8.4 Qualitative Assessment to Develop Short List of Alternative Haul Routes

8.4.1 Comparison of the Alternative Links near the Intersection of Concession 11 E and Milburough Line

Given the location of the proposed site near the intersection of Milburough Line and Concession 11E, the first set of alternative links that were assessed as possible haul route (i.e. connection of links to create a haul route) were: south on Milburough Line, north on Milburough Line, west on Concession 11E, and east on Steeles Avenue.

Steeles Avenue from Milburough Line to Guelph Line was not included in the long list of alternatives because of the substandard visibility along the roadway.

As described in **Section 8.2.2.6,** Milburough Line from Concession 11E to Derry Road was eliminated because of significant engineering and safety deficiencies. An example of the narrow right-of-way and horizontal alignment concerns along this link is illustrated in **Photo 8-56.**

Photo 8-56: Right-of-way and horizontal alignment along Milburough Line between Concession 11E and Derry Road

Milburough Line from Concession 11E to Derry Road is the only reasonable connection to Derry Road. Given this link was eliminated, the links of Derry Road between Milburough Line and Guelph Line and Carlisle Road between Milburough Line and Centre Road become discontinuous routes. Consequently, these two east-west links were also eliminated.

The two short listed links at the Concession 11E and Milburough Line intersection were Milburough Line from Concession 11E to Campbellville Road and Concession 11E from the proposed site to Centre Road. These links have the potential for fewer community and alignment impacts than Steeles or Milburough Line south of Concession 11E. As described in **Section 8.2.2.5** and **Section 8.2.2.12** respectively**,** each link was carried forward to be analyzed as part of the short list of alternatives.

Illustrated in **Photo 8-59** is an example of the straight alignment along Milburough Line between Concession 11E and Campbellville Road. This alignment is likely to offer fewer potential impacts than other possible road sections (such as Milburough Line south of Concession 11E shown in **Photo 8-58** for example).

Photo 8-59: Horizontal Alignment along Milburough Line between Concession 11E and Campbellville Road

8.4.2 Comparison of the Links at the Concession 11 E and Centre Road Intersection

Following Concession 11E west, the next set of links that was qualitatively compared to help develop the short list of alternative haul routes was the set of links that intersect at Concession 11E and Centre Road. These links are Centre Road north to Campbellville Road, Concession 11E west to Highway 6, and Centre Road south to Carlisle Road.

Of these three links, the only one that was not carried forward to the short list of alternatives was Centre Road south from Concession 11E. As described in **Section 8.2.2.2,** this link was screened out because it passes through the heart of the Carlisle community, including six businesses, two schools and several other community facilities. One of the key criteria in the first stage of screening is to avoid bisecting settlement and built up areas.

As a result of this Centre Road link being eliminated, the following links were subsequently eliminated primarily because they become discontinuous to a 400 series highway: Centre Road (Carlisle Road to Dundas Street), Carlisle Road (Centre Road to Highway 6), Concession 6E (Centre Road to Highway 6), Parkside Drive (Evans Road to Highway 6), Dundas Street (Guelph Line to Highway 6), and Brant Street (Dundas Street to Highway 407).

The three other links at the Concession 11E and Centre Road intersection were carried forwared to the short list of alternatives. As described in **Section 8.2.2.17,** Concession 11E from Centre Road to Highway 6 has a suitable horizontal alignment and no significant engineering deficiencies. As described in **Section 8.2.2.1,** a primary advantage of Centre Road from Concession 11E to Campbellville Road is that it is an existing designated truck route. The suitability of Concession 11E from Milburough Line to Centre Road is discussed in **Section 8.2.2.18** and **Section 8.4.1.**

8.4.3 Comparison of the Links at the Miburough Line and Campbellville Road Intersection

Following Milburough Line north, the set of links that was compared using a qualitative assessment to help develop the short list of alternative haul routes was the three links that intersect at Campbellville Road and Milburough Line. Two of these links were eliminated, Milburough Line from Campbellville Road north to Highway 401 and Campbellville Road from Centre Road to Milburough Line, and the preferred link carried forward was Campbellville Road from Milburough Line east to Twiss Road.

As described in **Section 8.3.1,** Milburough Line from Campbellville Road to Highway 401 was not carried forward because of feasibility concerns for the new Highway 401 interchange and significant property acquisition would be required. A new interchange here would likely change local traffic patterns and result in a high volume of vehicles passing by the Mountsberg Wildlife Centre.

As described in **Section 8.3.2,** Campbellville Road from Milburough Line to Centre Road was not carried forward primarily because of concerns with the vertical profile that would require significant property acquisition and major reconstruction to resolve.

The link that was preferred and carried forward was Campbellville Road from Milburough Line to Twiss Road. As described in **Section 8.2.2.13**, an advantage of this link is that it is an existing truck route.

8.4.4 Qualitative Assessment of Remaining Links

As described in **Section 8.2.2.11**, the link of Campbellville Road from Highway 6 to Centre Road was a suitable haul route and carried forward to the short list primarily because it is a designated truck route and has no significant engineering deficiencies.

Although Highway 6 between Highway 401 and Highway 403 does bisect a number of communities, this highway was preferred and carried forward to the short list because it is a provincial facility and a designated truck route.

The only links that were eliminated from the long list and whose elimination has not been previously discussed in **Sections 8.4.1, 8.4.2** or **8.4.3,** are Concession 12E, Campbellville Road from Twiss Road to Guelph Line, and Guelph Line.

As described in **Section 8.2.2.22**, it is only reasonable to consider Concession 12E a potential haul route if it can provide access between the proposed site and Centre Road. This is not feasible because connection to the proposed site would require Concession 12E to be extended easterly through a protected wetland.

As discussed in **Section 8.2.2.14**, Campbellville Road from Twiss Road to Guelph Line was not carried forward because it bisects the settlement area of the Campbellville community. The link also passes by the Campbellville Conservation Area and there are major physical building constraints at the Guelph Line intersection that would impede truck turning.

The links that were identified and carried forward in part because they by-pass the settlement area of Campbellville and are existing truck routes were Twiss Road from Campbellville Road to Reid Sideroad (described in **Section 8.2.2.26**) and Reid Sideroad from Twiss Road to Guelph Line (described in **Section 8.2.2.27**). Reid Sideroad has been designed for heavy-truck traffic and has a wide right-of way. This route would allow quarry truck traffic on Reid Sideroad to by-pass the settlement area of Campbellville rather than bisecting the built-up area.

For the assessment of Guelph Line, Reid Sideroad is the only reasonable connection for quarry truck traffic between Guelph Line and the links that have been carried forward. As described in **Section 8.2.2.8,** the Guelph Line link between Reid Sideroad and Derry Road was eliminated because it bisects the settlement area of the Campbellville community. Within Campbellville the link passes by several businesses, two churches, and the Campbellville Ball Park.

Resulting from the elimination of the Guelph Line link from Reid Sideroad to Derry Road, the sections of Guelph Line south of Derry Road were subsequently eliminated.

8.5 Short List of Alternative Haul Routes

Using the information presented in earlier sections, **Exhibit 8-10** shows the short list of alternative haul routes. The routes are shown in green. The eliminated links are shown as a faint red line.

Exhibit 8-10: Short List of Alternative Haul Routes

8.6 Haul Route Alternatives

The links that have been carried forward to the short list were combined in all reasonable combinations that would provide a direct and complete haul route between the proposed quarry and the 400 series highways. These combined short listed links have been developed into five potential haul routes. Three of the routes are distinct alternative haul routes, and two of the routes are combination haul routes.

This Section describes each potential haul route in turn:

- Alternative Haul Route 1 – **Section 8.6.1, Exhibit 8-11**
- Alternative Haul Route 2 **– Section 8.6.2, Exhibit 8-12**
- Alternative Haul Route 3 **– Section 8.6.3, Exhibit 8-13**
- Alternative Haul Route 4 – **Section 8.6.4, Exhibit 8-14**
- Alternative Haul Route 5 – **Section 8.6.5, Exhibit 8-15**

The five potential haul routes are carried forward for detailed analysis in the haul route study.

8.6.1 Alternative Haul Route 1

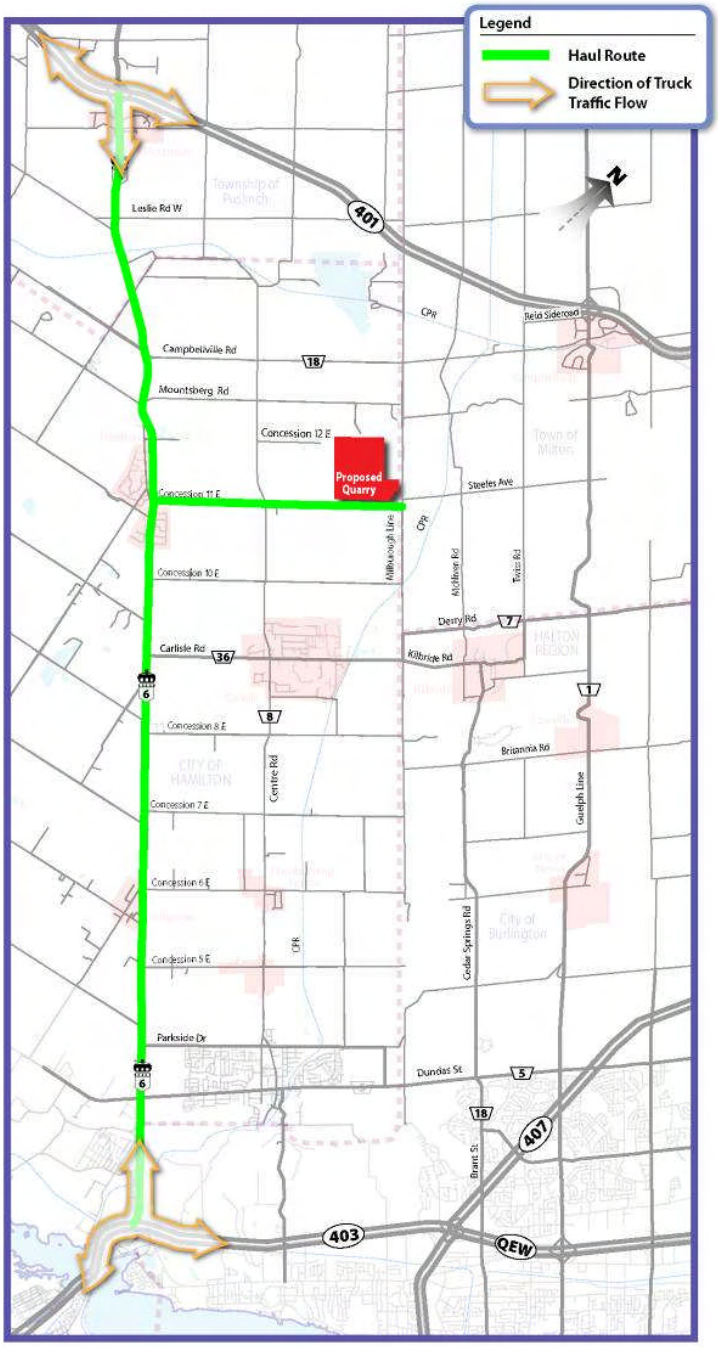


Exhibit 8-11: Potential Alternative Haul Route 1

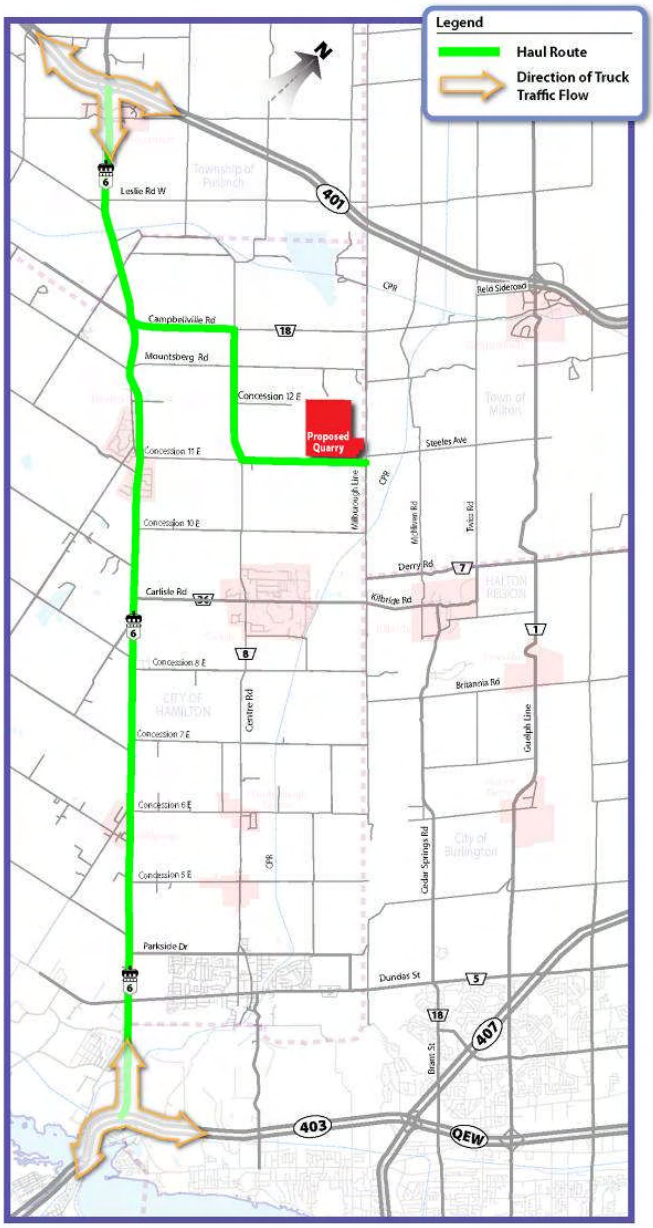
In the case of Alternative Haul Route 1, truck traffic destined for Highway 401 east would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 eastbound on-ramp.

Truck traffic destined for Highway 401 west would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403/QEW westbound on-ramp.

8.6.2 Alternative Haul Route 2



In the case of Alternative Haul Route 2 truck traffic destined for Highway 401 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and north on Highway 6 to the Highway 401 eastbound on-ramp.

Truck traffic destined for Highway 401 west would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403 /QEW westbound on-ramp.

Exhibit 8-12: Potential Alternative Haul Route 2

8.6.3 Alternative Haul Route 3

In the case of Alternative Haul Route 3, truck traffic destined for Highway 401 east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

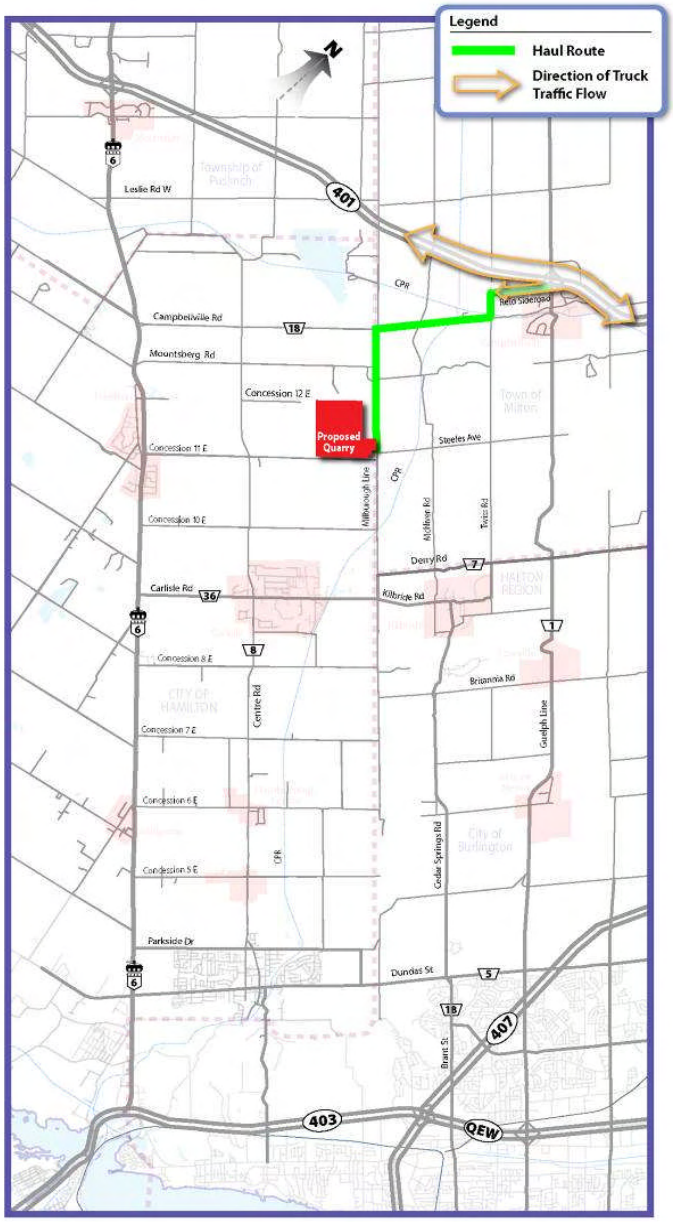


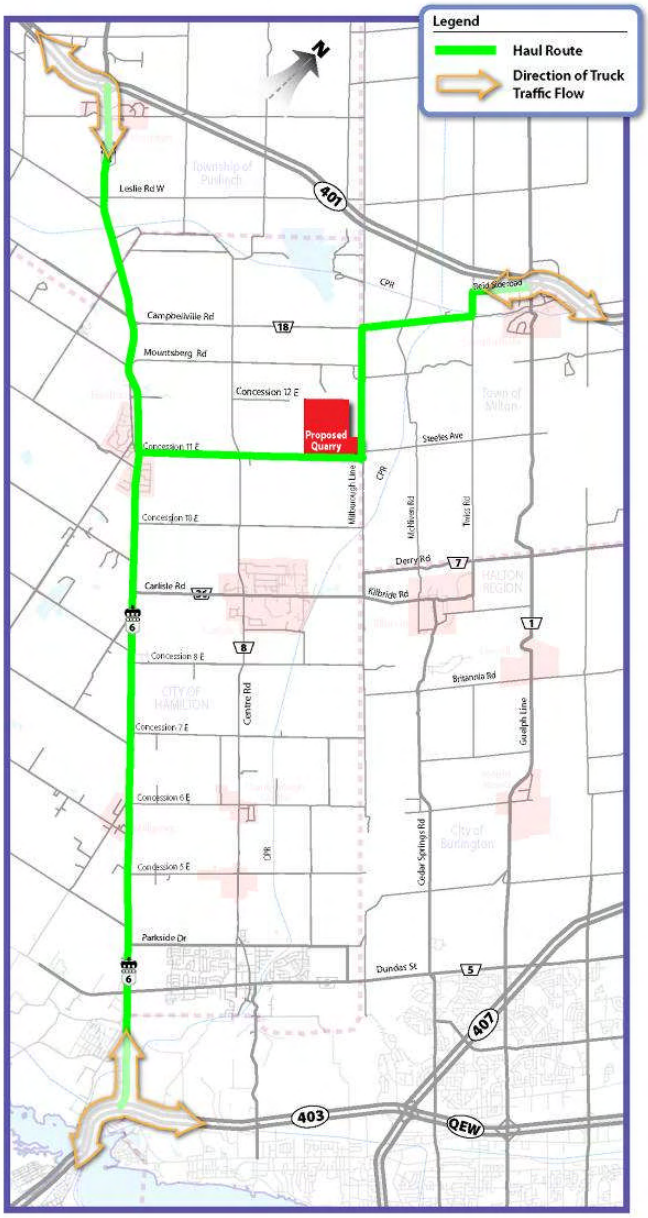
Exhibit 8-13: Potential Alternative Haul Route 3

Truck traffic destined for Highway 401 west would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, east on Reid Sideroad and north on Guelph Line to the Highway 401 westbound on-ramp

Truck traffic destined for Highway 403/QEW east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp. From here, there are several alternatives to reach the destination including taking the 407 ETR south to Highway 403.

Finally, truck traffic destined for Highway 403 west would travel north on Milburough Line, east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401. From here, there are several alternatives to reach the destination including taking the 407 ETR southwest or Highway 6 south to the 403/QEW.

8.6.4 Alternative Haul Route 4



In the case of Alternative Haul Route 4, truck traffic destined for Highway 401 east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

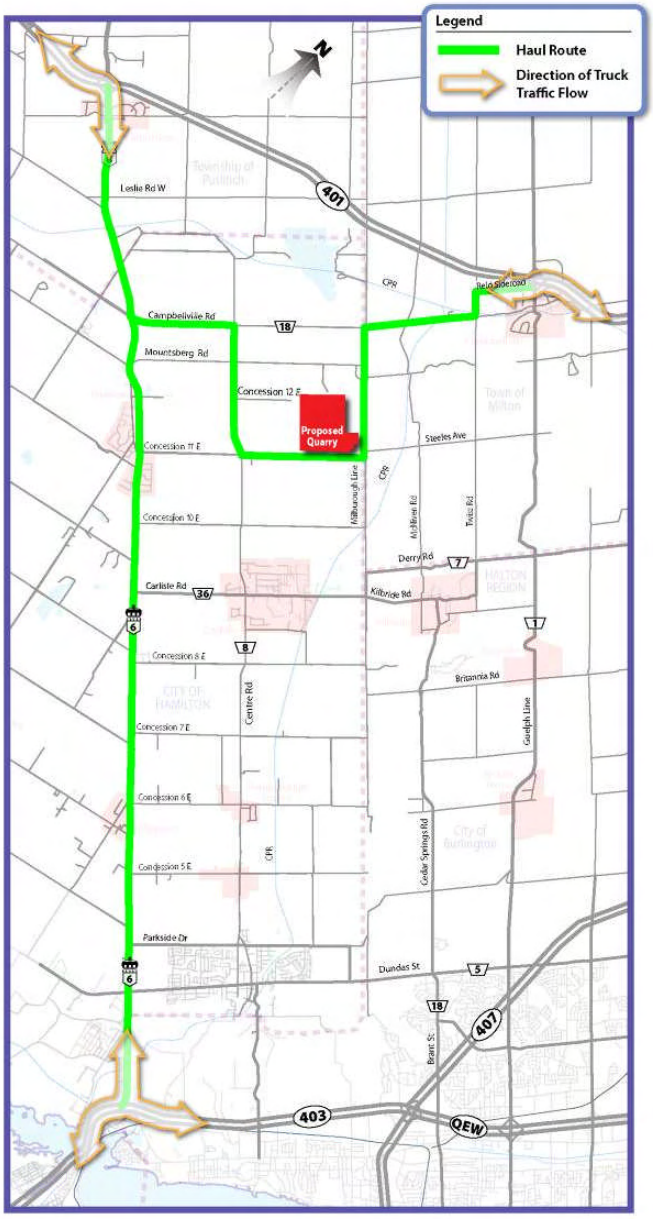
Truck traffic destined for Highway 401 west would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403 eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403 westbound on-ramp.

Exhibit 8-14: Potential Alternative Haul Route 4

8.6.5 Alternative Haul Route 5



In the case of Alternative Haul Route 5, truck traffic destined for Highway 401 east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

Truck traffic destined for Highway 401 west would travel west on Concession 11 E, then north on Centre Road, then west on Campbellville, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403 /QEW westbound on-ramp.

Exhibit 8-15: Potential Alternative Haul Route 5

9. TRAFFIC OPERATIONS APPROACH AND METHODOLOGY

This section discusses the approach and methodology used to analyze the intersection operations (**Section 9.1**) and warrants for turning lanes (**Section 9.2**).

9.1 Intersection Operations

Intersection operations for the study area's driveways and intersections were assessed using the software program Synchro 6, Traffic Signal Coordination Software version 6 Build 614 which employs methodology from the ***Highway Capacity Manual (HCM2000)*** published by the Transportation Research Board National Research Council. The software converts trucks to equivalent passenger car units for analysis (1 truck = 2 passenger car units).

Synchro 6 can analyze both signalized and unsignalized intersections in a road corridor or network taking into account the spacing, interaction, queues, and operations between intersections.

The signalized intersection analysis considers two separate measures of performance:
- The capacity of the intersection movements. This is based on a volume to capacity ratio.
- The level of service. This is based on the control delay per vehicle for the various movements through the intersection and overall.

The unsignalized intersection analysis considers two separate measures of performance:
- The capacity of the critical intersection movements. This is based on a volume to capacity ratio.
- The level of service for the critical movements. This is based on the average control delay per vehicle for the various critical movements within the intersection.

The methodologies used to analyze both the signalized and the unsignalized intersections indicate how an intersection is operating. The volume to capacity ratio is a measure for the degree of capacity utilized at an intersection. The delay is an indicator of how long a vehicle must wait (the level of service) to complete a movement. Delay is represented by a letter between "A" to "F," with "F" being the longest delay. The two measurements must be considered independently of each other.

9.2 Warrants for Turning Lanes

To determine whether the road network would require road alterations such as turning lanes, the warrants for additional turning lanes at intersections were applied. The warrants for turning lanes followed the methods outlined in the ***Geometric Design Standards for Ontario Highways*** published by the Ontario Ministry of Transportation (MTO).

Under *Section E.A.1, Left Turn Lane Warrants and Storage Lane Length for Two-Lane Highways for Unsignalized Intersections*, of the ***Geometric Design Standards for Ontario Highways***, the warrant for exclusive left turning lanes is based on turning, advancing and opposing design hour volumes, and volume thresholds. The design charts are based on passenger car dimensions and operating characteristics. Vehicle type, desired level of service level and surrounding terrain type are used to convert truck volumes to passenger-car equivalents. For level of service B and C, and rolling terrain, a truck equivalency factor of 5.0 passenger car equivalents per truck was used. If the input volumes meet the minimum thresholds on the design charts, a left turning lane is warranted.

Under Section E.2.6, Simple Intersection Design, right turn auxiliary lanes are applied where speeds and turning movement volumes increase collision potential. The addition of right turn auxiliary lanes acts as a speed change lane for right turning volumes.

10. FUNCTIONAL DESIGN METHODOLOGY

This section discusses the approach and methodology used to complete the functional design and asses the existing design characteristics of each Alternative Haul Route. This includes the design vehicles used for the geometric design (**Section 10.1)**, design of recommended cross sections (**Section 10.2**), assessment and analysis of sight distances (**Section 10.3**), and assessment of steep grades (**Section 10.4**).

10.1 Design Vehicles for Geometric Design

The design vehicles used for the geometric design of the site accesses, recommended intersection alterations, recommended horizontal alignment improvements and any other recommended road alterations are the WB 20TAC semi trailer (CB, 22.7m long), ATDTAC double trailer (CB-A, 24.5m long), and BTDTAC double trailer (CB-B, 25.0m long).

10.2 Design of Recommended Cross-Sections

The development of the recommended cross sections for the road sections under consideration as alternative haul routes was based on the methodology given in the following documents:

- Transportation Association of Canada's (TAC) Geometric Design Guide for Canadian Roads (1999)
- Town of Milton's Engineering and Parks Standards, dated April 2006
- Town of Milton's Trails Master Plan – 2007 Update, dated September 2007
- City of Hamilton Design Guideline for Bikeways, dated December 1999
- Halton's Cycling Infrastructure Plan, dated June 2004
- Ministry of Transportation of Ontario, Geometric Design Standards for Ontario Highways
- Ministry of Transportation of Ontario, Ontario Bikeways Planning and Design Guidelines (1996)

10.3 Sight Distance Assessment and Analysis

The different sight distance analyses that were conducted discussed in this section are as follows:

- Analysis for the design of the proposed site accesses adjusted for trucks (**Section 10.3.1)**
- Assessment of sections along each alternative (**Section 10.3.2**)
- Assessment of intersections along each alternative (**Section 10.3.3**)
- Assessment of the preferred haul route alternative adjusted for trucks (**Section 10.3.4**).

10.3.1 Sight Distance Analysis for Design of Quarry Accesses

To evaluate the available sight distance for the proposed quarry access on Concession 11E and the access on Milburough Line, the methodologies outlined in the ***Geometric Design of Highways and Streets*** published by the American Association of State Highway and Transportation Officials (AASHTO) were adopted. The sight distance requirements are based on a design speed of 10 km/hr above the posted speed limits.

The sight distance required for left turns from a stop were determined using *Exhibit 9-54 Time Gap for Case B1 (Left Turn from Stop)* and *Exhibit 9-55 Design Intersection Sight Distance for Case B1(Left Turn from Stop)* in the AASHTO guidelines. The minimum sight distance requirements for a truck turning from the proposed site access was obtained using *Exhibit 9-57 Time Gap for Case B2 (Right Turn from Stop) and Case B3 (Crossing Manoeuvre).*

Where applicable, the stopping sight distances were also adjusted for the existing grades using *Exhibit 3-2 Stopping Sight Distances on Grades* in the AASHTO guidelines.

As per the recommendation for large trucks, the approximate existing sight distances were obtained by measuring the distance from the truck driver's height of eye at 2.33m above the road surface to an object on the road surface at 0.6m above the road surface. The measurements were done on road profiles created from 3-D map information obtained from the City of Hamilton and survey information provided by Northway-Photomap Inc.

10.3.2 Assessment of the Sight Distance of Sections along Each Alternative

An assessment of the existing sight lines and vertical profiles was conducted to compare the number of locations with a limited sight distance along the sections of each alternative haul route. The intersections were analyzed separately and the analysis did not include the provincial highway, Highway 6.

The stopping sight distance for passenger vehicles was analyzed without any correction for trucks because of the following statement in the ***AASHTO Geometric Design of Highways and Streets***:

> The truck driver is able to see substantially farther beyond vertical sight obstructions because of the higher position of the seat in the vehicle. Separate stopping sight distances for trucks and passenger cars, therefore, are not generally used in highway design.

To determine the approximate number of locations along each link in each direction with a limited stopping sight distance for passenger vehicles, the methodologies outlined in the ***Geometric Design Guide for Canadian Roads*** published by the Transportation Association of Canada were adopted. The sight distance requirements were based on a design speed of 10 km/hr above the existing posted speed limits. The resulting design speeds range from 60 to 90 km/hr.

The sight distance analysis was based on stopping sight distance which is defined as the minimum visible distance that is required for a driver to bring a vehicle to a stop. This distance accounts for both perception and reaction time and braking distance. Using the design speed at each location and *Table 1.2.5.3 – Stopping Sight Distance for Automobiles and Trucks with Antilock Braking Systems*, the required stopping sight distances ranged from 75 m to 130 m.

The approximate existing sight distances were obtained by measuring the distance from a height of eye above the road surface of 1.05m to an object on the road surface at 0.35m above the road surface, without any obstructions (ie. a crest of a vertical curve). The measurements were done on road profiles created from 3-D map information obtained from the City of Hamilton and survey information provided by Northway-Photomap Inc.

10.3.3 Assessment of the Sight Distance at Intersections along Each Alternative

Given that intersections are subject to specific design standards, the number of intersections on non-provincial roads along the Alternative Haul Routes with at least one limited sight line was determined to evaluate each Alternative.

The stopping sight distance for passenger vehicles was analyzed for the reasons discussed previously in **Section 10.3.2**.

The number of intersections with a limited sight distance was determined using the methodologies outlined in the ***Geometric Design Standards for Ontario Highways*** published by the Ministry of Transportation Ontario. The sight distance requirements were based on a design speed 10 km/hr above the existing posted speed limits.

Each intersection was analyzed for both stopping and turning sight distance requirements for passenger vehicles. Stopping sight distance is defined as the minimum visible distance that is required for a driver of a vehicle on the roadway to bring a vehicle to a stop. Using the appropriate design speeds for each intersection and *Table E3-1 – Minimum Stopping Sight Distances for at-Grade Intersection*, the resulting stopping sight distance required range from is 85 m to 160 m.

The worst-case turning sight distance requirement is for a left or right turning vehicle to attain the assumed operating speed without being overtaken by a vehicle driving through the intersection in the same direction. If the vehicle going through the intersection has to reduce its speed from the design speed to 85% of the design speed to avoid overtaking the turning vehicle, the sight distance requirement is not met. Using *Figure E3-6 Sight Distance Requirements for Stopping, Crossing and Turning Movements,* the resulting sight distance requirements ranged from 136 m to 270 m.

The other type of turning sight distance requirement is the sight distance required to safely turn left onto a 2-lane highway across a vehicle approaching from the left. Using *Figure E3-6 Sight Distance Requirements for Stopping, Crossing and Turning Movements,* the resulting sight distance requirements ranged from 115 m to 170 m.

An intersection was considered to have limited sight distance if at least one of the above sight distance requirements was not satisfied.

The approximate existing sight distances were obtained by measuring the distance from a height of eye above the road surface at 1.05m above the road surface to an object at 0.35m above the road surface, without any obstructions (ie. a crest of a vertical curve). The measurements were done on road profiles created from 3-D map information obtained from the City of Hamilton and survey information provided by Northway-Photomap Inc.

10.3.4 Assessment of the Sight Distances along the Preferred Alternative (Adjusted for Trucks)

The vertical profile along the preferred alternative was analyzed to determine where the existing stopping sight distance for trucks is less than the minimum required. The minimum stopping sight distances were determined using the methodologies outlined in the ***Geometric Design Guide for Canadian Roads*** published by the Transportation Association of Canada (TAC). The sight distance requirements were based on a design speed 10 km/hr above the posted speed limits.

The sight distance analysis was based on stopping sight distance which is defined as the minimum visible distance that is required for a driver to bring a vehicle to a stop. This distance accounts for both perception and reaction time and braking distance. Using the design speed at each location and *Table 1.2.5.3 – Stopping Sight Distance for Automobiles and Trucks with Antilock Braking Systems*, the required stopping sight distances ranged from 75 m to 130 m.

The TAC guideline methodology was used for all aspects of the analysis except it was adjusted to account for truck vehicles using the ***Geometric Design of Highways and Streets*** published by AASHTO. As per the recommendations for large trucks, the approximate existing sight distances were obtained by measuring the distance from the truck driver's height of eye at 2.33m above the road surface to an object on the road surface at 0.6m above the road surface. Where applicable, the stopping sight distances were also adjusted for the existing grades as per *AASTHO Exhibit 3-2 Stopping Sight Distances on Grades*.

The measurements were done on road profiles created from 3-D map information obtained from the City of Hamilton and survey information provided by Northway-Photomap Inc.

10.4 Review of Steep Grades

For evaluation purposes, the number of locations with a steep grade on sections of the non-provincial links of the Alternative Haul Routes was determined using the methodologies outlined in the ***Geometric Design Standards for Ontario Highways*** published by the Ministry of Transportation Ontario. Using *Table C4-1 Maximum Grades (Percent) for Rural Roads* and the average annual daily traffic volumes, the required maximum grade was determined to be 12%.

The number of intersections with a steep grade was determined using the methodologies outlined in the ***Geometric Design Standards for Ontario Highways*** published by the Ministry of Transportation Ontario. The guidelines followed were in *Section E.4.2 Vertical Alignment (at Intersections)* which specifies that the grade on the main roads should be from 0.15% to 3%. On the sideroad the approach grades should be between 0.5% and 2% upgrade and should extend approximately 25 m back from the edge of the highway.

11. RECOMMENDED SITE ACCESSES

11.1 Recommended Site Access Location(s) for Each Alternative

The proposed location of the site access or accesses for the five Alternative Haul Routes (described in **Section 8.6**) are shown in **Table 11-1**.

Table 11-1: Site Access Location(s) for Each Alternative Haul Route

Alternative	Site Access Location(s)	Travel Directions
Alternative 1	Concession 11E	The truck traffic would exit from the south side of the proposed site on to Concession 11E and travel westbound to Highway 6.
Alternative 2	Concession 11E	The truck traffic would exit from the south side of the proposed site on to Concession 11E and travel westbound to Centre Road.
Alternative 3	Milburough Line	The truck traffic would exit from the east side of the proposed site onto Milburough Line and travel northbound to Campbellville Road.
Alternative 4	Concession 11E and Milburough Line	Truck traffic destined for Highway 401 east would exit from the east side of the proposed site onto Milburough Line and travel northbound to Campbellville Road. Truck traffic destined for Highway 403 or Highway 401 west would exit from the south side of the proposed site onto Concession 11E and travel westbound to Highway 6.
Alternative 5	Concession 11E and Milburough Line	Truck traffic destined for Highway 401 east would exit from the east side of the proposed site onto Milburough Line and travel northbound to Campbellville Road. Truck traffic destined for Highway 403 or Highway 401 west would exit from the south side of the proposed site onto Concession 11E and travel westbound to Centre Road.

11.2 Site Access on Milburough Line

11.2.1 Recommended Design

If Alternative Haul Route 3, 4 or 5 are carried forward as the preferred alternative, it is recommended that a new site access on Milburough Line be implemented. The recommended functional design of this access is illustrated in **Exhibit 11-1.**The proposed location of the access on the west side of Milburough Line is south of Steeles Avenue and approximately 530 m north of Concession 11E. The access would be a stop controlled T-intersection consisting of two 4.5 m lanes. It is recommended that trucks be prohibited from entering the site from the south and from exiting the site and traveling southbound on Milburough Line. This prohibition would be integrated into the access design using geometric design, concrete curb and gutter on the south edge of the driveway, and raised medians strategically located on Milburough Line and the site access driveway.

The existing vertical profile for Milburough Line will support truck movements and the required sight lines near this access. The design vehicles used for the geometric design of the site accesses are discussed in **Section 10.1** and the methodology for the site distance analysis is discussed in **Section 10.3.1**.

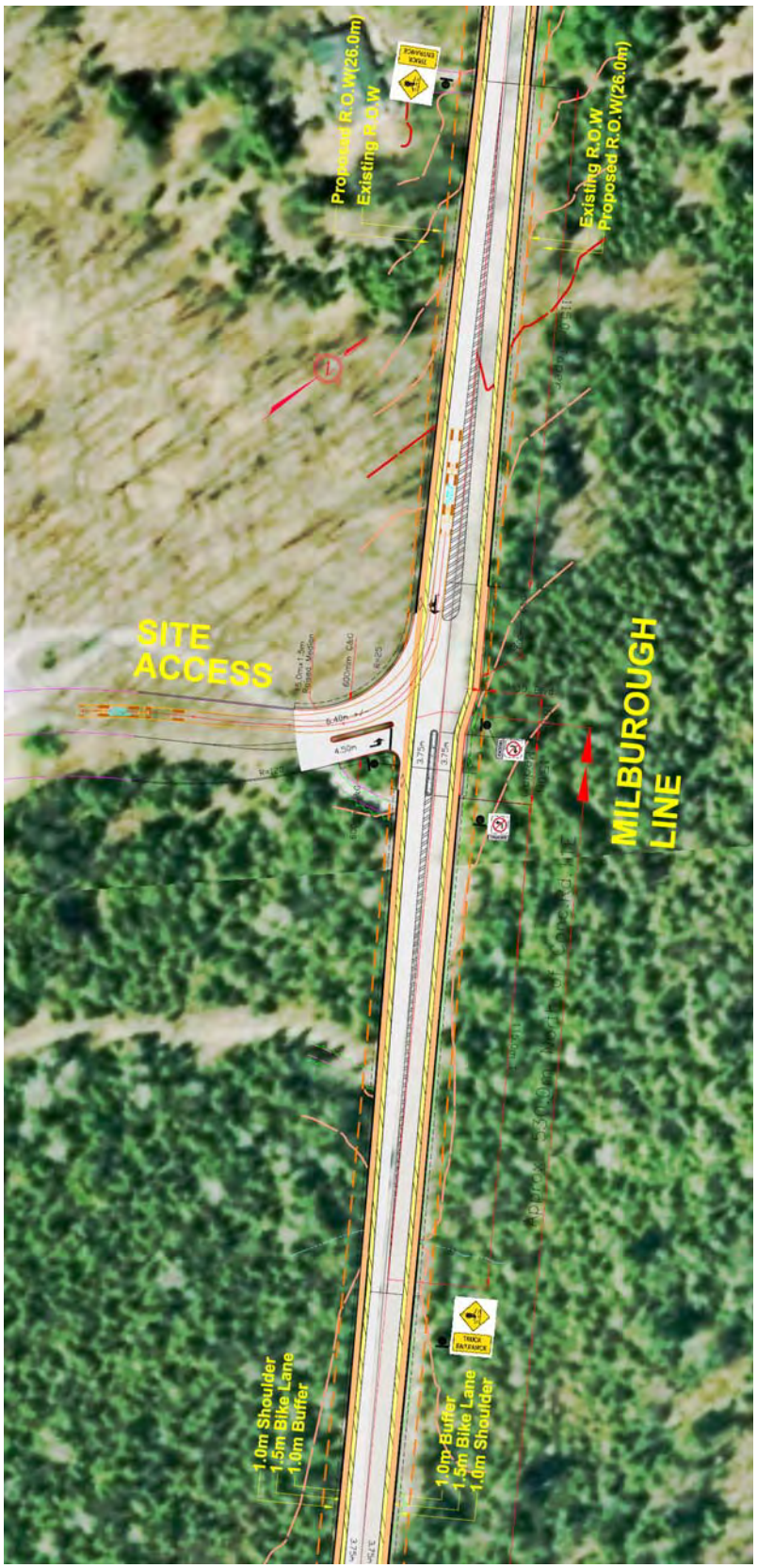


Exhibit 11-1: Recommended Design of Site Access on Milburough Line

Given the type of traffic that will be generated by the proposed quarry, the site entrance design is intended to mitigate nuisances to the surrounding residents. It is acknowledged that, in the busy construction season, trucks can arrive very early in the morning to get loaded first. It can mean one extra load a day which can result in more money for the driver/owner. If facilities are not provided, they will park on the road with their engines running and sleep till the quarry opens which is an obvious concern of the surrounding neighbours.

The Ministry requires that all licensed sites be fenced for security and that all gates be locked when the quarry is not in open. The hours of operation can state that the quarry may open early to admit trucks only, but if this is the case, someone must be there to open the gate and monitor the trucks and drivers.

To account for this scenario St. Marys is proposing a long entrance road which includes significant acoustical protection (**Exhibit 11-2**). At this time it is proposed that the license gate be located at the western end of the haul road where the quarry property starts. This way the gate can stay locked. The trucks can line up on the internal entrance road and the site will remain secure. The entrance road is approximately 777m long of which 650m would be well shielded visually or acoustically. This design can easily accommodate more than 40 trucks during the morning queuing scenario.

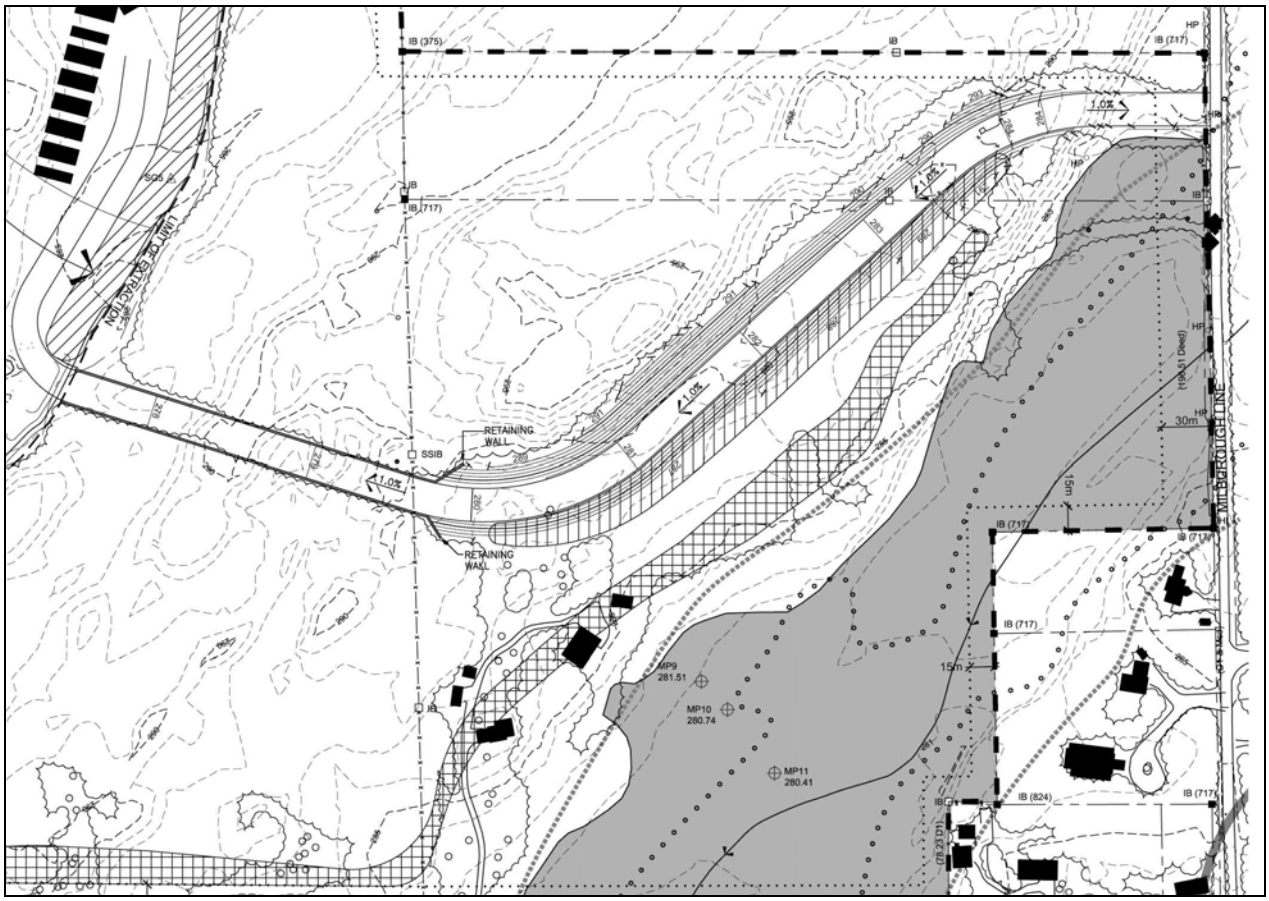


Exhibit 11-2: Illustration of the Proposed Site Driveway on Milburough Line

11.3 Site Access on Concession 11 E

11.3.1 Recommended Design

If Alternative Haul Route 1, 2, 4 or 5 are carried forward as the preferred alternative, it is recommended that the following road alterations be implemented for the site access on Concession 11E. The recommended functional design of this access is illustrated in **Exhibit 11-3.** The proposed location for the site access on the west side of Concession 11E is approximately 810 m west of Milburough Line. The access would be a stop controlled T-intersection consisting of two 4.5 m lanes. It is recommended that trucks be prohibited from entering the site from the east and from exiting the site and traveling eastbound on Concession 11E. This prohibition would be integrated into the access design using geometric design, concrete curb and gutter on the east edge of the driveway, and raised medians strategically located on Conession 11E and the site access driveway.

The design vehicles used for the geometric design of the site accesses are discussed in **Section 10.1** and the methodology for the site distance analysis is discussed in **Section 10.3.1**.

As illustrated in **Exhibit 11-3**, vertical profile alterations for Concession 11E are recommended in order to obtain the required sight distances for trucks. This recommended alteration includes lowering the elevation of Concession 11E by 0.6m slightly east of the proposed site access.

The recommended site access design and vertical profile alterations would not impede access to the two private driveways near the access on the south side of Concession 11E.

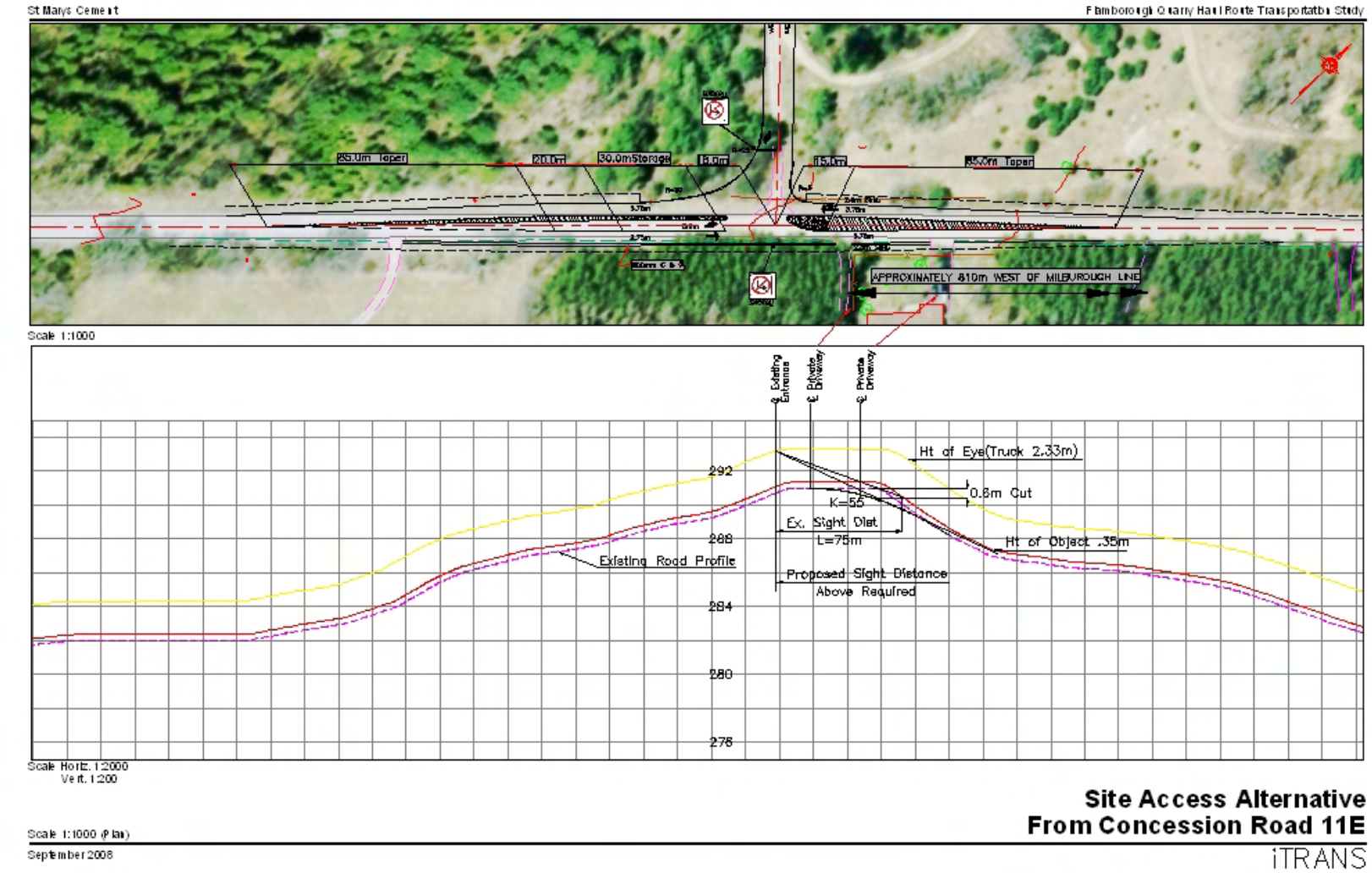


Exhibit 11-3: Recommended Design of Site Access on Concession 11

12. ALTERNATIVE HAUL ROUTE ANALYSIS OF EXISTING BASELINE CONDITIONS

This Section examines existing baseline conditions on the five alternative haul routes. (The five alternative haul routes are shown in **Exhibit 8-11**.) Four conditions are analyzed:

- Turning movement counts and traffic volumes (**Section 12.1**)
- Existing cycling facilities (**Section 12.2**)
- Cross-sections (**Section 12.4**)
- Collisions (**Section 12.6**).

12.1 Turning Movement Counts and Traffic Volumes

12.1.1 Turning Movement Counts

Traffic counts for the 25 study intersections were undertaken by iTRANS during the weekday AM peak period (7:00 AM – 9:00 AM) and the weekday PM peak period (3:00 PM – 6:00 PM). The counts were conducted in January and February 2008.

Exhibit 12-1 shows existing lane configurations at the intersections. The dates and locations of the traffic counts are listed in **Table 12-1.**

Table 12-1: Traffic Count Locations and Dates

Location	Date
Highway 401 Westbound Ramps / Highway 6	AM – February 27, 2008 PM – February 27, 2008
Highway 401 Eastbound Ramps / Highway 6	AM – February 27, 2008 PM – February 27, 2008
Badenoch Street / Calfass Road / Highway 6	AM – January 29, 2008 PM – January 29, 2008
Carlisle Road / Highway 6	AM – February 5, 2008 PM – January 29, 2008
Concession 6E / Highway 6	AM – January 30, 2008 PM – January 30, 2008
Parkside Drive / Highway 6	AM – January 30, 2008 PM – January 30, 2008
Dundas Street / Highway 6	AM – February 11, 2008 PM – February 11, 2008
Northcliffe Avenue / Plains Road West / Highway 6	AM – January 30, 2008 PM – January 30, 2008
Campbellville Road / Highway 6	AM – January 29, 2008 PM – January 29, 2008
Concession 11E / Highway 6	AM – January 29, 2008 PM – January 29, 2008
Campbellville Road / Centre Road	AM – February 12, 2008 PM – February 12, 2008

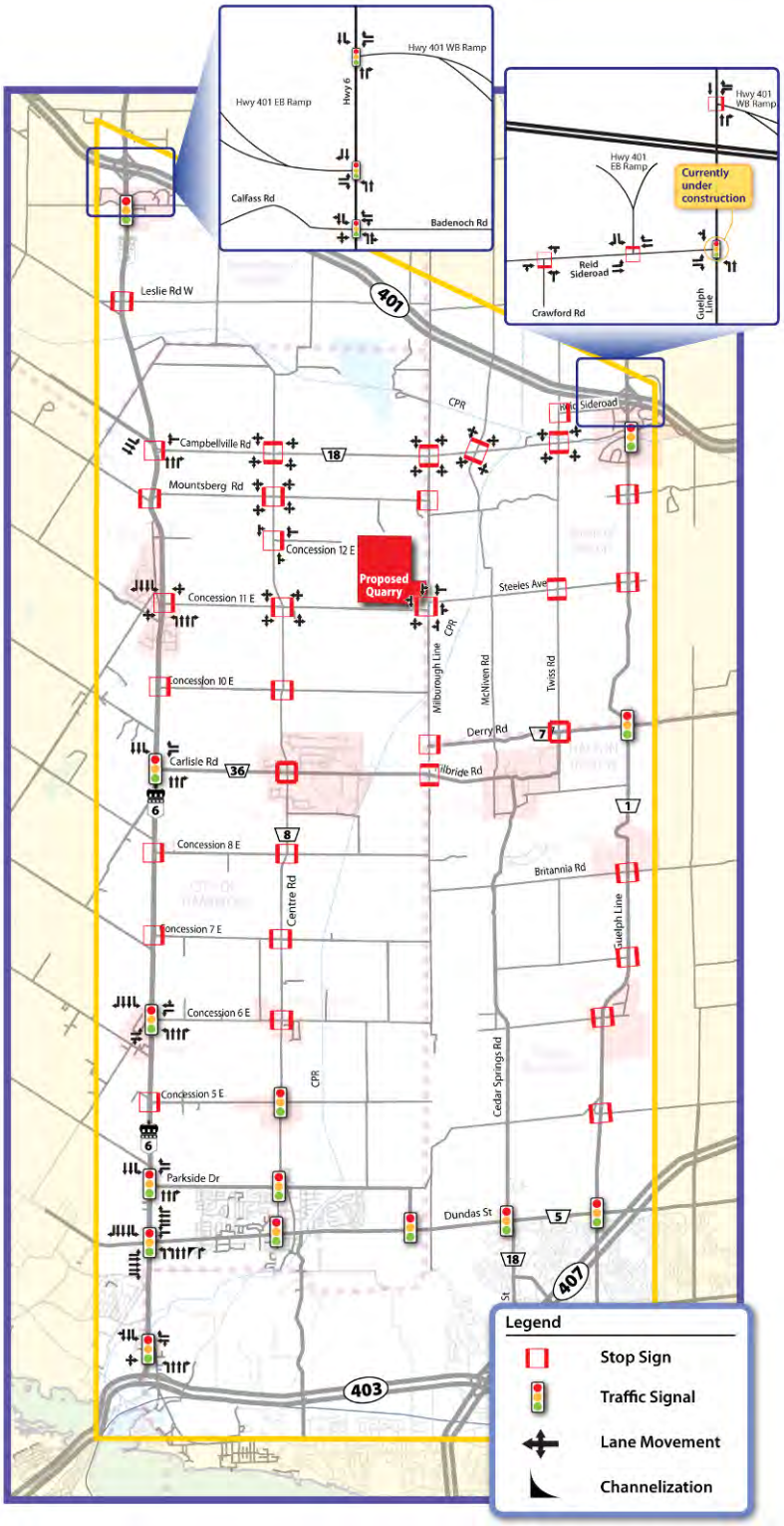
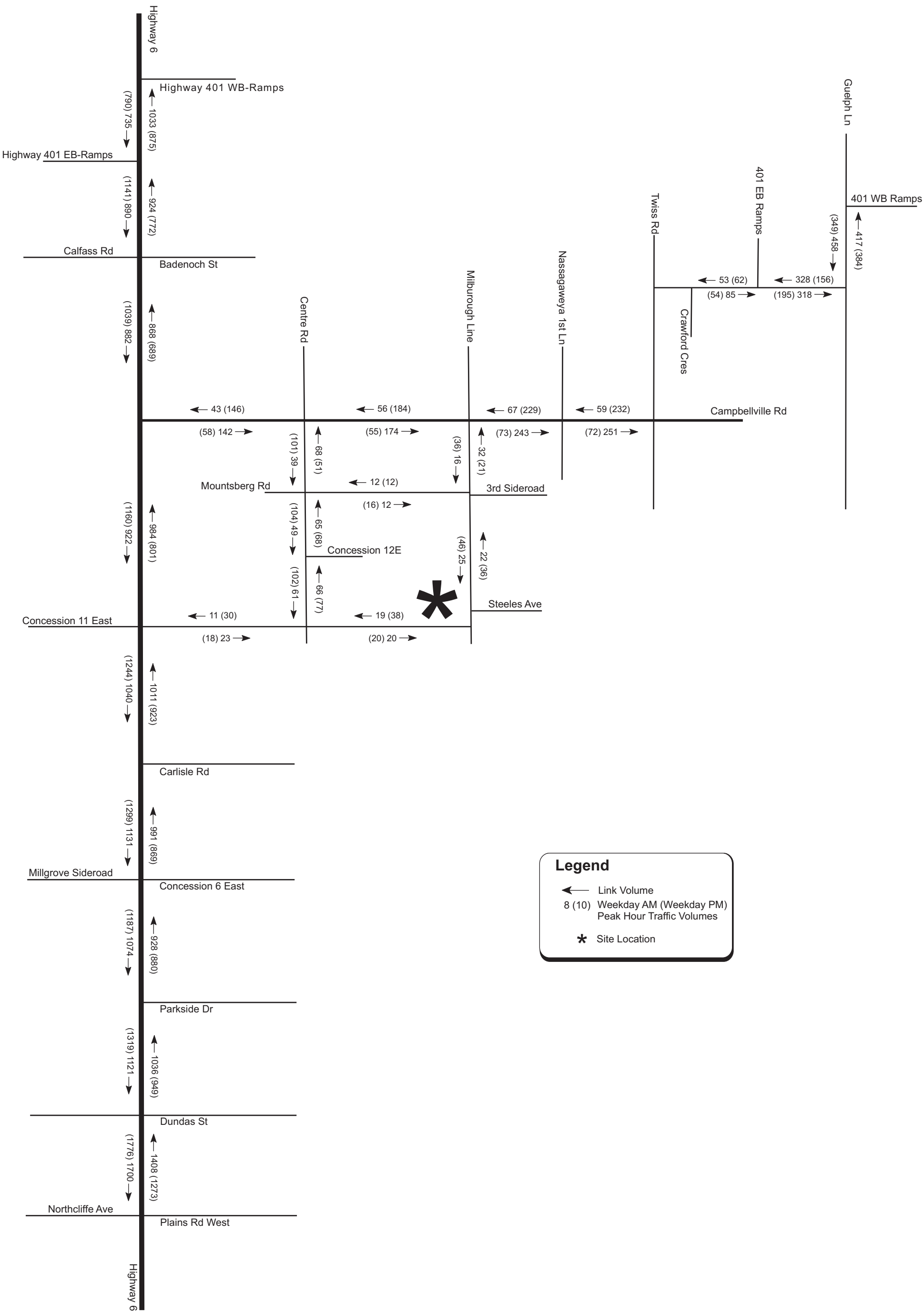


Exhibit 12-1: Existing Lane Configurations

Table 12-1 (Continued)

Location	Date
Campbellville Road / Milburough Line	AM – February 12, 2008 PM – February 12, 2008
Campbellville Road / Nassagaweya 1st Line	AM – February 13, 2008 PM – February 13, 2008
Campbellville Road / Twiss Road	AM – February 12, 2008 PM – February 12, 2008
Reid Sideroad / Crawford Crescent	AM – February 12, 2008 PM – February 12, 2008
Reid Sideroad / Highway 401 EB Ramps	AM – February 12, 2008 PM – February 12, 2008
Reid Sideroad / Guelph Line	AM – February 12, 2008 PM – February 12, 2008
Guelph Line / Highway 401 WB Ramps	AM – February 12, 2008 PM – February 12, 2008
Mountsberg Road / Centre Road	AM – February 14, 2008 PM – February 14, 2008
Mountsberg Road / Milburough Line	AM – February 14, 2008 PM – February 14, 2008
Concession 12E / Centre Road	AM – February 13, 2008 PM – February 13, 2008
Concession 11E / Centre Road	AM – February 14, 2008 PM – February 14, 2008
Concession 11E / Milburough Line	AM – February 14, 2008 PM – February 14, 2008
3rd Sideroad / Milburough Line	AM – February 27, 2008 PM – February 27, 2008
Steeles Avenue / Milburough Line	AM – February 27, 2008 PM – February 27, 2008

Exhibit 12-2 shows the average link volumes for the weekday AM and PM peak hours. Detailed in depth turning movement data are provided in **Appendix C**.



Not To Scale

Exhibit 12-2
Average Existing Weekday Peak Hour Link Volumes

12.1.2 Background Traffic Seasonal Patterns

Traffic volumes for relevant links in the study area were extrapolated from the turning movement counts described in **Table 12-1**.

The amount of traffic on a road can vary throughout the year. Variation of traffic flow tends to occur in areas with recreation traffic. The existing traffic counts were conducted in January and February which tend to have lower traffic volumes compared with summer months. To account for the variation, a seasonal adjustment factor was applied to the existing traffic. The MTO's 2004 Seasonal Variation Curves were used to derive a seasonal factor to apply.

The traffic flow classification along Highway 6 is a mixture of commuter traffic and intermediate recreation traffic. Based on these two traffic flow types we calculated an average factor to increase the traffic volumes to the highest month. We have applied a 30% factor to existing volumes on Highway 6. **Exhibit 12-3** shows the average link volumes with seasonal adjustment for the weekday AM and PM peak hours.

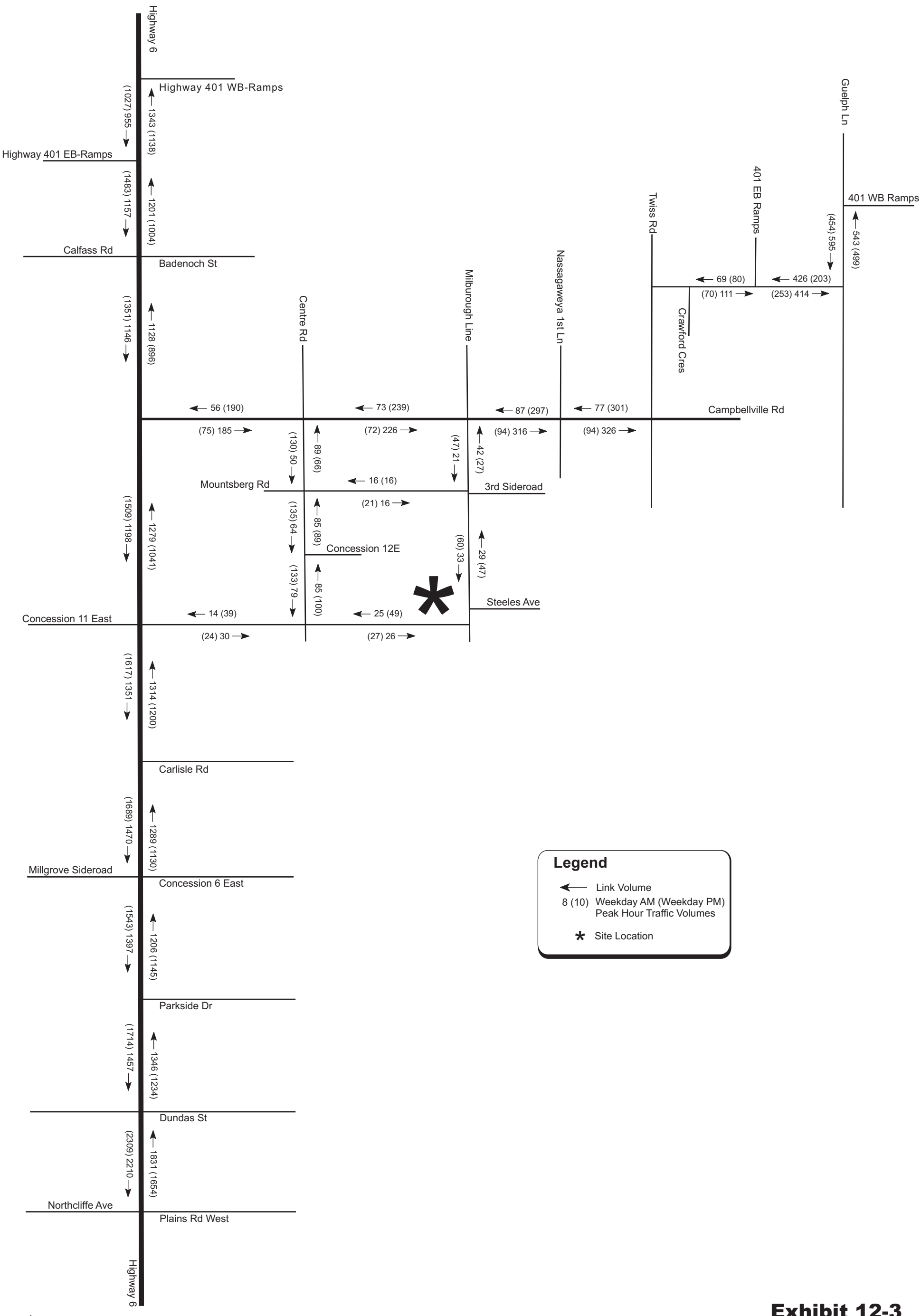


Exhibit 12-3
Average Existing Weekday Peak Hour Link Volumes with Seasonal Adjustment

12.2 Existing Rail Facilities

There are two Canadian Pacific (CP) rail lines that run within the study area: CP Galt Subdivision runs east-west and the CP Hamilton Subdivision runs north-south. The two rail lines intersect at Guelph Junction north of Campbellville Road and west of Twiss Road.

There are six at grade rail crossings in the north half of the study area closest to the proposed quarry site:

- Campbellville Road west of Twiss Road – Lights only
- Campbellville Road east of Twiss Road – Lights and Gates
- Guelph Line south of Campbellville Road – Lights and Gates
- Twiss Road north of Campbellville Road – Lights and Gates
- Milburough Line north of Campbellville Road – Lights only
- Milburough Line just south of Concession 10E – Lights only
- Steeles Ave east of Milburough Line – Lights only

The above mentioned rail crossings are depicted in **Photo 12-1** through **Photo 12-7** as captured during field visits.

Photo 12-1: At Grade Rail Crossing with Lights only – Campbellville Road west of Twiss Road

Photo 12-2: At Grade Rail Crossing with Lights and Gates - Campbellville east of Twiss Road

Photo 12-3: At Grade Rail Crossing with Lights and Gates – Guelph Line south of Campbellville

Photo 12-4: At Grade Rail Crossing with Lights and Gates – Twiss Road north of Campbellville

Photo 12-5: At Grade Rail Crossing with Lights only – Milburough Line north of Campbellville Road

Photo 12-6: At Grade Rail Crossing with Lights only – Milburough Line just south of Concession 10E

Photo 12-7: At Grade Rail Crossing with Lights only – Steeles Avenue east of Milburough Line

12.2.1 Rail Surveys

CP Rail does not have a schedule for these rail lines. To get an understanding of rail activity, rail surveys were conducted on two separate dates November 7, 2007 and July 16, 2008 from 6am to 6pm. summarizes the results of the surveys.

Table 12-2: Results of Rail Survey

Date	Location	No. Trains	Average Delay (min:sec)	% Time Occupied
November 7, 2007	Twiss Rd north of Campbellville Rd	22	1:51	5.2%
July 16, 2008	Twiss Rd north of Campbellville Rd	10	1:51	4.6%
July 16, 2008	Campbellville Rd west of Twiss Rd	4	5:16	2.9%

The percentage of time the crossing is occupied by a train is greater in the fall versus the summer at the Twiss Road crossing (CP Galt Subdivision). Also worth noting is that the average delay's were the same for both days. The Campbellville crossing (CP Hamilton Subdivision) is occupied less of the time, but the average delay is longer.

Several observations were made during the surveys:

- The train signals often run for a few minutes before a train is visible (maximum observed was 8 minutes)
- During the summer survey, the activation of the signals was always followed by the appearance of a train (although it was often a delayed appearance) however this was not the case for the fall survey when a train was recorded only 14 out of the 22 times the gates and lights were in operation.
- The number of vehicles violating the train signals was very high. There were even vehicles observed violating the signals on Twiss Rd, which have gates. Vehicles were observed performing a "rolling stop" at low-medium speeds, possibly indicating that residents do not have high regard for the reliability of the signals and may be approaching signals with little intention of stopping unless a train is clearly visible.

12.3 Existing Cycling Facilities

There were no counts conducted to estimate the volume of cyclists that use the roadways in the study area or the breakdown of recreation versus utility cycling trips. These data are very sensitive to specific events and seasonal changes. Rather than using the specific volumes to dictate, the recommended cycling infrastructure improvements reflect the applicable Transportation Master Plans, municipal cycling maps, and other municipal policies and goals. These municipal policies were developed through public consultations and with participation from various cycling agencies.

Four sections of roadway under consideration as alternative haul routes are classified as either on road suggested cycling routes or on road cautionary un-signed cycling routes. The four sections are:

- Concession 11 E between Highway 6 and Centre Road
- Centre Road between Concession 11 E and Campbellville Road
- Campbellville Road between Milburough Line and Twiss Road
- Milburough Line between Concession 11 E and Campbellville Road

12.3.1 Concession 11 E between Highway 6 and Centre Road

Concession 11 E from Highway 6 to Centre Road is classified as a rural collector under the jurisdiction of the City of Hamilton. Concession 11 E and has a posted speed limit of 50 km/hr from Highway 6 to approximately 0.30 km west of Highway 6. The speed limit then increases to 60 km/hr.

The City of Hamilton Bike Routes, Trails and Parks map designates this roadway section as a cautionary un-signed bike route with low to moderate traffic volume. Concession 11 E is currently a two-lane roadway with unpaved shoulders, as shown in **Photo 12-8**. Pedestrians and cyclists are required to share the travel lanes with motorists. There is no "Share the Road" signing along this section of roadway.

Photo 12-8: Concession 11 E west of Centre Road looking in the Westbound direction

12.3.2 Centre Road between Concession 11 E and Campbellville Road

Centre Road from Concession 11 E to Campbellville Road is a two-lane minor arterial road under the jurisdiction of the City of Hamilton. The posted speed limit is 60 km/hr from Concession 11 E to just north of Concession 12 E. The speed limit then increases to 80

km/hr. As shown in **Exhibit 3-10** in **Section 3.5**, Centre Road has substandard visibility at its intersection with Concession 11 E, and for some distance north of the intersection.
The City of Hamilton Bike Routes, Trails and Parks map designates this roadway section as a cautionary un-signed bike route with low to moderate traffic volume. **Photo 12-9** shows that cyclists, pedestrians and motorists are required to share the roadway, and that the shoulders are unpaved. There are no "Share the Road" signs along the road section.

Photo 12-9: Centre Road near Concession 12 E

12.3.3 Campbellville Road between Milburough Line and Twiss Road

Campbellville Road between Milburough Line and Twiss Road is a 2-lane minor arterial road under the jurisdiction of the Town of Milton. As this section of Campbellville Road is classified as an on road suggested cycling route in Halton's 2006 Cycling Map, there are no designated bicycle lanes or signs.

Campbellville Road between Milburough Line and Twiss Road has a posted speed limit of 60 km/hr. There is a CP Hamilton Subdivision railway crossing on Campbellville Road to the west of Twiss Road. The crossing is controlled by flashing beacons only, as shown in **Photo 12-10**. **Photos 12-10 and 12-11** show that pedestrians and cyclists are required to share the road with motorists, and that the shoulders are unpaved.

There are no "Share the Road" signs in the westbound direction as per the Halton 2006 Cycling Map's definition of an on road suggested cycling route. However, there is a "Share the Road" sign in the eastbound direction which is located just east of the Campbellville Road and Milburough Line intersection.

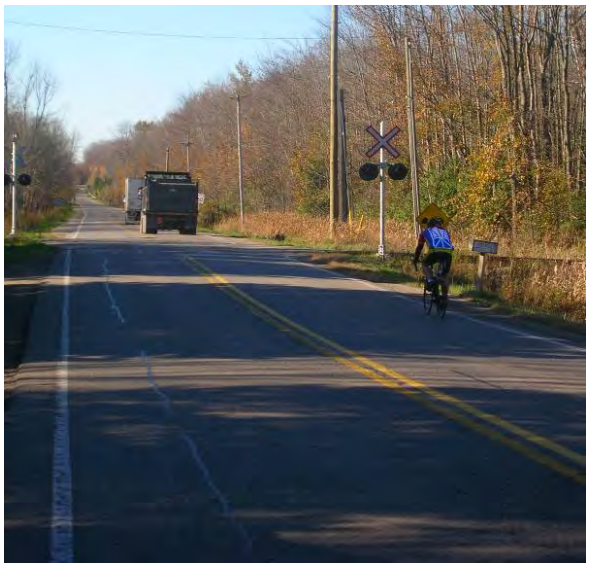


Photo 12-10: Rail Crossing on Campbellville Road West of Twiss Road

Photo 12-11: Campbellville Road

12.3.4 Milburough Line between Concession 11 E and Campbellville Road

Milburough Line is a north-south boundary road between the City of Hamilton and the Town of Milton. The City of Hamilton's 2008 Bike Routes, Trails and Parks map classifies this section of Milburough Line as a cautionary un-signed bike route and Halton's 2006 Cycling Map classifies the section as an on road suggested cycling route. According to information provided by Milton's municipal staff, Milburough Line between Steeles Avenue and Campbellville Road is under the jurisdiction of the Town of Milton.

This section of Milburough Line is classified as a 2-lane rural collector. There are no enhancing road sharing features as per the definitions provided on the Halton 2006 Cycling Map for an on road suggested cycling route. The centre-line is not painted on this road section and the shoulders are unpaved as illustrated in **Photo 12-12**. Cyclists, pedestrians and motorists must share the travel lanes. As illustrated in **Exhibit 3-10** in **Section 3.5**, Milburough Line between Concession 11 E and Campbellville Road has some sections with substandard visibility.

Photo 12-12: Milburough Line

12.4 Emergency Detour Route

At a public meeting, the St. Marys Cement consulting team was informed that Campbellville Road, between Highway 6 and Twiss Road, is designated as an emergency detour route (EDR) for Highway 401. iTRANS approached the relevant government agencies and this EDR was confirmed by Region of Halton. Site visits indicate that there are no EDR signs posted along this link.

Given the function of Campbellville Road as an EDR, it is recommended that any proposed road improvements to the road consider the EDR function of the road. This can be accommodated within the Municipal Environmental Assessment process.

12.5 Cross-Sections

Typical existing cross sections for each haul route were estimated using a representative slice of roadway as a sample. Cross sections may vary at different locations along the same section of road. **Table 12-3** summarizes the approximate right-of-way (ROW), pavement width, and shoulder dimensions in metres.

Table 12-3: Cross Section Dimensions for the Alternative Haul Routes

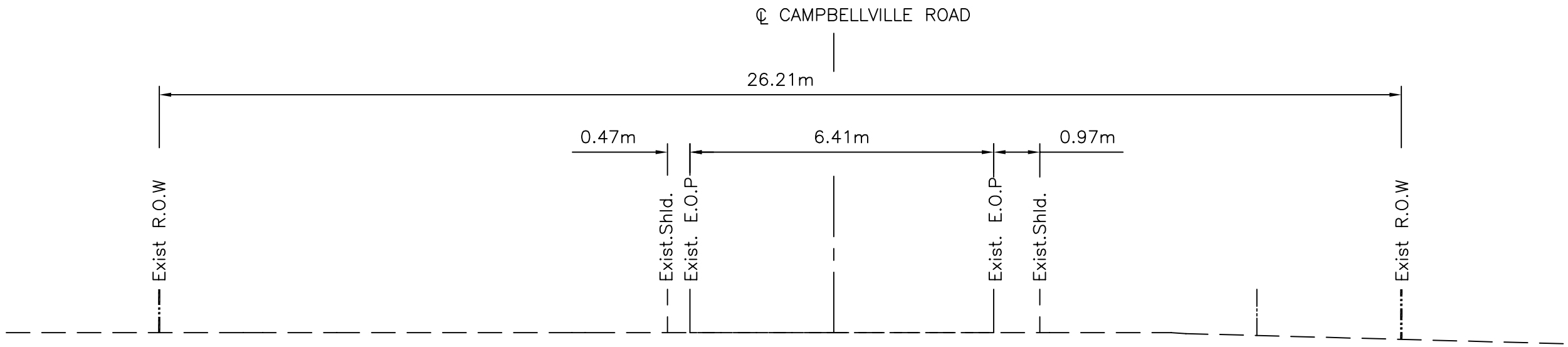
Road	From	To	ROW (m)	Pavement Width (m)	Left Shoulder (m)	Right Shoulder (m)
Campbellville Road	Highway 6	Centre Road	23.21	6.41	0.47	0.97
Campbellville Road	Milburough Line	Twiss Road	26.20	6.51	2.97	2.37
Concession 11 E	Highway 6	Centre Road	20.07	6.20	1.50	2.11

Concession 11 E	Centre Road	Milburough Line	20.11	6.46	0.0	0.0
Twiss Road	Campbellville Road	Reid Sideroad	20.10	7.00	0.0	0.0
Reid Sideroad	Twiss Road	Guelph Line	26.51	6.50	0.0	0.0
Centre Road	Campbellville Road	Concession 11 E	20.11	6.70	1.08	0.99
Milburough Line	Campbellville	Concession 11 E	18.59	6.70	0.0	0.0

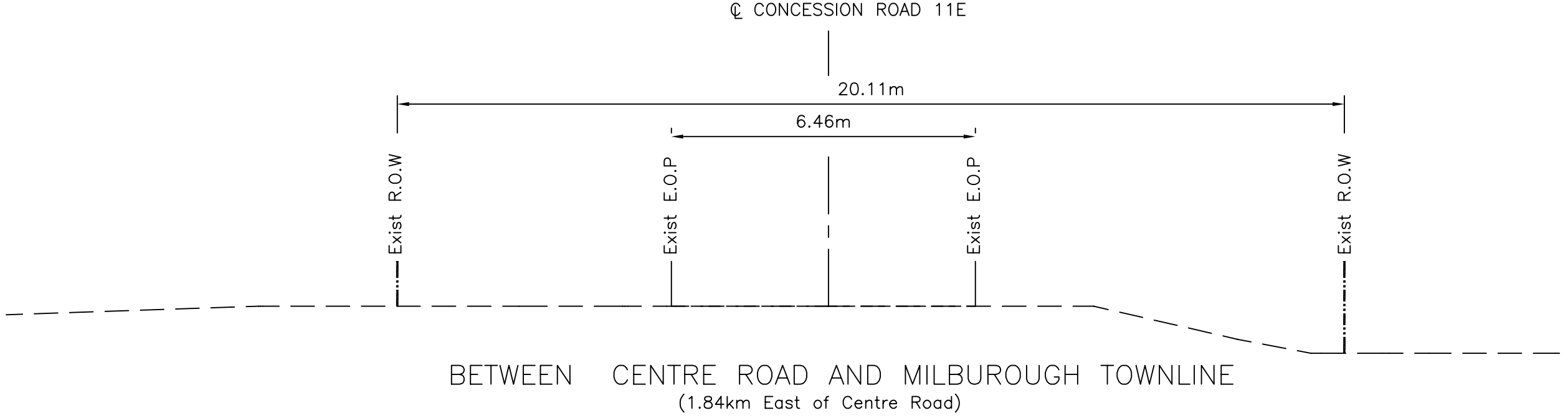
Milburough Line has the narrowest ROW at 18.59 m, and Campbellville east of Milburough has the widest ROW at 26.20. Twiss Road has the widest pavement width at 7.0 m (3.5 m per travel lane), and Concession 11 E west of Centre Road has the narrowest pavement width at 6.20 m (3.1 m per travel lane).

Concession 11 E east of Centre Road, Twiss Road, Reid Sideroad, and Milburough Line have no existing shoulders. Campbellville Road west of Milburough has the widest shoulders (2.97 m for the left, and 2.37 m for the right). The shoulders are gravel.

The cross sections are shown in **Exhibit 12-4** through **Exhibit 12-7**.



BETWEEN HWY 6. AND CENTRE ROAD
(1.5km East of Hwy. 6)

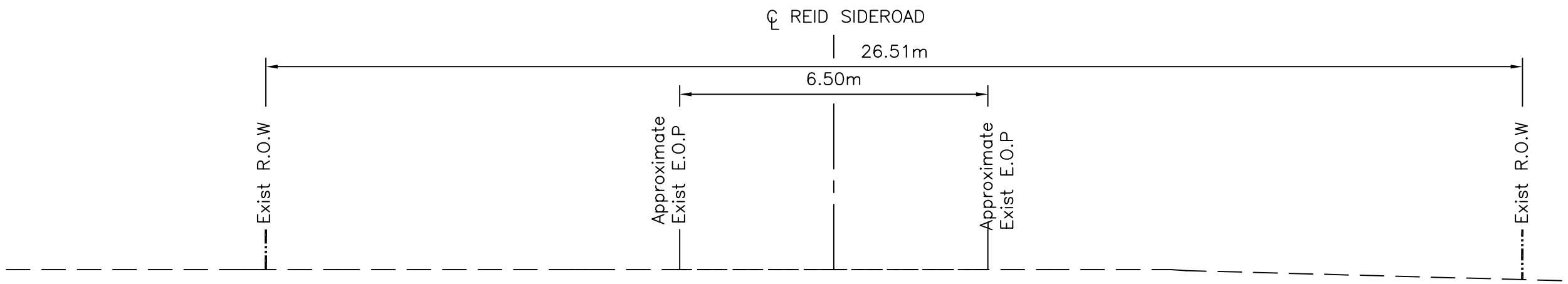


BETWEEN CENTRE ROAD AND MILBUROUGH TOWNLINE
(1.84km East of Centre Road)

Exhibit 12 - 4
Existing Typical Sections
Campbellville Road & Concession Road 11E

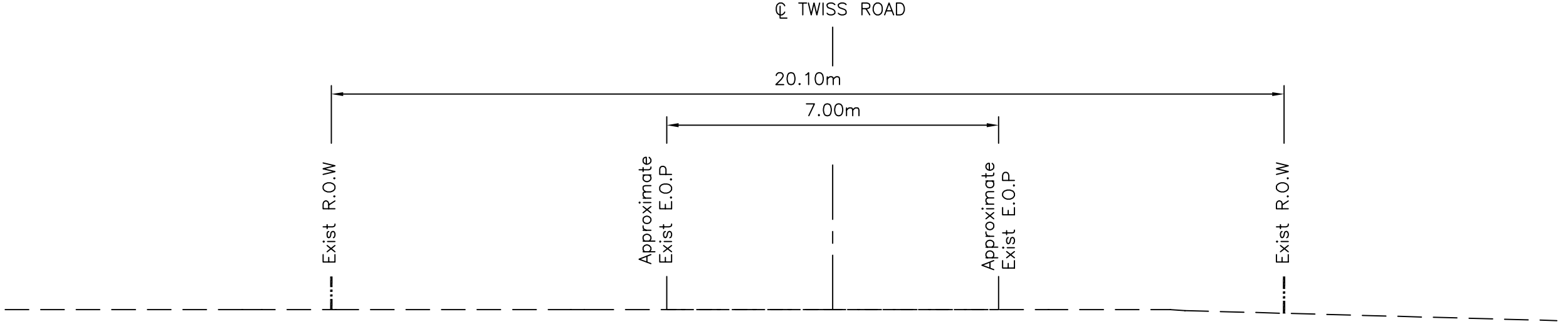
Scale 1:100

October 2008



BETWEEN TWISS ROAD AND GUELPH LINE

NOTE:– DETAIL INFORMATION
e.g. E.O.P or Ex.SHLD.
NOT AVAILABLE

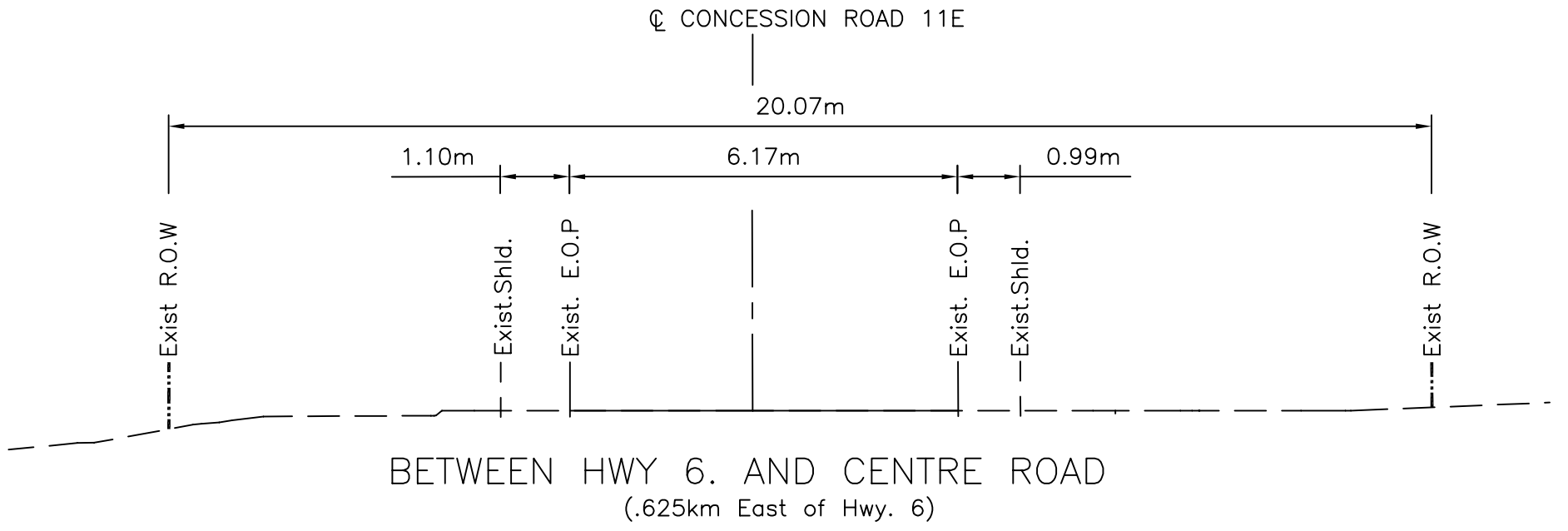


BETWEEN CAMPBELLVILLE ROAD AND REID SIDEROAD

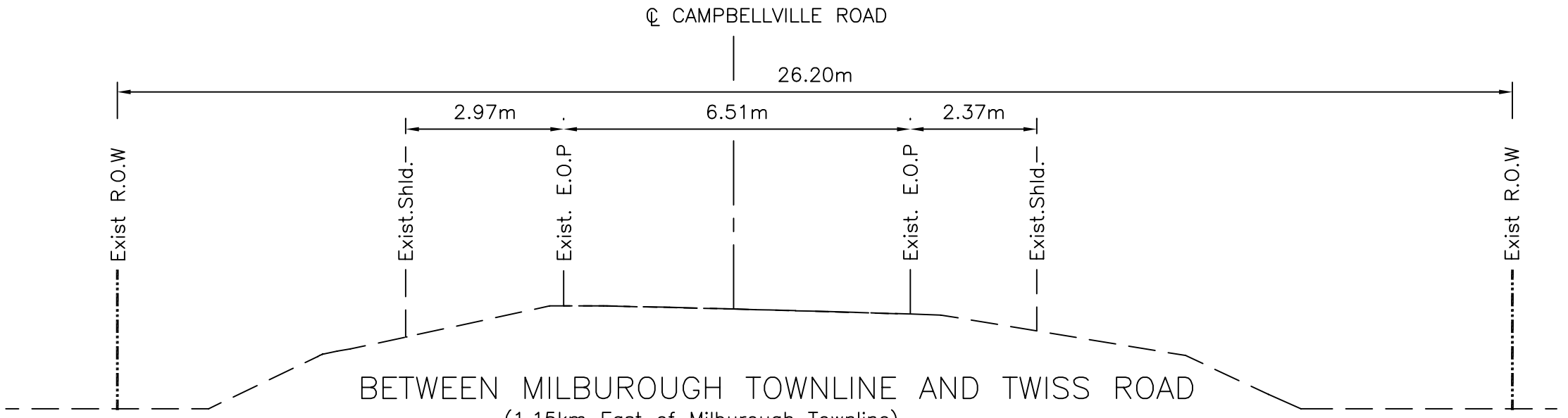
NOTE:– DETAIL INFORMATION
e.g. E.O.P or Ex.SHLD.
NOT AVAILABLE

Exhibit 12 - 5
Existing Typical Sections
Reid Sideroad & Twiss Road

Scale 1:100



BETWEEN HWY 6. AND CENTRE ROAD
(.625km East of Hwy. 6)

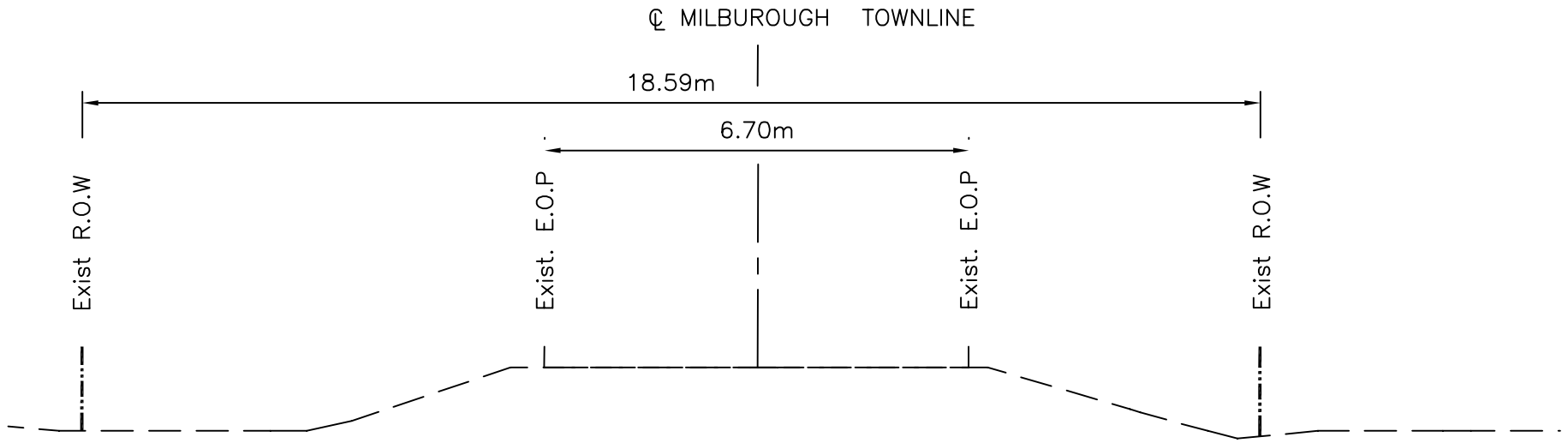


BETWEEN MILBUROUGH TOWNLINE AND TWISS ROAD
(1.15km East of Milburough Townline)

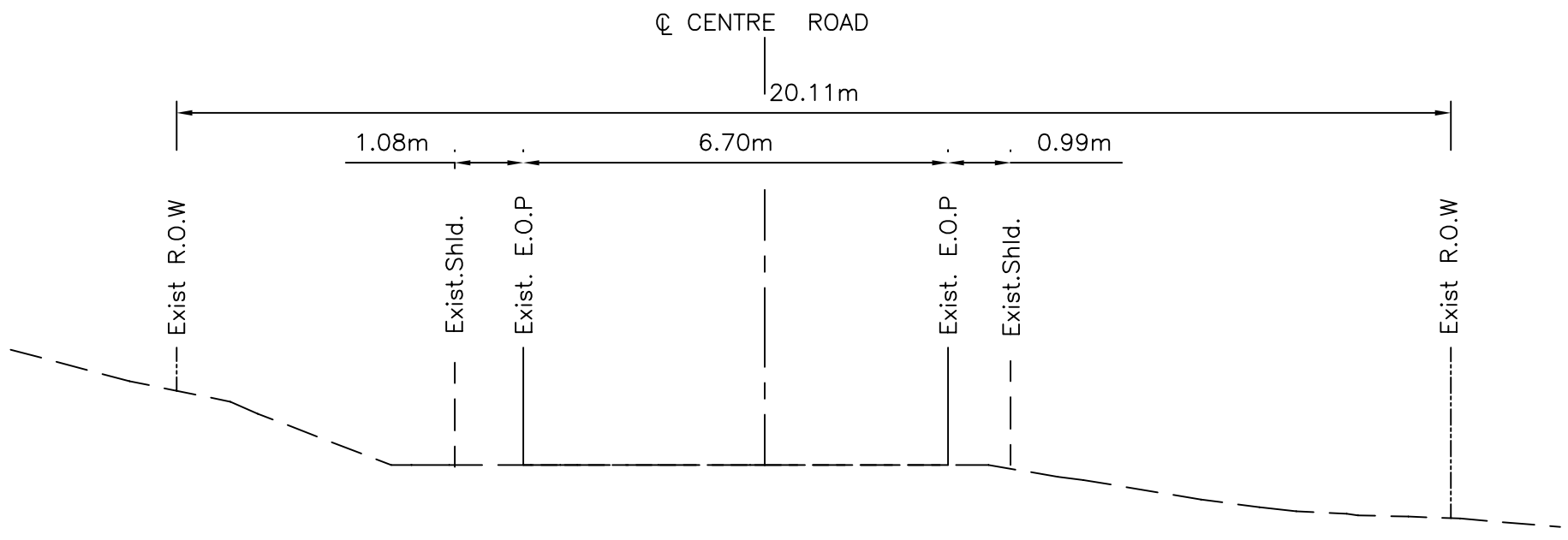
Exhibit 12 - 6
Existing Typical Sections
Campbellville Road & Concession Road 11E

Scale 1:100

October 2008



(2.25km South of Campbellville Road)



(BETWEEN CAMPBELLVILLE ROAD AND CONC.ROAD 11E)
(2.3km South of Campbellville Road)

Exhibit 12 - 7
Existing Typical Sections
Milburough Townline & Centre Road

Scale 1:100
October 2008

iTRANS

12.6 Collision Analysis

The collision information provided by each agency was carefully and thoroughly reviewed to identify potential patterns. Any potential patterns are documented below and considered in establishing current deficiencies and potential changes to the routes to improve safety.

The City of Hamilton provided five years of collision data (2002 to 2006) for the following road sections:
- Campbellville Road – Highway 6 to Centre Road (2.5 km)
- Centre Road – Campbellville Road to Concession 11 E (3.2 km)
- Concession 11 E – Highway 6 to Milburough Line (5.7 km)
- Milburough Line – Campbellville Road to Concession 11 E (3.3 km)

The City of Hamilton collision data are discussed in **Section 12.6.1**.

The Ministry of Transportation Ontario (MTO) provided five years of collision data (2001 to 2005) for the following road sections:
- Highway 6 – Highway 401 to Highway 403 (25.9 km)
- Highway 401 – Highway 6 South to Guelph Line (11.8 km)

The MTO collision data are discussed in **Section 12.6.2 (**Highway 6 between Highway 401 and Highway 403), and in **Section 10.4.3** (Highway 401 between Highway 6 South and Guelph Line. **Section 12.6.4** provides a discussion of the MTO collision data.

The Town of Milton reported that the following road sections had no reported collisions during the last five years:
- Campbellville Road – Milburough Line to Twiss Road (2.8 km)
- Twiss Road – Reid Sideroad to Campbellville Road (0.7 km)
- Reid Side Road – Twiss Road to Main Street North (1.5 km)

12.6.1 Five-year (2002-2006) Collision Data from City of Hamilton

During the five years, the four City of Hamilton road sections recorded 53 collisions involving 71 vehicles. There were no fatalities. Information on injury and property damage only (PDO) collisions was not provided.

Table 12-4 to **Table 12-8** present the following analyses for the 53 reported collisions and the four road sections:
- **Table 12-4** – collisions per year
- **Table 12-5** – collisions by month
- **Table 12-6** – initial impact type
- **Table 12-7** – type of vehicle involved
- **Table 12-8** – primary event associated with the collisions

Table 12-4 shows the number of reported collisions per year for each road section. The Average Daily Traffic (ADT) for each road section is also shown for reference.

Collisions numbers fluctuate, as can be seen in **Table 12-4.** On average, there were 10.6 collisions per year. Over the five years, just over half of the collisions (27) occurred on Centre Road between Campbellville Road and Concession 11 E. As a result, Centre Road between Campbellville Road and Concession 11 E had the highest average number of collisions per year (5.4). The second highest average was Campbellville Road between Highway 6 and Centre Road which averaged 3.2 collisions per year.

Table 12-4: Collisions per Year by Road Section

Road Section	2002	2003	2004	2005	2006	Total Collisions	ADT[1]
Campbellville Road – Highway 6 to Centre Road	6	3	4	2	1	**16**	**2,400**
Centre Road – Campbellville Road to Concession 11 E	2	4	6	11	4	**27**	**1,650**
Concession 11 E – Highway 6 to Milburough Line	3	1	2	0	1	**7**	**550**
Milburough Line – Campbellville Road to Concession 11 E	1	0	0	1	1	**3**	**600**
Total	**12**	**8**	**12**	**14**	**7**	**53**	

1 Most recent year shown, if more volume changes along section, then an average is shown

Table 12-5 shows the number of reported collisions per month for each road section.

December had the highest number of collisions (12). The winter months from November to March accounted for 66% of the collisions (35 collisions). .

Table 12-5: Collisions per Month by Road Section

Month	Campbellville Road – Highway 6 to Centre Road	Centre Road – Campbellville Road to Concession 11 E	Concession 11 E – Highway 6 to Milburough Line	Milburough Line – Campbellville Road to Concession 11 E	Total Collisions
January	2	4	0	0	**6**
February	0	3	2	0	**5**
March	2	3	1	0	**6**
April	0	1	0	0	**1**
May	0	1	1	1	**3**
June	0	0	1	0	**1**
July	1	0	0	0	**1**
August	3	3	0	0	**6**
September	0	2	0	0	**2**
October	1	3	0	0	**4**
November	4	2	0	0	**6**
December	3	5	2	2	**12**
Total	**16**	**27**	**7**	**3**	**53**

Table 12-6 shows the initial impact type of the collisions.

Single motor vehicle (SMV) - Other collisions were the most common type of collision and accounted for 33 of the 53 reported collisions along the proposed haul routes. Most of the SMV – Other collisions (25) occurred on Campbellville Road between Highway 6 and Centre Road or on Centre Road between Campbellville Road and Concession 11E.

Intersection 90 Degree collisions (right-angle collisions) were the second most common type of collision (11 collisions). Ten of the 11 occurred on Centre Road from Campbellville Road to Concession 11 E.

Table 12-6: Collisions by Initial Impact Type by Road Section

Initial Impact Type	Campbellville Road – Highway 6 to Centre Road	Centre Road – Campbellville Road to Concession 11 E	Concession 11 E – Highway 6 to Milburough Line	Milburough Line – Campbellville Road to Concession 11 E	Total Collisions
Intersection 90 Degrees	0	10	1	0	**11**
Left Turn	1	2	0	0	**3**
Pedestrian / Vehicle	1	1	0	0	**2**
Rear End	0	2	1	0	**3**
Side Swipe	1	0	0	0	**1**
Single Motor Vehicle (SMV) Other	13	12	5	3	**33**
Total	**16**	**27**	**7**	**3**	**53**

Table 12-7 shows the type of vehicle involved in the collisions.

Most (68%) of the 71 vehicles involved in the 53 reported collisions were classified as Automobiles or Station Wagons. Pickups accounted for a further 12 of the 71 vehicles.

Six vehicles classified as a truck (1 truck-closed, 1 truck-dump, and 4 truck-other) were involved in the collisions. One truck was hit by a wild animal, another was run off the road, and four were involved with another motor vehicle.

Three of the six truck related collisions occurred at the following intersections:
- Centre Road and 11 Concession E (two Collisions)
- Campbellville Road and Centre Road (one Collision)

The remaining three collisions involving trucks occurred at the following locations:
- 185 metres south of 11 Concession E on Centre Road
- 500 metres south of Mountsberg Road on Milburough Line
- 1600 metres east of Highway 6 on Campbellville Road.

Table 12-7: Vehicles Types by Road Section

Vehicle Type	Campbellville Road – Highway 6 to Centre Road	Centre Road – Campbellville Road to Concession 11 E	Concession 11 E – Highway 6 to Milburough Line	Milburough Line – Campbellville Road to Concession 11 E	Total Vehicles
Automobile or Station Wagon	9	29	8	2	**48**
Motorcycle	1	1	0	0	**2**
Passenger Van	1	2	0	0	**3**
Pickup	6	5	1	0	**12**
Truck – Closed	0	1	0	0	**1**
Truck – Dump	0	1	0	0	**1**
Truck - Other	1	2	0	1	**4**
Total	**18**	**41**	**9**	**3**	**71**

Table 12-8 shows the primary event associated with the collisions.

The largest group of primary events was involvement with another motor vehicle which accounted for 20 of the 53 reported collisions. Nine collisions were classified as “run off the road,” and seven collisions involved wild animals. The remaining collisions were associated with skidding / sliding (4), another movable object (3), hitting a pole (3), hitting a tree / shrub / stump (2), going into a ditch (2), rolling over (2), and hitting a pedestrian (1).

An increase in truck traffic on the proposed haul routes may increase the potential for collisions involving other motor vehicles. Four of the six reported collisions involving trucks were collisions involving another motor vehicle. The sections of the proposed haul routes where the truck related collisions occurred currently have changing vertical and horizontal curve alignments that can contribute to reduced visibility.

Table 12-8: Collisions by Primary Event by Road Section

Event	Campbellville Road – Highway 6 to Centre Road	Centre Road – Campbellville Road to Concession 11 E	Concession 11 E – Highway 6 to Milburough Line	Milburough Line – Campbellville Road to Concession 11 E	Total Collisions
Animal – Wild	3	2	1	1	**7**
Ditch	2	0	0	0	**2**
Other Motor Vehicle	2	14	2	2	**20**
Other Movable Object	0	2	1	0	**3**
Pedestrian	1	0	0	0	**1**
Pole	2	1	0	0	**3**
Ran Off Road	4	4	1	0	**9**
Rollover	1	0	1	0	**2**
Skidding / Sliding	1	2	1	0	**4**
Tree, Shrub, Stump	0	2	0	0	**2**
Total	**16**	**27**	**7**	**3**	**53**

12.6.2 Five-year (2001-2005) Collision Data from MTO for Highway 6 between Highway 401 and Highway 403

During the five years from 2001 to 2005, Highway 6 between Highway 401 and Highway 403 recorded a total of 948 collisions involving 1,930 vehicles. The data available are summarized in **Table 12-9** to **Table 12-24**.

- **Table 12-9** - Collisions per Year by Road Section
- **Table 12-10** - Collisions by Month
- **Table 12-11** - Collisions by Severity
- **Table 12-12** - Collisions by Initial Impact Type
- **Table 12-13** - Collisions by Road Alignment
- **Table 12-14** - Collisions by Road Location
- **Table 12-15** - Collisions by Light Conditions
- **Table 12-16** - Collisions by Environmental Conditions
- **Table 12-17** - Collisions by Road Surface Conditions
- **Table 12-18** - Vehicles by Type
- **Table 12-19** - Truck Collisions by Initial Impact
- **Table 12-20** - Truck Collisions by Primary Event
- **Table 12-21** - Truck Collisions by LHRS

- **Table 12-22** - Truck Collisions at Intersection of Plains Road and Highway 6
- **Table 12-23** - Truck Collisions at Intersection of Highway 5 (Dundas Street) and Highway 6
- **Table 12-24** - Collisions by Primary Event

Table 12-9 shows the number of reported collisions per year for each road section. Highway 6 is divided into five sections each shown with the Linear Highway Reference System (LHRS) number. The length of the sections and the Average Daily Traffic (ADT) for each section is also shown for reference.

Table 12-9 shows that 303 (32%) of the 948 reported collisions, occurred along a 2.3 km section (Plains Road E. / Northcliffe Avenue W. to Highway 5) although this section accounts for only 9 percent of the total length of Highway 6 through the study area (25.9 kms).

Table 12-9: Collisions per Year by Road Section

LHRS	Description	Length of Section (km)	2001	2002	2003	2004	2005	Total Collisions	ADT[1]
13545	Highway 403 interchange to Plains Road	0.7	4	5	1	2	7	19	42,500
13560	Plains Road to Highway 5	2.3	56	61	65	60	61	303	42,500
13570	Highway 5 to County Road 597	13.1	67	76	68	94	75	380	26,900
13780	County Road 597 to Maddaugh Road	5.2	12	22	20	20	22	96	22,900
13785	Maddaugh Road to Highway 401 Interchange	4.6	19	37	29	32	33	150	22,900
Total		**25.9**	**158**	**201**	**183**	**208**	**198**	**948**	

1 Most recent year shown, if more volume changes along section, then an average is shown

Table 12-10 shows the number of reported collisions per month for each road section. The 948 reported collisions are spread evenly throughout the year. The only exception might be March when there was a slight drop in the number of collisions.

Table 12-10: Collisions by Month

Month	Number of Collisions
January	81
February	84
March	53
April	76
May	89
June	85
July	78
August	72
September	85
October	77
November	80
December	88
Total	**948**

Table 12-11 shows the severity of the 948 collisions: 72 % were property damage only, 27 % were injury collisions, and one percent of the collisions reported at least one fatality. Six of the nine fatal collisions were classified as truck-related.

Table 12-11: Collisions by Severity

Collision Class	Number of Collisions	Percent of Total Collisions
Property Damage Only	679	72%
Injury	260	27%
Fatal	9	1%
Total	**948**	**100%**

Table 12-12 shows the initial impact type of the collisions. Rear end collisions were the most common type of collision, and accounted for 434 (46%) out of the 948 reported collisions on the Highway 6 sections. Single vehicle impacts (23%), turning (13%), and side swipe (12%) were also common types of collision.

Table 12-12: Collisions by Initial Impact Type

Initial Impact Type	Number of Collisions	Percent of Total Collisions
Angle	25	3%
Approach	27	3%
Other – Initial Impact	2	0.2%
Rear End	434	46%
Side Swipe	118	12%
Single Vehicle Unattended	9	1%
Single Vehicle	213	23%
Turning	120	12%
Total	**948**	**100%**

Table 12-13 shows the road alignment at the site of the collisions. Most of Highway 6 is straight and most is level, and most 620 (65%) of the 948 reported collisions occurred where the road alignment was straight and level, but 288 (30%) occurred where the road alignment was straight but on a hill.

Table 12-13: Collisions by Road Alignment

Road Alignment	Number of Collisions
Curved Hill	9
Curved Level	31
Straight Hill	288
Straight Level	620
Total	**948**

Table 12-14 shows the road location of the collisions: 507 (53%) of the collisions occurred at non-intersection related areas on the roadway; 368 (39%) occurred at or near an intersection; 69 (7%) of collisions occurred at a private driveway; and four collisions occurred at an overpass.

Table 12-14: Collisions by Road Location

Road Location	Number of Collisions
At intersection	88
Near intersection	280
Not intersection related	507
Over pass	4
Private Driveway	69
Total	**948**

Table 12-15 provides information about the lighting conditions when the collisions occurred: 715 (75%) collisions occurred during daylight hours with or without artificial light; 186 (20%) occurred during dark conditions with or without artificial light; 29 (3%) were reported during dusk (four with artificial light); and 18 (2%) were reported during dawn (one with artificial light).

Table 12-15: Collisions by Light Conditions

Light Conditions	Number of Collisions
Dark	145
Dark Artificial	41
Dawn	17
Dawn Artificial	1
Daylight	705
Daylight Artificial	10
Dusk	25
Dusk Artificial	4
Total	**948**

Table 12-16 shows the environmental conditions at the time of the collisions: 736 (78%) collisions occurred under clear conditions; 98 (10%) involved snow conditions: and 77 (8%) were associated with rain.

Table 12-16: Collisions by Environmental Conditions

Environmental Conditions	Number of Collisions
Clear	736
Drifting Snow	5
Fog	16
Freezing Rain	10
Other-Environmental Condition	1
Rain	77
Snow	98
Windy	5
Total	**948**

Table 12-17 reports the road surface conditions at the time of the collisions: 678 (72%) collisions occurred during dry road surface conditions; 150 (16%) occurred when the road surface was wet. Loose snow was reported for 43 collisions, slushy conditions for 30, icy conditions for 25, packed snow for 17, and other surface conditions for five collisions.

Table 12-17: Collisions by Road Surface Conditions

Road Surface Conditions	Number of Collisions
Dry	678
Ice	25
Loose Snow	43
Other Surface Condition	5
Packed Snow	17
Slush	30
Wet	150
Total	**948**

Table 12-18 provides a detailed breakdown of the 1930 vehicles involved in the 948 reported collisions. Most (1230, or 64%) were classified as an automobile or station wagon. Trucks accounted for 210 (11%) of the vehicles, and were sub-divided as follows:

- Tractor – 131
- Closed – 41
- Dump – 22
- Open – 10
- Tank – 5
- Other – 1

Table 12-18: Vehicles by Type

Vehicle Type	Number of Vehicles
Ambulance	2
Automobile or Station Wagon	1230
Bicycle	3
Bus – Other	2
Delivery Van	52
Farm Tractor Vehicle	1
Fire Vehicle	1
Motor Home	3
Motorcycle	10
Non-Motorized	4
Passenger Van	173
Pickup Truck	195
Police Vehicle	7
School Bus	4
Tow Truck	5
Truck – Closed	41
Truck – Dump	22
Truck – Open	10
Truck – Other	1
Truck – Tank	5
Truck – Tractor	131
Unknown Vehicle Type	28
Total	**1,930**

Table 12-19 shows the 210 truck collisions by the type of initial impact. Rear end collisions were the most common and accounted for 93 (44%) of the collisions. Side swipe collisions were the second most common and accounted for 66 (31%) of the collisions.

Table 12-19: Truck Collisions by Initial Impact

Initial Impact Type	Number of Trucks
Angle	2
Approach	9
Rear End	93
Side Swipe	66
Single Unattended Vehicle	2
Single Vehicle	23
Turning	15
Total	**210**

Table 12-20 shows the truck collisions by the primary event. Other motor vehicles were by far the most common primary event and were involved in 183 (87%) of the 210 truck collisions.

Table 12-20: Truck Collisions by Primary Event

Primary Event	Number of Trucks
Animal – Wild	1
Cyclist	1
Debris off road	3
Jack Knifing	3
Load Spill	1
Other Event	8
Other Motor Vehicle	183
Pole	2
Ran off Road	1
Skidding / Sliding	7
Total	**210**

Table 12-21 shows the number of truck collisions by LHRS. LHRS 13560 (Plains Road to Highway 5) and LHRS 13570 (Highway 5 to County Road) accounted for 80 (38%) and 78 (37%) truck collisions respectively.

LHRS 13545 (Highway 403 interchange to Plains Road) had two collisions. These two collisions should be reviewed as this section of roadway is only 700 metres in length.

Table 12-21: Truck Collisions by LHRS

LHRS	Description	Number of Trucks Involved
13545	Highway 403 interchange to Plains Road	2
13560	Plains Road to Highway 5	80
13570	Highway 5 to County Road 597	78
13580	County Road 597 to Maddaugh Road	14
13585	Maddaugh Road to Highway 401 Interchange	36
Total		**210**

As shown in **Table 12-22**, the intersection of Highway 6 and Plains Road (within 1 km north and south of the intersection) reported 44 collisions involving 52 trucks. Most of the 52 trucks (42, or 81%) were travelling in the northbound direction.

Table 12-22: Truck Collisions at Intersection of Plains Road and Highway 6

Section of Roadway	Number of Collisions	Number of Trucks Involved	Number of Northbound Trucks
Up to 1 km south of intersection	2	2	2
Up to 1 km north of intersection	42	50	40
Total	**44**	**52**	**42**

As shown in **Table 12-23**, the intersection of Highway 6 and Highway 5 (Dundas Street) (within 1 km north and south of the intersection) reported 32 collisions involving 54 trucks. Most of the 54 trucks (45, or 83%) were also travelling in the northbound direction.

Table 12-23: Truck Collisions at Intersection of Highway 5 (Dundas Street) and Highway 6

Section of Roadway	Number of Collisions	Number of Trucks Involved	Number of Northbound Trucks
Up to 1 km south of intersection	23	30	25
Up to 1 km north of intersection	19	24	20
Total	**32**	**54**	**45**

Table 12-24 shows the primary event associated with the 948 collisions recorded on Highway 6 between Highway 401 and Highway 403. Another motor vehicle was by far the most common primary event, and accounted for 674 (71%) of the collisions.

Other primary events of significance were: skidding / sliding (92, or 10%), the vehicle running off the road (53, or 6%), and wild animals (49, or 5%).

An increase in truck traffic may lead to more rear end and sideswipe collisions, typically in the vicinity of the intersections of Plains Road and Highway 6, and Highway 5 (Dundas Street) and Highway 6. An increase in rear end and sideswipe collisions implies an increase in multi-vehicle collisions.

Table 12-24: Collisions by Primary Event

Primary Event of Primary Vehicle	Number of Collisions
Animal – Domestic	2
Animal – Wild	47
Cable Guide Rail	1
Crash Cushion	1
Curb	4
Cyclist	2
Debris off Vehicle	5
Debris on Road	3
Ditch	5
Fire / Explosion	4
Jack / Knifing	3
Load Spill	1
Other Event	29
Other Motor Vehicle	674
Pedestrian	2
Pole – Sign	5
Pole – Utility	1
Ran off Road	53
Rollover	3
Skidding / Sliding	92
Steel Guide Rail	5
Unattended Vehicle	6
Total	**948**

12.6.3 Five-year (2001-2005) Collision Data from MTO for Highway 401 between Highway 6 South and Guelph Line

During the five years from 2001 to 2005, Highway 401 between Highway 6 South and Guelph Line recorded a total of 1,055 collisions involving 1,783 vehicles. The data available are summarized in:

- **Table 12-25** – collisions per year by road section
- **Table 12-26** – collisions by month
- **Table 12-27** – collisions by severity

Table 12-25 shows the number of reported collisions per year for each road section. The section of Highway 401 that is being considered as a haul route is divided into two sections and an interchange, each shown with the LHRS number.

Table 12-25 shows that the 4.5 km section of LHRS 47710 (Guelph Line Interchange to Milton western boundary) recorded 489 collisions, and that the 7.3 km section of LHRS 47715 (Milton western boundary to Highway 6 south interchange) recorded 429 collisions. The interchange (LHRS 47720) recorded 137 collisions, all of which occurred at offset 0.0 (Highway 6 South interchange).

Table 12-25: Collisions per Year by Road Section

LHRS	Section Description	Length of Section (km)	2001	2002	2003	2004	2005	Total Collisions
47710	Guelph Line Interchange to Milton Town Limits	4.5	85	74	94	122	114	489
47715	Milton Town Limits to Highway 6 South Interchange	7.3	80	66	78	88	117	429
47720	Highway 6 South Interchange	0	31	22	32	25	27	137
Total		**11.8**	**196**	**162**	**204**	**235**	**258**	**1,055**

Table 12-26 shows the number of reported collisions per month. January had the highest number of collisions (202). The winter months from November to March accounted for 54% of the collisions (569 collisions).

Table 12-26: Collisions by Month

Month	Number of Collisions
January	202
February	83
March	90
April	89
May	57
June	73
July	54
August	74
September	61
October	78
November	76
December	118
Total	**1,055**

Table 12-27 shows the severity of the 1,055 collisions: 82% were property damage only, 18% were injury collisions, and less than one percent of the collisions (3 collisions) reported at least one fatality. The three fatal collisions led to four fatalities. All four fatalities occurred in the summer months.

Two of the fatal collisions were single vehicle collisions, but the third collision was a sideswipe collision which involved a truck-tractor. The collision record shows that a passenger van was trying to overtake the truck-tractor, but was sideswiped and skidded/slid into the ditch.

Table 12-27: Collisions by Severity

Collision Class	Number of Collisions	Percentage of Total Collisions
Property Damage Only	862	82%
Injury	190	18%
Fatal	3	<1%
Total	**1,055**	**100%**

12.6.4 Discussion of the Collision Data

Unfortunately, the City of Hamilton and MTO data provide different information in some instances, and different levels of detail, but the analysis of the available collision data suggests that the following intersections are areas of concern on the alternative haul routes:

Intersection of Centre Road and Concession 11 E (City of Hamilton data)

- Two of the six truck collisions reported involving trucks occurred at or near this intersection.
- There is a constrained sight distance to the north from the eastbound approach due to the horizontal and vertical curve alignments on Centre Road north of Concession 11 E, (although the direction of travel of the vehicles was not reported)
- One of the collisions (reported just south of the intersection) was a single vehicle collision involving a wild animal.

Intersection of Highway 6 and Highway 5 (Dundas Street), and
Intersection of Highway 6 and Plains Road (MTO data)

- The two intersections reported 42 and 44 collisions involving at least one truck respectively.
- The 86 collisions at the two intersections involved 52 and 54 trucks respectively.
- Together, the two intersections accounted for 106 (50%) of the 210 trucks involved in collisions in the MTO dataset
- Most (87, or 82%) of the 106 trucks reported in collisions at the two intersections were travelling in the northbound direction:
  - At the intersection of Highway 6 and Highway 5 (Dundas Street), the northbound approach has a straight alignment, but up a steep uphill grade approaching the intersection. The grade may reduce the intersection's visibility.
  - At the intersection of Highway 6 and Plains Road, the northbound approach is from the Highway 403 interchange. The road follows a curved hill alignment with only 700 m separating the intersection and the interchange. Vehicles going north are generally travelling quite fast and may find the geometry of the road reduces the intersection's visibility.

It should also be noted that:

- Most collisions involving trucks were multi-vehicle collisions.
- An increase in truck traffic at any of the intersections on the alternative haul routes may lead to an increase in the number of rear end and sideswipe type collisions.

13. ALTERNATIVE HAUL ROUTE FUTURE BASELINE CONDITIONS

13.1 Future Background Traffic Projections

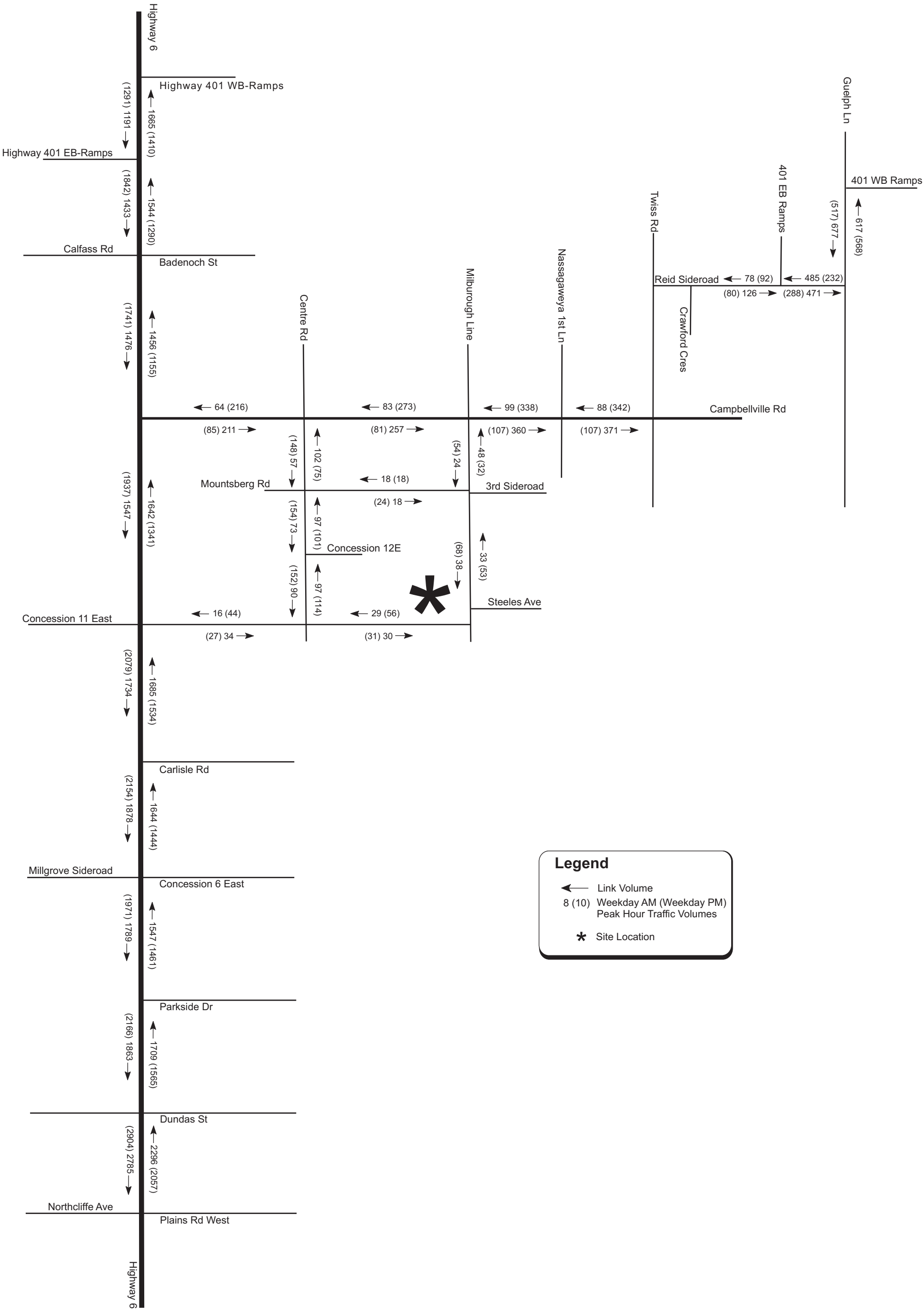
The future background traffic volumes have been developed based on an observation of historical traffic volumes, projected population numbers, and discussions with agencies.

A review of the Ministry of Transportation (MTO) Average Annual Daily Data (AADT) historical traffic volumes along Highway 6 showed a 3% growth rate over the past 15 years. Further, a 10-year and 5-year growth rate was also calculated and the growth rates decreased which suggests the growth rate is levelling off. A growth rate of 2.0% per annum was assumed for the Highway 6 corridor.

The projected population numbers provided by the City of Hamilton were reviewed. The growth rate for the area within the vicinity of the site (i.e. off Highway 6) is less than a tenth of a percent per annum. To be conservative we have assumed a 1.0% per annum growth rate. This growth rate is inline with 1.0% per annum growth rate for Guelph Line provided by Halton Region.

No specific background developments were included in the future background traffic volumes. These were assumed to be captured in the projected growth rates.

The 2021 and 2031 future background traffic volumes are summarized in **Exhibit 13-1** and **Exhibit 13-2**.



Not To Scale

Exhibit 13-1
2021 Future Background Average Link Traffic Volumes

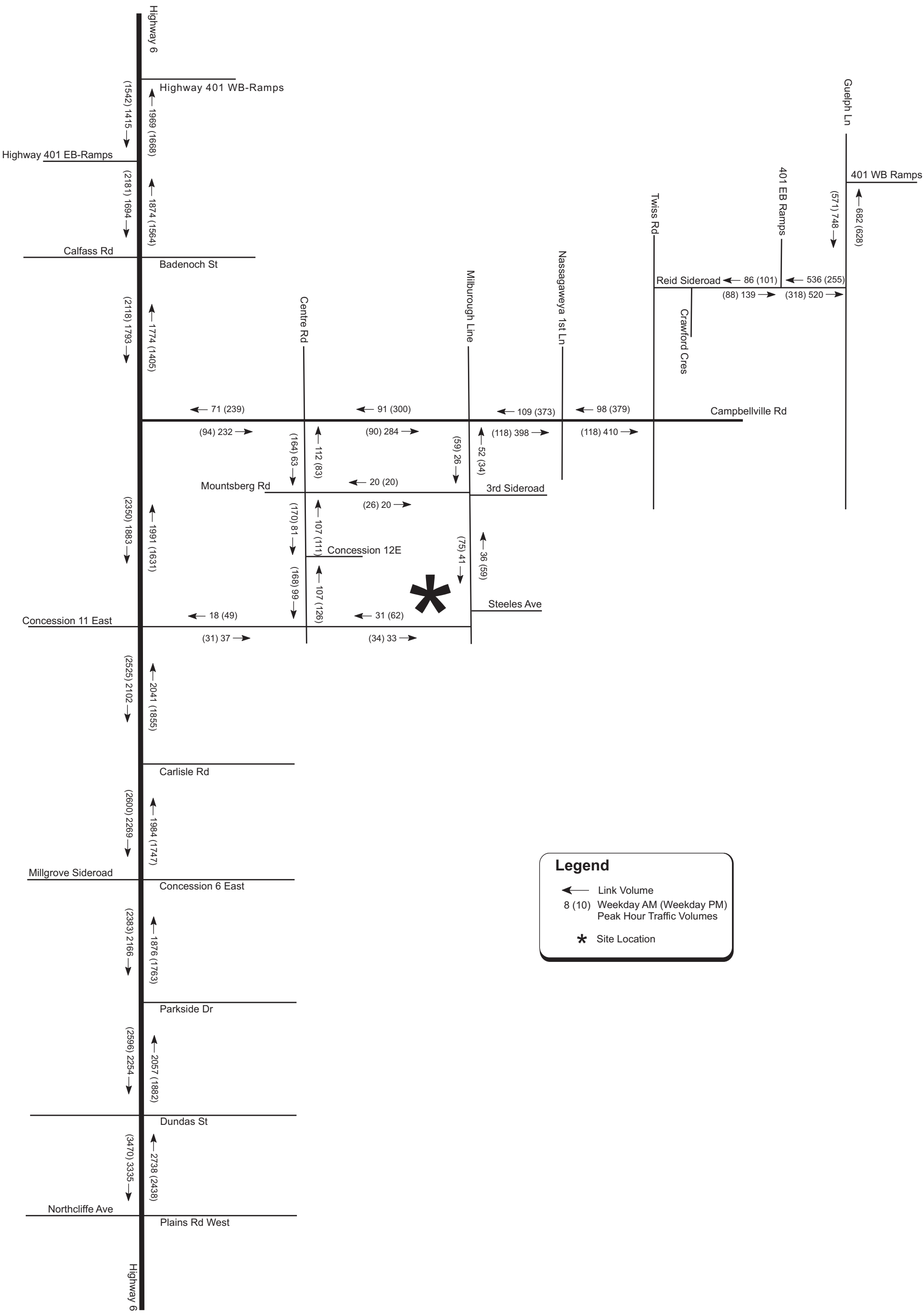


Exhibit 13-2
2031 Future Background Average Link Traffic Volumes

13.2 Future Road Network Improvements

13.2.1 City of Hamilton

The City of Hamilton's (City) road network improvements were obtained from various sources including the City's Official Plan, the Transportation Master Plan (TMP), and the Waterdown / Aldershot Transportation Master Plan Phase 2 Study as well as the City's 10-Year Capital Program.

13.2.1.1 Road Network

The City of Hamilton's TMP states that the preferred 2031 road network solution maximizes the efficiency of the existing road network while making strategic road improvements to enhance economic development and goods movement. The TMP states that one of the challenges facing the City is the growing number of roads in need of rehabilitation and maintenance. Therefore, a strategic and focussed approach was adopted by the City for the road network strategic development, which incorporated the following key objectives:

- Maximize the efficiency of the existing road network in order to minimize the need for new Escarpment crossings and other potentially high impact projects
- Focus road improvements on goods movement corridors and enhancing access to employment lands

The TMP states that the development of this strategy was based on a transportation demand modelling exercise to determine the 2031 road network deficiencies and possible improvements. It further states that the 2031 road network strategy generally reflects the committed and planned improvements identified through previous studies, including the Waterdown/Aldershot Transportation Master Plan Phase 2 Study and the Waterdown North & Waterdown South Secondary Plan & Class Environmental Assessment. The Proposed Road Capital Improvements to 2031 are illustrated in **Exhibit 13-3**.

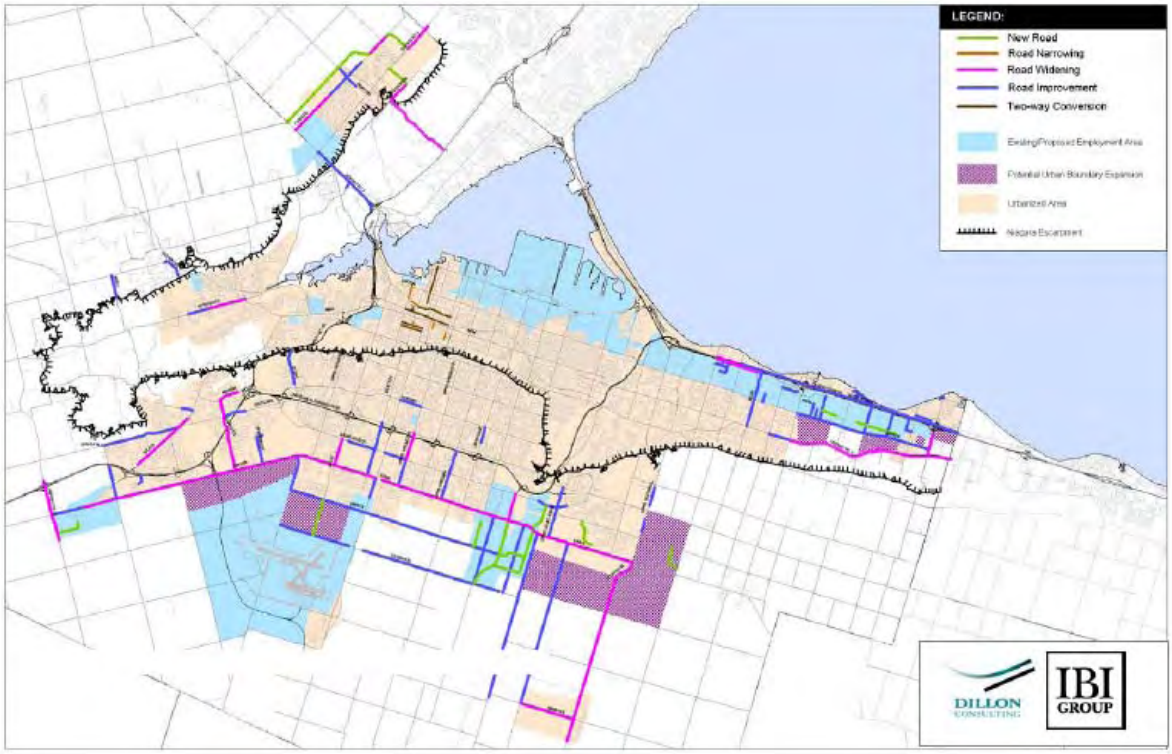


Exhibit 13-3: Proposed Road Capital Improvements to 2031

As illustrated in **Exhibit 13-3**, there is only one proposed road capital improvement to 2031 which will have an impact on the traffic operations of some of the alternative haul routes. The environmental assessment was recently completed for the widening of Highway 6 to five lanes (3 northbound and 2 southbound) south of Dundas Street. The timing for this improvement was not known at the time of this study.

The Road Network Strategy also outlines the Proposed Road Infrastructure Improvements to the year 2021. The only road infrastructure improvement within the City of Hamilton's side of the study area and which is relevant to this study is the proposed Highway 5 / Highway 6 intersection improvement with an anticipated timing of 2012 to 2021.

Based on our discussions with City staff, rehabilitation of Concession 11 E from Milburough Line to Highway 6 was completed in 2005. Rehabilitation of Centre Road from Concession 11 E to Campbellville Road was completed in 2007. Road rehabilitation is not scheduled for the remaining road sections under consideration as potential haul routes within the next five years. The MTO is currently reconstructing the Guelph Line and Reid Sideroad intersection as described in **Section 13.2.4**.

13.2.1.2 Cycling Network

A Cycling Network Strategy was developed as part of the City's TMP. It states "…reflecting that a successful Cycling Network Strategy should address all types of cycling activity, the goals of the Strategy are to:

- Facilitate efficient and safe travel for commuters and other cyclists through expansion and improvement of the network of on-street cycling facilities and Escarpment connections; and
- Promote recreational cycling and active transportation through the development of off-street facilities."

The Proposed Bicycle Infrastructure Improvements, 2006 – 2021, are illustrated in **Exhibit 13-4**. It should be noted that a number of plans were consulted during the development of the preferred cycling strategy to determine when roadway capital projects such as when widening and extensions are to occur. Some of these documents include the Hamilton Development Charges Background Study – Transportation Projects (2004), the Hamilton 2004 – 2014 Capital Budget, and the Waterdown / Aldershot TMP Phase 2 Study.

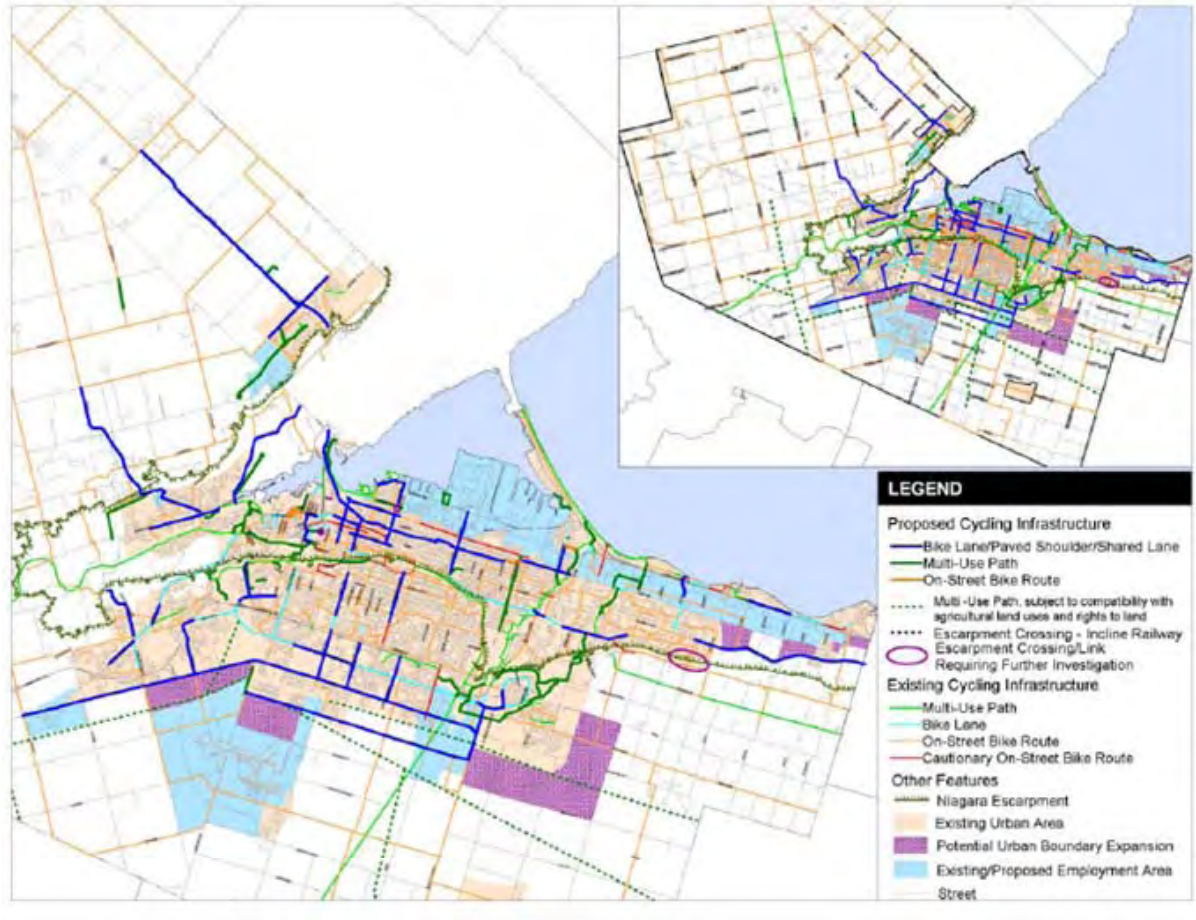


Exhibit 13-4: Proposed Bicycle Infrastructure Improvements, 2006-2021

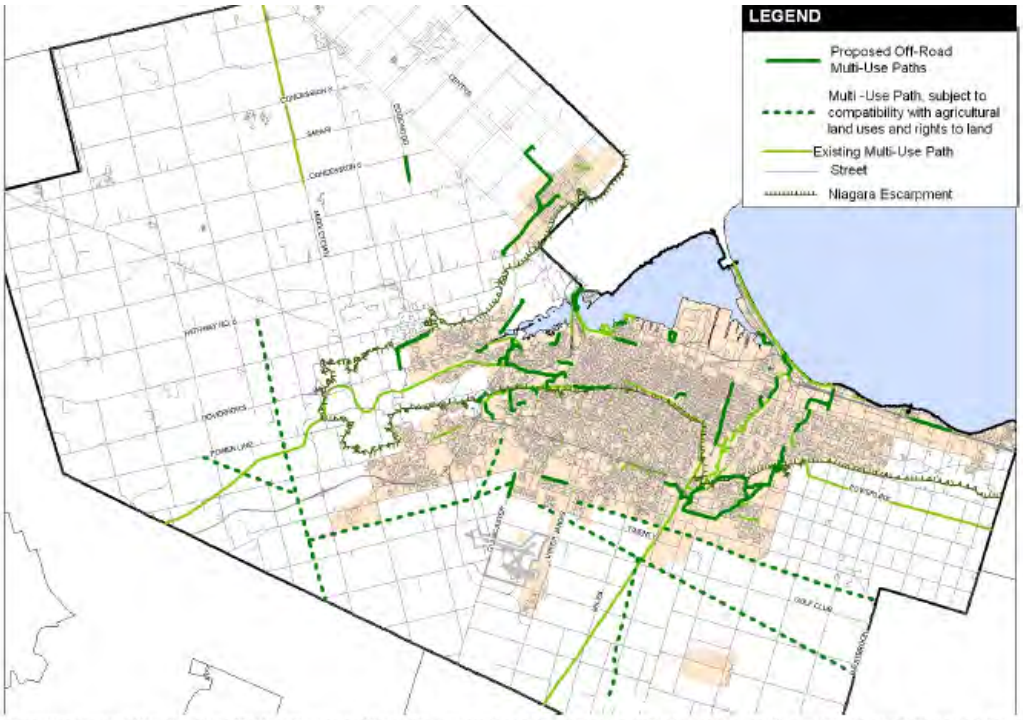
As illustrated in **Exhibit 13-4**., there are no proposed cycling facility upgrades on any of the road sections under consideration as an alternative haul route.

13.2.1.3 Pedestrian Network Strategy

A Pedestrian Network Strategy was developed as part of the City of Hamilton's TMP. It states "reflecting that a successful Pedestrian Network Strategy should address all factors affecting pedestrian activity to promote both utilitarian and recreational trips, the goals of the Strategy are to:

- Facilitate efficient, safe, and enjoyable travel for commuters and other pedestrians through expansion and improvement of the network of on-street pedestrian facilities; and
- Promote recreational walking and active transportation through the development of off-street facilities."

The City's Proposed Infrastructure Improvements to the Off-Road Multi-Use Pathway Network are illustrated in **Exhibit 13-5**



Note: Recommendations from the Trails Master Plan (Open Space Development and Park Planning, City of Hamilton, 2006) provide the basis for many of the proposed improvements. See this document for a more detailed discussion of many of the proposed multi-use pathways. Also not proposed paths on hydro corridors through agricultural lands are subject to further review.

Exhibit 13-5: Proposed Improvements to Off-Road Multi-Use Pathway Network

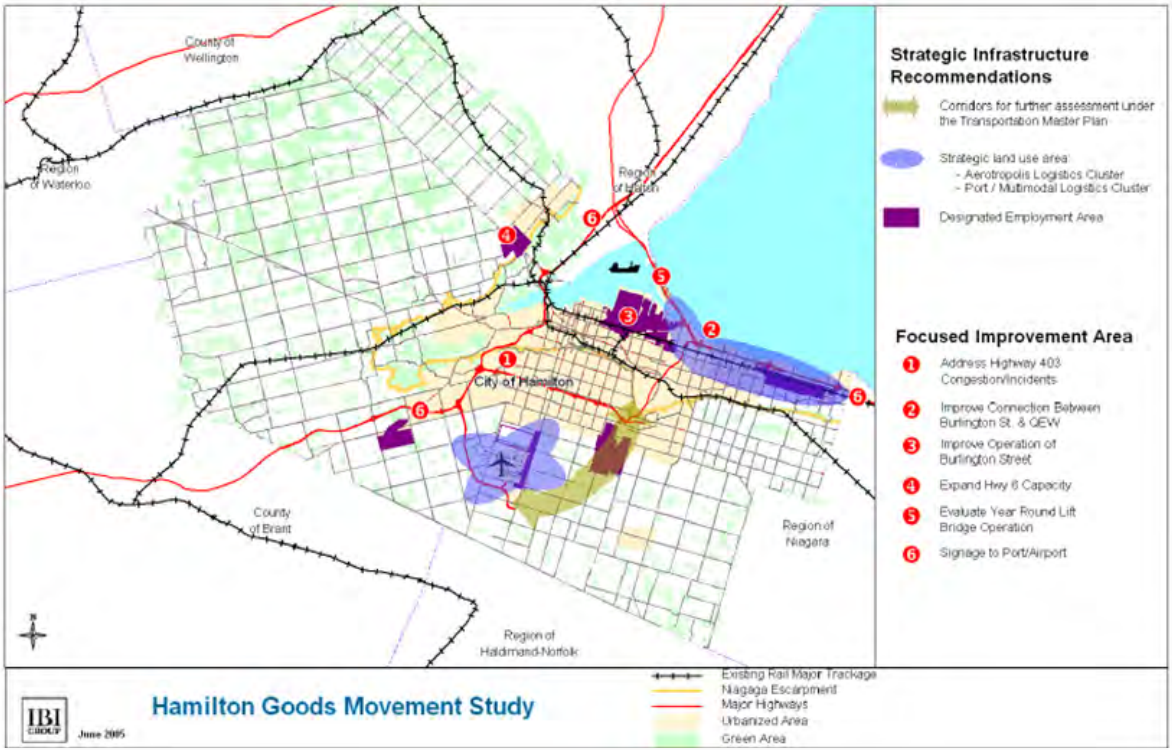
As illustrated in Error! Reference source not found., there are no proposed off-road multi-use paths in the vicinity of any of the road sections under consideration as an alternative haul routes.

13.2.1.4 Goods Movement

The City's TMP supports the recommendations for the goods movement as outlined in the Hamilton Goods Movement Study, which was completed in June 2005. These recommendations are illustrated in **Exhibit 13-6**.

The relevant key recommendations of the Goods Movement Study include:

- Resolve freight bottlenecks including short term measures such as improving signage for truck routes to and from major industrial areas, to and from the Port and to and from the Airport;
- Re-examine specifications for truck routes within the City to ensure that clearances are appropriate for traffic entering and leaving the Port area in particular.



Source: Hamilton Goods Movement Study, 2005

Exhibit 13-6: Strategic Goods Movement Initiatives

As illustrated in **Exhibit 13-6,** the Hamilton Goods Movement Study identified the requirement to expand the capacity of Highway 6 within Focussed Improvement Area No. 4. A portion of the No. 4 improvement area is located within the study area of this report. As previously stated, the environmental assessment was recently completed for the widening of Highway 6 to five lanes (3 northbound and 2 southbound) south of Dundas Street.

13.2.2 Region of Halton

The Region of Halton's future road and cycling network improvements are contained within the 2004 Transportation Master Plan and the Region's 2008 – 2017 Capital Projects. Based on our review of these documents, there are no proposed and/or planned road improvements for any of the roads under consideration as alternative haul route under the jurisdiction of the Region of Halton.

A current construction project under the jurisdiction of the Ontario Ministry of Transportation includes geometric improvements and signalization of the Reid Sideroad / Guelph Line intersection. The traffic signals are expected to be in operation by September 2008.

The Region's 2004 Cycling and Pedestrian Infrastructure Plan provides the cycling network which *may* be achieved over the next 20 years through the implementation of the recommendations contained within the Plan. The Conceptual Regional Cycling and Pathways Network contained within the Region's Plan illustrates that Campbellville Road from Milburough Line to Twiss Road is a "Potential On-Road Cycling Facility Municipal Road". As previously stated Campbellville Road from Milburough Line to Twiss Road is under the jurisdiction of the Town of Milton. It further illustrates that Guelph Line from Campbellville Road to north of Highway 401 is a "Potential On-Road Cycling Facility Regional Road". This would require on-road cycling facilities at least up to the Highway 6/Guelph Line Interchange.

13.2.3 Town of Milton

The Town's 2009 – 2017 Capital Projects Budget indicates that there are no road improvements proposed and/or planned for any of the alternative haul route roads under the jurisdiction of the Town of Milton.

13.2.4 Ontario Ministry of Transportation

13.2.4.1 Guelph Line & Reid Sideroad Improvements

The intersection of Guelph Line and Reid Sideroad is currently under construction. The project includes geometric improvements and signalization that is expected to begin operation by September 2008.

13.2.4.2 Highway 5 & Highway 6 Improvements

The intersection of Highway 5 and Highway 6 is currently under construction. The future design for this intersection is illustrated in **Exhibit 13-7**

Exhibit 13-7: Future Design for the Highway 5 & 6 Intersection (Source: Provided by MTO staff)

13.2.4.3 Highway 6 from Freelton to Guelph Environmental Assessment

The Ministry of Transportation has completed the Environmental Assessment and Preliminary Design Report for Highway 6 from Freelton Road northerly 16.9 km to Guelph. The study area, as well as the recommended Highway 6 route, is illustrated in **Exhibit 13-8**.

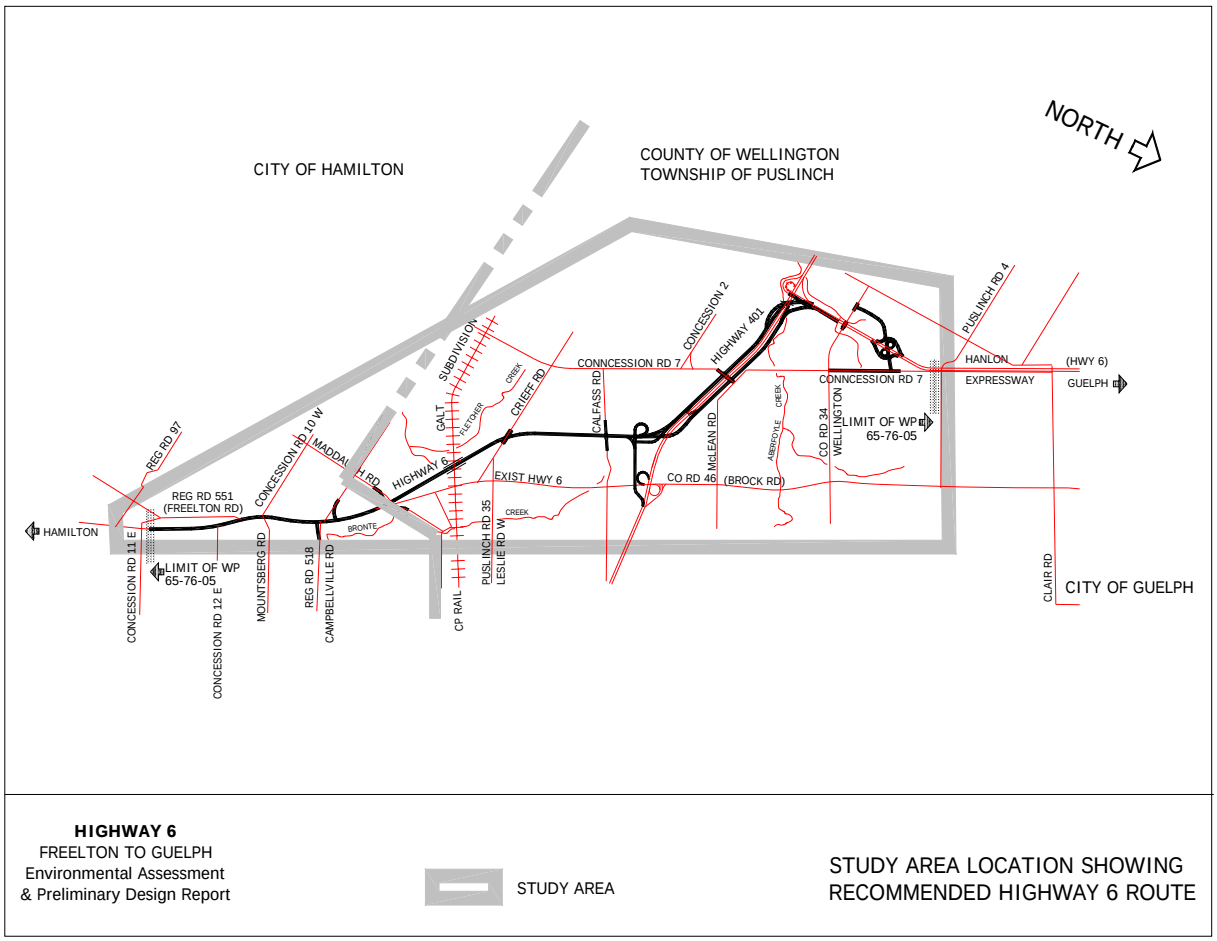


Exhibit 13-8: Highway 6 from Freelton Road to Guelph Study Area and Recommended Route (Source: Provided by MTO staff)

As illustrated in **Exhibit 13-8**, Highway 6 will be constructed on a new alignment from Maddaugh Road to Highway 401 to bypass the communities of Puslinch and Morriston. This new section of Highway 6 will be a fully controlled access, 4-lane divided highway with median separator barrier and will provide full eastbound and westbound access to Highway 401 via various ramp configurations.

Based on discussions with MTO staff, Highway 6 from Freelton to Guelph EA is currently going through the EA approval process and the timing of this road improvement is unknown. Therefore, it was not included in the assessment of the alternative haul routes.

13.3 Analysis of Future Baseline Conditions

The future baseline analysis was undertaken assuming existing lane configurations.

13.3.1 Level of Service

13.3.1.1 Future Baseline Condition – 2021

iTRANS assessed the operations for the future 2021 baseline condition. The signalized operations are summarized in **Table 13-1**. Detailed summaries of the analyses can be found in **Appendix D**. All of the intersection signal timings were optimized. The intersection of Guelph Line / Reid Sideroad has recently been signalized, however at the time of our counts was stop controlled. For background analysis we have signalized this intersection.

Table 13-1: Signalized Intersections - 2021 Background Traffic

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**A**		**B**	
Westbound Left-turn	D	0.44	D	0.78
Westbound Right-turn	A	0.30	A	0.48
Northbound Through	A	0.52	A	0.38
Northbound Right-turn	A	0.62	A	0.60
Southbound Left-turn	A	0.33	A	0.37
Southbound Through	B	0.91	C	0.93
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.48
Eastbound Right-turn	F	1.15	F	1.44
Northbound Left-turn	A	0.14	C	0.14
Northbound Through	F	1.22	D	1.06
Southbound Through	E	0.98	F	1.26
Southbound Right-turn	C	0.45	C	0.29
Highway 6 / Badenoch Street / Calfass Road				
Overall	**E**		**F**	
Eastbound Left-Through-Right	D	0.31	D	0.22
Westbound Left-Through	D	0.54	D	0.51
Westbound Right-turn	D	0.03	D	0.02
Northbound Left-turn	-	-	-	-
Northbound Through-Right	D	1.04	B	0.80
Southbound Left-turn	C	0.40	A	0.15
Southbound Through-Right	E	1.10	F	1.30

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Carlisle Road				
Overall	**C**		**C**	
Westbound Left-turn	C	0.72	D	0.83
Westbound Right-turn	C	0.30	C	0.28
Northbound Through	C	0.95	C	0.85
Northbound Right-turn	A	0.13	B	0.09
Southbound Left-turn	D	0.86	C	0.73
Southbound Through	B	0.82	C	0.99
Highway 6 / Concession 6 E				
Overall	**B**		**A**	
Eastbound Left-turn	C	0.57	D	0.45
Eastbound Through-Right	C	0.20	C	0.09
Westbound Left-turn	C	0.24	D	0.51
Westbound Through-Right	C	0.13	C	0.26
Northbound Left-turn	A	0.01	A	0.08
Northbound Through	A	0.69	A	0.51
Northbound Right-turn	A	0.05	A	0.03
Southbound Left-turn	A	0.25	A	0.10
Southbound Through	B	0.85	A	0.79
Southbound Right-turn	A	0.05	A	0.07
Highway 6 / Parkside Drive				
Overall	**B**		**D**	
Westbound Left-turn	C	0.33	F	1.03
Westbound Right-turn	C	0.08	C	0.19
Northbound Through	B	0.79	D	0.96
Northbound Right-turn	A	0.11	B	0.08
Southbound Left-turn	D	0.83	F	1.03
Southbound Through	A	0.64	B	0.84
Highway 6 / Dundas Street				
Overall	**E**		**F**	
Eastbound Left-turn	F	0.94	F	0.89
Eastbound Through	D	0.58	C	0.35
Eastbound Right-turn	F	0.97	D	0.83
Westbound Left-turn	F	1.04	F	1.48
Westbound Through	D	0.53	D	0.86
Westbound Right-turn	D	0.07	C	0.13
Northbound Left-turn	F	1.03	F	1.33
Northbound Through	D	0.79	C	0.80
Northbound Right-turn	C	0.21	C	0.37
Southbound Left-turn	E	0.78	F	0.91
Southbound Through	E	1.06	F	1.12
Southbound Right-turn	C	0.13	C	0.17

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Northcliffe Avenue / Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.14	C	0.34
Westbound Left-Through	F	1.86	F	1.10
Westbound Right-turn	D	0.71	D	0.66
Northbound Left-turn	E	0.71	F	1.38
Northbound Through	F	1.18	E	1.05
Northbound Right-turn	B	0.06	B	0.12
Southbound Left-turn	F	1.11	F	1.06
Southbound Through-Right	F	1.50	F	1.55
Guelph Line / Reid Sideroad				
Overall	**B**		**B**	
Eastbound Left-turn	C	0.57	C	0.37
Eastbound Right-turn	C	0.21	C	0.13
Northbound Left-turn	A	0.04	A	0.02
Northbound Through	A	0.45	A	0.42
Southbound Through-Right	A	0.58	A	0.44

LOS – Level of Service; v/c – volume-capacity ratio;

There are several capacity constraints along the Highway 6 corridor. The intersections of Highway 6 / Highway 401 Eastbound Ramps, Highway 6 / Badenoch Street / Calfass Road, Highway 6 / Parkside Drive, Highway 6 / Dundas Road and Highway 6 / Northcliffe Avenue / Plains Road West have individual movement volume to capacity ratios greater than 1.00. The operational constraints are attributed to the growth of traffic along Highway 6.

The unsignalized operations are summarized in **Table 13-2**. Detailed summaries of the analyses can be found in **Appendix D**.

Table 13-2: Unsignalized Intersections - 2021 Background Traffic

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Campbellville Road				
Westbound Left-Right	F	2.14	F	6.27
Southbound Left-turn	C	0.10	B	0.06
Highway 6 / Concession 11 E				
Eastbound Left-Through-Right	E	0.40	F	1.42
Westbound Left-Through-Right	F	1.23	F	Err
Northbound Left-turn	C	0.05	D	0.25
Southbound Left-turn	B	0.02	B	0.01
Campbellville Road / Centre Road				
Eastbound Left-Through-Right	A	0.00	A	0.00
Westbound Left-Through-Right	A	0.03	A	0.06
Northbound Left-Through-Right	B	0.21	B	0.14
Southbound Left-Through-Right	B	0.11	B	0.14

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Campbellville Road / Milburough Line				
Eastbound Left-Through-Right	A	0.00	A	0.00
Westbound Left-Through-Right	A	0.01	A	0.03
Northbound Left-Through-Right	B	0.08	B	0.04
Southbound Left-Through-Right	B	0.05	B	0.03
Campbellville Road / Nassagaweya 1st Line				
Eastbound Left-Through-Right	A	0.02	A	0.02
Westbound Left-Through-Right	A	0.00	A	0.01
Northbound Left-Through-Right	B	0.05	B	0.05
Southbound Left-Through-Right	B	0.11	B	0.11
Campbellville Road / Twiss Road				
Eastbound Left-Through-Right	A	0.05	A	0.02
Westbound Left-Through-Right	A	0.00	A	0.02
Northbound Left-Through-Right	B	0.08	B	0.03
Southbound Left-Through-Right	B	0.04	B	0.20
Reid Sideroad / Crawford Crescent				
Westbound Left-Through	A	0.01	A	0.01
Northbound Left-Right	A	0.02	A	0.03
Reid Sideroad / Highway 401 EB Ramp				
Eastbound Left-turn	A	0.10	A	0.03
Southbound Left-turn	D	0.75	B	0.33
Southbound Right-turn	A	0.02	A	0.01
Guelph Line / Highway 401 WB Ramps				
Westbound Left-turn	D	0.41	C	0.43
Westbound Right-turn	B	0.21	C	0.58
Mountsberg Road / Centre Road				
Eastbound Left-Through-Right	A	0.03	B	0.02
Westbound Left-Through-Right	B	0.04	B	0.02
Northbound Left-Through-Right	A	0.00	A	0.01
Southbound Left-Through-Right	A	0.00	A	0.01
Mountsberg Road / Milburough Line				
Eastbound Left-Right	A	0.03	A	0.02
Northbound Left-Through	A	0.00	A	0.01
Centre Road / Concession 12E				
Westbound Left-Right	A	0.04	B	0.01
Southbound Left-Through	A	0.00	A	0.01
Concession 11 E / Centre Road				
Eastbound Left-Through-Right	B	0.07	B	0.05
Westbound Left-Through-Right	B	0.05	B	0.10
Northbound Left-Through-Right	A	0.00	A	0.02
Southbound Left-Through-Right	A	0.01	A	0.00
Concession 11 E / Milburough Line				
Eastbound Left-Right	A	0.04	A	0.02
Northbound Left-Through	A	0.00	A	0.02
Milburough Line / 3rd Sideroad				
Westbound Left-Right	A	0.01	A	0.01
Southbound Left-Through	A	0.00	A	0.00
Milburough Line / Steeles Avenue				
Westbound Left-Right	A	0.01	A	0.05
Southbound Left-Through	A	0.01	A	0.01

LOS – Level of Service; v/c – volume-capacity ratio;

The unsignalized intersections operate with an individual movement volume to capacity ratio of 0.75 or better during the AM and PM peak hours, with a couple exceptions. The intersections of Highway 6 / Campbellville Road and Highway 6 / Concession 11 East operate with individual movement volume to capacity ratios greater than 1.00. The westbound left-through-right at Highway 6 / Concession 11 East in the PM peak hour produces an "Err" volume to capacity ratio, this is an error that occurs because of a high volume to capacity ratio. The increase of traffic along Highway 6 is the main reason for these over capacity movements.

13.3.1.2 Future Baseline Condition – 2031

The signalized operations are summarized in **Table 13-3**. Detailed summaries of the analyses can be found in **Appendix D**. Again, the signal timings were optimized for each intersection using existing lane configurations.

Table 13-3: Signalized Intersections - 2031 Background Traffic

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**C**		**C**	
Westbound Left-turn	D	0.48	E	0.87
Westbound Right-turn	A	0.34	A	0.53
Northbound Through	A	0.63	A	0.47
Northbound Right-turn	A	0.69	A	0.66
Southbound Left-turn	A	0.45	A	0.48
Southbound Through	E	1.11	E	1.13
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.53
Eastbound Right-turn	F	1.53	F	1.73
Northbound Left-turn	A	0.20	B	0.17
Northbound Through	F	1.52	F	1.30
Southbound Through	D	0.94	F	1.41
Southbound Right-turn	C	0.50	B	0.37
Highway 6 / Badenoch Street / Calfass Road				
Overall	**F**		**F**	
Eastbound Left-Through-Right	D	0.33	D	0.23
Westbound Left-Through	D	0.52	D	0.54
Westbound Right-turn	D	0.04	D	0.02
Northbound Left-turn	-	-	-	-
Northbound Through-Right	F	1.27	C	0.98
Southbound Left-turn	C	0.43	B	0.42
Southbound Through-Righ	F	1.35	F	1.59
t				

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Carlisle Road				
Overall	**C**		**F**	
Westbound Left-turn	F	0.99	D	0.86
Westbound Right-turn	D	0.41	C	0.29
Northbound Through	D	0.98	E	1.10
Northbound Right-turn	A	0.14	B	0.10
Southbound Left-turn	F	0.93	D	0.72
Southbound Through	B	0.88	F	1.23
Highway 6 / Concession 6 E				
Overall	**C**		**C**	
Eastbound Left-turn	D	0.65	C	0.42
Eastbound Through-Right	C	0.23	C	0.11
Westbound Left-turn	D	0.26	C	0.46
Westbound Through-Right	C	0.17	C	0.34
Northbound Left-turn	A	0.01	A	0.10
Northbound Through	B	0.82	A	0.65
Northbound Right-turn	A	0.05	A	0.04
Southbound Left-turn	C	0.49	A	0.16
Southbound Through	D	1.01	C	1.01
Southbound Right-turn	A	0.06	A	0.07
Highway 6 / Parkside Drive				
Overall	**C**		**E**	
Westbound Left-turn	C	0.35	F	1.14
Westbound Right-turn	C	0.09	C	0.31
Northbound Through	D	1.00	F	1.14
Northbound Right-turn	A	0.12	B	0.09
Southbound Left-turn	D	0.82	F	1.23
Southbound Through	A	0.78	D	1.03
Highway 6 / Dundas Street				
Overall	**F**		**F**	
Eastbound Left-turn	F	1.30	F	1.50
Eastbound Through	D	0.64	C	0.38
Eastbound Right-turn	F	1.18	E	0.95
Westbound Left-turn	F	1.33	F	1.82
Westbound Through	D	0.56	D	0.85
Westbound Right-turn	D	0.08	C	0.19
Northbound Left-turn	F	1.35	F	1.77
Northbound Through	D	0.91	D	0.98
Northbound Right-turn	C	0.26	C	0.54
Southbound Left-turn	F	0.91	F	0.98
Southbound Through	F	1.19	F	1.30
Southbound Right-turn	C	0.15	C	0.20

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Northcliffe Avenue and Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.18	C	0.40
Westbound Left-Through	F	1.97	F	1.21
Westbound Right-turn	D	0.76	E	0.95
Northbound Left-turn	F	0.79	F	1.71
Northbound Through	F	1.49	F	1.17
Northbound Right-turn	B	0.07	B	0.13
Southbound Left-turn	F	1.23	F	1.80
Southbound Through	F	1.89	F	1.89
Southbound Through-Right	-	-	-	-
Guelph Line / Reid Sideroad				
Overall	**B**		**B**	
Eastbound Left-turn	C	0.62	C	0.41
Eastbound Right-turn	C	0.23	C	0.15
Northbound Left-turn	A	0.05	A	0.02
Northbound Through	A	0.50	A	0.46
Southbound Through-Right	B	0.65	A	0.48

LOS – Level of Service; v/c – volume-capacity ratio;

All the signalized intersections along Highway 6 have capacity problems. The operation constraints are attributed to the continued growth along Highway 6.

The unsignalized operations are summarized in **Table 13-4**. Detailed summaries of the analyses can be found in **Appendix D**.

Table 13-4: Unsignalized Intersections - 2031 Background Traffic

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Campbellville Road				
Westbound Left-Right	F	5.94	F	15.16
Southbound Left-turn	C	0.16	B	0.09
Highway 6 / Concession 11E				
Eastbound Left-Through-Right	F	0.97	F	8.29
Westbound Left-Through-Right	F	5.90	F	Err
Northbound Left-turn	C	0.08	E	0.43
Southbound Left-turn	C	0.03	C	0.01
Campbellville Road / Centre Road				
Eastbound Left-Through-Right	A	0.00	A	0.00
Westbound Left-Through-Right	A	0.03	A	0.06
Northbound Left-Through-Right	B	0.24	B	0.17
Southbound Left-Through-Right	B	0.13	C	0.17
Campbellville Road / Milburough Line				
Eastbound Left-Through-Right	-	0.00	-	0.00
Westbound Left-Through-Right	A	0.01	A	0.03
Northbound Left-Through-Right	B	0.09	B	0.04
Southbound Left-Through-Right	B	0.06	B	0.03

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Campbellville Road / Nassagaweya 1st Line				
Eastbound Left-Through-Right	A	0.03	A	0.02
Westbound Left-Through-Right	A	0.01	A	0.01
Northbound Left-Through-Right	B	0.06	B	0.06
Southbound Left-Through-Right	B	0.13	B	0.13
Campbellville Road / Twiss Road				
Eastbound Left-Through-Right	A	0.06	A	0.02
Westbound Left-Through-Right	A	0.00	A	0.02
Northbound Left-Through-Right	B	0.09	B	0.05
Southbound Left-Through-Right	B	0.05	B	0.24
Reid Sideroad / Crawford Crescent				
Westbound Left-Through	A	0.01	A	0.01
Northbound Left-Right	A	0.02	B	0.04
Reid Sideroad / Highway 401 EB Ramp				
Eastbound Left-turn	A	0.12	A	0.03
Southbound Left-turn	E	0.89	B	0.37
Southbound Right-turn	A	0.02	A	0.01
Guelph Line / Highway 401 WB Ramps				
Westbound Left-turn	D	0.52	C	0.52
Westbound Right-turn	B	0.24	C	0.67
Mountsberg Road / Centre Road				
Eastbound Left-Through-Right	A	0.03	B	0.02
Westbound Left-Through-Right	B	0.05	B	0.02
Northbound Left-Through-Right	A	0.00	A	0.01
Southbound Left-Through-Right	A	0.00	A	0.01
Mountsberg Road / Milburough Line				
Eastbound Left-Right	A	0.03	A	0.03
Northbound Left-Through	A	0.00	A	0.01
Centre Road / Concession 12E				
Westbound Left-Right	A	0.04	B	0.02
Southbound Left-Through	A	0.00	A	0.01
Concession 11E / Centre Road				
Eastbound Left-Through-Right	B	0.08	B	0.06
Westbound Left-Through-Right	B	0.06	B	0.12
Northbound Left-Through-Right	A	0.00	A	0.03
Southbound Left-Through-Right	A	0.01	A	0.00
Concession 11E / Milburough Line				
Eastbound Left-Right	A	0.04	A	0.02
Northbound Left-Through	A	0.00	A	0.02
Milburough Line / 3rd Sideroad				
Westbound Left-Right	A	0.01	A	0.01
Southbound Left-Through	A	0.00	A	0.00
Milburough Line / Steeles Avenue				
Westbound Left-Right	A	0.01	A	0.06
Southbound Left-Through	A	0.01	A	0.01

LOS – Level of Service; v/c – volume-capacity ratio;

The 2031 background unsignalized intersections operate with an individual movement volume to capacity ratio of 0.89 or better during the AM and PM peak hours with a couple of exceptions. The intersections of Highway 6 / Campbellville Road and Highway 6 / Concession 11 East operate with individual movement volume to capacity ratios greater than 1.00. The westbound left-through-right at Highway 6 / Concession 11 East in the PM peak hour produces an "Err" volume to capacity ratio, this is an error that occurs because of a high volume to capacity ratio.

14. ALTERNATIVE HAUL ROUTE 1

14.1 Quarry Trip Assignment and Distribution

This alternative assumes all quarry truck traffic uses Concession 11 East and Highway 6 to access the quarry. The truck traffic volumes for this route are shown in **Exhibit 14-1**.

14.2 Assumed Road Network Alterations

For this alternative we have assumed the following intersection alterationss:

Highway 6 / Concession 11 E
- Signalization
- Exclusive westbound left-turn lane
- Exclusive westbound right-turn lane

The intersection lane configurations are also summarized in **Exhibit 14-2**.

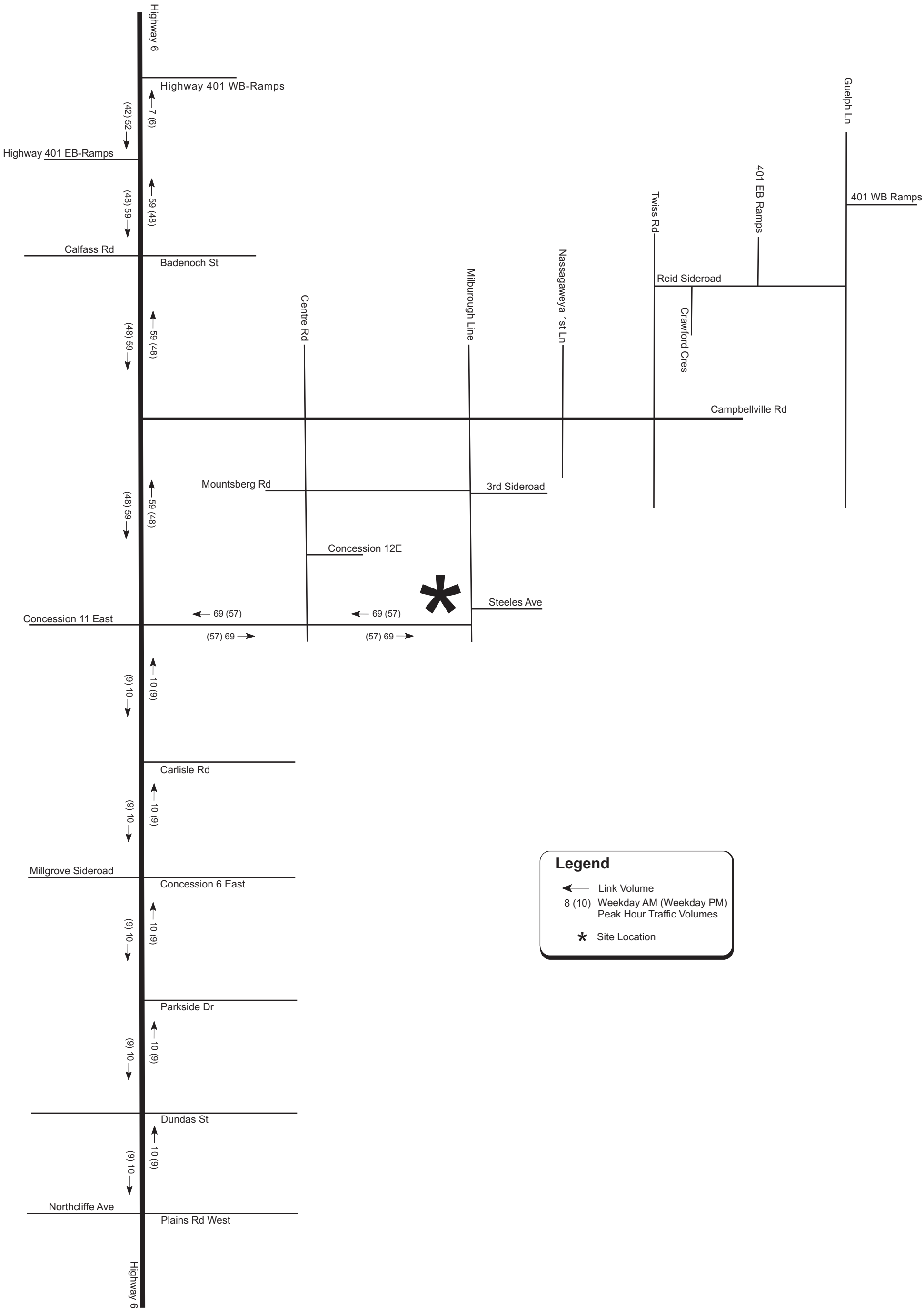


Exhibit 14-1
Quarry Truck Traffic Average Link Volumes Alternative 1

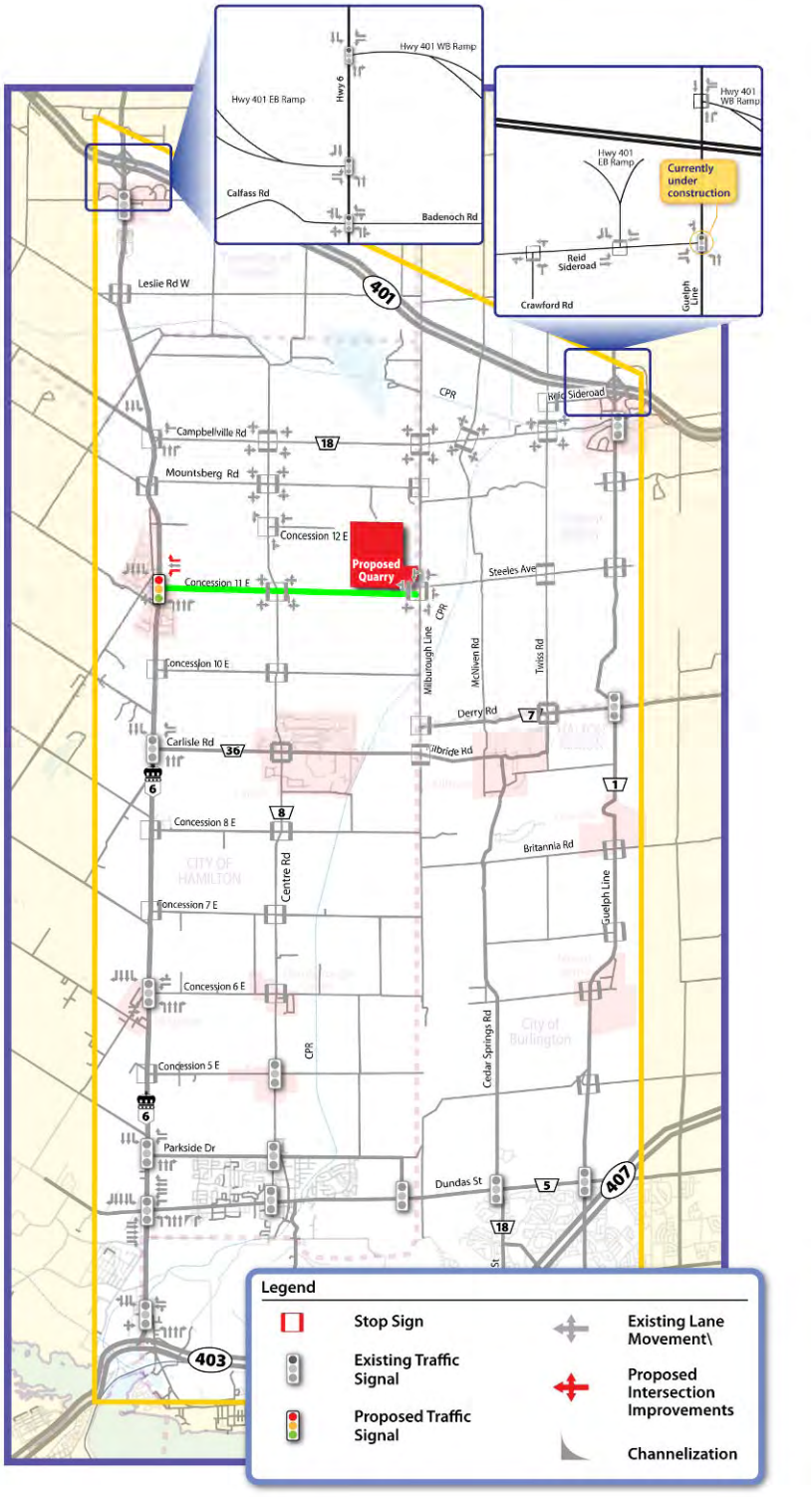


Exhibit 14-2: Alternative 1 Intersection Lane Configurations

14.3 Alternative Haul Route Total Future Conditions

14.3.1 Total Future Traffic Volumes

The site traffic volumes and the background traffic volumes were added together to create the total traffic average link volumes for Alternative 1, the 2021 total are shown in **Exhibit 14-3** and 2031 total are shown in **Exhibit 14-4**.

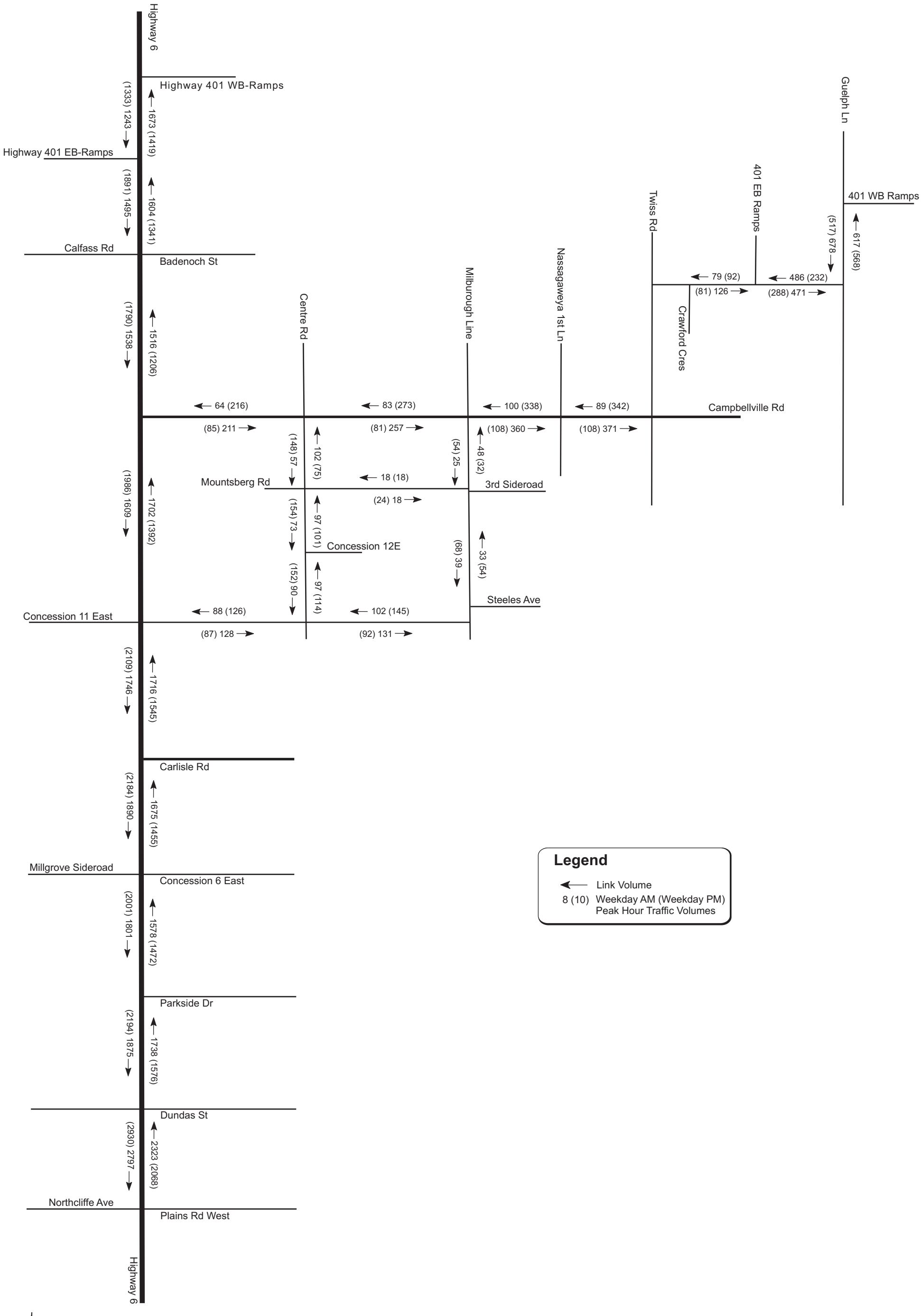
14.3.2 Analysis of Total Future Conditions

14.3.2.1 Level of Service Total Future Conditions – 2021

The intersection operations for the signalized intersections are summarized in **Table 14-1**. Detailed summaries of the analyses can be found in **Appendix E**. The truck percentages were recalculated to reflect the increase in trucks due to the quarry. In order to calculate the truck percentages, the existing truck percentages were carried forward to the background traffic and then the site trucks were added on top of that. Detailed summaries of the analyses can be found in **Appendix E**. For the analysis, all of the signal timings were optimized. Since the operations for the Highway 6 / Concession 11 East intersection was over capacity in the background scenario, we have signalized it in the analysis of this alternative.

Table 14-1: Signalized Intersections - 2021 Total Traffic - Alternative 1

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**B**		**B**	
Westbound Left-turn	E	0.76	F	0.93
Westbound Right-turn	A	0.30	A	0.49
Northbound Through	A	0.55	A	0.41
Northbound Right-turn	A	0.64	A	0.60
Southbound Left-turn	A	0.37	A	0.39
Southbound Through	C	0.97	C	0.95
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.48
Eastbound Right-turn	F	1.31	F	1.51
Northbound Left-turn	A	0.32	C	0.28
Northbound Through	F	1.23	E	1.07
Southbound Through	D	0.96	F	1.32
Southbound Right-turn	C	0.45	B	0.30



Not To Scale

Exhibit 14-3

2021 Total Traffic Volumes - Alternative Haul Route 1

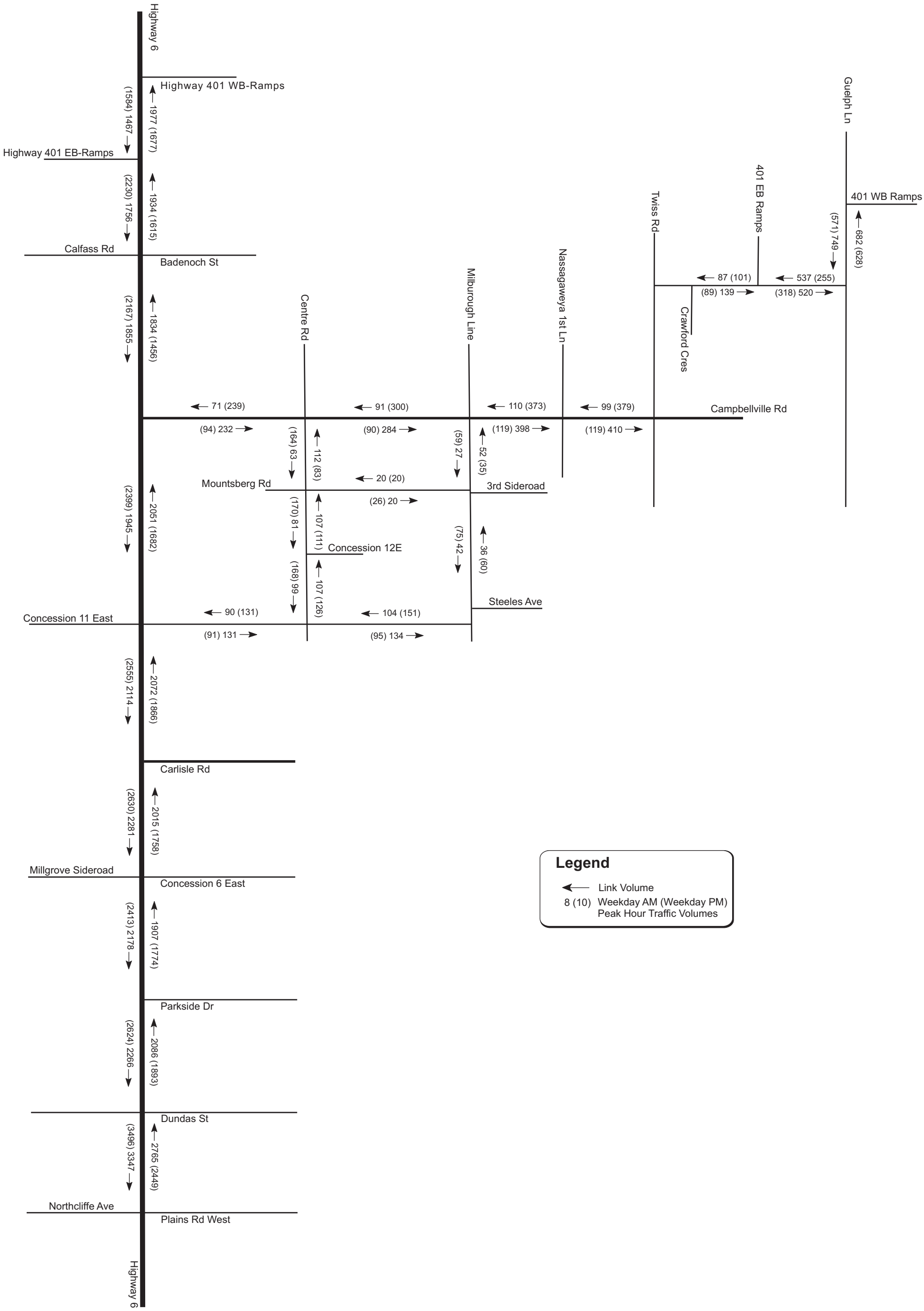


Exhibit 14-4
2031 Total Traffic Volumes - Alternative Haul Route 1

Table 14-1: Continued

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Badenoch Street / Calfass Road				
Overall	**F**		**F**	
Eastbound Left-Through-Right	D	0.30	D	0.22
Westbound Left-Through	D	0.53	D	0.51
Westbound Right-turn	D	0.03	D	0.02
Northbound Left-turn	A	0.00	A	0.00
Northbound Through-Right	E	1.11	B	0.87
Southbound Left-turn	C	0.40	A	0.17
Southbound Through-Right	F	1.18	F	1.37
Highway 6 / Carlisle Road				
Overall	**C**		**C**	
Westbound Left-turn	C	0.72	D	0.83
Westbound Right-turn	C	0.30	C	0.28
Northbound Through	C	0.98	C	0.86
Northbound Right-turn	A	0.13	B	0.09
Southbound Left-turn	D	0.86	C	0.73
Southbound Through	B	0.83	C	1.00
Highway 6 / Concession 11 E				
Overall	**B**		**B**	
Eastbound Left-Through-Right	C	0.19	C	0.22
Westbound Left-turn	C	0.17	C	0.34
Westbound Through	A	0.00	C	0.02
Westbound Right-turn	C	0.09	C	0.35
Northbound Left-turn	A	0.11	C	0.63
Northbound Through	B	0.84	A	0.61
Northbound Right-turn	A	0.05	A	0.03
Southbound Left-turn	B	0.53	C	0.56
Southbound Through	A	0.69	B	0.86
Southbound Right-turn	A	0.00	A	0.00
Highway 6 / Concession 6 E				
Overall	**B**		**A**	
Eastbound Left-turn	C	0.57	D	0.45
Eastbound Through-Right	C	0.20	C	0.09
Westbound Left-turn	C	0.23	D	0.51
Westbound Through-Right	C	0.13	C	0.26
Northbound Left-turn	A	0.01	A	0.09
Northbound Through	A	0.71	A	0.52
Northbound Right-turn	A	0.05	A	0.03
Southbound Left-turn	A	0.26	A	0.10
Southbound Through	B	0.87	A	0.81
Southbound Right-turn	A	0.05	A	0.07
Highway 6 / Parkside Drive				
Overall	**B**		**D**	
Westbound Left-turn	C	0.33	F	1.03
Westbound Right-turn	C	0.08	C	0.19
Northbound Through	B	0.80	D	0.97
Northbound Right-turn	A	0.11	B	0.08
Southbound Left-turn	D	0.85	F	1.03
Southbound Through	A	0.64	B	0.86

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Highway 6 / Dundas Street				
Overall	**E**		**F**	
Eastbound Left-turn	F	0.94	F	0.89
Eastbound Through	D	0.58	C	0.35
Eastbound Right-turn	F	0.97	D	0.83
Westbound Left-turn	F	1.04	F	1.48
Westbound Through	D	0.53	D	0.86
Westbound Right-turn	D	0.07	C	0.13
Northbound Left-turn	F	1.03	F	1.33
Northbound Through	D	0.81	D	0.82
Northbound Right-turn	C	0.21	C	0.37
Southbound Left-turn	E	0.78	F	0.91
Southbound Through	F	1.07	F	1.14
Southbound Right-turn	C	0.13	C	0.17
Highway 6 / Northcliffe Avenue and Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.14	C	0.34
Westbound Left-Through	F	1.86	F	1.10
Westbound Right-turn	D	0.72	D	0.70
Northbound Left-turn	E	0.71	F	1.54
Northbound Through	F	1.19	E	1.04
Northbound Right-turn	B	0.06	B	0.12
Southbound Left-turn	F	1.10	F	1.12
Southbound Through-Right	F	1.50	F	1.54

LOS – Level of Service; v/c – volume-capacity ratio;

There are a few intersections that have movements over capacity. The Highway 401 Eastbound Ramp / Highway 6, Highway 6 / Badenoch, Highway 6 / Carlisle Road, Highway 6 / Parkside Drive, Highway 6 / Dundas Street and Highway 6 / Northcliffe Avenue intersections have individual movements with a volume to capacity ratio greater than 1.00. Compared with the 2021 background analysis the increases in volume to capacity ratio are relatively small.

The unsignalized intersection operations are summarized in **Table 14-2**. Detailed summaries of the analyses can be found in **Appendix E**.

Table 14-2: Unsignalized Intersections - 2021 Total Traffic - Alternative 1

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Concession 11 E / Centre Road				
Eastbound Left-Through-Right	B	0.29	B	0.20
Westbound Left-Through-Right	B	0.24	C	0.32
Northbound Left-Through-Right	A	0.00	A	0.02
Southbound Left-Through-Right	A	0.01	A	0.00
Concession 11 E / Site Driveway				
Eastbound Left-turn	A	0.09	A	0.06
Southbound Left-turn	B	0.00	B	0.00
Southbound Right-turn	A	0.10	A	0.11

LOS – Level of Service; v/c – volume-capacity ratio;

The unsignalized intersections operate with a maximum individual movement volume to capacity ratio of 0.32. All the intersections operate with reserve capacity.

14.3.2.2 Storage Requirements for Total Future Conditions – 2021

The storage requirements at the intersections of Highway 6 / Concession 11E, and the site driveway were assessed based on Synchro 6 queue estimates. The available storage was compared to the 95th percentile queues for the weekday AM and PM peak hours. The results are summarized in **Table 14-3**. Detailed analysis is contained in **Appendix E**.

Table 14-3: Intersection Queues - 2021 Total Traffic

		Weekday AM Peak Hour	Weekday PM Peak Hour
Intersection and Movements	**Storage (m)**	**95th Queue (m)**	**95th Queue (m)**
Highway 6 / Concession 11E			
Eastbound Left-Through-Right	-	15	15
Westbound Left-turn	30	10	15
Westbound Through	-	<7	<7
Westbound Right-turn	30	<7	16
Northbound Left-turn	300	<7	24
Northbound Through	-	184	80
Northbound Right-Turn	30	<7	<7
Southbound Left-turn	275	13	23
Southbound Through	-	82	219
Southbound Right-turn	25	<7	<7
Concession 11 E / Site Driveway			
Eastbound Left-turn	30	<7	<7
Eastbound Through	-	<7	<7
Westbound Through	-	<7	<7
Westbound Right-turn	30	<7	<7
Southbound Left-turn	-	<7	<7
Southbound Right-turn	-	<7	<7

The results of the queuing analysis for the intersection suggest that the storage provided at the various intersection movements is sufficient to accommodate the anticipated queues.

14.3.2.3 Recommendations Total Future Conditions – 2021

The use of Milburough Line and Highway 6 as Alternative Haul Route 1 will require new traffic signals to be installed at the intersection of Highway 6 / Concession 11E. For our analysis it was assumed that they would operate with an 80 second cycle length during both AM and PM peak hours.

14.3.2.4 Level of Service Total Future Conditions – 2031

The intersection operations for the signalized intersections are summarized in **Table 14-4**. Detailed summaries of the analyses can be found in **Appendix E**. All intersection signal timings were optimized.

Table 14-4: Signalized Intersections - 2031 Total Traffic - Alternative 1

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**D**		**D**	
Westbound Left-turn	E	0.81	F	1.07
Westbound Right-turn	A	0.34	A	0.54
Northbound Through	A	0.67	A	0.49
Northbound Right-turn	A	0.70	A	0.66
Southbound Left-turn	B	0.52	A	0.49
Southbound Through	F	1.18	F	1.14
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.54
Eastbound Right-turn	F	1.49	F	1.82
Northbound Left-turn	B	0.37	C	0.33
Northbound Through	F	1.52	F	1.30
Southbound Through	F	1.15	F	1.48
Southbound Right-turn	C	0.50	B	0.39
Highway 6 / Badenoch Street / Calfass Road				
Overall	**F**		**F**	
Eastbound Left-Through-Right	D	0.33	D	0.23
Westbound Left-Through	D	0.52	D	0.54
Westbound Right-turn	D	0.07	D	0.02
Northbound Left-turn	A	0.00	A	0.00
Northbound Through-Right	F	1.35	D	1.05
Southbound Left-turn	A	0.14	D	0.66
Southbound Through-Right	F	1.44	F	1.66
Highway 6 / Carlisle Road				
Overall	**C**		**F**	
Westbound Left-turn	F	1.03	D	0.86
Westbound Right-turn	D	0.47	C	0.29
Northbound Through	D	0.98	E	1.10
Northbound Right-turn	A	0.14	B	0.10
Southbound Left-turn	F	1.00	D	0.72
Southbound Through	B	0.87	F	1.25
Highway 6 / Concession 11E				
Overall	**C**		**C**	
Eastbound Left-Through-Right	D	0.33	D	0.31
Westbound Left-turn	C	0.21	D	0.44
Westbound Through	A	0.00	D	0.03
Westbound Right-turn	C	0.09	D	0.08
Northbound Left-turn	B	0.22	F	0.90
Northbound Through	C	1.00	B	0.82
Northbound Right-turn	A	0.05	A	0.04
Southbound Left-turn	C	0.54	C	0.54
Southbound Through	A	0.82	C	0.99
Southbound Right-turn	A	0.00	A	0.00

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Concession 6E				
Overall	**C**		**C**	
Eastbound Left-turn	D	0.65	C	0.42
Eastbound Through-Right	C	0.23	C	0.11
Westbound Left-turn	D	0.26	C	0.46
Westbound Through-Right	C	0.18	C	0.34
Northbound Left-turn	A	0.01	A	0.10
Northbound Through	B	0.84	A	0.66
Northbound Right-turn	A	0.05	A	0.04
Southbound Left-turn	C	0.53	A	0.17
Southbound Through	D	1.02	D	1.02
Southbound Right-turn	A	0.06	A	0.07
Highway 6 / Parkside Drive				
Overall	**C**		**E**	
Westbound Left-turn	C	0.35	F	1.19
Westbound Right-turn	C	0.09	C	0.32
Northbound Through	D	1.02	F	1.12
Northbound Right-turn	A	0.12	B	0.09
Southbound Left-turn	D	0.82	F	1.24
Southbound Through	A	0.79	D	1.02
Highway 6 / Dundas Street				
Overall	**F**		**F**	
Eastbound Left-turn	F	1.30	F	1.50
Eastbound Through	D	0.64	C	0.38
Eastbound Right-turn	F	1.18	E	0.95
Westbound Left-turn	F	1.33	F	1.82
Westbound Through	D	0.56	D	0.85
Westbound Right-turn	D	0.08	C	0.19
Northbound Left-turn	F	1.35	F	1.75
Northbound Through	D	0.94	D	0.99
Northbound Right-turn	C	0.26	C	0.54
Southbound Left-turn	F	0.91	F	0.98
Southbound Through	F	1.19	F	1.32
Southbound Right-turn	C	0.15	C	0.20
Highway 6 / Northcliffe Avenue and Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.19	C	0.40
Westbound Left-Through	F	1.97	F	1.21
Westbound Right-turn	D	0.76	E	0.95
Northbound Left-turn	D	0.79	F	1.71
Northbound Through	F	1.50	F	1.18
Northbound Right-turn	B	0.07	B	0.14
Southbound Left-turn	F	1.23	F	1.80
Southbound Through-Right	F	1.89	F	1.90

LOS – Level of Service; v/c – volume-capacity ratio;

All of the intersections experience capacity issues in one or both of the time periods. The capacity issues are related mainly to background traffic volumes.

The unsignalized intersection operations are summarized in **Table 14-5**. Detailed summaries of the analyses can be found in **Appendix E**.

Table 14-5: Unsignalized Intersections - 2031 Total Traffic - Alternative 1

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Concession 11E / Centre Road				
Eastbound Left-Through-Right	B	0.31	C	0.22
Westbound Left-Through-Right	B	0.25	C	0.35
Northbound Left-Through-Right	A	0.00	A	0.03
Southbound Left-Through-Right	A	0.01	A	0.00
Concession 11 E / Site Driveway				
Eastbound Left-turn	A	0.09	A	0.06
Southbound Left-turn	B	0.00	B	0.00
Southbound Right-turn	A	0.10	A	0.11

LOS – Level of Service; v/c – volume-capacity ratio;

The unsignalized intersections operate with a maximum individual movement volume to capacity ratio of 0.35. All the intersections operate with reserve capacity.

14.3.2.5 Storage Total Future Conditions – 2031

The storage requirements at the intersections of Highway 6 / Concession 11E and the site driveway were assessed based on Synchro 6 queue estimates. The available storage was compared to the 95th percentile queues for the weekday AM and PM peak hours. The results are summarized in **Table 14-6**. Detailed analysis is contained in **Appendix E**.

Table 14-6: Intersection Queues - 2031 Total Traffic

		Weekday AM Peak Hour	Weekday PM Peak Hour
Intersection and Movements	**Storage (m)**	**95th Queue (m)**	**95th Queue (m)**
Highway 6 / Concession 11E			
Eastbound Left-Through-Right	-	18	21
Westbound Left-turn	30	10	20
Westbound Through	-	<7	<7
Westbound Right-turn	30	<7	13
Northbound Left-turn	300	<7	25
Northbound Through	-	247	233
Northbound Right-Turn	30	8	<7
Southbound Left-turn	275	13	15
Southbound Through	-	139	345
Southbound Right-turn	25	<7	<7
Concession 11 E / Site Driveway			
Eastbound Left-turn	30	<7	<7
Eastbound Through	-	<7	<7
Westbound Through	-	<7	<7
Westbound Right-turn	30	<7	<7
Southbound Left-turn	-	<7	<7
Southbound Right-turn	-	<7	<7

The results of the queuing analysis for the intersection suggest that the storage provided at the various intersection movements is sufficient to accommodate the anticipated queues.

14.3.2.6 Recommendations Total Future Conditions – 2031

New traffic signals at the intersection of Highway 6 / Concession 11E will need to be installed. These signals can function effectively with an 80 second cycle length during the AM peak hour and a 100 second cycle length during the PM peak hour.

15. ALTERNATIVE HAUL ROUTE 2

15.1 Quarry Trip Assignment and Distribution

Alternative Haul Route 2 assumes all quarry truck traffic uses a combination of Concession 11 E, Centre Road, Campbellville Road, and Highway 6 to access the quarry. The truck traffic volumes for this route are shown in **Exhibit 15-1**.

15.2 Assumed Road Network Alterations

For this alternative we have assumed the following intersection alterations:

Highway 6 / Campbellville Road	▪ Signalization ▪ Exclusive westbound right-turn lane
Campbellville Road / Centre Road	▪ Exclusive eastbound right-turn lane ▪ Exclusive northbound left-turn lane
Concession 11 E / Centre Road	▪ Exclusive southbound left-turn ▪ Exclusive westbound right-turn

The intersection lane configurations are also summarized in **Exhibit 15-2**.

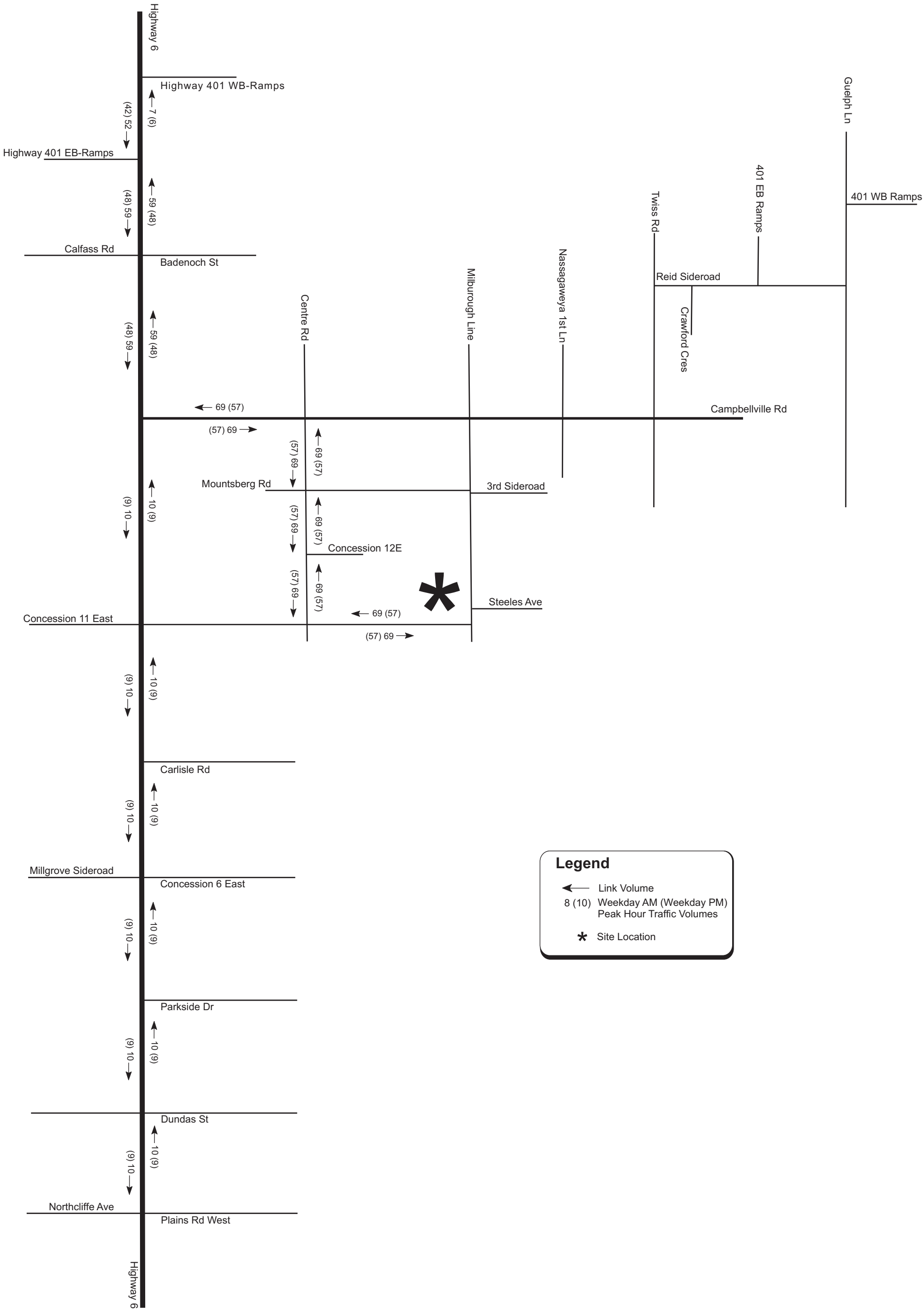


Exhibit 15-1

Quarry Truck Traffic Average Link Volumes Alternative 2

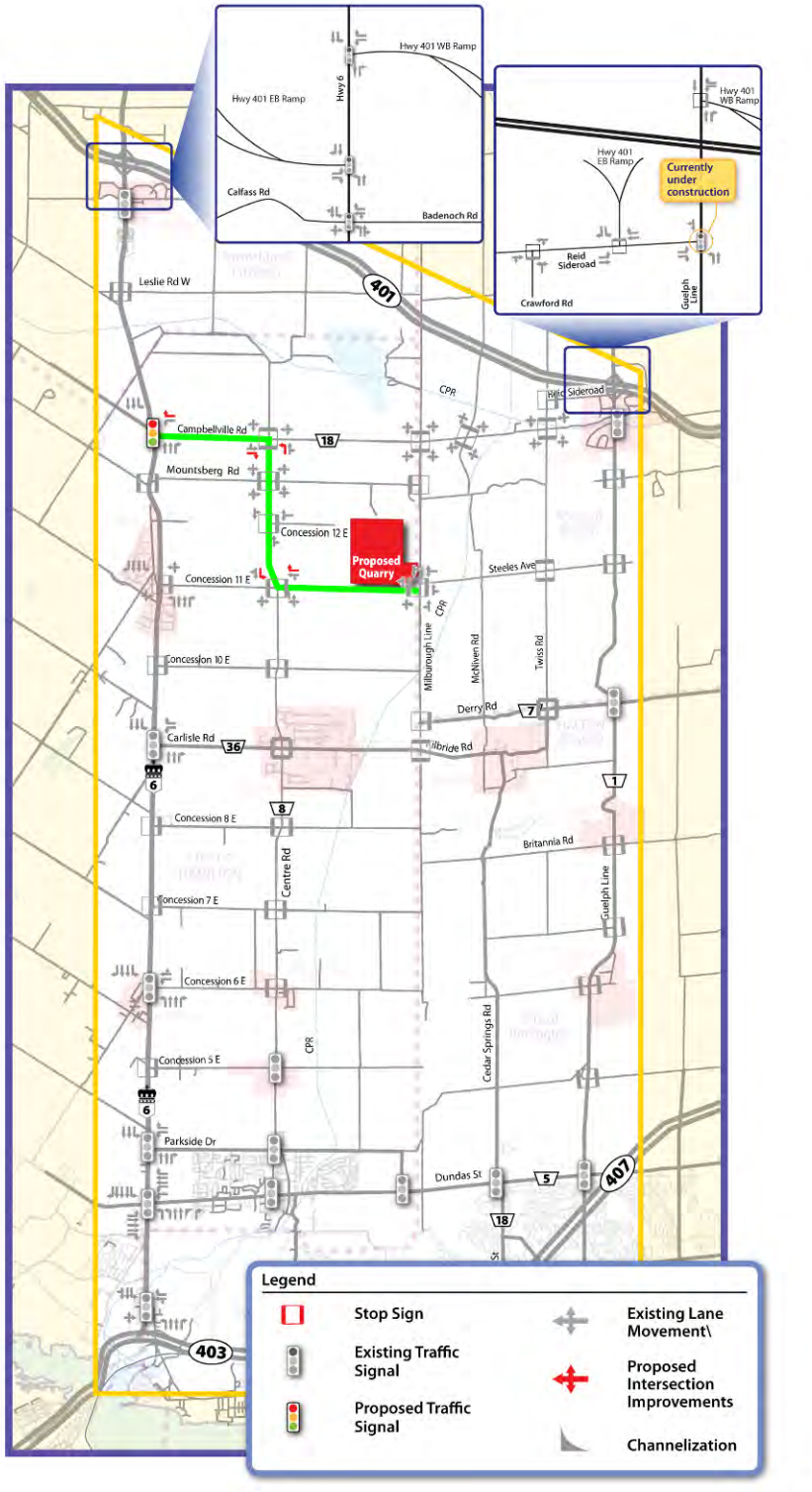


Exhibit 15-2: Alternative 2 Intersection Lane Configurations

15.3 Alternative Haul Route Total Future Conditions

15.3.1 Total Future Traffic Volumes

The site traffic volumes and the background traffic volumes were added together to create the total traffic average link volumes for Alternative 2, the 2021 total are shown in **Exhibit 15-3** and 2031 total are shown in **Exhibit 15-4**.

15.3.2 Analysis of Total Future Conditions

15.3.2.1 Level of Service Total Future Conditions – 2021

The intersection operations for the signalized intersections are summarized in **Table 15-1.** Detailed summaries of the analyses can be found in **Appendix F**. The truck percentages were recalculated to reflect the increase in trucks due to the quarry. In order to calculate the truck percentages, the existing truck percentages were carried forward from the background traffic and then the site trucks were added on top of that. All intersection signal timings were optimized.

Table 15-1: Signalized Intersections - 2021 Total Traffic - Alternative 2

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**B**		**B**	
Westbound Left-turn	E	0.76	F	0.93
Westbound Right-turn	A	0.30	A	0.49
Northbound Through	A	0.55	A	0.41
Northbound Right-turn	A	0.64	A	0.60
Southbound Left-turn	A	0.37	A	0.39
Southbound Through	C	0.97	C	0.95
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.48
Eastbound Right-turn	F	1.31	F	1.51
Northbound Left-turn	A	0.32	C	0.28
Northbound Through	F	1.23	E	1.07
Southbound Through	D	0.96	F	1.32
Southbound Right-turn	C	0.45	B	0.30
Highway 6 / Badenoch Street / Calfass Road				
Overall	**F**		**F**	
Eastbound Left-Through-Right	D	0.30	D	0.22
Westbound Left-Through	D	0.53	D	0.51
Westbound Right-turn	D	0.03	D	0.02
Northbound Left-turn	A	0.00	A	0.00
Northbound Through-Right	E	1.11	B	0.87
Southbound Left-turn	C	0.40	A	0.17
Southbound Through-Right	F	1.18	F	1.37

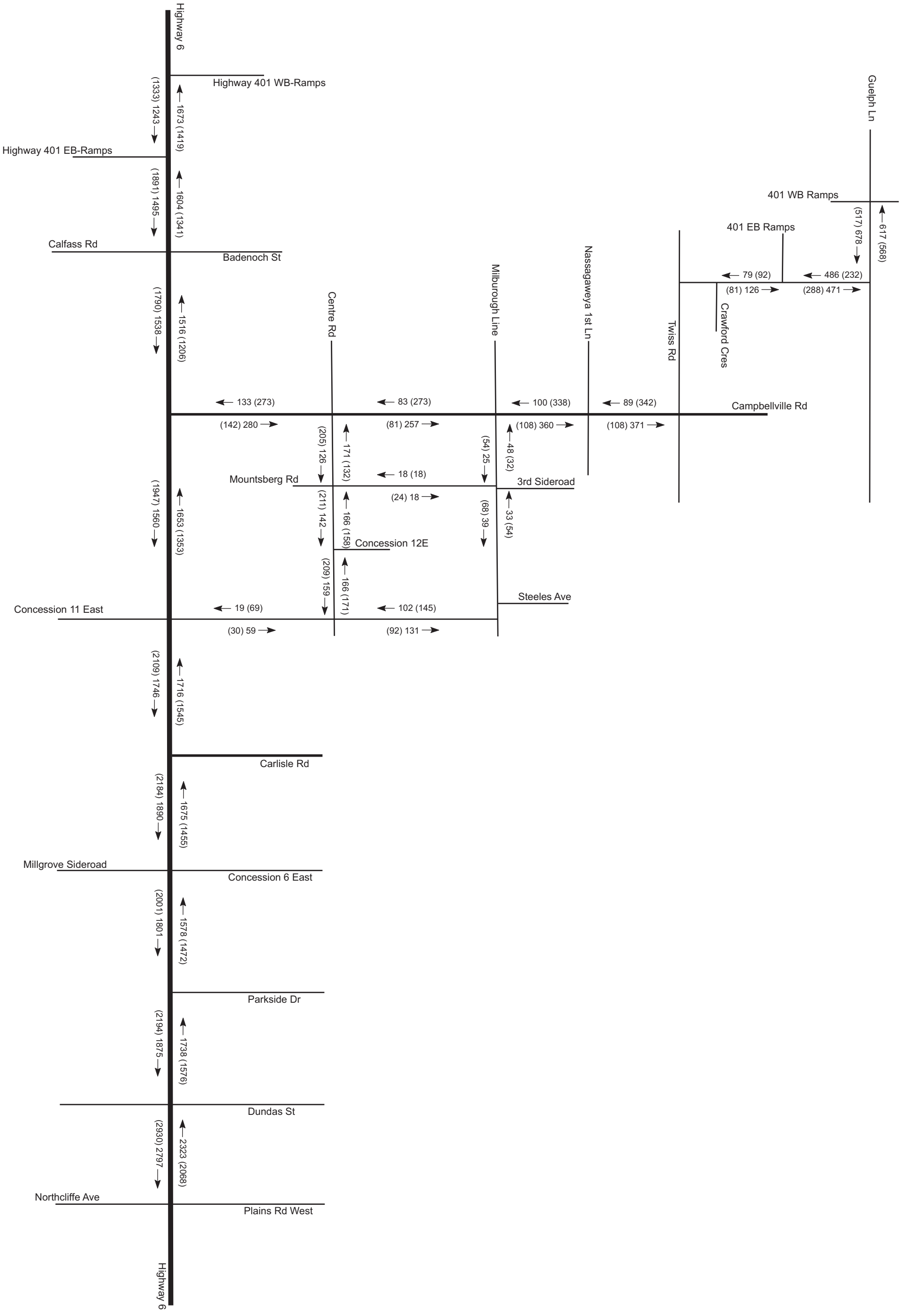
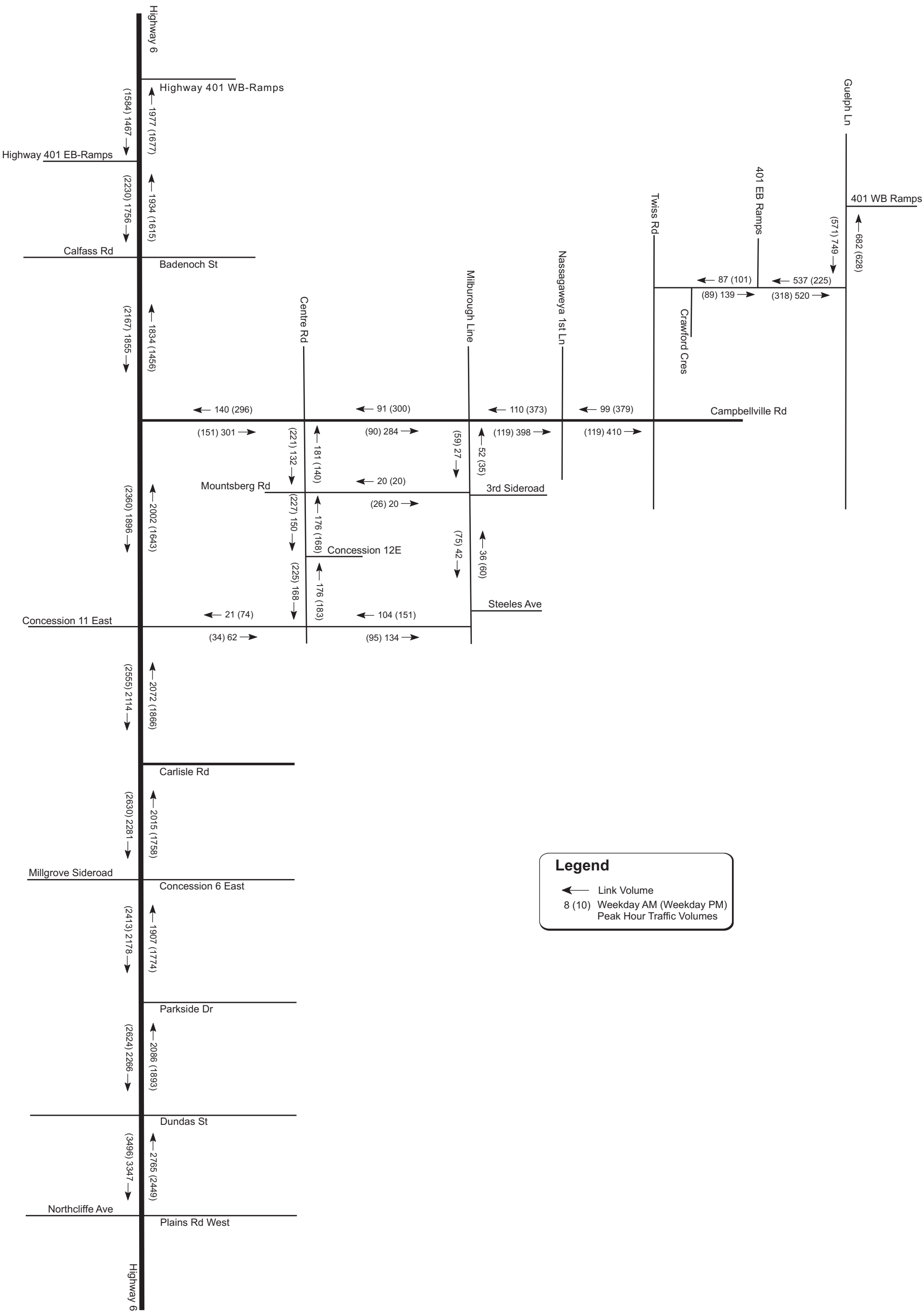


Exhibit 15-3
2021 Total Traffic Volumes - Alternative Haul Route 2



Not To Scale

Exhibit 15-4
2031 Total Traffic Volumes - Alternative Haul Route 2

Table 15-1: Continued

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Carlisle Road				
Overall	**C**		**C**	
Westbound Left-turn	C	0.72	D	0.83
Westbound Right-turn	C	0.30	C	0.28
Northbound Through	C	0.98	C	0.86
Northbound Right-turn	A	0.13	B	0.09
Southbound Left-turn	D	0.86	C	0.73
Southbound Through	B	0.83	C	1.00
Highway 6 / Campbellville Road				
Overall	**B**		**B**	
Westbound Left-turn	D	0.33	D	0.69
Westbound Right-turn	D	0.10	C	0.08
Northbound Through	B	0.83	A	0.55
Northbound Right-turn	A	0.14	A	0.05
Southbound Left-turn	C	0.55	C	0.59
Southbound Through	A	0.66	B	0.73
Highway 6 / Concession 6E				
Overall	**B**		**A**	
Eastbound Left-turn	C	0.57	D	0.45
Eastbound Through-Right	C	0.20	C	0.09
Westbound Left-turn	C	0.23	D	0.51
Westbound Through-Right	C	0.13	C	0.26
Northbound Left-turn	A	0.01	A	0.09
Northbound Through	A	0.71	A	0.52
Northbound Right-turn	A	0.05	A	0.03
Southbound Left-turn	A	0.26	A	0.10
Southbound Through	B	0.87	A	0.81
Southbound Right-turn	A	0.05	A	0.07
Highway 6 / Parkside Drive				
Overall	**B**		**D**	
Westbound Left-turn	C	0.33	F	1.03
Westbound Right-turn	C	0.08	C	0.19
Northbound Through	B	0.80	D	0.97
Northbound Right-turn	A	0.11	B	0.08
Southbound Left-turn	D	0.85	F	1.03
Southbound Through	A	0.64	B	0.86
Highway 6 / Dundas Street				
Overall	**E**		**F**	
Eastbound Left-turn	F	0.94	F	0.89
Eastbound Through	D	0.58	C	0.35
Eastbound Right-turn	F	0.97	D	0.83
Westbound Left-turn	F	1.04	F	1.48
Westbound Through	D	0.53	D	0.86
Westbound Right-turn	D	0.07	C	0.13
Northbound Left-turn	F	1.03	F	1.33
Northbound Through	D	0.81	D	0.82
Northbound Right-turn	C	0.21	C	0.37
Southbound Left-turn	E	0.78	F	0.91
Southbound Through	F	1.07	F	1.14
Southbound Right-turn	C	0.13	C	0.17

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Northcliffe Avenue and Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.18	C	0.34
Westbound Left-Through	F	2.06	F	1.10
Westbound Right-turn	D	0.74	D	0.66
Northbound Left-turn	E	0.71	F	1.38
Northbound Through	F	1.17	E	1.06
Northbound Right-turn	A	0.06	B	0.12
Southbound Left-turn	F	1.10	F	1.06
Southbound Through-Right	F	1.48	F	1.57

LOS – Level of Service; v/c – volume-capacity ratio;

There are a few intersections that experience capacity issues. The Highway 401 Eastbound Ramp / Highway 6, Highway 6 / Badenoch, Highway 6 / Dundas Street and Highway 6 / Northcliffe Avenue intersections have individual movements with a volume to capacity ratio over 1.0. The over capacity movements are mainly due to background traffic demands.

The unsignalized intersection operations are summarized in **Table 15-2**. Detailed summaries of the analyses can be found in **Appendix F**.

Table 15-2: Unsignalized Intersections - 2021 Total Traffic - Alternative 2

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Campbellville Road / Centre Road				
Eastbound Through-Left	A	0.00	A	0.00
Westbound Left-Through-Right	A	0.03	A	0.06
Northbound Left-turn	C	0.27	C	0.26
Northbound Through-Right	B	0.18	B	0.11
Southbound Left-Through-Right	B	0.11	C	0.15
Mountsberg Road / Centre Road				
Eastbound Left-Through-Right	B	0.03	B	0.02
Westbound Left-Through-Right	B	0.05	B	0.02
Northbound Left-Through-Right	A	0.00	A	0.01
Southbound Left-Through-Right	A	0.00	A	0.01
Concession 12E / Centre Road				
Westbound Left-Right	B	0.05	B	0.02
Southbound Through-Left	A	0.00	A	0.01
Concession 11E / Centre Road				
Eastbound Left-Through-Right	B	0.16	B	0.07
Westbound Through-Left	B	0.12	B	0.20
Westbound Right-turn	A	0.00	A	0.00
Northbound Left-Through-Right	A	0.00	A	
Southbound Left-turn	A	0.09	A	0.02
				0.06

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Concession 11 E / Site Driveway				
Eastbound Left-turn	A	0.09	A	0.06
Southbound Left-turn	B	0.00	B	0.00
Southbound Right-turn	A	0.10	A	0.11

LOS – Level of Service; v/c – volume-capacity ratio;

The unsignalized intersections operate with a maximum individual movement volume to capacity ratio of 0.27 or better during both the AM and PM peak hour. All intersections operate with reserve capacity.

15.3.2.2 Storage Total Future Conditions – 2021

The storage requirements for the intersections along Alternative Haul Route 2 were assessed based on Synchro 6 queue estimates. The available storage was compared to the 95th percentile queues for the weekday AM and PM peak hours. The results are summarized in **Table 15-3**. Detail queue analyses can be found in **Appendix F**.

Table 15-3: Intersection Queues - 2021 Total Traffic

		Weekday AM Peak Hour	Weekday PM Peak Hour
Intersection and Movements	**Storage (m)**	**95th Queue (m)**	**95th Queue (m)**
Highway 6 / Campbellville Road			
Westbound Left-turn	30	19	56
Westbound Right-turn	-	13	11
Northbound Through	-	190	79
Northbound Right-Turn	95	10	<7
Southbound Left-turn	90	23	36
Southbound Through	-	90	132
Campbellville Road / Centre Road			
Eastbound Left-Through		<7	<7
Eastbound Right-turn	30	<7	<7
Westbound Left-Through-Right		<7	<7
Northbound Left-turn	30	8	8
Northbound Through-Right		<7	<7
Southbound Left-Through-Right		<7	<7
Concession 11E / Centre Road			
Eastbound Left-Through-Right		<7	<7
Westbound Left-Through		<7	<7
Westbound Right-turn	30	<7	<7
Northbound Left-Through-Right		<7	<7
Southbound Left-turn	30	<7	<7
Southbound Through-Right		<7	<7
Concession 11E / Site Driveway			
Eastbound Left-turn	30	<7	<7
Eastbound Through		<7	<7
Westbound Through		<7	<7
Westbound Right-turn	30	<7	<7
Southbound Left-turn		<7	<7
Southbound Right-turn		<7	<7

The results of the queuing analysis for the intersections suggest that the storage provided at the various intersection movements is sufficient to accommodate the anticipated queues except the westbound left-turn at Highway 6 and Campbellville Road should be increased to 60 metres.

15.3.2.3 Recommendations Total Future Conditions – 2021

To address the needs of traffic for Alternative Haul Route 2, new traffic signals will need to be installed at the intersection of Highway 6 / Campellville. The analysis suggests the intersection will operate effectively with 90 second cycle length during the AM and PM peak hours.

15.3.2.4 Level of Service Total Future Conditions – 2031

The intersection operations for the signalized intersections for the year 2031 are summarized in **Table 15-4.** Detailed summaries of the analyses can be found in **Appendix F**. All intersection signal timings were optimized.

Table 15-4: Signalized Intersections - 2031 Total Traffic - Alternative 2

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**D**		**D**	
Westbound Left-turn	E	0.81	F	1.07
Westbound Right-turn	A	0.34	A	0.54
Northbound Through	A	0.67	A	0.49
Northbound Right-turn	A	0.70	A	0.66
Southbound Left-turn	B	0.52	A	0.49
Southbound Through	F	1.18	F	1.14
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.54
Eastbound Right-turn	F	1.49	F	1.82
Northbound Left-turn	B	0.37	C	0.33
Northbound Through	F	1.52	F	1.30
Southbound Through	F	1.15	F	1.48
Southbound Right-turn	C	0.50	B	0.39
Highway 6 / Badenoch Street / Calfass Road				
Overall	**F**		**F**	
Eastbound Left-Through-Right	D	0.33	D	0.23
Westbound Left-Through	D	0.52	D	0.54
Westbound Right-turn	D	0.07	D	0.02
Northbound Left-turn	A	0.00	A	0.00
Northbound Through-Right	F	1.35	D	1.05
Southbound Left-turn	A	0.14	D	0.66
Southbound Through-Righ t	F	1.44	F	1.66

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Carlisle Road				
Overall	**C**		**F**	
Westbound Left-turn	F	1.03	D	0.86
Westbound Right-turn	D	0.47	C	0.29
Northbound Through	D	0.98	E	1.10
Northbound Right-turn	A	0.14	B	0.10
Southbound Left-turn	F	1.00	D	0.72
Southbound Through	B	0.87	F	1.25
Highway 6 / Campbellville Road				
Overall	**C**		**C**	
Westbound Left-turn	D	0.38	D	0.72
Westbound Right-turn	D	0.10	C	0.08
Northbound Through	D	1.04	B	0.81
Northbound Right-turn	A	0.15	A	0.05
Southbound Left-turn	B	0.51	D	0.75
Southbound Through	A	0.80	B	0.90
Highway 6 / Concession 6E				
Overall	**C**		**C**	
Eastbound Left-turn	D	0.65	C	0.42
Eastbound Through-Right	C	0.23	C	0.11
Westbound Left-turn	D	0.26	C	0.46
Westbound Through-Right	C	0.18	C	0.34
Northbound Left-turn	A	0.01	A	0.10
Northbound Through	B	0.84	A	0.66
Northbound Right-turn	A	0.05	A	0.04
Southbound Left-turn	C	0.53	A	0.17
Southbound Through	D	1.02	D	1.02
Southbound Right-turn	A	0.06	A	0.07
Highway 6 / Parkside Drive				
Overall	**C**		**E**	
Westbound Left-turn	C	0.35	F	1.19
Westbound Right-turn	C	0.09	C	0.32
Northbound Through	D	1.02	F	1.12
Northbound Right-turn	A	0.12	B	0.09
Southbound Left-turn	D	0.82	F	1.24
Southbound Through	A	0.79	D	1.02
Highway 6 / Dundas Street				
Overall	**F**		**F**	
Eastbound Left-turn	F	1.30	F	1.50
Eastbound Through	D	0.64	C	0.38
Eastbound Right-turn	F	1.18	E	0.95
Westbound Left-turn	F	1.33	F	1.82
Westbound Through	D	0.56	D	0.85
Westbound Right-turn	D	0.08	C	0.19
Northbound Left-turn	F	1.35	F	1.75
Northbound Through	D	0.94	D	0.99
Northbound Right-turn	C	0.26	C	0.54
Southbound Left-turn	F	0.91	F	0.98
Southbound Through	F	1.19	F	1.32
Southbound Right-turn	C	0.15	C	0.20

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Northcliffe Avenue and Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.19	C	0.40
Westbound Left-Through	F	1.97	F	1.21
Westbound Right-turn	D	0.76	E	0.95
Northbound Left-turn	D	0.79	F	1.71
Northbound Through	F	1.50	F	1.18
Northbound Right-turn	B	0.07	B	0.14
Southbound Left-turn	F	1.23	F	1.80
Southbound Through-Right	F	1.89	F	1.90

LOS – Level of Service; v/c – volume-capacity ratio;

All of the intersections have individual movement volume to capacity ratios greater than 1.00. These are mainly attributed to background traffic demands.

The intersection operations for the 2031 total unsignalized intersections are summarized in **Table 15-5**. Detailed summaries of the analyses can be found in **Appendix F**.

Table 15-5: Unsignalized Intersections - 2031 Total Traffic - Alternative 2

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Campbellville Road / Centre Road				
Eastbound Left-Through	A	0.00	A	0.00
Westbound Left-Through-Right	A	0.04	A	0.07
Northbound Left-turn	C	0.29	C	0.30
Northbound Through-Right	B	0.21	B	0.13
Southbound Left-Through-Right	B	0.14	C	0.18
Mountsberg Road / Centre Road				
Eastbound Left-Through-Right	B	0.03	B	0.02
Westbound Left-Through-Right	B	0.06	B	0.02
Northbound Left-Through-Right	A	0.00	A	0.01
Southbound Left-Through-Right	A	0.00	A	0.01
Concession 12 E / Centre Road				
Westbound Left-Right	B	0.05	B	0.02
Southbound Through-Left	A	0.01	A	0.01
Concession 11 E / Centre Road				
Eastbound Left-Through-Right	B	0.17	B	0.08
Westbound Through-Left	B	0.13	B	0.22
Northbound Left-Through-Right	A	0.00	A	0.03
Southbound Left	A	0.09	A	0.06
Concession 11 E / Site Driveway				
Eastbound Left-turn	A	0.09	A	0.06
Southbound Left-turn	B	0.00	B	0.00
Southbound Right-turn	A	0.10	A	0.11

LOS – Level of Service; v/c – volume-capacity ratio;

The unsignalized intersections operate with a maximum individual movement volume to capacity ratio of 0.30 or better during both the AM and PM peak hours. All intersections operate with reserve capacity.

15.3.2.5 Storage Total Future Conditions – 2031

The storage requirements at the intersection along Alternative Haul Route 2 were assessed based on Synchro 6 queue estimates. The available storage was compared to the 95th percentile queues for the weekday AM and PM peak hours. The results are summarized in **Table 15-6**. Detail queue analyses can be found in **Appendix F**.

Table 15-6: Intersection Queues - 2021 Total Traffic

		Weekday AM Peak Hour	Weekday PM Peak Hour
Intersection and Movements	**Storage (m)**	**95th Queue (m)**	**95th Queue (m)**
Highway 6 / Campbellville Road			
Westbound Left-turn	30	20	62
Westbound Right-turn		14	11
Northbound Through		257	163
Northbound Right-Turn	95	10	<7
Southbound Left-turn	90	23	28
Southbound Through		148	236
Campbellville Road / Centre Road			
Eastbound Left-Through		<7	<7
Eastbound Right-turn	30	<7	<7
Westbound Left-Through-Right		<7	<7
Northbound Left-turn	30	10	10
Northbound Through-Right		<7	<7
Southbound Left-Through-Right		<7	<7
Concession 11E / Centre Road			
Eastbound Left-Through-Right		<7	<7
Westbound Through-Left		<7	<7
Westbound Right-turn	30	<7	<7
Northbound Left-Through-Right		<7	<7
Southbound Left-turn	30	<7	<7
Southbound Through-Right		<7	<7
Concession 11E / Site Driveway			
Eastbound Left-turn	30	<7	<7
Eastbound Through		<7	<7
Westbound Through		<7	<7
Westbound Right-turn	30	<7	<7
Southbound Left-turn		<7	<7
Southbound Right-turn		<7	<7

The results of the queuing analysis for the intersections suggest that the storage provided at the various intersection movements is sufficient to accommodate the queues except the westbound left-turn lane at Highway 6 and Campbellville Road should be increased to 65 metres.

15.3.2.6 Recommendations Total Future Conditions – 2031

To accommodate the needs of traffic along Alternative Haul Route 2, new traffic signals at the intersection of Highway 6 / Campellville Road will need to be installed with a 90 second cycle length during the AM and PM peak hours.

16. ALTERNATIVE HAUL ROUTE 3

16.1 Quarry Assignment and Distribution

This alternative assumes all quarry truck traffic follows the route of Milburough Townline, Campbellville Road, Twiss Road, Reid Sideroad and Guelph Line north for access from the quarry. The truck traffic volumes for this route are shown in **Exhibit 16-1**.

16.2 Assumed Road Network Alterations

For this alternative we have assumed the following intersection alterations:

Campbellville Road / Milburough Road	▪ Exclusive westbound left-turn lane ▪ Exclusive northbound right-turn lane
Campbellville Road / Twiss Road	▪ Exclusive eastbound left-turn lane ▪ Exclusive southbound right-turn lane
Guelph Line / Reid Sideroad	▪ Exclusive southbound right-turn

The intersection lane configurations are also summarized in **Exhibit 16-2**.

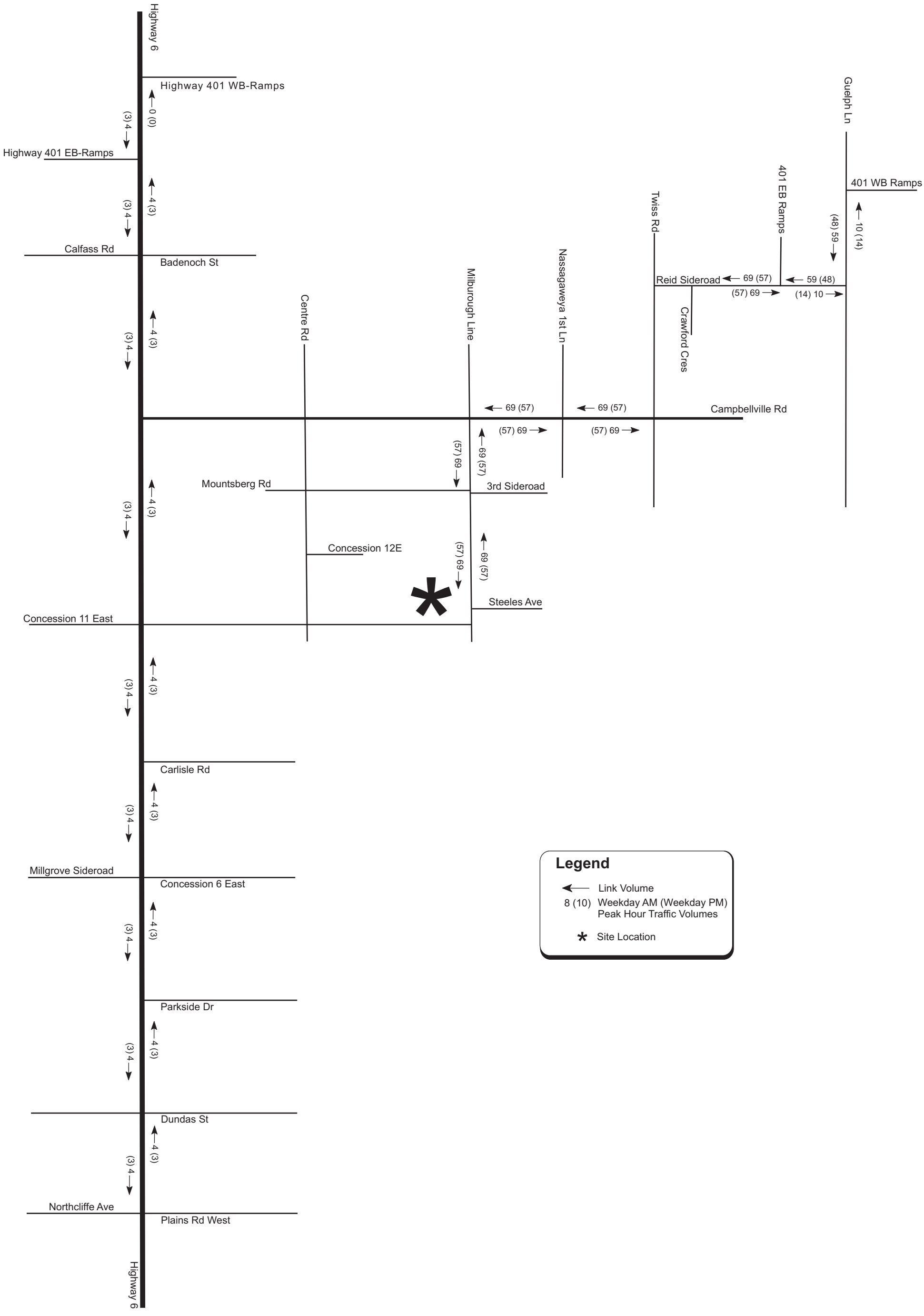


Exhibit 16-1

Quarry Truck Traffic Average Link Volumes Alternative 3

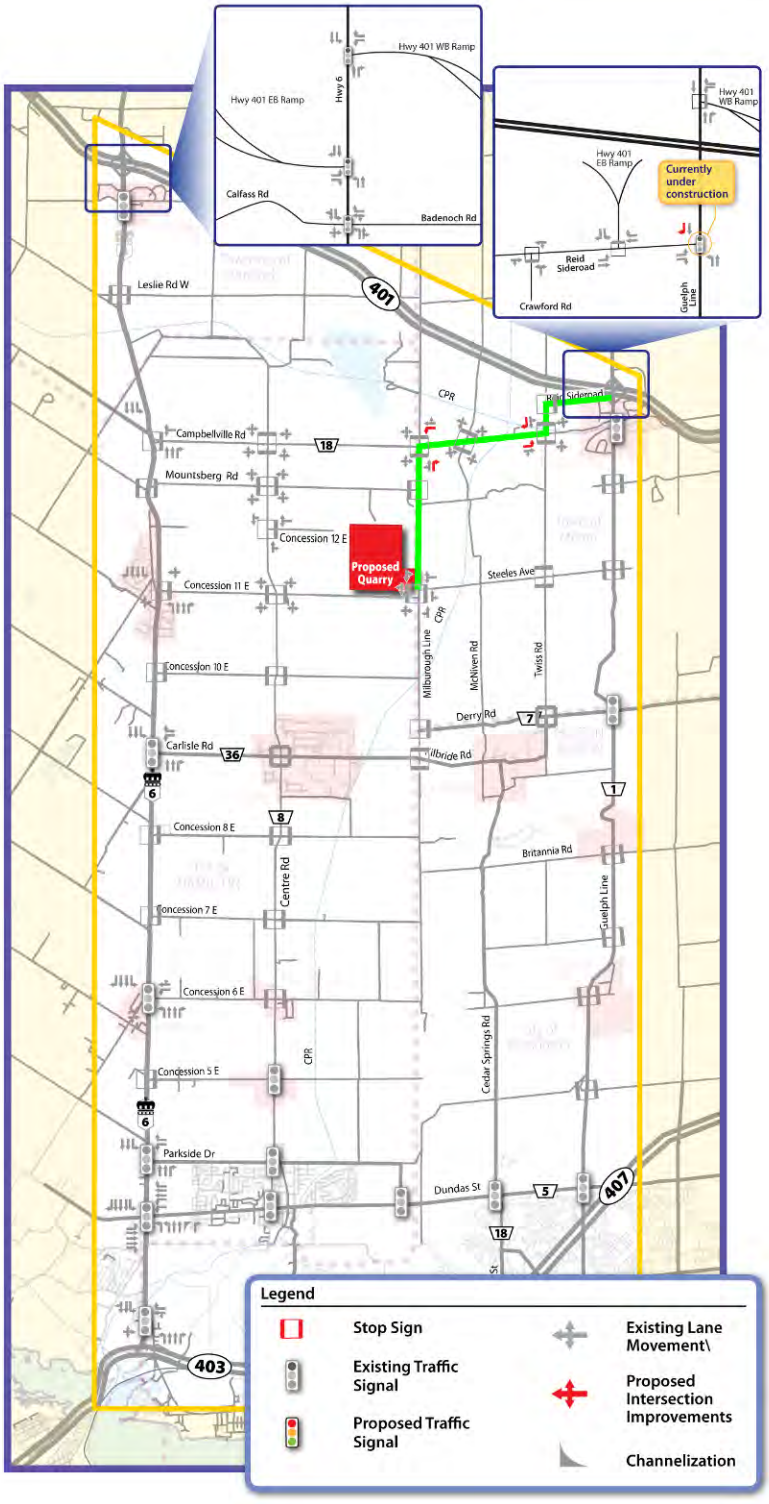


Exhibit 16-2: Alternative 3 Intersection Lane Configurations

16.3 Alternative Haul Route Total Future Conditions

16.3.1 Total Future Traffic Volumes

The site traffic volumes and the background traffic volumes were added together to create the total traffic average link volumes for Alternative 3, the 2021 total are shown in **Exhibit 16-3** and 2031 total are shown in **Exhibit 16-4**.

16.3.2 Analysis of Future Conditions

16.3.2.1 Level of Service Total Future Conditions – 2021

The intersection operations for the 2021 total traffic volumes at signalized intersections are summarized in **Table 16-1**. Detailed summaries of the analyses can be found in **Appendix G**. The truck percentages were calculated to reflect the increase in trucks due to the quarry. In order to calculate the truck percentages, the existing truck percentages were carried forward from the background traffic and then the site trucks were added.

Table 16-1: Signalized Intersections - 2021 Total Traffic - Alternative 3

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**A**		**B**	
Westbound Left-turn	D	0.47	D	0.77
Westbound Right-turn	A	0.30	A	0.49
Northbound Through	A	0.52	A	0.39
Northbound Right-turn	A	0.62	A	0.59
Southbound Left-turn	A	0.33	A	0.37
Southbound Through	B	0.92	C	0.92
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.48
Eastbound Right-turn	F	1.24	F	1.46
Northbound Left-turn	A	0.16	C	0.16
Northbound Through	F	1.22	D	1.06
Southbound Through	D	0.86	F	1.25
Southbound Right-turn	C	0.45	C	0.30

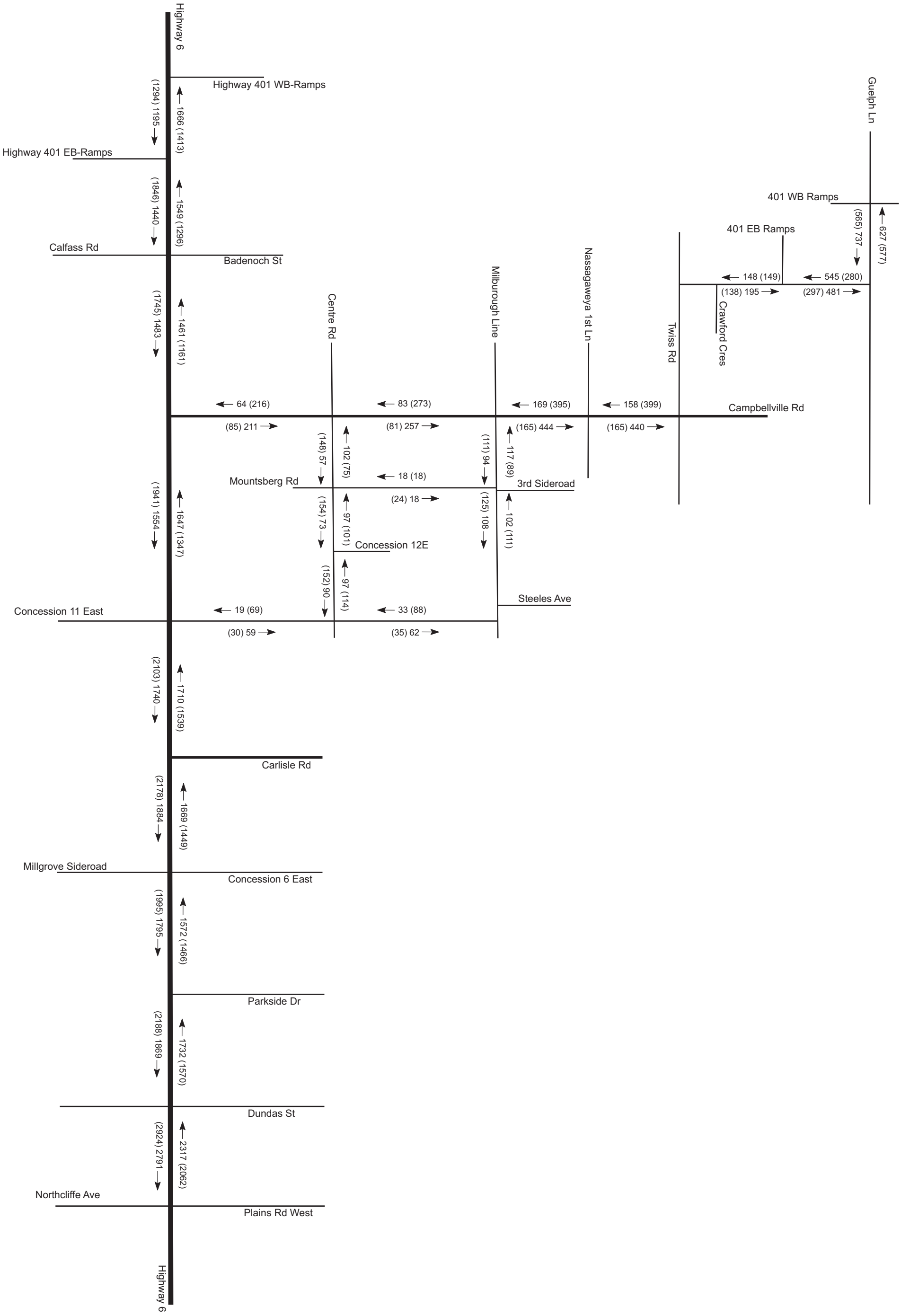
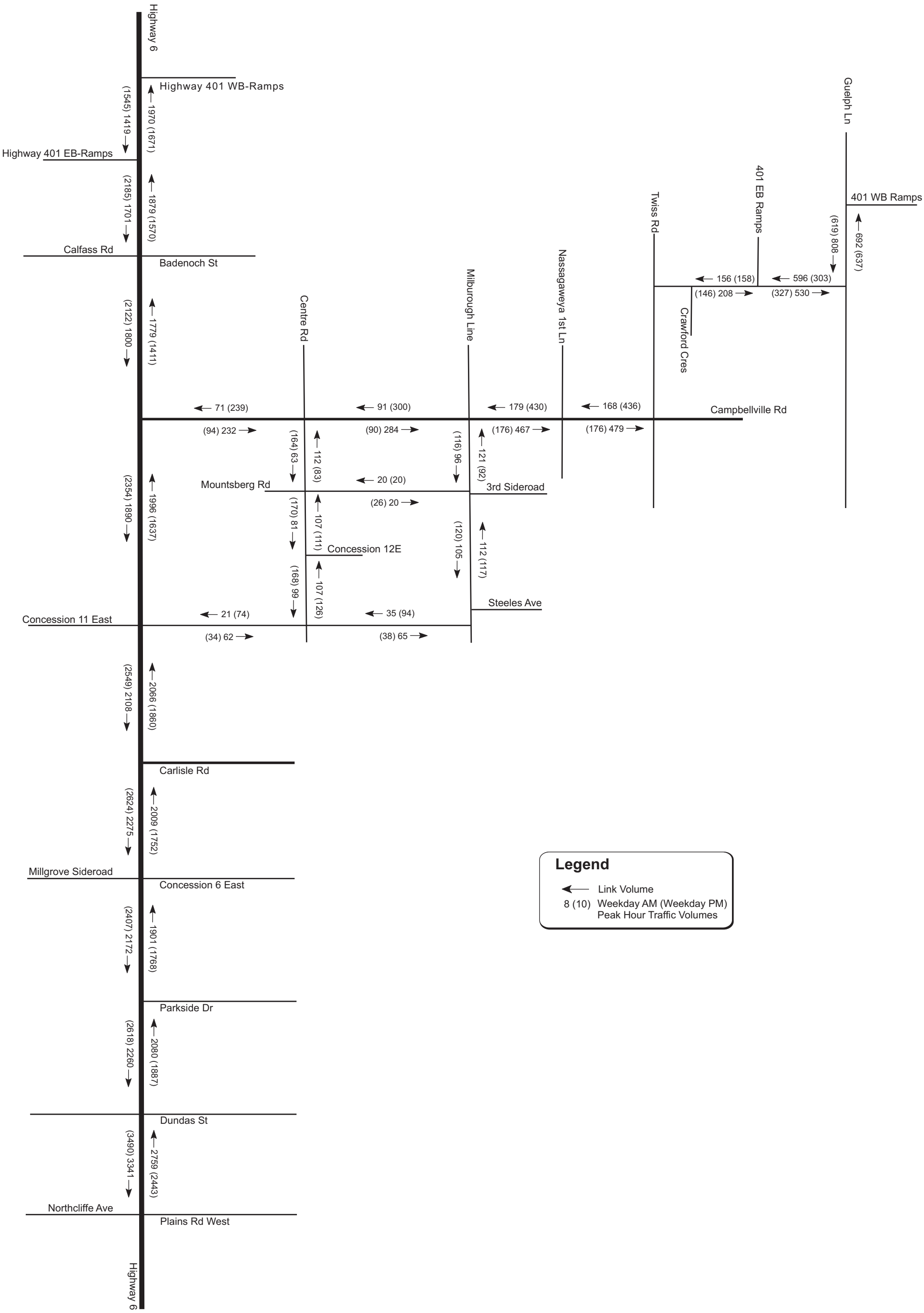


Exhibit 16-3
2021 Total Traffic Volumes - Alternative Haul Route 3



Not To Scale

Exhibit 16-4
2031 Total Traffic Volumes - Alternative Haul Route 3

Table 16-1: Continued

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Badenoch Street / Calfass Road				
Overall	**E**		**F**	
Eastbound Left-Through-Right	D	0.30	D	0.22
Westbound Left-Through	D	0.53	D	0.51
Westbound Right-turn	D	0.03	D	0.02
Northbound Left-turn	A	0.00	A	0.00
Northbound Through-Right	D	1.04	B	0.81
Southbound Left-turn	C	0.40	A	0.15
Southbound Through-Right	E	1.11	F	1.30
Highway 6 / Carlisle Road				
Overall	**C**		**C**	
Westbound Left-turn	C	0.72	D	0.83
Westbound Right-turn	C	0.30	C	0.28
Northbound Through	C	0.96	C	0.85
Northbound Right-turn	A	0.13	B	0.09
Southbound Left-turn	D	0.86	C	0.73
Southbound Through	B	0.83	C	1.00
Guelph Line / Reid Sideroad				
Overall	**B**		**A**	
Eastbound Left-turn	C	0.58	C	0.41
Eastbound Right-turn	C	0.21	C	0.13
Northbound Left-turn	A	0.02	A	0.01
Northbound Through	A	0.47	A	0.43
Southbound Through	A	0.22	A	0.24
Southbound Right-turn	A	0.39	A	0.23
Highway 6 / Concession 6E				
Overall	**B**		**A**	
Eastbound Left-turn	C	0.57	D	0.45
Eastbound Through-Right	C	0.20	C	0.09
Westbound Left-turn	C	0.23	D	0.51
Westbound Through-Right	C	0.13	C	0.26
Northbound Left-turn	A	0.01	A	0.09
Northbound Through	A	0.71	A	0.51
Northbound Right-turn	A	0.05	A	0.03
Southbound Left-turn	A	0.25	A	0.10
Southbound Through	B	0.86	A	0.80
Southbound Right-turn	A	0.05	A	0.07
Highway 6 / Parkside Drive				
Overall	**B**		**D**	
Westbound Left-turn	C	0.33	F	1.03
Westbound Right-turn	C	0.08	C	0.19
Northbound Through	B	0.80	D	0.96
Northbound Right-turn	A	0.11	B	0.08
Southbound Left-turn	D	0.84	F	1.03
Southbound Through	A	0.64	B	0.85

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Dundas Street				
Overall	**E**		**F**	
Eastbound Left-turn	F	0.94	F	0.89
Eastbound Through	D	0.58	C	0.35
Eastbound Right-turn	F	0.97	D	0.83
Westbound Left-turn	F	1.04	F	1.48
Westbound Through	D	0.53	D	0.86
Westbound Right-turn	D	0.07	C	0.13
Northbound Left-turn	F	1.03	F	1.33
Northbound Through	D	0.80	C	0.80
Northbound Right-turn	C	0.21	C	0.37
Southbound Left-turn	E	0.78	F	0.91
Southbound Through	F	1.07	F	1.14
Southbound Right-turn	C	0.13	C	0.17
Highway 6 / Northcliffe Avenue and Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.18	C	0.34
Westbound Left-Through	F	2.06	F	1.10
Westbound Right-turn	D	0.74	D	0.66
Northbound Left-turn	E	0.71	F	1.38
Northbound Through	F	1.17	E	1.06
Northbound Right-turn	A	0.06	B	0.12
Southbound Left-turn	F	1.10	F	1.06
Southbound Through-Right	F	1.48	F	1.56

LOS – Level of Service; v/c – volume-capacity ratio;

The total traffic operations are similar to the background operations along Highway 6 travelling to and from Highway 401 and Highway 403. A portion of the trucks from the proposed quarry will use Highway 6 to travel to and from Highway 403. There are 8 truck trips along Highway 6 in the AM peak hour and 6 truck trips in the PM peak hour.

The intersection operations for the 2021 total traffic volumes at unsignalized intersections are summarized in **Table 16-2**. Detailed summaries of the analyses can be found in **Appendix G.**

Table 16-2: Unsignalized Intersections - 2021 Total Traffic - Alternative 3

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Campbellville Road / Milburough Line				
Eastbound Left-Through-Right	A	0.00	A	0.00
Westbound Left-turn	A	0.11	A	0.09
Northbound Left-Through	B	0.22	B	0.10
Northbound Right-turn	B	0.22	B	0.10
Southbound Left-Through-Right	C	0.07	C	0.04
Campbellville Road / Nassagaweya 1st Line				
Eastbound Left-Through-Right	A	0.02	A	0.02
Westbound Left-Through-Right	A	0.01	A	0.01
Northbound Left-Through-Right	B	0.05	B	0.06
Southbound Left-Through-Right	C	0.14	B	0.13

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Campbellville Road / Twiss Road				
Eastbound Left-turn	A	0.12	A	0.09
Westbound Left-Through-Right	A	0.00	A	0.01
Northbound Left-Through-Right	B	0.10	C	0.05
Southbound Left-Through	B	0.12	B	0.25
Southbound Right-turn	B	0.12	B	0.25
Reid Sideroad / Crawford Crescent				
Westbound Left-Through	A	0.01	A	0.01
Northbound Left-Right	A	0.02	B	0.04
Reid Sideroad / Highway 401 EB Ramp				
Eastbound Left-turn	B	0.21	A	0.09
Southbound Left-turn	F	1.13	C	0.43
Southbound Right-turn	A	0.04	A	0.02
Guelph Line / Highway 401 WB Ramps				
Westbound Left-turn	E	0.69	D	0.59
Wrestbound Right-turn	B	0.21	C	0.58
Mountsberg Road / Milburough Line				
Eastbound Left-Right	A	0.03	A	0.03
Northbound Left-Through	A	0.00	A	0.01
Milburough Line / 3rd Sideroad				
Westbound Left-Right	B	0.01	B	0.01
Southbound Left-Through	A	0.00	A	0.00
Steeles Ave / Milburough Tl				
Westbound Left-Right	A	0.01	A	0.06
Southbound Through-Left	A	0.01	A	0.01
Milburough Line / Site Driveway				
Eastbound Left-turn	B	0.12	B	0.09
Eastbound Right-turn	A	0.01	A	0.04
Northbound Left-turn	A	0.02	A	0.00

LOS – Level of Service; v/c – volume-capacity ratio;

The unsignalized intersections operate with a volume to capacity ratio of 0.69 or better during the AM and PM peak hours, with the exception of the southbound left-turn at Reid Sideroad / Highway 401 Eastbound Ramp which operates with a volume to capacity ratio of 1.13 in the AM peak hour.

16.3.2.2 Storage Total Future Conditions – 2021

The storage requirements along Alternative Haul Route 3 were assessed based on Synchro 6 queue estimates. The available storage was compared to the 95th percentile queues for the weekday AM and PM peak hours. The results are summarized in **Table 16-3**. Detailed summaries of the analyses can be found in **Appendix G.**

Table 16-3: Intersection Queues - 2021 Total Traffic

		Weekday AM Peak Hour	Weekday PM Peak Hour
Intersection and Movements	**Storage (m)**	**95th Queue (m)**	**95th Queue (m)**
Campbellville Road / Milburough Town Line			
Eastbound Left-Through-Right		<7	<7
Westbound Left-turn	30	<7	<7
Westbound Through-Right		<7	<7
Northbound Left-Through		<7	<7
Northbound Right-turn	30	<7	<7
Southbound Left-Through-Right		<7	<7
Campbellville Road / Twiss Road			
Eastbound Left-turn	30	<7	<7
Eastbound Through-Right		<7	<7
Westbound Left-Through-Right		<7	<7
Northbound Left-Through-Right		<7	<7
Southbound Left-Through		<7	8
Southbound Right-turn	30	<7	8
Milburough Townline / Site Driveway			
Eastbound Left-turn		<7	<7
Eastbound Right-turn		<7	<7
Northbound Left-turn	30	<7	<7
Northbound Through		<7	<7
Southbound Through		<7	<7
Southbound Right-turn	30	<7	<7

The results of the queuing analysis for the intersections suggest that the storage provided at the various intersection movements is sufficient to accommodate the anticipated queues.

16.3.2.3 Recommendations Total Future Conditions – 2021

There are no recommended alterations needed to the road network to accommodate Alternative Haul Route 3 beyond those previously identified.

16.3.2.4 Level of Service Total Future Conditions – 2031

The intersection operations for the 2031 total traffic volumes at signalized intersections are summarized in **Table 16-4**. Detailed summaries of the analyses can be found in **Appendix G.**

Table 16-4: Signalized Intersections - 2031 Total Traffic - Alternative 3

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 WB Ramps				
Overall	**C**		**C**	
Westbound Left-turn	D	0.42	E	0.91
Westbound Right-turn	A	0.34	A	0.54
Northbound Through	A	0.65	A	0.47
Northbound Right-turn	A	0.69	A	0.65
Southbound Left-turn	A	0.49	A	0.46
Southbound Through	F	1.14	E	1.11

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Highway 401 EB Ramps				
Overall	**F**		**F**	
Eastbound Left-turn	F	0.97	D	0.54
Eastbound Right-turn	F	1.54	F	1.74
Northbound Left-turn	A	0.22	C	0.19
Northbound Through	F	1.52	F	1.29
Southbound Through	D	0.94	F	1.40
Southbound Right-turn	C	0.50	B	0.38
Highway 6 / Badenoch Street / Calfass Road				
Overall	**F**		**F**	
Eastbound Left-Through-Right	D	0.33	D	0.23
Westbound Left-Through	D	0.52	D	0.54
Westbound Right-turn	D	0.04	D	0.02
Northbound Left-turn	A	0.00	A	0.00
Northbound Through-Right	F	1.27	C	0.99
Southbound Left-turn	C	0.44	B	0.44
Southbound Through-Right	F	1.35	F	1.59
Highway 6 / Carlisle Road				
Overall	**C**		**F**	
Westbound Left-turn	F	1.03	D	0.86
Westbound Right-turn	D	0.47	C	0.29
Northbound Through	C	0.97	E	1.10
Northbound Right-turn	A	0.14	B	0.10
Southbound Left-turn	F	1.00	D	0.72
Southbound Through	B	0.87	F	1.25
Guelph Line / Reid Sideroad				
Overall	**B**		**B**	
Eastbound Left-turn	C	0.61	C	0.45
Eastbound Right-turn	C	0.23	C	0.15
Northbound Left-turn	A	0.02	A	0.01
Northbound Through	A	0.52	A	0.47
Southbound Through	A	0.24	A	0.26
Southbound Right-turn	A	0.42	A	0.25
Highway 6 / Concession 6E				
Overall	**C**		**C**	
Eastbound Left-turn	D	0.65	C	0.42
Eastbound Through-Right	C	0.23	C	0.11
Westbound Left-turn	D	0.26	C	0.46
Westbound Through-Right	C	0.18	C	0.34
Northbound Left-turn	A	0.01	A	0.10
Northbound Through	B	0.83	A	0.65
Northbound Right-turn	A	0.05	A	0.04
Southbound Left-turn	C	0.52	A	0.17
Southbound Through	D	1.01	C	1.02
Southbound Right-turn	A	0.06	A	0.07

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Highway 6 / Parkside Drive				
Overall	**C**		**E**	
Westbound Left-turn	C	0.35	F	1.14
Westbound Right-turn	C	0.09	C	0.31
Northbound Through	D	1.02	F	1.15
Northbound Right-turn	A	0.12	B	0.09
Southbound Left-turn	D	0.82	F	1.24
Southbound Through	A	0.78	D	1.04
Highway 6 / Dundas Street				
Overall	**F**		**F**	
Eastbound Left-turn	F	1.30	F	1.50
Eastbound Through	D	0.64	C	0.38
Eastbound Right-turn	F	1.18	E	0.95
Westbound Left-turn	F	1.33	F	1.82
Westbound Through	D	0.56	D	0.85
Westbound Right-turn	D	0.08	C	0.19
Northbound Left-turn	F	1.35	F	1.75
Northbound Through	D	0.93	D	0.98
Northbound Right-turn	C	0.26	C	0.54
Southbound Left-turn	F	0.91	F	0.98
Southbound Through	F	1.19	F	1.31
Southbound Right-turn	C	0.15	C	0.20
Highway 6 / Northcliffe Avenue and Plains Road W				
Overall	**F**		**F**	
Eastbound Left-Through-Right	F	1.19	C	0.40
Westbound Left-Through	F	1.97	F	1.21
Westbound Right-turn	D	0.76	E	0.95
Northbound Left-turn	F	0.79	F	1.71
Northbound Through	F	1.50	F	1.18
Northbound Right-turn	B	0.07	B	0.13
Southbound Left-turn	F	1.23	F	1.80
Southbound Through-Right	F	1.89	F	1.90

LOS – Level of Service; v/c – volume-capacity ratio;

With the exception of Guelph Line / Reid Sideroad all of the intersections have individual movement volume to capacity ratios greater than 1.00. The deficiencies in operations are mainly attributed to the general growth in background traffic volumes.

The intersection operations for the 2031 total traffic volumes at unsignalized intersections are summarized in **Table 16-5**. Detailed summaries of the analyses can be found in **Appendix G**.

Table 16-5: Unsignalized Intersections - 2031 Total Traffic - Alternative 3

	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection and Movements	**LOS**	**v/c**	**LOS**	**v/c**
Campbellville Road / Milburough Line				
Eastbound Left-Through-Right	A	0.00	A	0.00
Westbound Left-turn	A	0.12	A	0.09
Northbound Left-Through	B	0.24	B	0.10
Northbound Right-turn	B	0.24	B	0.10
Southbound Left-Through-Right	C	0.09	C	0.04
Campbellville Road / Nassagaweya 1st Line				
Eastbound Left-Through-Right	A	0.03	A	0.02
Westbound Left-Through-Right	A	0.01	A	0.01
Northbound Left-Through-Right	B	0.07	B	0.06
Southbound Left-Through-Right	C	0.16	B	0.15
Campbellville Road / Twiss Road				
Eastbound Left-turn	A	0.13	A	0.10
Westbound Left-Through-Right	A	0.00	A	0.02
Northbound Left-Through-Right	C	0.12	C	0.06
Southbound Left-Through	B	0.12	B	0.27
Southbound Right-turn	B	0.12	B	0.27
Reid Sideroad / Crawford Crescent				
Westbound Left-Through	A	0.01	A	0.01
Northbound Left-Right	A	0.02	B	0.05
Reid Sideroad / Highway 401 EB Ramp				
Eastbound Left-turn	B	0.24	A	0.09
Southbound Left-turn	F	1.35	C	0.49
Southbound Right-turn	A	0.04	A	0.02
Guelph Line / Highway 401 WB Ramps				
Westbound Left-turn	F	0.85	E	0.70
Westbound Right-turn	B	0.24	C	0.66
Mountsberg Road / Milburough Line				
Eastbound Left-Right	A	0.04	A	0.03
Northbound Left-Through	A	0.00	A	0.01
3rd Sideroad / Milburough Tl				
Westbound Left-Right	B	0.02	B	0.01
Southbound Through-Left	A	0.00	A	0.00
Milburough Line / Site Driveway				
Eastbound Left-turn	B	0.12	B	0.10
Eastbound Right-turn	A	0.01	A	0.04
Northbound Left-turn	A	0.03	A	0.00

LOS – Level of Service; v/c – volume-capacity ratio;

The unsignalized intersections operate with a volume to capacity ratio of 0.85 or better during the AM and PM peak hour, with the exception of the southbound left-turn at Reid Sideroad / Highway 410 Eastbound Ramp which operates with a volume to capacity ratio of 1.35 in the AM peak hour.

16.3.2.5 Storage Total Future Conditions – 2031

The storage requirements along Alternative Haul Route 3 were assessed based on Synchro 6 queue estimates. The available storage was compared to the 95th percentile queues for the weekday AM and PM peak hours. The results are summarized in **Table 16-6**. Detailed summaries of the analyses can be found in **Appendix G**

Table 16-6: Intersection Queues - 2031 Total Traffic

		Weekday AM Peak Hour	Weekday PM Peak Hour
Intersection and Movements	**Storage (m)**	**95th Queue (m)**	**95th Queue (m)**
Campbellville Road / Milburough Town Line			
Eastbound Left-Through-Right		<7	<7
Westbound Left-turn	30	<7	<7
Westbound Through-Right		<7	<7
Northbound Left-Through		7	<7
Northbound Right-turn	30	7	<7
Southbound Left-Through-Right		<7	<7
Campbellville Road / Twiss Road			
Eastbound Left-turn	30	<7	<7
Eastbound Through-Right		<7	<7
Westbound Left-Through-Right		<7	<7
Northbound Left-Through-Right		<7	<7
Southbound Left-Through		<7	9
Southbound Right-turn	30	<7	9
Milburough Tl / Site Driveway			
Eastbound Left-turn		<7	<7
Eastbound Right-turn		<7	<7
Northbound Left-turn	30	<7	<7
Northbound Through		<7	<7
Southbound Through		<7	<7
Southbound Right-turn	30	<7	<7

The results of the queuing analysis for the intersections suggest that the storage provided at the various intersections is sufficient to accommodate the anticipated queues.

16.3.2.6 Recommendations Total Future Conditions – 2031

There are no recommended alterations required to the road network to accommodate Alternative Haul Route 3 beyond those previously identified.