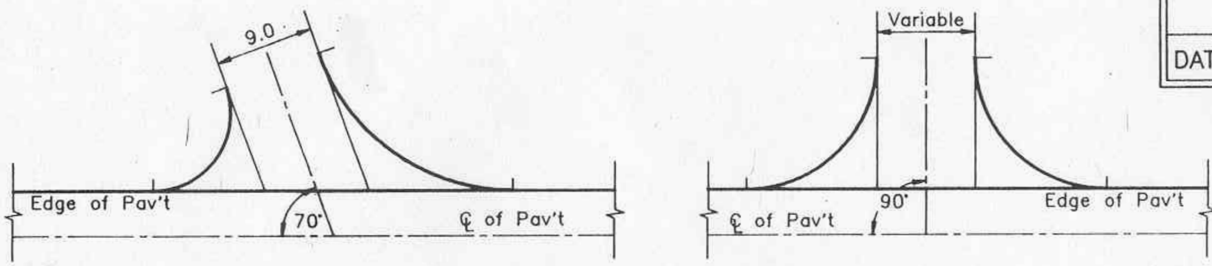
SCALE 1:500

MINISTRY OF TRANSPORTATION
ONTARIO

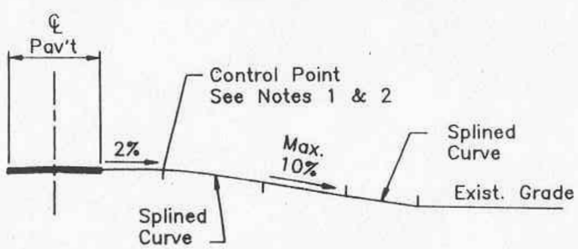
CSAS – PROF

COMMERCIAL SITE PROFILE STANDARD

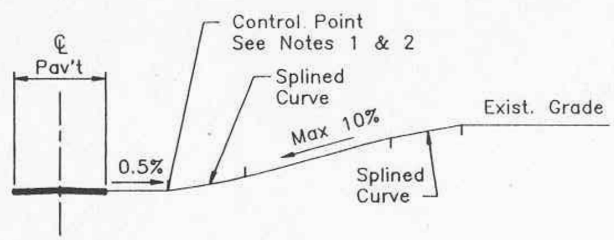
DATE: 1994–01 | REV:



TYPICAL ENTRANCES



TYPICAL PROFILE IN FILL



TYPICAL PROFILE IN CUT

NOTES:

1 For CSAS Designs with islands, the control point is the curb line adjacent to the edge of pavement.

2 For CSAS Designs without islands, the control point is the edge of shoulder.

3 Profiles apply to entrances from 70° to 90°.

4 All dimensions are in metres unless otherwise specified.