APPENDIX 2.0-A

TRAFFIC IMPACT STUDY REPORT
MARCH 2008

Atlantic Road & Traffic Management

Traffic Engineering Specialists

Draft Report

Traffic Impact Study
Proposed Container Terminal
Melford, Guysborough Co., NS

Prepared for

Melford International Terminal Inc.

March 2008

0775

Table of Contents

Prepared by:

Ken O'Brien, PEng
Greg O'Brien, PEng

Atlantic Road & Traffic Management
PO Box 25205
Halifax, NS B3M 4H4

Phone (902) 443-7747
Fax (902) 443-7747
Email **traffic@ns.sympatico.ca**

1.0 Introduction

Background

Melford International Terminal Inc. propose construction of a container terminal and logistics park at Melford, Guysborough County (Figure 1). The project is planned as a transshipment terminal with approximately 98% of the landed containers being transported by rail or short sea shipping. The terminal and logistics park will initially occupy about 350 acres of the approximately 14,500 acres of the Melford Industrial Land Reserve which is administered jointly by the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) and Nova Scotia Business Inc.

Construction start is planned for the summer of 2008, with the Container Port being operational in 2011.

Atlantic Road & Traffic Management has been retained to complete a Traffic Impact Study satisfactory NSTIR.

Traffic Impact Study Usually Considers Four Questions

A Traffic Impact Study for a proposed project usually consists of four steps to answer the following questions:

1. **What are the existing traffic situations** on roads serving the study site? How have traffic volumes increased historically? What has been the collision experience during the past five years?
2. **What traffic changes are expected** on Study Area roads and intersections? How many vehicle trips will be generated by the proposed project during weekday AM and PM peak hours during both the construction and production phases? How will the traffic be distributed to Study Area roads and intersections?
3. **What traffic impacts will occur** on Study Area roads and intersections? How will level of performance be affected?
4. **What road or intersection improvements are required** to mitigate project impacts on Study Area traffic movements?

Traffic Impact Study Scoping Document

A Traffic Impact Study prepared to meet NSTIR requirements is usually initiated by submission of a Scoping Document to describe study methodology and objectives. After a project initiation meeting with NSTIR during October, 2007, ARTM submitted a Scoping Document (included as Appendix A) on November 20, 2007, and received NSTIR approval on November 21, 2007.

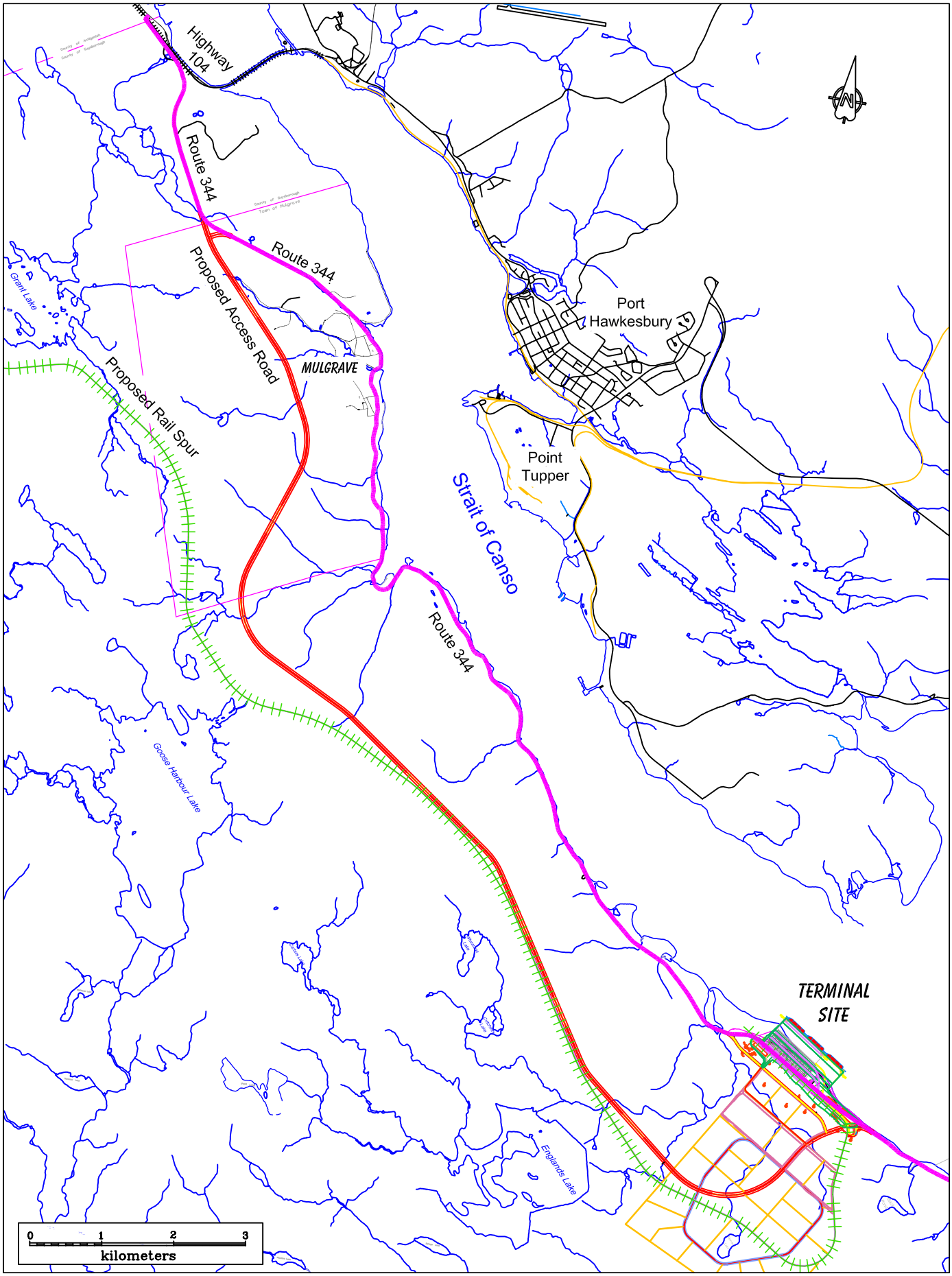
Study Objectives of the Traffic Impact Study

Specific concerns included in the Traffic Impact Study include:

1. Identification of the proposed access route between Highway 104 and the project location in Melford, Guysborough County.
2. Evaluation of 2008, and projected 2011 and 2021, traffic volumes on Study Area road sections, without addition of site generated trips.
3. Examination of collision experience, including collision numbers by collision severity, and collision rates for Study Area road sections

during the last five years.

4. Estimation of the number of passenger vehicle and large truck trips that will be generated during AM and PM peak hours, for both the construction and operation phases of the Container Port.
5. Evaluation of the impacts of site generated trips for both the construction and operation phases on the safety and level of performance of access route road sections including the following areas:
   - The intersection of Highway 104 and Route 344;
   - The impact that additional traffic will have on the at-grade railroad crossing on Route 344 due to the proximity to the Highway 104 / Route 344 intersection;
   - The intersection of the existing Route 344 and the Melford Access Road north of Mulgrave;
   - A potential Mulgrave Connector intersection with the Melford Access Road;
   - Intersections north and south of the Container Terminal with existing Route 344 and the proposed Route 344 realignment through the site;
   - The intersection of the Melford Access Road and Route 344 at the Container Terminal;
   - Stopping sight distances at intersections;
   - Geometry of intersections with regards to heavy vehicle turning requirements;
   - Need for left turn and right turn lanes;
   - Need for traffic signals;
   - Level of service analyses for projected horizon year design hour volumes using Synchro 6.0.



Atlantic Road & Traffic Management
Traffic Engineering Specialists

Figure 1.1
Study Area

March 2008

2.0 Description of the Project Access Route

Identification of Proposed Access Route

The existing access route for the Melford Terminal site includes approximately nineteen kilometers of Route 344 starting at Highway 104 in Aulds Cove and extending southerly through the Town of Mulgrave to the north end of the Melford Loop road. A new site access route has been planned to connect with Route 344 near the Mulgrave north town limit and extend southerly to the west of the developed area along the Strait of Canso and then reconnect with Route 344 south of the terminal site about two kilometers south of the north intersection of Melford Loop. Existing and planned access roads are illustrated on Figures 1.1, 2.1, 2.2, and 2.3.

Description of Highway 104 / Route 344 Intersection

Route 344 intersects with Highway 104 at an existing T-intersection opposite the Irving Big Stop in Aulds Cove. There is a left turn lane on Highway 104 and the sight distances on both intersection approaches are adequate for the posted 70 km/h speed limit. There is a railroad crossing on Route 344 immediately south of Highway 104 with about 32 meters between the north rail and the STOP bar (Photo 2.1).

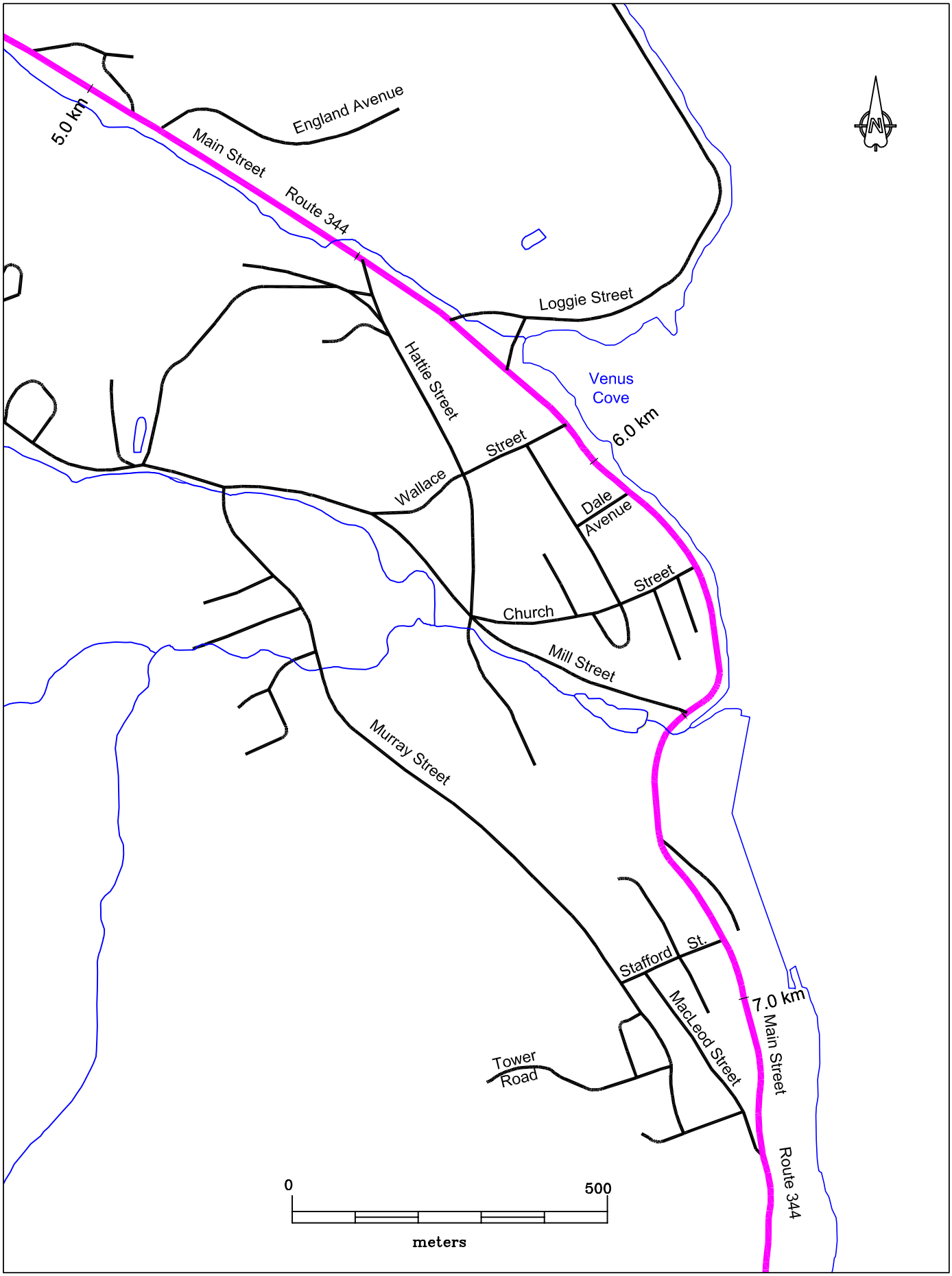
Photo 2.1 - Looking north on Route 344 at the Highway 104 intersection.

Description of Route 344 Cross Section

The section of Route 344 from Highway 104 to Melford Loop can be characterized by the four different road cross sections and development densities described in Table 2.1.

Table 2.1 - Route 344 Road Characteristics

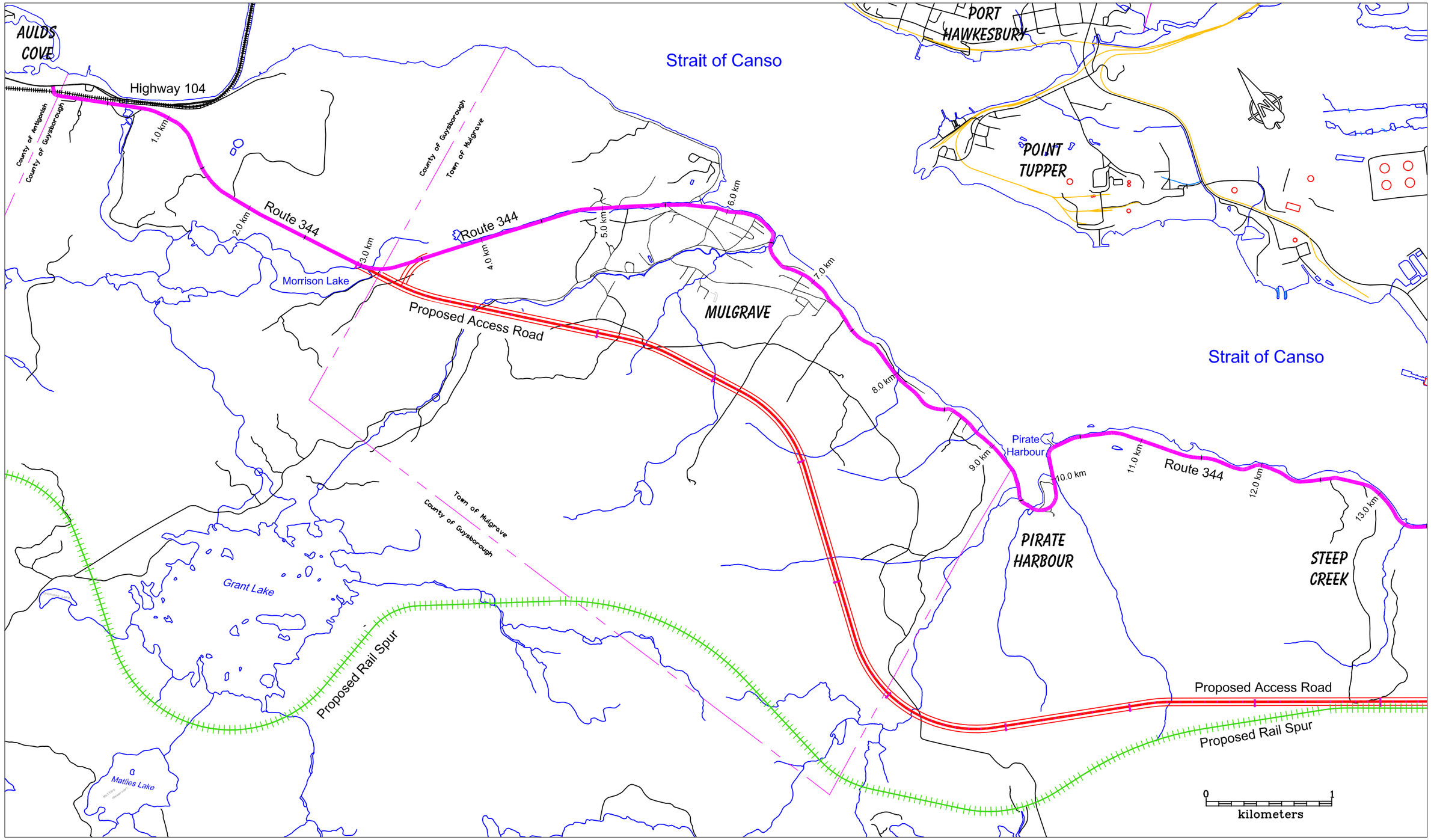
Section	Description	Length, km	Photos
1	Highway 104 to one km south of Mulgrave Town Limit; limited number of accesses; wide lanes with southbound climbing lane; 90 km/h	4.0	2.2
2	One km south of Mulgrave Limit to Hattie Street; several residential driveways; wide lanes with northbound climbing lane; 80 km/h for 0.9 km and 50 km/h for 0.6 km	1.5	2.3
3	Hattie Street to Pirate Harbour; Mulgrave urban area with curb and sidewalk along west side for about 1.8 km and open ditches both sides for 1.8 km; includes commercial area and residential development mostly on west side; 50 km/h	3.6	2.4; 2.5
4	Pirate Harbour to Melford Loop; rural cross section with 6.2 to 6.6 m wide pavement, gravel shoulders and open ditches; 50 km/h for 0.1 km; 60 km/h for 1.4 km; and 80 km/h for 6.3 km	9.8	2.6; 2.7; 2.8; 2.9
	Total Length	18.9	



Atlantic Road & Traffic Management
Traffic Engineering Specialists

Figure 2.1
Mulgrave Area

March 2008



Atlantic Road & Traffic Management
Traffic Engineering Specialists

Figure 2.2 - Site Access Route
Highway 104 to Steep Creek

March 2008

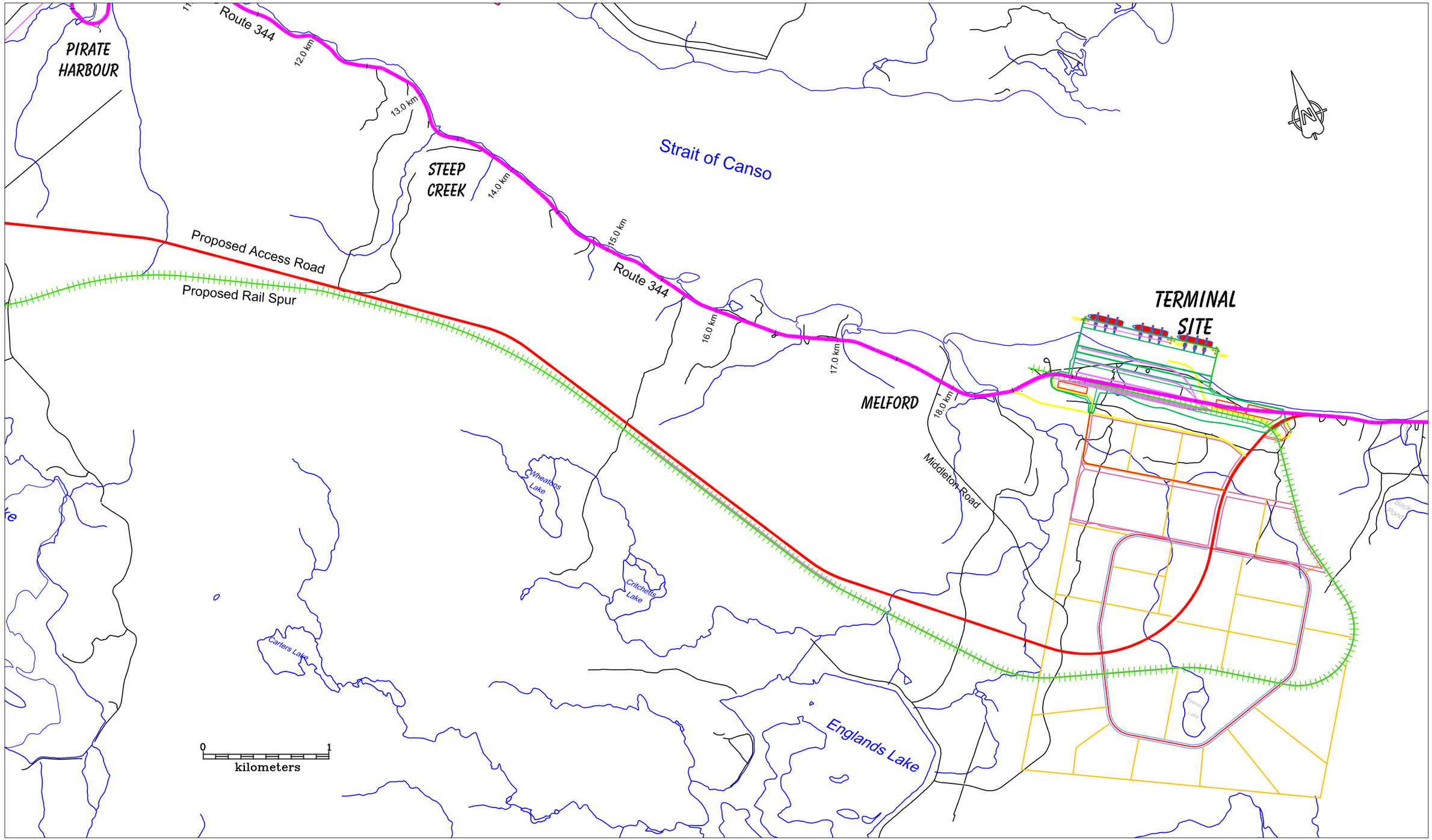


Figure 2.3 - Site Access Route
Steep Creek to Melford

March 2008

Photo 2.2 - Looking north on Route 344 about 0.7 km south of Highway 104 at Aulds Cove

Photo 2.3 - Looking north from the Hattie Street intersection in Mulgrave at the south end of the improved section of Route 344.

Photo 2.4 - Looking north on Route 344 in Mulgrave just north of Wallace Street intersection and about 0.9 km north of the post office.

Photo 2.5 - Looking north on Route 344 in Mulgrave about 0.3 km north of Pirate Harbour.

Photo 2.6 - Route 344 looking north at the Mulgrave / Pirate Harbour Line

Photo 2.7 - Looking north on Route 344 in Pirate Harbour about 0.3 km south of Mulgrave Town Line.

Description of Road Cross Sections

The first 5.5 kilometers of Route 344 was reconstructed over twenty years ago with 3.7 meter lanes, appropriate climbing lanes, and paved shoulders as illustrated in Photos 2.2 and 2.3. As discussed in Table 2.1, there is about 1.8 kilometers of urban cross section in the Town of Mulgrave, and the remaining 11.6 kilometers of the access route consists of a typical rural highway with two paved lanes, gravel shoulders, and open ditches. Pavement and shoulder widths at several locations are tabulated in Table 2.2 and are also illustrated in Photos 2.4 to 2.8.

Table 2.2 - Typical Pavement and Shoulder Widths on Route 344

Location (See Figures 2.1 and 2.2)	East Shoulder Width	Pavement Width	West Sidewalk or Shoulder Width	Photo
Just north of Wallace Street (km 5.9)	1.3 S	7.6	1.5 SW	2.4
Just south of Church Street (km 6.2)	2.6 S	7.4	1.6 SW	-
At Post Office; just north of Stafford Street (km 6.8)	1.2 S	8.0	1.5 SW	-
At end of the sidewalk; just south of MacLeod Street (km 7.3)	3.0 S	7.4	1.5 SW	-
Approximately at Mulgrave / Pirate Harbour line (km 9.2)	1.4 S	6.7	1.4 S	2.6
Just south of bridge at Pirate Harbour (km 9.5)	-	6.6	-	2.7
At Pirate Harbour / Steep Creek line (km 10.5)	-	6.2	-	-
At Sable Gas liquid line crossing (km 13.9)	-	6.4	-	2.8
Just north of Middleton Road (km 17.5)	-	6.4	-	-

NOTES: 1. SW indicates sidewalk with curb; S indicates edge of pavement to shoulder rounding or guardrail.

Photo 2.8 - Looking north on Route 344; at Sable Gas liquid line crossing approximately five km south of Mulgrave

Photo 2.9 - Looking south on Route 344 ; 0.8 km north of Melford Loop.

Posted Speed Limits

Speed limit details throughout the approximately nineteen kilometre access route are included in Table 2.3. Site visits to the access route indicate that the posted speed limits appear to be suitable for the roadside development. Horizontal and vertical alignments throughout the approximately ten kilometer rural road section between Mulgrave and the Melford Loop are comparable to many roads throughout the Province.

Table 2.3 - Speed Limit Details for the Access Route from Highway 104 to Sable Road

Road Section Description (See Figures 2.1 to 2.3)	Km Location	Length km	Posted Limit km/h
Highway 104 to 1.0 km south of Mulgrave north limit	0.0 - 4.0	4.0	90
1.0 km south of Mulgrave north limit to just north of England Avenue	4.0 - 4.9	0.9	80
Just north of England Avenue through Mulgrave to just south of Mulgrave / Pirate Harbour line	4.9 - 9.2	4.3	50
Just south of the Mulgrave / Pirate Harbour line to just south of the Pirate Harbour / Steep Creek line	9.2 - 10.6	1.4	60
Just south of the Pirate Harbour / Steep Creek line to Melford Loop Road	10.6 - 18.9	8.3	80

NOTES:
1. The average posted speed for the 18.9 km route is 73.8 km/h
2. Travel time for the 18.9 km route would be about 15.4 minutes if the posted limit could be maintained in all areas.

Study Area Intersections

The Study Area includes existing intersections on Route 344 between Highway 104 and Melford, as well as intersections needed for the planned new Terminal Access Road.

The Highway 104 / Route 344 intersection and three quarry entrance intersections on the first four kilometers of the improved section of Route 344 (see Table C-1) currently provide for satisfactory operation by tractor trailer trucks.

The new Terminal Access Road will include the following intersections:

1. Route 344 near the Mulgrave Town Limit - This intersection to be located at the end of Morrison Lake will be on a tangent section of the extension of Route 344 southerly onto the new road. A site visit confirmed that sight distances should be acceptable for 90 km/h operation. The intersection must be designed to NSTIR standards and include a left turn lane for vehicles turning left towards Mulgrave and a right turn channel for vehicle from Mulgrave turning right to proceed toward Aulds Cove.
2. Mulgrave Connector - The Town of Mulgrave has requested consideration of an intersection near the commercial area of Town to accommodate a Mulgrave Connector road. While the location of that road has not yet been determined, the intersection must be designed to provide geometry and sight distances suitable for the design speed of the Terminal Access Road.
3. Route 344 intersections at Melford - The Terminal plans include realignment of about a two kilometer section of Route 344 at the Terminal site. Intersections, and possibly a grade separated interchange a the south end of the Terminal, will be designed to NSTIR standards and will be presented for review and approval be NSTIR.

Review of Needs for Climbing Lanes

The 5.5 kilometer long improved section of Route 344 between Highway 104 and the developed area in Mulgrave has appropriate climbing lanes, including a 1.9 kilometer long southbound lane and a two kilometer long northbound lane. Climbing lanes will be included on the proposed Terminal Access Road in accordance with grades and projected traffic volumes.

The need for construction of additional climbing lanes on Route 344 between Mulgrave and Melford was considered during site visits. While the route includes sections of rolling terrain, grades are short and are not expected to have a significant effect on truck travel speeds relative to the posted speed limits. Consequently, additional climbing lanes are not suggested at any additional locations on Route 344.

Horizontal Curves

During site visits to Route 344 between Highway 104 and Melford, curves included in Table 2.4 were observed. While most curves appear to have appropriate warning signs relative to posted speed limits and reasonable approach speeds, the curve in the 90 km/h speed zone just south of Highway 104 should have warning sign and speed zone changes as discussed in the following paragraph. Also, signing for all curves should be reviewed each spring to replace warning signs that may have been damaged by snow plows.

Table 2.4 - Curves on Route 344 - Highway 104 ro Melford

Location	Kilometer (Figures 2.1 to 2.3)	Speed Limit	Photos
1. Just south of Highway 104 (30 km/h tab NB)	0.1	90	2.12; 2.13
2. Reverse curve	6.3	50	2.10
3. Curve with houses close to road	8.5	50	2.11
4. Pirate Harbour (40 km/h tab NB)	9.4	60	2.7
5. Pirate Harbour (55 km/h tab)	9.7	60	-
6. Just north of Steep Creek (50 km/h tabs)	10.1	60	-
7. Reverse curve (50 km/h tabs)	11.8	80	-

Photo 2.10 - Looking north on Route 344 at a reverse curve in Mulgrave just south of Mill Street; note tractor trailer pulp trucks

Photo 2.11 - Looking south on Route 344 in Mulgrave about 0.6 km north of Pirate Harbour.

Recommended Curve Signing Changes

Review of signing on the northbound approach to the curve on Route 344 immediately south of Highway 104 indicated need for warning and regulatory sign changes. A vertical curve reduces visibility to the turn warning sign as illustrated in Photos 2.12 and 2.13. It is recommended that the TURN warning sign with 30 km/h advisory tab be relocated to replace the SLOW sign shown in the photos, and that Chevrons and a Checkerboard be erected at the curve as supplementary warning devices. Also, since the existing 90 km/h speed limit allows a high speed approach to a low speed turn, it is recommended that a 60 km/h transition speed zone be established beginning south of Lower Quarry Road intersection.

Photo 2.12 - Looking north on Route 344 on the approach to the turn just south of Highway 104. Note that the TURN sign is hidden by the crest.

Photo 2.13 - Looking north on Route 344 on the approach to the turn just south of Highway 104. Note the TURN sign is now becoming visible.

Maximum Weight Allowances

The NSTIR Vehicle Compliance Officer for the area indicated that Route 344 is a designated Schedule C route from Highway 104 to the Mulgrave / Pirate Harbour line and a designated B-Train route for the remaining approximately ten kilometers to the Melford Loop. Therefore, project generated construction and operation traffic will be able to use 8-axle B-Train units and 6-axle semi-trailer units within the allowable maximum gross vehicle weights for the designated B-Train routes. This will permit the following maximum allowable gross vehicle weights, except during Spring weight restriction periods:

- Schedule C section
  - Six-axle tridem semi-trailer 49,500 kg (plus tolerance for 2008)
  - 8-Axle B-Train 62,500 kg
  - Not affected by Spring weight restrictions

- B-Train sections of Route 344
  - Six-axle tridem semi-trailer 47,500 kg
  - 8-Axle B-Train 62,500 kg
  - Weights will probably be reduced to about 60% of allowable gross vehicle weight during four to six weeks each Spring.

The section of Route 344 from Mulgrave to the Terminal Site will need to be strengthened to provide an all year maximum allowable weight road to satisfy the needs of the Container Terminal. Pavement testing should be completed using the DYNAFLECT (Dynamic Deflection Determination System) methodology when pavement and weather conditions permit.

Bridges on the Access Route

The following three wooden bridges have been noted during site visits:

1. Mulgrave, just south of Mill Street (km 6.5) - included on Photo 2.10;
2. Pirate Harbour, just south of Mulgrave (km 9.4) - included on Photo 2.7;
3. Melford, about 0.6 kilometers north of Melford Loop (km 18.3) - included on Photo 2.9.

Since the first bridge is on a road section now designated as a Schedule C road, it is assumed that the bridge structure is suitable for current permitted loadings. While the other two bridges are on road sections that allow B-Train maximum weights and a slightly reduced six-axle tridem weight, it will be necessary to evaluate those bridge structures to determine suitability for the allowable maximum weights on a Schedule C road.

Historical Traffic Volumes and Growth Trends

NSTIR has obtained traffic count data on the Canso Causeway and at two locations on Route 344 for over thirty years. Annual volumes for the three locations have been tabulated (Tables B-1 to B-3, Appendix B) and regression analyses of volume growth trends have been completed (Figures B-1 to B-3). Estimated 2008 Annual Average Daily Traffic (AADT) volumes, growth rates, and projected 2011 and 2021 AADT volumes are included in Table 2.5. While volume on Highway 104 is high, existing and projected volumes on Route 344 are low between Highway 104 and Mulgrave, and very low south of Melford.

For this Study, the 2008, 2011 and 2021 AADT volumes for Route 344 from Highway 104 through Mulgrave to Pirate Harbour will be assumed to be the same as the volumes between Highway 104 and Mulgrave. Since the other Route 344 count location is south of Melford, and since there is some scattered residential development between Mulgrave and Melford, the 2008, 2011 and 2021 AADT volumes between Mulgrave and Melford will be assumed to be 125% of the indicated volumes south of Melford.

Table 2.5 - Volume Growth Trends on Highway 104 and Route 344

Location	Table / Figure [1]	Annual Growth Rate (vpd/year)	Estimated 2008 AADT	Annual % Growth	Projected AADT Volumes [2]	
					2011	2021
Highway 104 - Canso Causeway	B-1	140	8000	1.7	8400	9800
Route 344 - Highway 104 to Mulgrave	B-2	35	2100	1.7	2200	2550
Route 344 - South of Melford	B-3	3	440	0.7	450	480
AADT Volumes used in the Traffic Impact Study						
Route 344 - Highway 104 to Pirate Harbour [3]			2100		2200	2550
Route 344 - Mulgrave to Melford [4]			550		565	600

NOTES:
1. Complete volume and regression details are available in Appendix B, Tables and Figures B-1 to B-3.
2. Projected 2011 and 2021 AADT volumes are based on estimated 2008 AADT with addition of the appropriate Annual Growth Rate of vpd/year.
3. Volumes from Highway 104 through Mulgrave to Pirate Harbour are assumed to be the same as the volumes between Highway 104 and Mulgrave.
4. Volumes between Mulgrave and Melford are assumed to be 125% of the indicated volumes south of Melford

Determination of 2008 Design Hourly Volumes (DHVs)

Tabulated hourly volumes for machine traffic counts obtained by NSTIR at two locations on Route 344 route during 2002 and 2005 are tabulated in Tables B-4 to B-7, Appendix B. Average weekday hourly volumes for each location are also illustrated diagrammatically in Figures B-4 and B-5.

The 2005 AM peak hourly volumes have been increased by 10%, and PM peak hour volumes have been increased by 20%, to provide estimates of 2005 AM and PM Design Hourly Volumes (DHVs). Estimated 2005 DHVs for the road section between Highway 104 and Melford have been increased by 1.7% annual volume growth rate, and those for the road section south of Melford have been increased by 0.7% annual volume growth rate, to provide estimated 2008, 2011 and 2021 DHVs. Traffic volume data, including estimated 2008 AM and PM DHVs, are summarized in Table 2.6.

The volumes for the section of Route 344 between Highway 104 and Mulgrave have been assumed to be representative of the volumes though Mulgrave to Pirate Harbour. Volumes for the section Route 344 between Pirate Harbour and Melford have been assumed to be 125% of the projected volumes south of Melford. Projected DHVs for these sections of Route 344 are included in Table 2.6. Projected background volumes on Route 344 are low between Highway 104 and Pirate Harbour, and very low between Pirate Harbour and Melford.

Table 2.6 - Summary of Machine Traffic Count Data

Count Location	2005 Count Dates	Table	2005 Weekday Volume	2005 DHVs [1]		2008 DHVs [2]		2011 DHVs [2]		2021 DHVs [2]	
				AM	PM	AM	PM	AM	PM	AM	PM
Highway 104 to Mulgrave	May	B-5	2,260	190	215	200	225	210	235	240	275
South of Melford	May	B-7	310	20	30	20	30	20	30	25	35
Highway 104 to Pirate Harbour [3]				190	215	200	225	210	235	240	275
Mulgrave to Melford [4]				25	40	25	40	25	40	30	45

Notes:
1. 2005 AM peak hourly volumes from Appendix B tabulated data have been increased by 10%, and PM peak hour volumes have been increased by 20%, to provide estimates of 2005 AM and PM Design Hourly Volumes (DHVs).
2. Estimated 2005 DHVs for the road section between Highway 104 and Melford have been increased by 1.7% annual volume growth rate, and those for the road section south of Melford have been increased by 0.7% annual volume growth rate, to provide estimated 2008, 2011 and 2021 DHVs.
3. Volumes for the section of Route 344 between Highway 104 and Mulgrave have been assumed to be representative of the volumes though Mulgrave to Pirate Harbour.
4. Volumes for the section Route 344 between Pirate Harbour and Melford have been assumed to be 125% of the projected volumes south of Melford.

Turning Movement Volumes - Intersection Highway 104 and Route 344

A manual turning movement count was completed at the Highway 104 / Route 344 intersection in Aulds Cove during AM, Noon, and PM peak travel periods on Thursday, January 31, 2008. Counted volumes are tabulated in Table B-8, Appendix B, and the AM and PM peak hour volumes are shown diagrammatically in Figure B-6, Boxes A and B. Review of available hourly data from the Canso Causeway permanent count location just east of the intersection indicate that the manual count volumes are typical of those for other Thursdays in January and February when road and weather conditions are clear.

Review of hourly volumes for the Canso Causeway for Thursdays and Fridays during July and August 2007 indicate that AM peak hour volumes do not vary significantly from winter to summer peak periods, however, the summer PM peak hour volumes are significantly higher than winter volumes. The 2008 two-way AM DHV east of the Highway 104 / Route 344 intersection has been estimated to be 450 vph, compared to the counted volume of 435 vph (Figure B-6, Box A), and the 2008 PM DHV has been estimated to be 1000 vph, compared to the counted volume of 595 vph (Figure B-6, Box B). Estimated 2008 DHV volumes at the Highway 104 / Route 344 intersection are shown diagrammatically in Figure B-6, Boxes C and D. Projected 2010, 2011, and 2021 DHV volumes, based on 1.7% annual growth in background traffic volumes, are shown in Figures B-7 to B-9, Boxes A and B, respectively.

Roadside Development - Number of Driveways

Roadside residential driveway development throughout the approximately 19 kilometer section of Route 344 from Highway 104 to Melford Loop, with the exception of the developed area of Mulgrave, was observed during a site visit in March 2008. The numbers of driveways per kilometer are included in Table C-2, Appendix C. The locations of one kilometer

roadside study sections along the access route can be approximated by referring to the one kilometer sections marked on Figures 2.2 and 2.3. Roadside development information, summarized in Table 2.7, indicates that roadside development is very light for areas north and south of the Town of Mulgrave.

Table 2.7 - Summary of Roadside Development Information

Road Section	Length, km	Average Number of Driveways / km		
		West Side	East Side	Both Sides
Highway 104 to beginning of Mulgrave developed area	5.0	1.0	1.2	2.2
Developed area of Town of Mulgrave	4.0	Residential and commercial development; mostly on the west side of Route 344		
Mulgrave to Melford Loop	9.9	3.4	2.3	5.7
NOTE: Driveway density by kilometre is shown in detail in Tables C-1 to C-3, Appendix C.				

Summary - Collision History (2001 to 2006)

NSTIR maintains a collision data base of all reported motor vehicle collisions in the Province. Collision data for the six year period from 2001 to 2006 for the Highway 104 / Route 344 intersection in Aulds Cove and for Route 344 from Highway 104 to Melford Loop were obtained and have been evaluated for the following four areas:

1. Highway 104 / Route 344 intersection
2. Route 344 - Highway 104 to the developed area for Mulgrave
3. Route 344 - Mulgrave developed area
4. Route 344 - Mulgrave to Melford Loop

The Highway 104 / Route 344 intersection had two reported property damage only collisions, one each in 2001 and 2003. One collision involved a vehicle pulling onto Highway 104 from the STOP sign that was struck by a vehicle on Highway 104, and the other collision involved a vehicle turning left from Route 344 in collision with a vehicle turning left from Highway 104. While traffic volumes on Highway 104 are high, the collision record does not suggest any existing safety problems on Highway 104 at the Route 344 intersection.

Collision records for the three areas on Route 344 between Highway 104 and Melford Loop are tabulated in Table 2.8. Collision rates, based on the number of collisions per hundred million vehicle kilometers (HMVK), have been calculated and are included in Table 2.8. The overall collision rate for the 18.9 kilometer section of collector road for the six years 2001 to 2006 was 50.8 collisions per HMVK. The Route 344 collision rate compares favorably to the overall provincial rate of 83.0 collisions per HMVK for all collector road sections in the Province.

Review of individual collision records for the 14 reported collisions on the five kilometer section of Route 344 from Highway 104 to the beginning of the developed area of Mulgrave indicated that three collisions occurred at the turn at the railroad crossing immediately south of Highway 104. Improved warning signs and a reduced speed zone on the northbound approach to the turn, recommended in a previous section of this Report, should improve the safety at the turn. Other collisions on this section of road included animals (2),weather (6), inattention (2) and vehicle malfunction (1).

Table 2.8 - Collision Statistics for Route 344 - Highway 104 to Melford Loop

Year	AADT	HMVK[1]	Number of Collisions by Severity				Collision Rates [2]			
			PDO	Injury	Fatal	Total	PDO	Injury	Fatal	Total
Highway 104 Aulds Cove to Developed Section of Mulgrave just North of Hattie Street (4.0 km)										
2001	1800	0.0263	2	0	0	2	76.0	0.0	0.0	76.0
2002	1800	0.0263	2	0	0	2	76.0	0.0	0.0	76.0
2003	1860	0.0272	3	0	0	3	110.3	0.0	0.0	110.3
2004	1900	0.0278	0	0	0	0	0.0	0.0	0.0	0.0
2005	1990	0.0291	1	1	0	2	34.4	34.4	0.0	68.7
2006	2025	0.0296	1	4	0	5	33.8	135.1	0.0	168.9
Collision Totals and Five Year Average Collision Rates		0.1663	9	5	0	14	54.1	30.1	0.0	84.2
Developed section of Mulgrave south to Pirate Harbour (5.0 km)										
2001	1800	0.0329	0	1	0	1	0.0	30.4	0.0	30.4
2002	1800	0.0329	2	1	0	3	60.8	30.4	0.0	91.2
2003	1860	0.0339	1	0	0	1	29.5	0.0	0.0	29.5
2004	1900	0.0348	1	0	0	1	28.7	0.0	0.0	28.7
2005	1990	0.0363	1	0	0	1	27.5	0.0	0.0	27.5
2006	2025	0.0370	0	1	0	1	0.0	27.0	0.0	27.0
Collision Totals and Five Year Average Collision Rates		0.2078	5	3	0	8	24.1	14.4	0.0	38.5
Mulgrave to Melford Loop (9.9 km)										
2001	510	0.0184	2	0	0	2	108.7	0.0	0.0	108.7
2002	550	0.0199	1	0	0	1	50.3	0.0	0.0	50.3
2003	550	0.0199	0	0	0	0	0.0	0.0	0.0	0.0
2004	550	0.0199	0	0	0	0	0.0	0.0	0.0	0.0
2005	550	0.0199	0	0	0	0	0.0	0.0	0.0	0.0
2006	550	0.0199	0	0	0	0	0.0	0.0	0.0	0.0
Collision Totals and Five Year Average Collision Rates		0.1179	3	0	0	3	25.4	0.0	0.0	25.4
Six Year Average Collision Rates for the three Collector Highway Sections [4]							**34.6**	**16.3**	**0.0**	**50.8**

NOTES:
1. HMVK means 'Hundred Million Vehicle Kilometrer'
2. Collision rates are 'Number of collisions per HMVK of vehicle travel.
3. These are the average collision rates for the entire 18.9 km section of Route 344 in the Study Area.

Summary - Collision History (Continued)

One of the eight reported collision in the developed area of Mulgrave was a property damage only collision at the Main Street (Route 344) / Hattie Street intersection. The other seven collisions occurred at various locatios on Main Street. Contributing factors for the collisions included inattention (6), weather (10), and animal (1).

The three reported collisions on Route 344 between Mulgrave and Melford Loop all involved collisions with deer.

Conclusions - Collision Review

1. While traffic volumes on Highway 104 are high, the collision record (two property damage only collision in six years) does not suggest any existing safety problems on Highway 104 at the Route 344 intersection.

2. The overall collision rate for the 18.9 kilometer section of Route 344 from Highway 104 to Melford Loop for the six years 2001 to 2006 was 50.8 collisions per HMVK, which compares favorably to the overall provincial rate of 83.0 collisions per HMVK for all collector road sections in the Province. There is no indication of abnormal collision experience for the Study Area sections of Route 344.

3. The turn on Route 344 at the railroad crossing immediately south of Highway 104 was the only location of note in the collision review. Improved warning signs and a reduced speed zone on the northbound approach to the turn, recommended in a previous section of this Report, should improve the safety at the turn.

Railroad Crossing Warning Devices

The requirements for warning devices at the railroad crossing on Route 344 immediately south of Highway 104 have been reviewed. There are currently four train movements per day on the railroad and the estimated AADT volume on Route 344 is 2100 vehicles per day. The rail crossing is protected by signs and warning devices, including lights and bells.

Railway crossing signing details on the approaches to railroad crossings, and the requirement to install a grade crossing warning system, are included in *RTD 10, Road / Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements* published by the Rail Safety Directorate, Transport Canada. *Section 11.1* indicates that a grade crossing warning system is required if the cross-product of train movements and road vehicle annual average daily traffic (AADT) volumes is 1000. *Section 12.1* indicates that the warning system shall include gates if the cross-product is 50,000 or more.

Since the cross-product at the crossing for 2008 is estimated to be 8400, the existing warning devices satisfy the RTD 10 requirements. Gates will not be required until there is a significant increase in traffic volumes.

3.0 Trip Generation, Trip Distribution and Assignment

Construction will Begin during 2008 and Extend to the End of 2010

Site development is expected to start during the summer of 2008 and the estimated construction period for all aspects of the project is 625 days, or 2.5 years using a five day work week. Construction is expected to be completed by the end of 2010 so that the terminal will become operational in early 2011.

Estimates of Construction Related Employee Trips

Site development is expected to be accomplished with 35 pieces of materials moving equipment working two shifts per day. In addition to equipment operators, there will be engineers and testing and inspection personnel. It is estimated that there will be about 40 vehicles per shift so that there will be 40 vehicles entering the site and 40 vehicles exiting the site during each shift change. Since entering and exiting trips will probably be spread over a two hour period, peak hour site development construction generated trips have been assumed to occur 75% during a peak hour with 30 vehicles entering and 30 vehicles exiting the site during AM and PM peak hours.

It is estimated that the construction of the terminal will require about 70 workers, including the following:

- 15 for building construction
- 10 ironworkers
- 10 concrete crew
- 10 paving crew
- 10 electricians
- 5 inspectors
- 10 miscellaneous technicians and commissioning personnel.

Since all workers will probable not be on site at the same time, it is assumed that about 35 vehicles will enter the site during the AM peak hour and 35 vehicles will exit from the site during the PM peak hour.

The 'worst case' employee movement for site development and terminal construction workers includes the following:

- AM peak hour - 65 vehicles enter and 30 vehicles exit the site
- PM peak hour - 30 vehicles enter and 65 vehicles exit the site.

Distribution of Construction Employee Trips

After a study of the local road network and locations of communities in the Antigonish - Port Hawkesbury - Mulgrave - Guysborough areas, the following trip distribution has been assumed for construction employee trips:

- 20% - south on Route 344 towards Guysborough;
- 20% - Mulgrave area;
- 30% - West on Highway 104 towards Antigonish; and
- 30% - East on Highway 104 towards Cape Breton Island.

Transportation of Construction Materials

Although wharf face cribs, some construction materials, and the cranes will arrive by water, significant construction materials will also be transported by truck. It is estimated that the following 12,565 loads of construction materials will arrive by truck:

- Rebar for reinforced concrete - 350 truck loads;
- Concrete for deck - 4800 truck loads;
- Concrete for copewall and gradebeams - 1200 truck loads;
- Asphalt - 6000 truck loads;
- Miscellaneous building material - 150 truck loads; and
- Mobile and fixed equipment.

If construction materials arrive throughout the entire 625 day construction period, there would be an average of about 20 trucks entering and 20 trucks leaving the site each work day. Since there will be bulking up of deliveries during some construction phases, it has been assumed that the 'design day' will include 40 trucks entering and 40 trucks leaving the site. If 10% of these truck trips occur during peak hours, there will be four trucks entering and 4 trucks leaving the site during AM and PM peak hours.

All truck trips are assumed to use Route 344 between Highway 104 and the Site, with 50% from Highway 104 west and 50% from Highway 104 east.

Projected DHVs that Include Construction Trips

Construction generated trips, distributed to access route road sections based on the assumed trip distributions discussed above, have been added to projected 2010 background DHVs to provide estimated 2010 DHVs that include site generated construction trips which are shown in Table 3.1.

Construction trips assigned to the Highway 104 / Route 344 intersection are shown diagrammatically in Figure B-7, Boxes C and D. Construction trips have been added to the projected 2010 DHVs for the intersection (Figure B-7, Boxes A and B) to provided estimated 2010 DHVs that include construction generated trips shown in Figure 7, Boxes E and F.

Table 3.1 - Estimated 2010 Two-Way Design Hourly Volumes during the Construction Phase

Count Location	Background 2010 DHVs [1]		Construction Vehicle Trips [2]		Estimated 2010 DHVs with Construction Trips	
	AM	PM	AM	PM	AM	PM
Route 344 - Highway 104 to Pirate Harbour	210	235	65	65	275	300
Route 344 - Pirate Harbour to Melford	25	40	84	84	109	124
Route 344 - south of Melford	20	30	19	19	39	49

Notes:
1. 2011 DHVs from Table 2.6 have been used as 2010 DHVs.
2. Construction generated trips have been distributed to road sections based on the trip distribution assumptions included above. Volumes included in this table are two-way hourly volumes for a peak hour during a shift change. Since entering and exiting employee trips will probably be spread over a two hour period, peak hour construction generated trips have been assumed to be 75% of the total two-way volumes generated by a shift change.

Impacts of Construction Generated Trips on Performance of Route 344

Since estimated 2010 AM and PM peak hour volumes on Route 344 that include construction generated traffic (Table 3.1) are low, it is expected that the Route 344 sections will provide satisfactory performance while accommodating traffic generated by construction of the Container Terminal from 2008 to 2010.

The level of performance of the Highway 104 / Route 344 intersection has been evaluated for estimated 2010 DHVs that include construction generated trips using Synchro 6.0. Evaluation results are included in Appendix D and are summarized in Section 4.2.

Estimation of Passenger Vehicle Trips Generated by Operation of the Container Terminal

The Melford Container Terminal is expected to begin operation by early 2011 with about three vessels per week. Initially the terminal is expected to operate 24 hours per day with two shifts of about 62 employees each working from 7:00 AM to 7:00 PM and 7:00 PM to 7:00 AM. After five years of operation (2016), there are expected to be about five vessels per week, served by about 125 employees per shift.

The logistics park is expected to start with 150 employees working two shifts per day with about 75 employees per shift. Staffing requirements are expected to increase to about 300 employees after five years of operation (2016), working two shifts per day with 150 employees per shift.

The employee movements for the Container Terminal and Logistics Park will include about 137 employees arriving and 137 employees leaving the site during AM and PM peak travel periods in 2011. By 2016, employee movements are expected to increase to about 275 employees arriving and 275 employees leaving the site during peak periods.

Assuming an average of two people per vehicle, operation employees are expected to generate about 70 entering and 70 exiting vehicles during peak periods in 2011, and about 140 entering and 140 exiting vehicles during peak periods in 2016.

Since entering and exiting trips will probably be spread over a two hour period, peak hour site operation generated trips have been assumed to occur 75% during a peak hour with 53 entering and 53 exiting vehicles during AM and PM peak hours in 2011, and about 105 entering and 105 exiting vehicles during AM and PM peak hours in 2016.

Distribution of Operation Employee Vehicle Trips

Operation employee trips are expected to be distributed throughout the Guysborough, Antigonish and Cape Breton areas, and have been assumed to be distributed in the same manner as construction employee trips.

Estimation of Truck Traffic during Operational Phases

Since about 98% of the containers landed at the terminal will be shipped by rail or water, only limited numbers will be shipped by road. During the

first five years of operation, it is estimated that road transport will include 58 containers leaving the terminal and 58 containers entering the terminal each week. After five years (2016) it is estimated that road transport will increase to 168 containers leaving and 168 containers entering each week. Since the terminal is expected to operate seven days per week, the following daily container movements can be expected:

- 2011 - average 8 to 9 per day each way; assume one leaving and one entering during each AM and PM peak hour;
- 2016 - average 24 per day each way; assume three leaving and three entering during each AM and PM peak hour.

All truck trips are assumed to use Route 344 between the Terminal and Highway 104, with 90% using Highway 104 west and 10% using Highway 104 east.

Projected DHVs that Include Operational Trips

Operation generated trips from the Terminal start-up phase in 2011, distributed to access route road sections based on the assumed trip distributions discussed above, have been added to projected 2011 background volumes to provide estimated 2011 DHVs that include site generated operational trips from the Terminal start-up phase. Terminal operation trips at full build-out have been added to projected 2021 background DHVs to provide estimated 2021 DHVs that include site generated trips five years beyond the time that the Terminal becomes fully operational. Estimated 2011 and 2021 DHVs are shown in Table 3.2.

Table 3.2 - Estimated 2011 Two-Way Design Hourly Volumes during the Operation Phase I

Count Location	Background 2011 DHVs [1]		Operation Vehicle Trips [2]		Estimated 2011 DHVs with Operation Trips [3]	
	AM	PM	AM	PM	AM	PM
Route 344 - Highway 104 to Pirate Harbour	210	235	66	66	276	301
Route 344 - Pirate Harbour to Melford	25	40	87	87	112	127
Route 344 - south of Melford	20	30	21	21	41	51

Estimated 2021 Two-Way Design Hourly Volumes during the Full Build-out Operation

Count Location	Background 2021 DHVs [1]		Operation Vehicle Trips [2]		Estimated 2021 DHVs with Operation Trips [4]	
	AM	PM	AM	PM	AM	PM
Route 344 - Highway 104 to Pirate Harbour	240	275	132	132	372	407
Route 344 - Pirate Harbour to Melford	30	45	174	174	204	219
Route 344 - south of Melford	25	35	42	42	67	77

Notes:
1. Projected 2011 and 2021 background DHVs are from Table 2.6.
2. Operation generated trips have been distributed to road sections based on the trip distribution assumptions included above. Volumes included in this table are two-way hourly volumes for a peak hour during a shift change. Since entering and exiting employee trips will probably be spread over a two hour period, peak hour construction generated trips have been assumed to be 75% of the total two-way volumes generated by a shift change.
3. Estimated two-way volumes during 2011 with Terminal start-up traffic.
4. Estimated two-way volumes during 2021 five years after the Terminal reaches full built-out operation.

Projected DHVs that Include Operational Trips (Continued)

Trips generated by operation of Terminal Phase 1 in 2011 have been assigned to the Highway 104 / Route 344 intersection and are shown diagrammatically in Figure B-8, Boxes C and D. Phase 1 operational trips have been added to the projected 2011 DHVs (Figure B-8, Boxes A and B) to provided estimated 2011 DHVs that include partial terminal operation generated trips which are shown on Figure B-8, Boxes E and F.

Trips generated by operation of Terminal build-out expected in 2016 have been assigned to the Highway 104 / Route 344 intersection and are shown diagrammatically in Figure B-9, Boxes C and D. Build-out operational trips have been added to the projected 2021 DHVs (Figure B-9, Boxes A and B) to provided estimated 2021 DHVs that include terminal generated trips five years after full build-out, shown on Figure B-9, Boxes E and F.

Impacts of Operation Generated Trips on Performance of Route 344

Since estimated 2011 and 2021 AM and PM peak hour volumes on Route 344 that include operation generated traffic (Table 3.2) are low to moderate, it is expected that the Route 344 sections will provide satisfactory performance while accommodating traffic generated by operation of the Container Terminal from 2011 to 2021.

The level of performance of the Highway 104 / Route 344 intersection has been evaluated for estimated 2011 and 2021 DHVs that include operation generated trips using Synchro 6.0. Evaluation results are included in Appendix D and are summarized in Section 4.2.

4.0 Intersection and Railway Crossing Evaluations

4.1 Signal Warrant Analysis

Traffic Signal Warrant Principles

A signal warrant analysis is completed to determine if the installation of traffic signals at an intersection will provide a positive impact on total intersection operation. That is, the benefits in time saved and improved safety that will accrue to vehicles entering from a side street will exceed the impact that signals will have in time lost and potential additional collisions for vehicles approaching the intersection on the main street.

The *Canadian Traffic Signal Warrant Matrix Analysis* (*Transportation Association of Canada (TAC)*, 2005) considers 100 warrant points as an indication that traffic signals will provide a positive impact. Signal warrant analysis uses vehicular and pedestrian volumes, and intersection, roadway and study area characteristics to calculate a warrant point value.

Traffic Signal Warrant Analysis Results

Signal warrant analyses have been completed for Highway 104 / Route 344 intersection in Aulds Cove for scenarios from the 2008 counted volumes on January 31, 2008, to 2021 DHVs that include trips generated by full build-out of the Container Terminal. Signal warrant analysis sheets are included in Tables D-1 to D-6, Appendix D, and analysis results are summarized in Table 4.1.

Table 4.1 - Summary of Signal Warrant Analysis Priority Points

Year and Scenario	Analyses Without Terminal		Analyses with Terminal	
	Priority Points	Warranted?	Priority Points	Warranted?
2008 - January 31, 2008	22	No	-	-
2008 - Estimated DHVs	37	No	-	-
2010 - Terminal Construction Trips	-	-	52	No
2011 - Terminal Phase 1 Operation Trips	-	-	49	No
2021 - Terminal Build-out Trips	57	No	78	No

Conclusions Reached from Signal Warrant Analysis Results

Traffic signals are not warranted for existing volumes at the Highway 104 / Route 344 intersection in Aulds Cove and are not expected to be required by 2021, five years after full build-out of the Container Terminal.

4.2 Level of Service Analysis

Intersection Level of Service Analysis

The level or quality of performance of an intersection in terms of traffic movement is determined by a level of service (LOS) analysis. LOS for intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time.

Table 4.2 - Level of Service (LOS) Criteria

LOS	LOS Description	Two Way Stop Controlled (TWSC) Intersections Control Delay (seconds per vehicle)
A	Very low delay; most vehicles do not stop **(Excellent)**	less than 10.0
B	Higher delay; more vehicles stop **(Very Good)**	between 10.0 and 15.0
C	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping **(Good)**	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop **(Satisfactory)**	between 25.0 and 35.0
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of **acceptable** delay	between 35.0 and 50.0
F	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection **(Unacceptable)**	greater than 50.0

LOS Criteria

LOS criteria (Table 4.2) are stated in terms of average control delay per vehicle which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS 'A' describes an intersection approach with a very low control delay of up to ten seconds per vehicle. On the other hand, LOS 'F' describes an intersection with control delay greater than 50 seconds for STOP control, which is considered unacceptable by most drivers.

LOS Analysis - Years and Development Scenarios

Level of service (LOS) analyses have been completed using *Synchro 6.0.* Analyses results for Highway 104 / Route 344 intersection in Aulds Cove are included in Appendix D and are summarized in Table 4.3. LOS analyses have been completed for AM and PM peak hour volumes for the following scenarios:

1. 2008 - estimated DHVs without Terminal (Figure B-6, Boxes C and D);
2. 2010 - estimated DHVs with Construction Trips (Figure B-7, Boxes E and F);
3. 2011 - estimated DHVs with Phase 1 Operation Trips (Figure B-8, Boxes E and F);
4. 2021 - estimated DHVs without Terminal (Figure B-9, Boxes A and B);
5. 2021 - estimated DHVs with Full Build-out Operation Trips (Figure B-9, Boxes E and F).

Table 4.3 - LOS for Highway 104 / Route 344 Intersection, Aulds Cove					
LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement				Intersection LOS
	EB-TR	WB-L	WB-T	NB-LR	
AM Peak Hour - 2008 Design Hourly Volumes Without Site (Page D-7)					
Delay	0.0	8.1	0.0	11.8	3.0
LOS	A	A	A	B	A
v/c	0.19	0.04	0.08	0.12	-
Queue	0.0	1.1	0.0	3.3	-
AM Peak Hour - 2010 Design Hourly Volumes with Construction Trips (Page D-9)					
Delay	0.0	8.2	0.0	12.8	3.6
LOS	A	A	A	B	A
v/c	0.22	0.07	0.08	0.17	-
Queue	0.0	1.7	0.0	4.9	-
AM Peak Hour - 2011 Design Hourly Volumes with Phase 1 Operation Trips (Page D-11)					
Delay	0.0	8.2	0.0	12.9	3.9
LOS	A	A	A	B	A
v/c	0.21	0.06	0.08	0.19	-
Queue	0.0	1.6	0.0	5.7	-
AM Peak Hour - 2021 Design Hourly Volumes Without Site (Page D-13)					
Delay	0.0	8.3	0.0	13.2	3.4
LOS	A	A	A	B	A
v/c	0.24	0.06	0.09	0.17	-
Queue	0.0	1.4	0.0	5.0	-
AM Peak Hour - 2021 Design Hourly Volumes with Full Build-out Operation Trips (Page D-15)					
Delay	0.0	8.5	0.0	14.7	4.7
LOS	A	A	A	B	A
v/c	0.26	0.09	0.09	0.39	-
Queue	0.0	2.5	0.0	14.8	-
PM Peak Hour - 2008 Design Hourly Volumes Without Site (Page D-8)					
Delay	0.0	8.5	0.0	14.8	2.2
LOS	A	A	A	B	A
v/c	0.28	0.06	0.29	0.17	-
Queue	0.0	1.5	0.0	4.9	-
PM Peak Hour - 2010 Design Hourly Volumes with Construction Trips (Page D-10)					
Delay	0.0	8.7	0.0	17.5	3.1
LOS	A	A	A	C	A
v/c	0.29	0.07	0.30	0.27	-
Queue	0.0	1.9	0.0	8.6	-
PM Peak Hour - 2011 Design Hourly Volumes with Phase 1 Operation Trips (Page D-12)					
Delay	0.0	8.7	0.0	17.7	3.0
LOS	A	A	A	C	A
v/c	0.30	0.08	0.30	0.26	-
Queue	0.0	2.2	0.0	8.2	-
PM Peak Hour - 2021 Design Hourly Volumes Without Site (Page D-14)					
Delay	0.0	8.9	0.0	18.5	2.6
LOS	A	A	A	C	A
v/c	0.34	0.08	0.35	0.24	-
Queue	0.0	2.1	0.0	7.3	-
PM Peak Hour - 2021 Design Hourly Volumes with Full Build-out Operation Trips (Page D-16)					
Delay	0.0	9.2	0.0	32.5	5.6
LOS	A	A	A	D	A
v/c	0.36	0.12	0.35	0.66	-
Queue	0.0	3.3	0.0	35.7	-

Summary Level of Service Analysis Highway 104 / Route 344 Intersection

- Container Terminal construction and Phase 1 operation generated trips will not have any significant affect on the performance of the Highway 104 / Route 344 intersection. The intersection will provide satisfactory performance for all 2008 to 2011 volume scenarios that include normal background growth and site generated trips.
- The intersection will provide satisfactory performance during 2021 with addition of trips generated by full build-out of the Container Port. While the intersection will operate with LOS 'A', the northbound approach from Route 344 is projected to have an average delay of 32.5 seconds per vehicle (LOS 'D') with a 95% queue of 35.7 meters.

4.3 Evaluation of Rail Crossing Protection

Evaluation of Rail Crossing Protection Required for 2008

The requirements for warning devices at the railroad crossing on Route 344 immediately south of Highway 104 were reviewed in Section 2.0, Page 19, in relation to the requirements of *RTD 10, Road / Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements* published by the Rail Safety Directorate, Transport Canada. The existing warning system of lights and bells satisfies the requirement for the 2008 cross-product of 8400 produced by the road volume of 2100 vpd and four train movements per day on the Cape Breton & Central Nova Scotia Railway.

Evaluation of Rail Crossing Protection Required for 2021

The Route 344 AADT background volume at the railroad crossing is projected to increase to about 2550 vpd based on an annual growth rate of 35 vpd/year (Figure B-2). With addition of about 1300 vpd of site generated trips from full build-out of the Container Terminal, the projected 2021 AADT will increase to about 3850 vpd.

If train volumes continue to include four train movements per day, the 2021 cross-product would be 15,400. Since this is considerably lower than the 50,000 cross-product required by *RTD 10 - Section 12.1* to warrant crossing gates, gates are not expected to be required by 2021 unless there is a significant increase in rail movements at the Route 344 grade crossing.

5.0 Summary, Recommendations, and Conclusions

Description of the Proposed Project

1. *Melford International Terminal Inc.* propose construction of a container terminal and logistics park at Melford, Guysborough County. The project is planned as a transshipment terminal with approximately 98% of the landed containers being transported by rail or short sea shipping. The terminal and logistics park will initially occupy about 350 acres of the approximately 14,500 acres of the Melford Industrial Land Reserve which is administered jointly by the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) and Nova Scotia Business Inc. Construction start is planned for the summer of 2008, with the Container Terminal being operational in 2011.

Identification of Proposed Access Route

2. The access route for the Melford Terminal includes approximately nineteen kilometres of Route 344 starting at Highway 104 in Aulds Cove and extending southerly through the Town of Mulgrave to the north end of the Melford Loop road. With appropriate upgrades to pavement and bridges, Route 344 will be used to serve the Container Terminal which will occupy only a small portion of the Melford Industrial Land Reserve.

   A rail line will be constructed to connect the Container Terminal to the Cape Breton & Central Nova Scotia Railway. A new site access route has been planned to connect with Route 344 near the Mulgrave north town limit and extend southerly, closely paralleling the new rail line, to reconnect with Route 344 south of the terminal site in Melford. While the rail connection will be completed to serve the Container Terminal when it becomes operational in 2011, the new road access will not be constructed until warranted by additional development on the Melford Industrial Land Reserve.

Evaluation of Existing and Projected Background Volumes

3. Volumes on Highway 104 at the Route 344 intersection are reasonably high with a 2008 estimated AADT of 8000 vehicles per day (vpd). However, Route 344 volumes are low between Highway 104 and Mulgrave (2008 AADT 2100 vpd) and very low between Mulgrave and Melford (estimated 2008 AADT 550 vpd). While volumes on Highway 104 and the northern section of Route 344 have 1.7% annual growth rates, volumes south of Mulgrave historically increases at only 0.7% per year.

Roadway Cross Section

4. The first 5.5 kilometers of Route 344 southerly from Highway 104 was reconstructed over twenty years ago with 3.7 meter lanes. There is about 1.8 kilometers of urban cross section in the Town of Mulgrave with curb and sidewalk on the west side and gravel shoulders on the east side. The remaining 11.6 kilometers of Route

344 south of the end of sidewalk consists of a typical rural highway with two paved lanes, gravel shoulders, and open ditches Pavement widths are generally about 6.4 meters, with about 1.2 meter wide gravel shoulders.

Posted Speed Limits

5. Site visits to the Route 344 access route indicate that the posted speed limits appear to be suitable for the roadside development. The average speed limit on the 18.9 kilometer access route is 73.8 km/h and includes the following posted speed limits:
   - 90 km/h; for 4.0 km
   - 80 km/h; for 9.2 km
   - 60 km/h; for 1.4 km
   - 50 km/h; for 4.3 km.

Examination of Collision History

6. Examination of the 2001 to 2006 collision history for the Highway 104 / Route 344 intersection, and Route 344 sections from Highway 104 to Melford indicated:
   - While traffic volumes on Highway 104 are high, the collision record (two property damage only collision in six years) does not suggest any existing safety problems on Highway 104 at the Route 344 intersection.
   - The turn on Route 344 immediately south of Highway 104 was the only location of note in the collision review. Recommendations for improved signing and a reduced speed zone on the northbound approach are included below.
   - The overall collision rate for the 18.9 kilometers section of Route 344 from Highway 104 to Melford Loop for the six years 2001 to 2006 was 50.8 collisions per HMVK, which compares favorably to the overall provincial rate of 83.0 collisions per HMVK for all collector road sections in the Province.
   - There is no indication of abnormal collision experience for the Study Area sections of Route 344.

Roadside Development - Number of Driveways

7. Roadside residential driveway development on Route 344 from Highway 104 to Melford Loop, with the exception of the developed area of Mulgrave, was recorded during a site visit. Roadside development is very light for areas north (2.2 driveways/km) and south (5.7 driveways/km) of the Town of Mulgrave.

Examination of Horizontal Alignment

8. With the exception of the curve on Route 344 in the 90 km/h speed zone just south of Highway 104, most curves appear to have appropriate warning signs relative to posted speed limits and reasonable approach speeds. While signs appeared to be in reasonable condition during site visits, signing for all curves should be reviewed each spring to replace warning signs that may have been damaged by snow plows.

Review of Needs for Climbing Lanes

9. The 5.5 kilometer long improved section of Route 344 between Highway 104 and the developed area in Mulgrave has appropriate climbing lanes, including a 1.9 kilometer long southbound lane and a two kilometer long northbound lane. The need for construction of additional climbing lanes on Route 344 between Mulgrave and Melford was considered during site visits. While the route includes sections of rolling terrain, grades are short and are not expected to have a significant effect on truck travel speeds relative to the posted speed limits.

Railroad Crossing Warning Devices

10. The railway grade crossing on Route 344 immediately south of Highway 104 is protected by signs and warning devices, including lights and bells. The requirements for warning devices at the crossing have been reviewed relative to *RTD 10, Road / Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements* published by the Rail Safety Directorate, Transport Canada. The existing warning devices satisfy the requirements of RTD 10 for the existing volumes of four train movements per day and 2100 vpd on Route 344. Gates will not be required unless there is a significant increase in background traffic volumes or rail movements.

Maximum Weight Allowances

11. It was determined that Route 344 is a designated Schedule C route from Highway 104 to the Mulgrave / Pirate Harbour line and a designated B-Train route for the remaining approximately ten kilometers to the Melford Loop. Therefore, project generated construction and operation traffic will be able to use 8-axle B-Train units and 6-axle semi-trailer units within the allowable maximum gross vehicle weights for the designated B-Train routes. Since the road south of Mulgrave is subject to spring weight restrictions, strengthening will be required to provide an all year maximum allowable weight road to satisfy the needs of the Container Terminal.

Bridges on the Access Route

12. Three wooden bridges have been noted during site visits:
    - Mulgrave, just south of Mill Street
    - Pirate Harbour, just south of Mulgrave
    - Melford, about 0.6 kilometers north of Melford Loop.

    Since the first bridge is on a road section now designated as a Schedule C road, it is assumed that the bridge structure is suitable for current permitted loadings. While the other two bridges are on road sections that allow B-Train maximum weights and a slightly reduced six-axle tridem weight, it will be necessary to evaluate those bridge structures to determine suitability for the allowable maximum weights on a Schedule C road.

Estimation of Construction Related Employee Trips

13. The construction period for the Container Terminal is expected to begin during summer 2008 and extend until the end of 2010. The 'worst case' employee movement for site development and terminal construction workers includes the following:
    - AM peak hour - 65 vehicles enter and 30 vehicles exit the site
    - PM peak hour - 30 vehicles enter and 65 vehicles exit the site.

    After a study of the local road network and locations of communities in the Antigonish - Port Hawkesbury - Mulgrave - Guysborough areas, the following trip distribution has been assumed for construction employee trips:
    - 20% - south on Route 344 towards Guysborough;
    - 20% - Mulgrave area;
    - 30% - West on Highway 104 towards Antigonish; and
    - 30% - East on Highway 104 towards Cape Breton Island.

Estimation of Construction Material Transport Trips

14. Although wharf face cribs, some construction materials, and the cranes will arrive by water, it is estimated that 12,565 loads of materials will be required. If materials arrive throughout the entire 625 day construction period, there would be an average of about 20 trucks entering and 20 trucks leaving the site each work day. Since there will be peaking during some construction phases, it has been assumed that the 'design day' will include 40 trucks entering and 40 trucks leaving the site. If 10% of these truck trips occur during peak hours, there will be four trucks entering and 4 trucks leaving the site during AM and PM peak hours. All truck trips are assumed to use Route 344 between Highway 104 and the Site, with 50% from Highway 104 west and 50% from Highway 104 east.

Estimation of Passenger Vehicle Trips Generated by Operation of the Container Terminal

15. The Melford Container Terminal is expected to begin operation by early 2011 with about three vessels per week, increasing to about five vessels per week by 2016. Initially the terminal is expected to operate 24 hours per day with two shifts of about 62 employees each working from 7:00 AM to 7:00 PM and 7:00 PM to 7:00 AM, with 125 emplyees per shift expected by 2016.

    The logistics park is expected to start with 150 employees working two shifts per day with about 75 employees per shift. Staffing requirements are expected to increase to about 300 employees after five years of operation (2016), working two shifts per day with 150 employees per shift.

    Since entering and exiting trips at shift change will probably be spread over a two hour period, peak hour site operation generated trips have been assumed to occur 75% during a peak hour with 53 entering and 53 exiting vehicles during AM and PM peak hours in

2011, and about 105 entering and 105 exiting vehicles during AM and PM peak hours in 2016.

Operation employee trips are expected to be distributed throughout the Guysborough, Antigonish and Cape Breton areas, and have been assumed to be distributed in the same manner as construction employee trips.

Estimation of Truck Traffic during Operational Phases

16. Since about 98% of the containers landed at the terminal will be shipped by rail or water, only limited numbers will be shipped by road. During the first five years of operation, it is estimated that road transport will include 58 containers leaving the terminal and 58 containers entering the terminal each week. After five years (2016) it is estimated that road transport will increase to 168 containers leaving and 168 containers entering each week. Since the terminal is expected to operate seven days per week, the following daily container movements can be expected:
    - 2011 - average 8 to 9 per day each way; assume one leaving and one entering during each AM and PM peak hour;
    - 2016 - average 24 per day each way; assume three leaving and three entering during each AM and PM peak hour.

Evaluation of Impacts of Construction and Operation Phase Vehicle Trips on Route 344

17. Since estimated future peak hour volumes on Route 344 that include construction and operation generated traffic are low to moderate, it is expected that the Route 344 sections will provide satisfactory performance while accommodating traffic generated by construction and operation of the Container Terminal from 2008 to 2021.

Evaluation of Impacts of Construction and Operation Phase Vehicle Trips on the Highway 104 / Route 344 Intersection

18. Signal warrant analysis completed for existing and projected design hourly volumes at the Highway 104 / Route 344 intersection in Aulds Cove indicate that traffic signals are not warranted for existing volumes, and are not expected to be required by 2021, five years after full build-out of the Container Terminal.

    Level of service analysis using Synchro 6.0 indicated that Container Terminal construction and start-up operation generated trips will not have any significant affect on the performance of the Highway 104 / Route 344 intersection. The intersection will provide satisfactory performance for all 2008 to 2011 volume scenarios that include normal background growth and site generated trips. Evaluation of projected volumes for 2021 indicate that the intersection will provide satisfactory performance during 2021, five years after full build-out of the Container Port.

Evaluation of Rail Crossing Protection Required for 2021

19. Route 344 AADT background volume at the railroad crossing is projected to increase to about 2550 vpd by 2012. With addition of about 1300 vpd of site generated trips from full build-out of the Container Terminal, the projected 2021 AADT will increase to about 3850 vpd.

    If train volumes continue to include four train movements per day, the 2021 cross-product of road and train volumes would be 15,400. Since this is considerably lower than the 50,000 cross-product required by *RTD 10 - Section 12.1* to warrant crossing gates, gates are not expected to be required by 2021 unless there is a significant increase in rail movements at the Route 344 grade crossing.

Recommendations Arising from the Traffic Impact Study

20. The following recommendations emanate from the Traffic Impact Study:

    A. Revise turn warning signing on the northbound approach and implement a reduced speed zone at the turn on Route 344 immediately south of Highway 104. It is recommended that the TURN warning sign with 30 km/h advisory tab be relocated southerly to replace an existing SLOW sign, and that Chevrons and a Checkerboard be erected at the curve as supplementary warning devices. Also, since the existing 90 km/h speed limit allows a high speed approach to a low speed turn, it is recommended that a 60 km/h transition speed zone be established beginning south of Lower Quarry Road intersection.

    B. Evaluate pavement strength on Route 344 from Mulgrave to the Terminal site in Melford to determine strengthening requirements to allow designation as a Schedule C all year maximum allowable weight road.

    C. Evaluate strength of structures on Route 344 to determine strengthening requirements to sustain Schedule C loading.

    D. Obtain traffic counts on Route 344 between Highway 104 and the Container Terminal after the Terminal begins operation in 2011, and every two years for ten years.

    E. Obtain traffic counts at the Highway 104 / Route 344 intersection and complete signal warrant analysis in the summer of 2011 after the Container Terminal begins operation, and re-evaluate every two years for ten years.

    F. Evaluate the impacts of Container Terminal generated trips on the level of service and safety of Route 344 within five years after the Terminal begins operation in 2011.

Conclusions of the Traffic Impact Study

21. A. Following completion of any needed pavement and bridge strengthening, it is concluded that existing sections of Route 344 can provide satisfactory levels of performance and safety while accommodating traffic generated by construction and operation of the Container Terminal from 2008 to 2021.

B. A new access road is not expected to be required to serve lands adjacent to the Container Terminal site until there is significant additional development on the remaining almost 14,000 acres of the Melford Industrial Land Reserve.

Appendix A

Project Scoping Document

Atlantic Road & Traffic Management
Traffic Engineering Specialists

PO Box 25205
Halifax, NS B3M 4H4

Phone (902) 443-7747
Fax (902) 443-7747
email traffic@ns.sympatico.ca

November 20, 2007

Mr. Paul Colton, P. Eng. Via Email 'coltonpv@gov.ns.ca '
Area Manager Antigonish
Department of Transportation Infrastructure Renewal
ANTIGONISH NS

Re: Scoping Document for a Traffic Impact Study, Proposed Container Terminal, Melford, Guysborough County 0775

Dear Mr. Colton:

Further to our recent telephone conversation, I am providing this Scoping Document to describe the Traffic Impact Study that we are preparing for the proposed Container Terminal in Melford. The traffic impact study will be completed in accordance with TIR *Guidelines for Completion of Traffic Impact Studies*.

The following methodology will be used to complete the TIS:

1. Project initiation will include [or has included] the following work tasks:
   - Meeting with TPW officials to discuss the Traffic Impact Study. At the request of our client, a meeting was held with Mike Croft to discuss the proposed project and to obtain preliminary TIR concerns. I understand that Mr. Croft has forwarded a copy of a plan showing preliminary routes for road and railroad site accesses.
   - Route 344 historical traffic count data for road sections between the Highway 104 intersection at Aluds Cove and south of Melford. AADT data for the past 30 years will be used to establish the annual volume growth rate for background traffic. Hourly machine count data from 2005 will be used to establish peak hour volumes and estimated design hourly volumes for various road sections.
   - Available collision data for 2001 to 2006 for appropriate sections of Route 344 will be obtained from the TIR collision data base.

2. It is understood that the following areas are of concern to TIR:
   - The intersection of Highway 104 and Route 344
   - The impact that additional traffic will have on the at-grade railroad crossing on Route 344 due to the proximity to the Highway 104 / Route 344 intersection
   - The intersection of the existing Route 344 and the Melford Access Road north of Mulgrave
   - A potential Mulgrave Connector intersection with the Melford Access Road
   - Intersections north and south of the Container Terminal with existing Route 344 and a needed Route 344 realignment through the site
   - The intersection of the Melford Access Road and Route 344 at the Container Terminal

3. The number of passenger vehicle and heavy truck trips that will be generated by the construction and operation phases of the projects will be estimated based on information provided by the developer. Trip generation estimates for the projects will be prepared for weekday daily volumes, as well as for weekday AM and PM peak hourly volumes. Site generated trips for construction and production phases of the projects will be distributed and assigned to the road sections. Site generated construction and operation trips will be added to the projected future horizon year volumes for the Study Area road sections to provide projected future year DHVs that include traffic that will be generated by the proposed development.

4. Study Area intersections will be examined with regards to the following:
   - Stopping sight distances will be measured for existing intersections and will be checked on design drawings, where appropriate
   - Need for left turn and right turn lanes
   - Geometry of intersections with regards to heavy vehicle turning requirements
   - Need for traffic signals
   - Level of service analyses will be completed for design hour volumes and projected horizon year volumes using Synchro 6.0.

5. A Draft Traffic Impact Study Report will be prepared to include review of study methodology, traffic volume growth rates, trip generation for construction and operation of the development, evaluation of intersection design requirements, and evaluation of projected horizon year volumes at Study Area intersections. The Draft Report will be sent to TPW for review and comment prior to printing the Final Report.

If there are questions or you require additional information, please contact me by Email to ***traffic@ns.sympatico.ca*** or telephone (902) 443-7747.

Sincerely:

Ken O'Brien, P. Eng.

cc: Mike Croft, P. Eng., TIR
Steve Williams, P. Eng., Mac Williams Engineering Limited

Appendix B

Traffic Volume Data

Table B-1 - Traffic Growth Trend on Highway 104 - Canso Causeway

Year	AADT	Year	AADT
1970	3800	1990	6110
1971	3810	1991	5980
1972	3920	1992	6190
1973	4300	1993	6610
1974	4290	1994	6820
1976	4310	1995	7270
1977	4390	1996	7180
1978	4540	1997	7780
1979	4590	1998	7990
1980	4530	1999	7670
1981	4580	2000	8100
1982	4330	2001	8290
1983	4490	2002	8100
1984	4710	2003	8900
1985	4690	2004	8300
1986	5410	2005	7610
1987	5500	2007	7880
1988	5830		
1989	6050		

Source: NSTIR
NOTE: The 2003 estimated AADT volume was not used in the analysis

Figure B-1 - Background Volume Growth Trend 1970 to 2021 (Highway 104 - Canso Causeway)

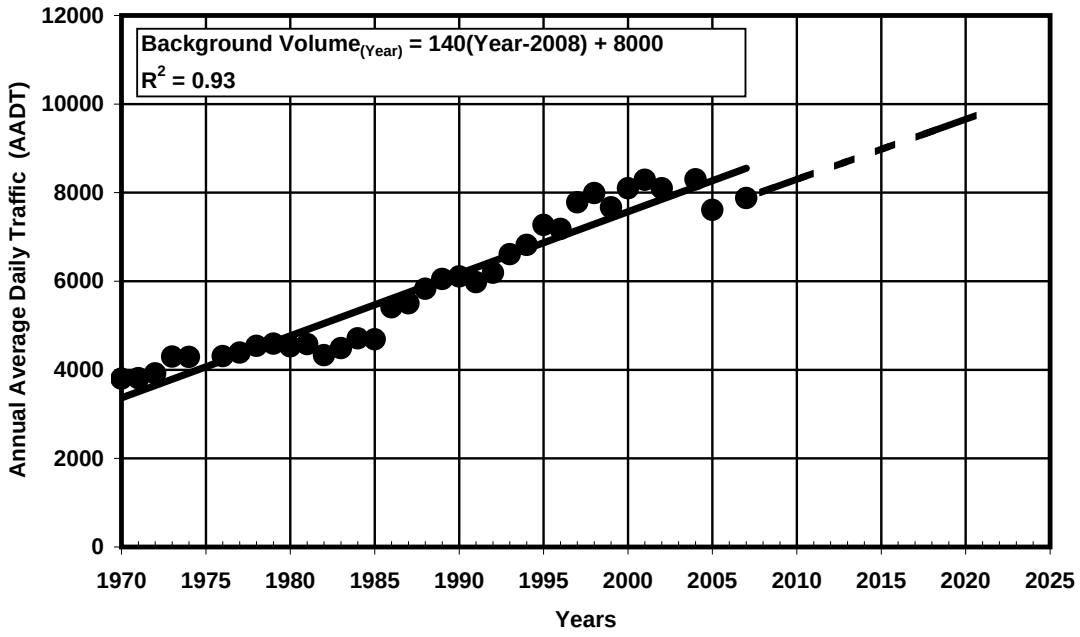


Table B-2 - Traffic Growth Trend on Route 344 - Highway 104 to Mulgrave

Year	AADT
1970	750
1971	790
1973	750
1975	880
1976	1170
1977	1080
1978	1320
1980	1160
1981	1320
1982	1010
1983	1500
1984	2330
1985	1260
1988	1360
1990	1410
1991	1490
1993	1480
1995	1920
1999	3100
2002	1800
2005	1990

Source: NSTIR
NOTE: The 1984 and 1999 estimated AADT volumes were not used in the analysis

Figure B-2 - Background Volume Growth Trend 1970 to 2021
(Route 344 - between Highway 104 and Mulgrave)

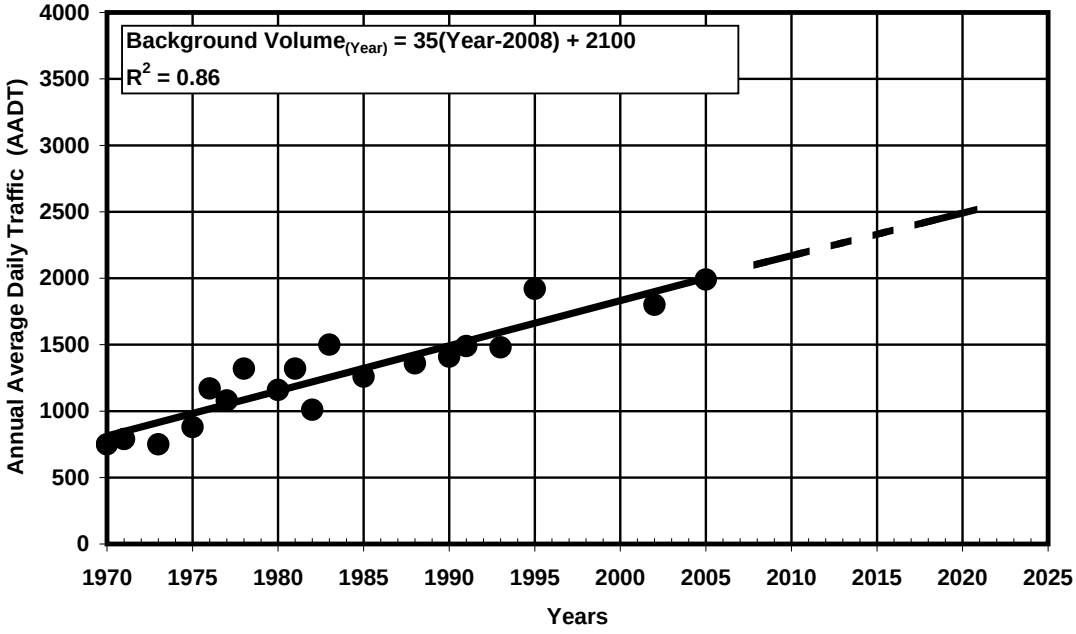


Table B-3 - Traffic Growth Trend on Route 344 - South of Melford

Year	AADT
1971	280
1972	280
1973	320
1975	350
1976	300
1977	300
1978	430
1980	370
1981	390
1982	340
1983	460
1984	440
1985	460
1991	320
1993	300
1995	310
1999	410
2002	440
2005	290

Source: NSTIR
NOTE: The 2005 estimated AADT volume was not used in the analysis

Figure B-3 - Background Volume Growth Trend 1970 to 2021 (Route 344 - South of Melford)

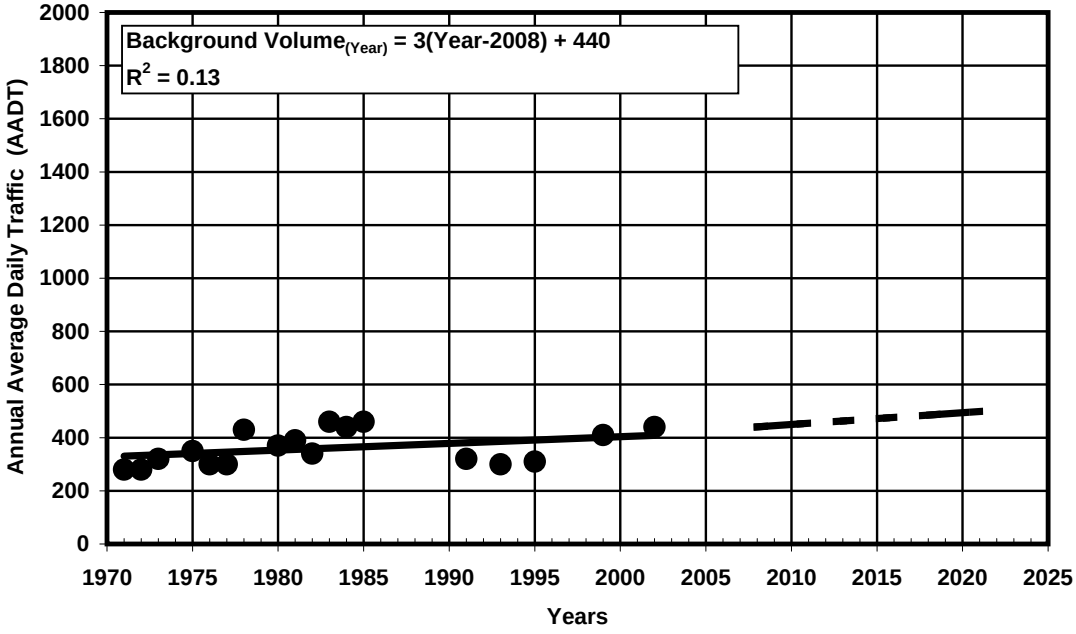


Table B-4 - Two-Way Hourly Volumes - Route 344 - Highway 104 to Mulgrave
(July 8 to 15, 2002)

Hour	Days of the Week							Hourly Average	
	Mon-15/08	Tue-09	Wed-10	Thu-11	Fri-12	Sat-13	Sun-14	Week	Weekday
0									
1	17	9	11	18	15	21	29	17	14
2	5	8	8	6	5	7	25	9	6
3	5	0	5	9	10	7	12	7	6
4	5	6	4	4	3	9	4	5	4
5	3	3	6	5	7	4	4	5	5
6	23	18	19	19	21	11	9	17	20
7	82	99	83	97	98	46	45	79	92
8	162	164	181	163	159	63	36	133	166
9	146	137	121	149	127	131	78	127	136
10	139	120	121	127	128	126	100	123	127
11	157	139	137	171	164	171	89	147	154
12	143	137	149	153	196	206	110	156	156
13	153	148	158	186	176	175	143	163	164
14	185	183	187	180	198	166	154	179	187
15	174	168	180	169	175	176	155	171	173
16	161	163	158	186	145	148	155	159	163
17	186	207	164	213	200	123	173	181	194
18	173	162	200	173	192	138	151	170	180
19	130	143	137	156	162	118	135	140	146
20	138	161	138	149	143	150	92	139	146
21	93	102	98	108	106	109	96	102	101
22	76	63	81	85	99	68	123	85	81
23	60	82	51	65	58	53	69	63	63
24	24	18	20	28	39	31	35	28	26
TOTALS	2440	2440	2417	2619	2626	2257	2022	2405	2510

Source: NSTIR - Estimated 2002 Annual Average Daily Traffic (AADT) volume is 1800 vehicles per day.

Table B-5 - Two-Way Hourly Volumes - Route 344 - Highway 104 to Mulgrave
(May 18 to 25, 2005)

Hour	Days of the Week							Hourly Average	
	Mon-23	Tue-24	Wed-25/18	Thu-19	Fri-20	Sat-21	Sun-22	Week	Weekday
0									
1	10	8	8	7	4	18	21	11	7
2	3	3	2	5	5	14	27	8	4
3	2	3	2	3	5	11	14	6	3
4	5	2	0	4	9	10	6	5	3
5	0	3	2	5	3	5	15	5	3
6	13	25	20	20	22	17	15	19	22
7	64	84	71	67	58	49	43	62	73
8	64	147	142	155	157	77	41	112	150
9	52	178	170	171	170	68	63	125	173
10	91	122	128	125	137	124	87	116	127
11	122	125	121	128	152	187	94	133	130
12	129	133	129	145	130	131	106	129	134
13	136	165	143	157	164	183	99	150	159
14	123	153	131	143	145	174	134	143	145
15	124	167	134	155	174	169	138	152	159
16	142	140	166	133	165	135	122	143	149
17	142	161	176	201	195	129	102	158	179
18	117	139	152	149	191	138	127	145	154
19	125	121	141	151	134	120	119	130	134
20	101	113	99	126	120	135	119	116	114
21	81	90	79	76	102	123	75	89	87
22	52	55	65	77	92	71	60	67	69
23	36	49	44	45	85	64	31	51	54
24	15	27	20	25	23	44	18	25	24
TOTALS	1749	2213	2145	2273	2442	2196	1676	2100	2256

Source: NSTIR - Estimated 2005 Annual Average Daily Traffic (AADT) volume is 2000 vehicles per day.
NOTE: Monday May 23 was Victoria Day; Tuesday volumes have been used twice to calculate weekday hourly volumes.

Figure B-4 - Route 344 - Highway 104 to Mulgrave
Average Weekday Hourly Volumes

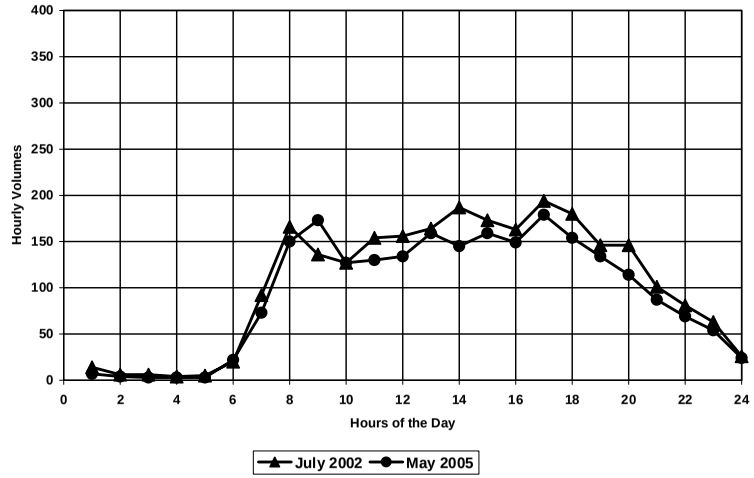


Table B-6 - Two-Way Hourly Volumes - Route 344 - Just South of Melford
(July 8 to 15, 2002)

Hour	Days of the Week							Hourly Average	
	Mon-15/08	Tue-09	Wed-10	Thu-11	Fri-12	Sat-13	Sun-14	Week	Weekday
0									
1	0	1	3	9	1	4	2	3	3
2	0	0	1	1	0	0	9	2	0
3	0	0	0	0	2	0	1	0	0
4	0	3	1	1	1	2	3	2	1
5	4	1	7	3	4	0	0	3	4
6	5	10	3	3	4	1	1	4	5
7	20	15	16	16	19	4	5	14	17
8	29	33	36	36	33	13	6	27	33
9	36	27	32	43	22	13	19	27	32
10	32	34	28	32	31	36	23	31	31
11	36	39	50	43	46	38	37	41	43
12	55	46	28	33	38	55	38	42	40
13	32	31	32	38	34	36	34	34	33
14	41	47	34	40	58	39	51	44	44
15	42	38	45	38	59	47	45	45	44
16	38	35	40	51	45	47	63	46	42
17	51	59	42	51	45	33	43	46	50
18	47	45	53	40	51	33	45	45	47
19	35	43	28	38	31	31	38	35	35
20	27	30	27	29	35	36	29	30	30
21	33	22	28	24	22	36	24	27	26
22	29	22	22	11	11	18	32	21	19
23	15	16	7	11	15	11	22	14	13
24	4	4	4	10	5	7	7	6	5
TOTALS	611	601	567	601	612	540	577	589	597

Source: NSTIR - Estimated 2002 Annual Average Daily Traffic (AADT) volume is 440 vehicles per day.

Table B-7 - Two-Way Hourly Volumes - Route 344 - Just South of Melford
(May 18 to 25, 2005)

Hour	Days of the Week							Hourly Average	
	Mon-23	Tue-24	Wed-25/18	Thu-19	Fri-20	Sat-21	Sun-22	Week	Weekday
0									
1	3	0	0	0	0	7	1	2	0
2	0	0	0	0	0	2	5	1	0
3	0	2	1	0	1	1	0	1	1
4	0	1	1	0	0	1	0	0	1
5	0	0	2	5	1	8	0	2	2
6	1	2	2	3	6	5	2	3	3
7	5	17	11	8	9	4	1	8	12
8	9	21	16	18	20	8	2	13	19
9	9	17	14	19	9	8	4	11	15
10	19	18	23	25	19	5	7	17	21
11	12	19	10	20	16	25	15	17	17
12	17	17	17	24	21	26	22	21	19
13	27	22	20	18	28	27	25	24	22
14	23	21	19	26	26	35	26	25	23
15	25	21	19	25	27	23	28	24	23
16	21	18	24	31	23	23	21	23	23
17	30	21	22	25	19	10	19	21	22
18	21	18	27	21	22	19	27	22	21
19	20	21	22	27	21	20	19	21	22
20	18	12	18	15	11	7	21	15	14
21	6	11	16	8	15	15	12	12	12
22	4	5	10	7	13	7	12	8	8
23	4	7	9	2	7	11	7	7	6
24	2	1	2	1	4	5	3	3	2
TOTALS	276	292	305	328	318	302	279	301	308

Source: NSTIR - Estimated 2005 Annual Average Daily Traffic (AADT) volume is 290 vehicles per day.
NOTE: Monday May 23 was Victoria Day; Tuesday volumes have been used twice to calculate weekday hourly volumes.

Figure B-5 - Route 344 - Highway 104 to Mulgrave
Average Weekday Hourly Volumes

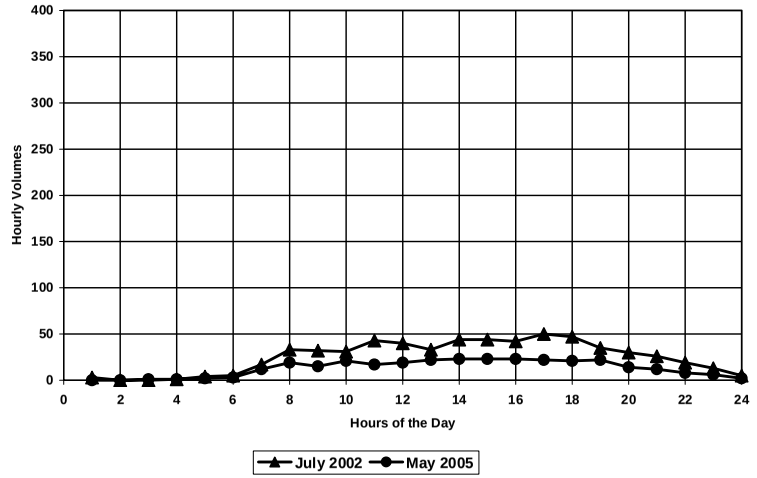
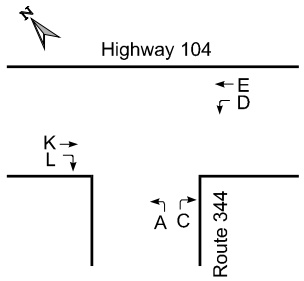


Table B-8

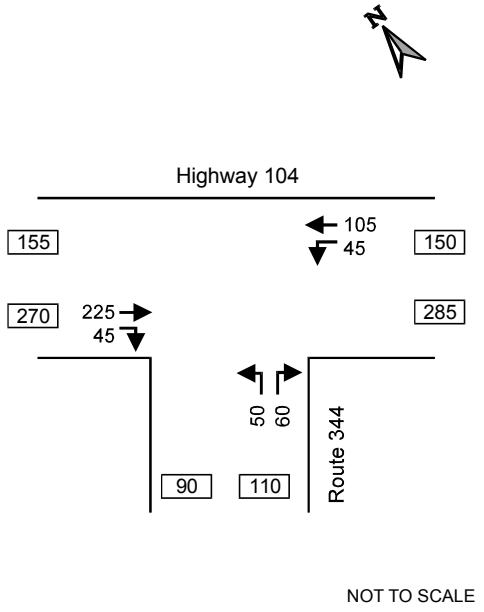
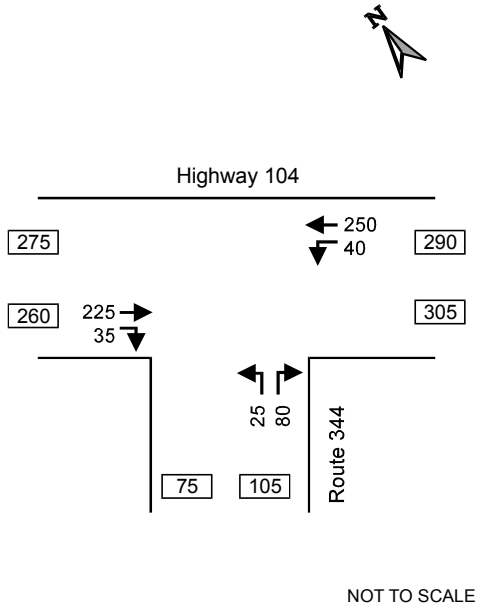
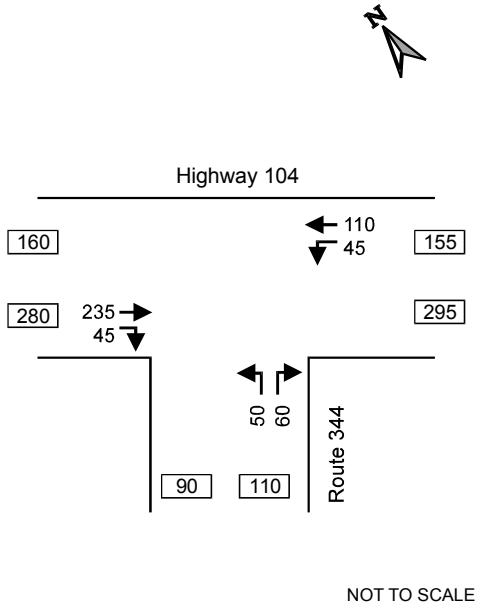
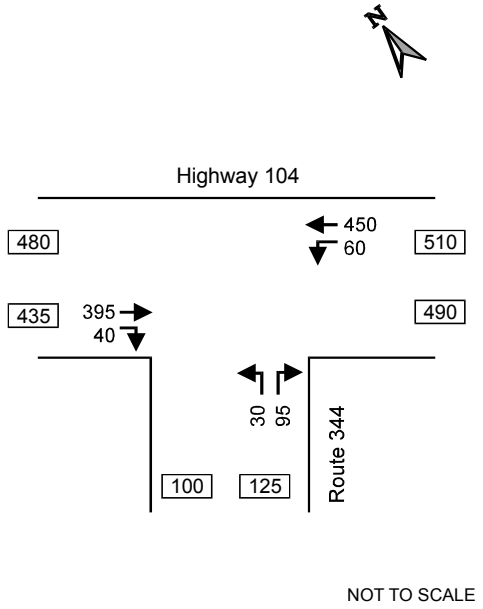
Highway 104 @ Route 344

Aulds Cove, Nova Scotia

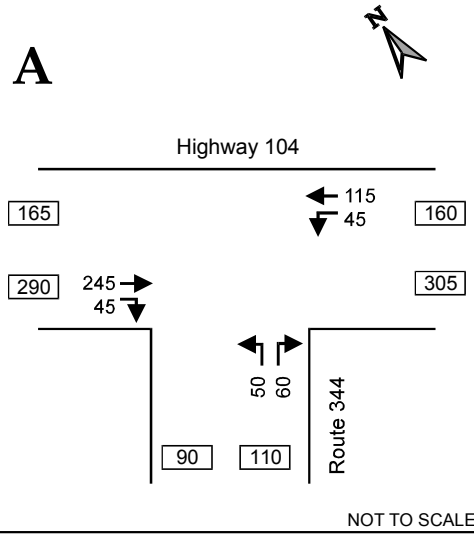
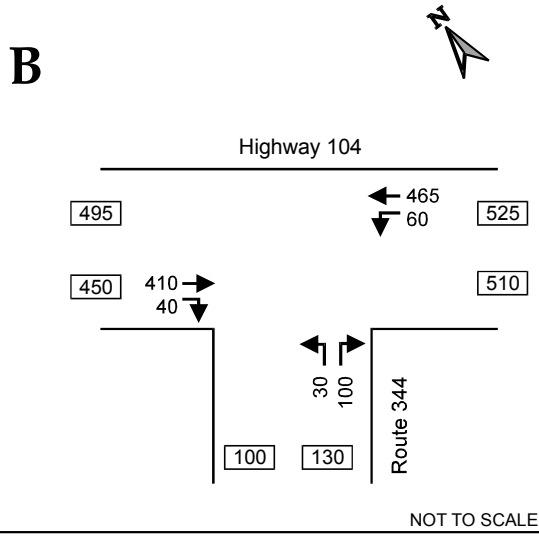
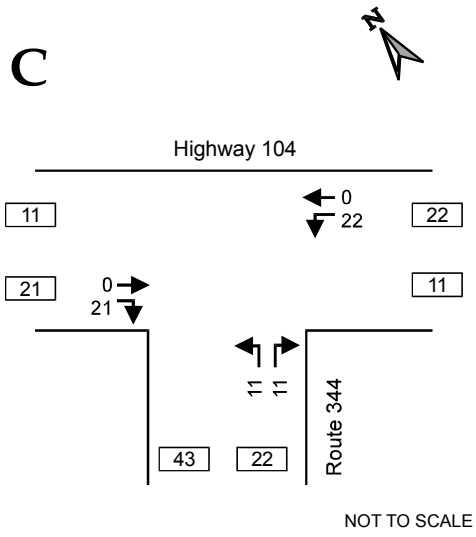
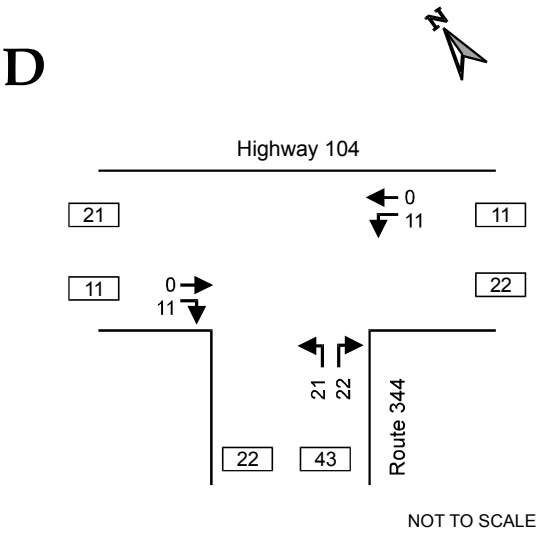
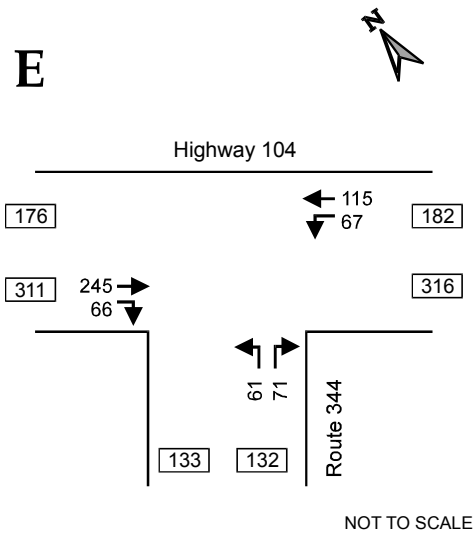
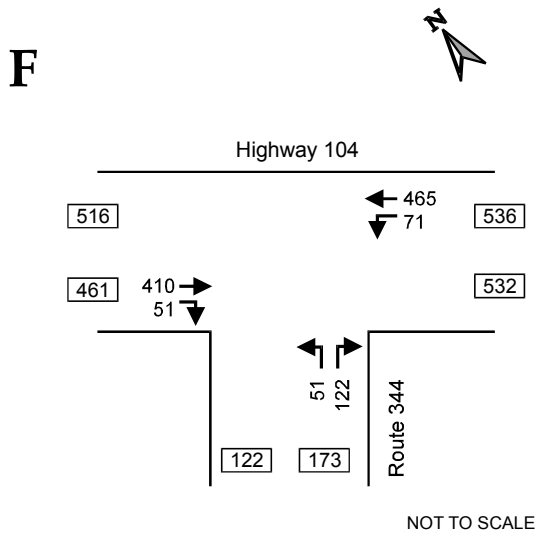
Thursday, January 31, 2008



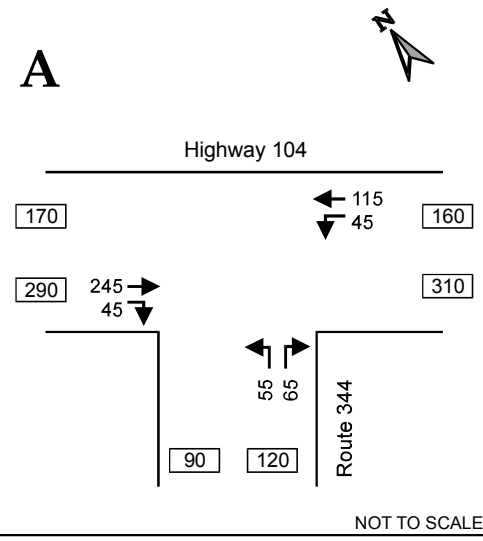
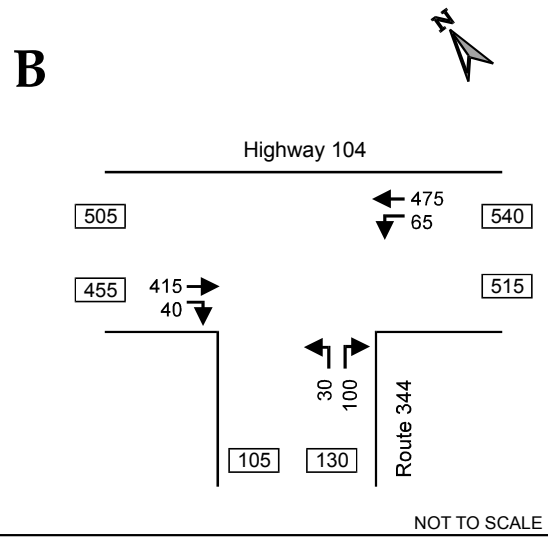
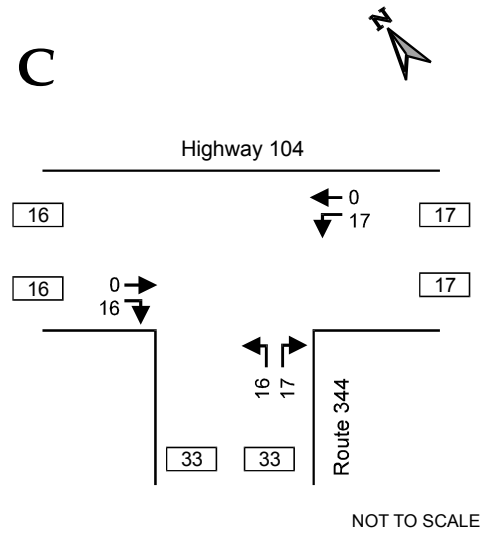
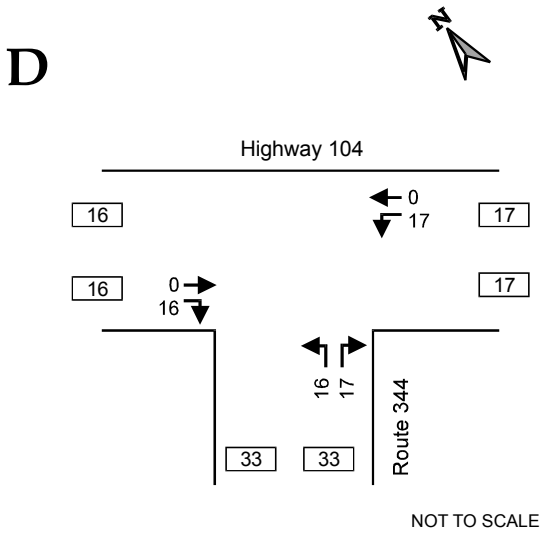
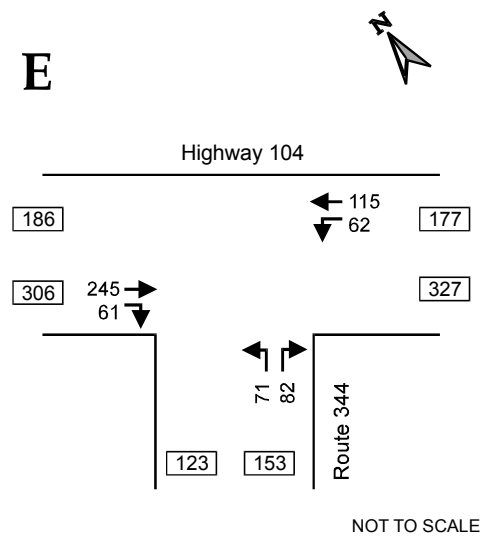
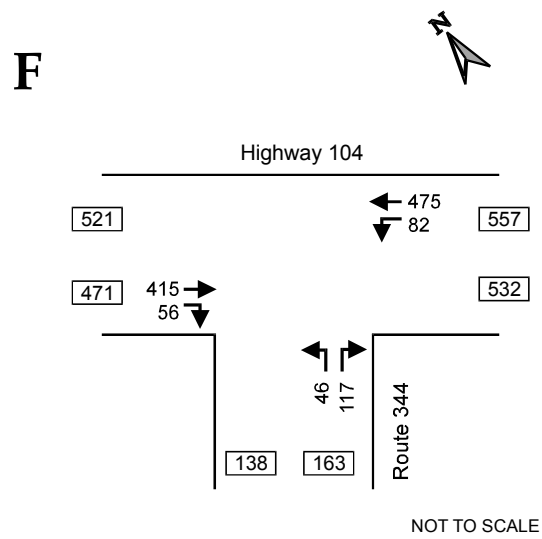
Time	Route 344 Northbound Approach		Highway 104 Westbound Approach		Highway 104 Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
07:00-07:15	24	11	4	21	23	6	89
07:15-07:30	15	13	4	27	50	10	119
07:30-07:45	10	9	14	23	54	9	119
07:45-08:00	16	14	15	24	53	14	136
08:00-08:15	11	23	10	30	66	14	154
08:15-08:30	8	14	5	27	56	8	118
08:30-08:45	7	9	2	38	50	11	117
08:45-09:00	8	5	8	45	36	12	114
07:00 to 08:00	65	47	37	95	180	39	463
08:00 to 09:00	34	51	25	140	208	45	503
AM Peak Hour	52	59	43	104	223	47	528
11:00-11:15	8	9	9	59	37	8	130
11:15-11:30	5	14	16	50	63	8	156
11:30-11:45	9	10	5	49	37	9	119
11:45-12:00	9	16	5	45	49	6	130
12:00-12:15	16	15	12	45	37	7	132
12:15-12:30	6	10	8	69	35	14	142
12:30-12:45	15	9	10	57	51	11	153
12:45-13:00	7	10	11	55	46	11	140
11:00 to 12:00	31	49	35	203	186	31	535
12:00 to 13:00	44	44	41	226	169	43	567
Noon Peak Hour	44	44	41	226	169	43	567
16:00-16:15	4	14	14	67	51	11	161
16:15-16:30	3	19	8	56	61	10	157
16:30-16:45	11	27	8	57	51	6	160
16:45-17:00	8	20	9	71	61	7	176
17:00-17:15	16	13	16	53	42	10	150
17:15-17:30	9	11	18	45	52	8	143
17:30-17:45	9	11	11	46	49	10	136
17:45-18:00	9	5	13	42	51	13	133
16:00 to 17:00	26	80	39	251	224	34	654
17:00 to 18:00	43	40	58	186	194	41	562
PM Peak Hour	26	80	39	251	224	34	654

	AM Peak Hour	PM Peak Hour
Counted Peak Hour Volumes Thursday, January 31, 2008	**A**  NOT TO SCALE	**B**  NOT TO SCALE
2008 DHV's	**C**  NOT TO SCALE	**D**  NOT TO SCALE

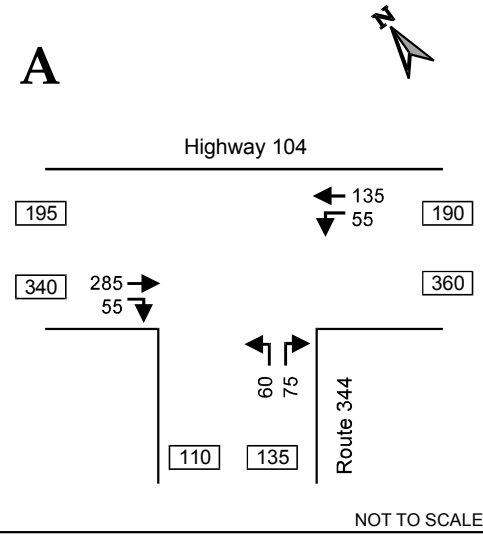
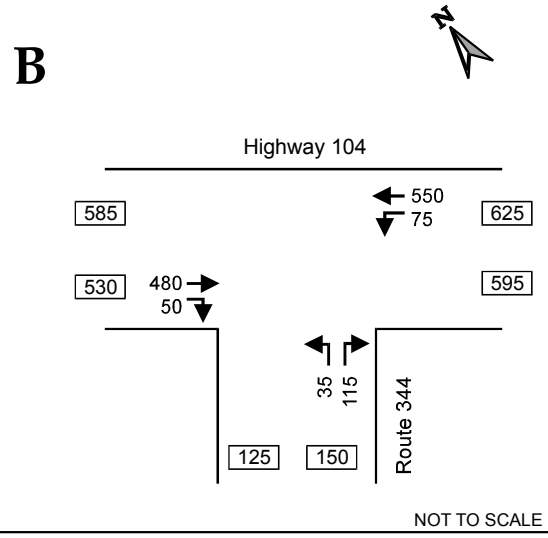
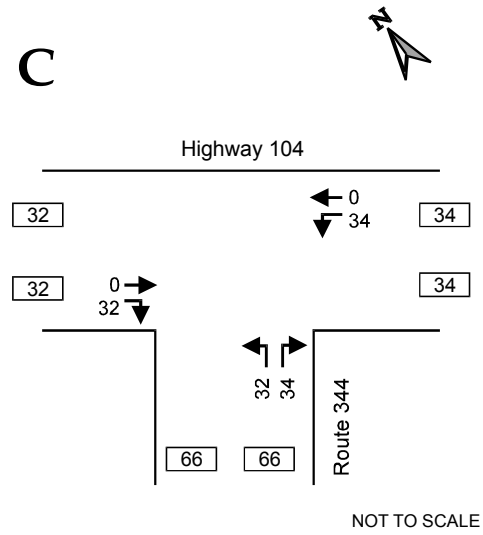
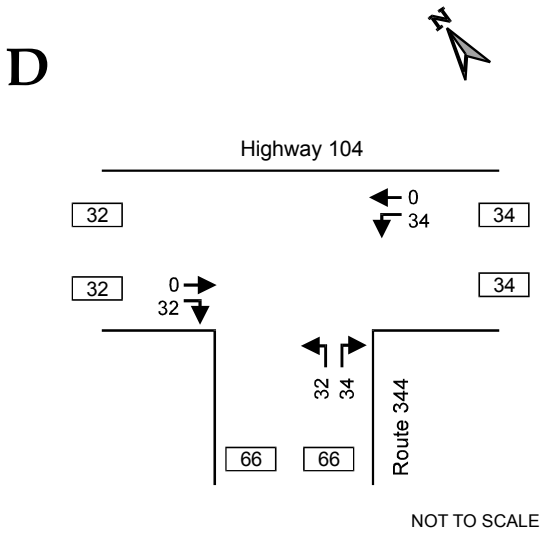
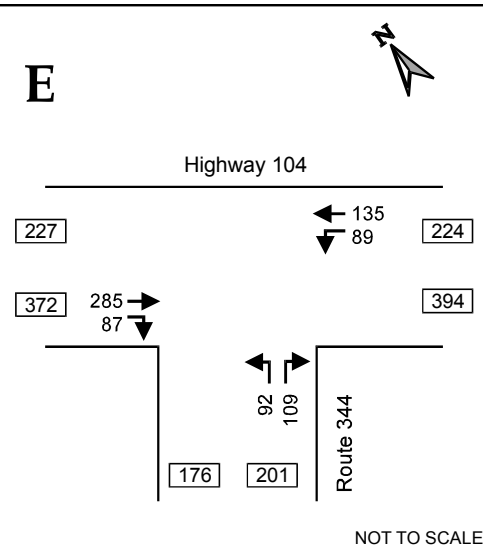
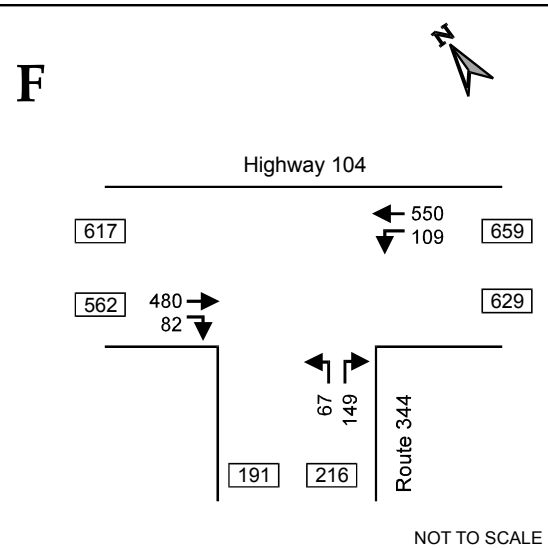
Atlantic Road & Traffic Management *Traffic Engineering Specialists*	**Traffic Impact Study, Proposed Container Terminal Melford, Guysborough Co., NS**	**Figure B-6**
	2008 Volumes without Site Development	**March 2008**

	AM Peak Hour	PM Peak Hour
Projected 2010 DHV's without Site Traffic		
Estimated Construction Generated Trips		
Projected 2010 DHV's with Construction Site Traffic		

Atlantic Road & Traffic Management *Traffic Engineering Specialists*	**Traffic Impact Study, Proposed Container Terminal Melford, Guysborough Co., NS**	**Figure B-7**
	2010 Volumes with Construction Site Development	**March 2008**

	AM Peak Hour	PM Peak Hour
Projected 2011 DHV's without Site Traffic		
Estimated Operation Phase 1 Generated Trips		
Projected 2011 DHV's with Operation Phase 1 Site Traffic		

Atlantic Road & Traffic Management *Traffic Engineering Specialists*	**Traffic Impact Study, Proposed Container Terminal Melford, Guysborough Co., NS**	**Figure B-8**
	2011 Volumes with Operation Phase 1	**March 2008**

	AM Peak Hour	PM Peak Hour
Projected 2021 DHV's without Site Traffic		
Estimated Terminal Buildout Generated Trips		
Projected 2021 DHV's with Terminal Buildout Site Traffic		

Atlantic Road & Traffic Management *Traffic Engineering Specialists*	**Traffic Impact Study, Proposed Container Terminal Melford, Guysborough Co., NS**	**Figure B-9**
	2021 Volumes with Terminal Buildout	**March 2008**

Appendix C

Roadside Development Details

Table C-1 - Kilometer Log of Route 344 - Highway 104 to Melford Loop	
Kilometer	**Location Description**
0.0	Highway 104
	Railroad Crossing (Rail to STOP bar is 32 m)
	Sharp turn - 30 km/h to right northbound
0.2	90 km/h sign (Guysborough County Line
0.2	Hillside Drive (R) and O'Brien Road (R)
0.5	Lower Quarry Road (L)
0.7	Begin southbound climbing lane
1.8	Upper Quarry Road (L)
2.6	End southbound climbing lane
3.0	**Mulgrave Town Line** (Mulgrave / Aulds Cove line)
3.5	End of northbound climbing lane
3.7	Quarry entrance (L)
4.0	Begin 80 km/h zone
4.9	Begin 50 km/h zone
5.1	England Avenue (L) Mulgrave Marine Industrial Park
5.2	70 km/h sign for northbound traffic
5.5	Hattie Street (R); begin northbound climbing lane
5.6	Loggie Street (L); begin of curb and sidewalk right side
5.7	Loggie Street (L)
5.9	Wallace Street (R)
6.0	Dale Avenue (R)
6.2	Church Street (R)
6.3	Reverse curve - right then left when southbound
6.4	Mill Street (R)
6.5	Wooden Bridge
6.5	Terminal entrance (L)
6.8	Post Office
6.8	Stafford Street (R) a
7.2	MacLeod Street (R) (Scotia Ferry Look-off (L) and Canadian Legion (R) just south of MacLeod Street)
7.3	End of curb and sidewalk
8.5	Curve to right with houses close to the road

Table C-1 - Kilometer Log of Route 344 - Highway 104 to Melford Loop	
Kilometer	**Location Description**
9.1	**Pirate Harbour sign** (Mulgrave / Pirate Harbour line)
9.2	Begin 60 km/h southbound
9.4	Wooden Bridge (There is a curve sign with 40 km/h for the northbound approach)
9.5	Pirate Harbour Loop (L)
9.7	Curve to the left (55 km/h tab)
10.1	Curve to the right (50 km/h tab)
10.5	**Steep Creek sign** (Steep Creek / Pirate Harbour line)
10.6	Begin 80 km/h southbound
11.8	Reverse curve - left then right (50 km/h tab)
13.9	Sable Gas Liquid line crosses under road
17.3	**Melford sign** (Melford / Steep Creek sign)
17.8	Middleton Road (R)
18.3	Wooden Bridge
18.9	Melford Loop Road (L)
NOTE: Kilometer distances were measured with a vehicle odometer on March 6, 2008	

Table C-2 - Number of Residential Driveways - Route 344 - Highway 104 to Melford Loop		
Kilometer (North to South)	**Number of Residential Driveways**	
	West Side	**East Side**
0 to 1	1	0
1 to 2	1	0
2 to 3	0	1
3 to 4	0	1
4 to 5	3	4
Average - Highway 104 to beginning of Mulgrave developed area	1.0	1.2
5 to 9 (Mulgrave developed area)	n/a	n/a
9 to 10	6	3
10 to 11	0	1
11 to 12	0	3
12 to 13	5	2
13 to 14	4	0
14 to 15	5	1
15 to 16	6	0
16 to 17	5	8
17 to 18	3	2
18 to 19	0	3
Average - Mulgrave to Melford	3.4	2.3
Residential driveway counts were obtained during a site visit on March 6, 2008		

Appendix D

Signal Warrant and

Level of Service Analyses

Atlantic Road & Traffic Management
Traffic Engineering Specialists

2005 Canadian Traffic Signal Warrant Matrix Analysis

Scenario: Table D-1 Highway 104 / Route 344 - 2008 - Jan. 31, 2008

Main Street (name)	Highway 104	Direction (EW or NS)	EW	Date:	March 2008
Side Street (name)	Route 344	Direction (EW or NS)	NS	City:	Aulds Cove

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Highway 104	WB	1		1				1	
Highway 104	EB			1				1	
Route 344	NB			1					
Route 344	SB								

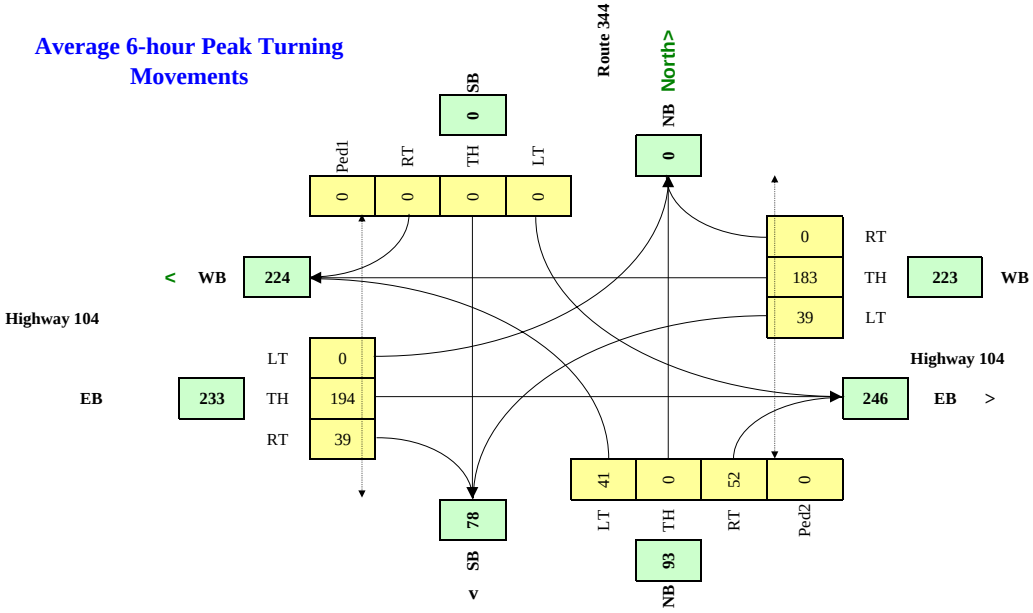
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Highway 104	EW	70	15.0%	n	0.0
Route 344	NS		5.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:30 - 8:30	0	0	0	0
8:30 - 9:30	0	0	0	0
11:00 - 12:00	0	0	0	0
12:00 - 13:00	0	0	0	0
16:00 - 17:00	0	0	0	0
17:00 - 18:00	0	0	0	0
Total (6-hour peak)	**0**	**0**	**0**	**0**
Average (6-hour peak)	**0**	**0**	**0**	**0**

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:30 - 8:30	65	0	45	0	0	0	35	95	0	0	180	40
8:30 - 9:30	35	0	50	0	0	0	25	140	0	0	210	45
11:00 - 12:00	30	0	50	0	0	0	35	205	0	0	185	30
12:00 - 13:00	45	0	45	0	0	0	40	225	0	0	170	45
16:00 - 17:00	25	0	80	0	0	0	40	250	0	0	225	35
17:00 - 18:00	45	0	40	0	0	0	60	185	0	0	195	40
Total (6-hour peak)	**245**	**0**	**310**	**0**	**0**	**0**	**235**	**1,100**	**0**	**0**	**1,165**	**235**
Average (6-hour peak)	**41**	**0**	**52**	**0**	**0**	**0**	**39**	**183**	**0**	**0**	**194**	**39**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$$

W =	22	22	0
		Veh	*Ped*

NOT Warranted

Atlantic Road & Traffic Management
Traffic Engineering Specialists

2005 Canadian Traffic Signal Warrant Matrix Analysis

Scenario: Table D-2 Highway 104 / Route 344 - 2008 - DHVs

Main Street (name)	**Highway 104**	**Direction (EW or NS)**	**EW**	**Date:**	**March 2008**
Side Street (name)	**Route 344**	**Direction (EW or NS)**	**NS**	**City:**	**Aulds Cove**

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Highway 104	WB	1		1				1	
Highway 104	EB			1				1	
Route 344	NB			1					
Route 344	SB								

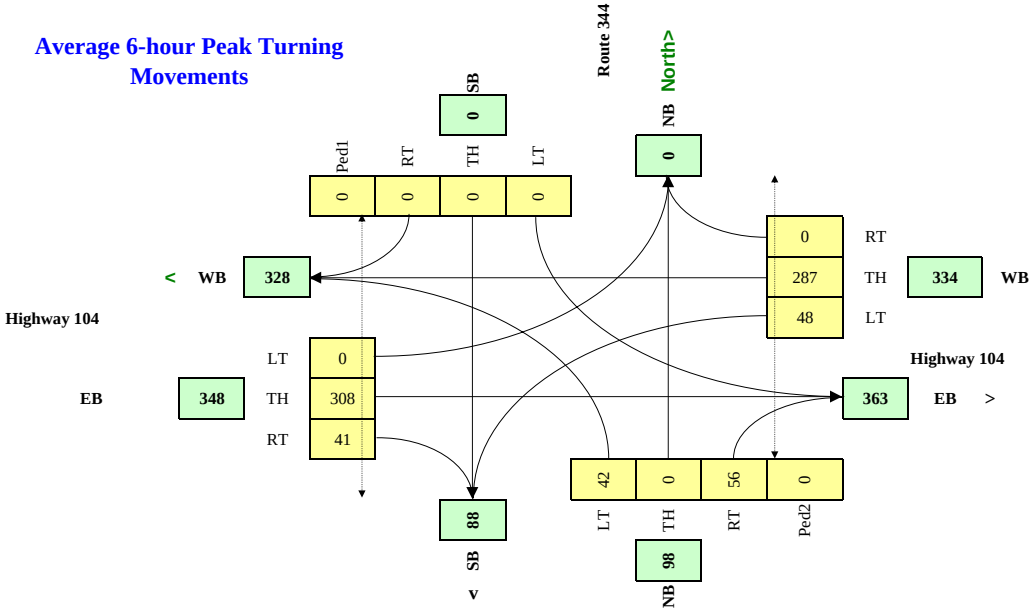
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Highway 104	EW	70	15.0%	n	0.0
Route 344	NS		5.0%	n	

	Ped1	**Ped2**	**Ped3**	**Ped4**
	NS	**NS**	**EW**	**EW**
	W Side	**E Side**	**N Side**	**S side**
7:30 - 8:30	0	0	0	0
8:30 - 9:30	0	0	0	0
11:00 - 12:00	0	0	0	0
12:00 - 13:00	0	0	0	0
16:00 - 17:00	0	0	0	0
17:00 - 18:00	0	0	0	0
Total (6-hour peak)	**0**	**0**	**0**	**0**
Average (6-hour peak)	**0**	**0**	**0**	**0**

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,000
Central Business District	(y/n)	n

Traffic Input	**NB**			**SB**			**WB**			**EB**		
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**
7:30 - 8:30	50	0	60	0	0	0	45	110	0	0	235	45
8:30 - 9:30	45	0	50	0	0	0	40	95	0	0	200	40
11:00 - 12:00	40	0	40	0	0	0	40	340	0	0	340	40
12:00 - 13:00	40	0	40	0	0	0	40	340	0	0	340	40
16:00 - 17:00	30	0	95	0	0	0	60	450	0	0	395	40
17:00 - 18:00	45	0	50	0	0	0	60	385	0	0	335	40
Total (6-hour peak)	**250**	**0**	**335**	**0**	**0**	**0**	**285**	**1,720**	**0**	**0**	**1,845**	**245**
Average (6-hour peak)	**42**	**0**	**56**	**0**	**0**	**0**	**48**	**287**	**0**	**0**	**308**	**41**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$$

W =	**37**	**37**	**0**
		Veh	***Ped***

NOT Warranted

Atlantic Road & Traffic Management
Traffic Engineering Specialists

2005 Canadian Traffic Signal Warrant Matrix Analysis

Scenario: Table D-3 Highway 104 / Route 344 - 2010 - DHVs + Construction

Main Street (name)	**Highway 104**	**Direction (EW or NS)**	**EW**	**Date:**	**March 2008**
Side Street (name)	**Route 344**	**Direction (EW or NS)**	**NS**	**City:**	**Aulds Cove**

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Highway 104	WB	1		1				1	
Highway 104	EB			1				1	
Route 344	NB			1					
Route 344	SB								

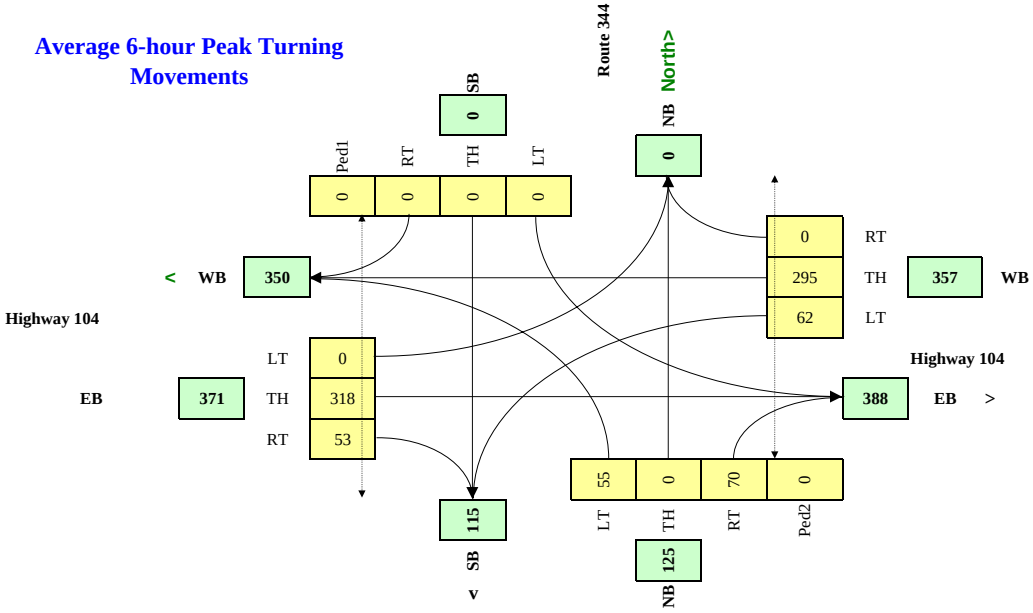
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Highway 104	EW	70	15.0%	n	0.0
Route 344	NS		5.0%	n	

	Ped1	**Ped2**	**Ped3**	**Ped4**
	NS	**NS**	**EW**	**EW**
	W Side	**E Side**	**N Side**	**S side**
7:30 - 8:30	0	0	0	0
8:30 - 9:30	0	0	0	0
11:00 - 12:00	0	0	0	0
12:00 - 13:00	0	0	0	0
16:00 - 17:00	0	0	0	0
17:00 - 18:00	0	0	0	0
Total (6-hour peak)	**0**	**0**	**0**	**0**
Average (6-hour peak)	**0**	**0**	**0**	**0**

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,000
Central Business District	(y/n)	n

Traffic Input	**NB**			**SB**			**WB**			**EB**		
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**
7:30 - 8:30	65	0	75	0	0	0	70	115	0	0	245	70
8:30 - 9:30	55	0	65	0	0	0	50	95	0	0	205	50
11:00 - 12:00	50	0	50	0	0	0	50	350	0	0	350	50
12:00 - 13:00	50	0	50	0	0	0	50	350	0	0	350	50
16:00 - 17:00	50	0	120	0	0	0	75	465	0	0	410	50
17:00 - 18:00	60	0	60	0	0	0	75	395	0	0	345	50
Total (6-hour peak)	**330**	**0**	**420**	**0**	**0**	**0**	**370**	**1,770**	**0**	**0**	**1,905**	**320**
Average (6-hour peak)	**55**	**0**	**70**	**0**	**0**	**0**	**62**	**295**	**0**	**0**	**318**	**53**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$$

W =	**52**	**52**	**0**
		Veh	***Ped***

NOT Warranted

Atlantic Road & Traffic Management
Traffic Engineering Specialists

2005 Canadian Traffic Signal Warrant Matrix Analysis

Scenario: Table D-4 Highway 104 / Route 344 - 2011 - DHVs + Phase I

Main Street (name)	Highway 104	Direction (EW or NS)	EW	Date:	March 2008
Side Street (name)	Route 344	Direction (EW or NS)	NS	City:	Aulds Cove

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Highway 104	WB	1		1				1	
Highway 104	EB			1				1	
Route 344	NB			1					
Route 344	SB								

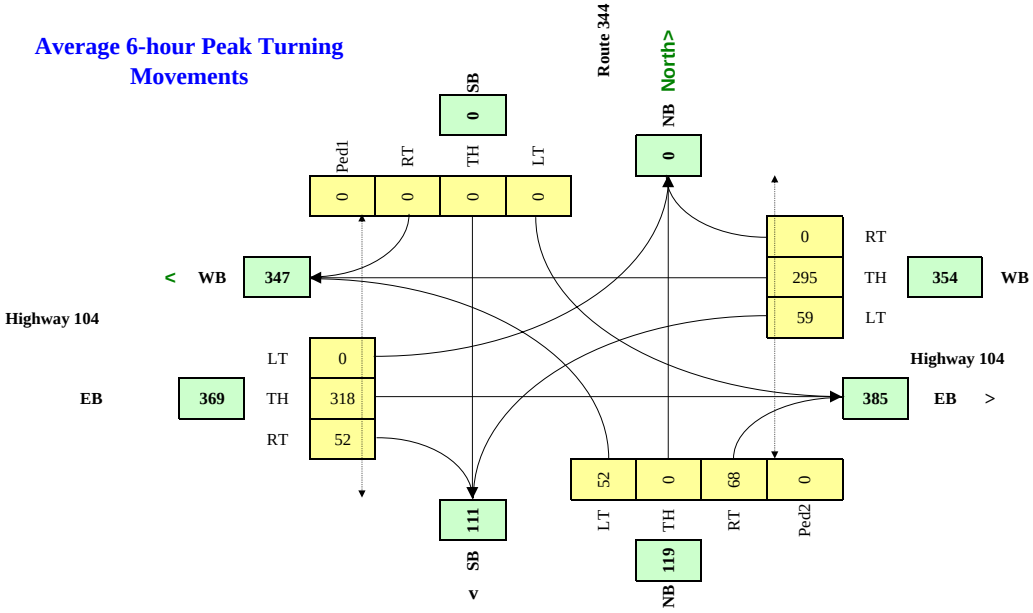
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Highway 104	EW	70	15.0%	n	0.0
Route 344	NS		5.0%	n	

	Ped1 NS W Side	Ped2 NS E Side	Ped3 EW N Side	Ped4 EW S side
7:30 - 8:30	0	0	0	0
8:30 - 9:30	0	0	0	0
11:00 - 12:00	0	0	0	0
12:00 - 13:00	0	0	0	0
16:00 - 17:00	0	0	0	0
17:00 - 18:00	0	0	0	0
Total (6-hour peak)	**0**	**0**	**0**	**0**
Average (6-hour peak)	**0**	**0**	**0**	**0**

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:30 - 8:30	70	0	80	0	0	0	65	115	0	0	245	65
8:30 - 9:30	50	0	60	0	0	0	50	95	0	0	205	50
11:00 - 12:00	45	0	45	0	0	0	45	350	0	0	350	45
12:00 - 13:00	45	0	45	0	0	0	45	350	0	0	350	45
16:00 - 17:00	45	0	115	0	0	0	80	465	0	0	410	55
17:00 - 18:00	55	0	60	0	0	0	70	395	0	0	345	50
Total (6-hour peak)	**310**	**0**	**405**	**0**	**0**	**0**	**355**	**1,770**	**0**	**0**	**1,905**	**310**
Average (6-hour peak)	**52**	**0**	**68**	**0**	**0**	**0**	**59**	**295**	**0**	**0**	**318**	**52**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$$

W =	49	49	0
		Veh	*Ped*

NOT Warranted

Atlantic Road & Traffic Management
Traffic Engineering Specialists

2005 Canadian Traffic Signal Warrant Matrix Analysis

Scenario: Table D-5 Highway 104 / Route 344 - 2021 - DHVs

Main Street (name)	**Highway 104**	**Direction (EW or NS)**	**EW**	**Date:**	**March 2008**
Side Street (name)	**Route 344**	**Direction (EW or NS)**	**NS**	**City:**	**Aulds Cove**

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Highway 104	WB	1		1				1	
Highway 104	EB			1				1	
Route 344	NB			1					
Route 344	SB								

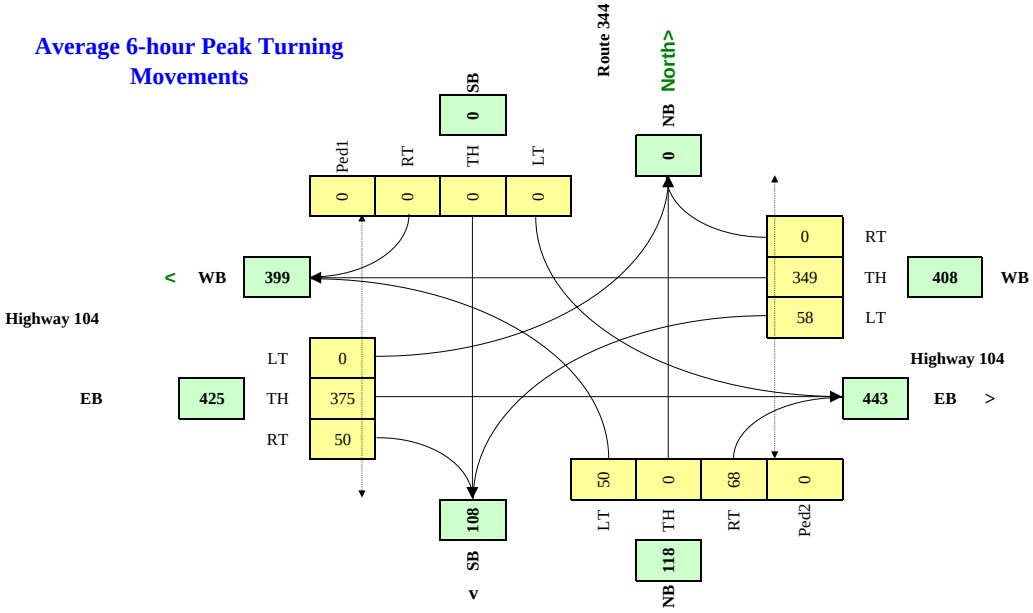
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Highway 104	EW	70	15.0%	n	0.0
Route 344	NS		5.0%	n	

	Ped1	**Ped2**	**Ped3**	**Ped4**
	NS	**NS**	**EW**	**EW**
	W Side	**E Side**	**N Side**	**S side**
7:30 - 8:30	0	0	0	0
8:30 - 9:30	0	0	0	0
11:00 - 12:00	0	0	0	0
12:00 - 13:00	0	0	0	0
16:00 - 17:00	0	0	0	0
17:00 - 18:00	0	0	0	0
Total (6-hour peak)	**0**	**0**	**0**	**0**
Average (6-hour peak)	**0**	**0**	**0**	**0**

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,000
Central Business District	(y/n)	n

Traffic Input	**NB**			**SB**			**WB**			**EB**		
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**
7:30 - 8:30	60	0	75	0	0	0	55	135	0	0	285	55
8:30 - 9:30	50	0	60	0	0	0	45	115	0	0	245	45
11:00 - 12:00	50	0	50	0	0	0	50	415	0	0	415	50
12:00 - 13:00	50	0	50	0	0	0	50	415	0	0	415	50
16:00 - 17:00	35	0	115	0	0	0	75	550	0	0	480	50
17:00 - 18:00	55	0	60	0	0	0	75	465	0	0	410	50
Total (6-hour peak)	**300**	**0**	**410**	**0**	**0**	**0**	**350**	**2,095**	**0**	**0**	**2,250**	**300**
Average (6-hour peak)	**50**	**0**	**68**	**0**	**0**	**0**	**58**	**349**	**0**	**0**	**375**	**50**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$$

W =	**57**	**57**	**0**
		Veh	***Ped***

NOT Warranted

Atlantic Road & Traffic Management
Traffic Engineering Specialists

2005 Canadian Traffic Signal Warrant Matrix Analysis

Scenario: Table D-6 Highway 104 / Route 344 - 2021 - DHVs + Build-Out

Main Street (name)	Highway 104	Direction (EW or NS)	EW	Date:	March 2008
Side Street (name)	Route 344	Direction (EW or NS)	NS	City:	Aulds Cove

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Highway 104	WB	1		1				1	
Highway 104	EB			1				1	
Route 344	NB			1					
Route 344	SB								

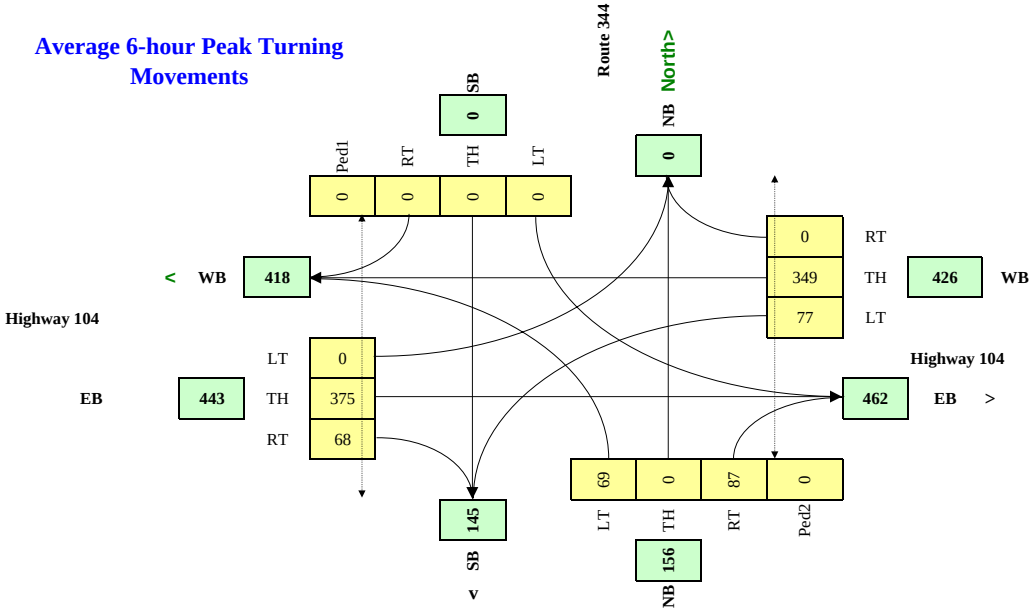
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Highway 104	EW	70	15.0%	n	0.0
Route 344	NS		5.0%	n	

	Ped1 NS W Side	Ped2 NS E Side	Ped3 EW N Side	Ped4 EW S side
7:30 - 8:30	0	0	0	0
8:30 - 9:30	0	0	0	0
11:00 - 12:00	0	0	0	0
12:00 - 13:00	0	0	0	0
16:00 - 17:00	0	0	0	0
17:00 - 18:00	0	0	0	0
Total (6-hour peak)	**0**	**0**	**0**	**0**
Average (6-hour peak)	**0**	**0**	**0**	**0**

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:30 - 8:30	95	0	105	0	0	0	90	135	0	0	285	85
8:30 - 9:30	70	0	80	0	0	0	65	115	0	0	245	65
11:00 - 12:00	55	0	55	0	0	0	55	415	0	0	415	55
12:00 - 13:00	55	0	55	0	0	0	55	415	0	0	415	55
16:00 - 17:00	70	0	150	0	0	0	105	550	0	0	480	85
17:00 - 18:00	70	0	75	0	0	0	90	465	0	0	410	65
Total (6-hour peak)	**415**	**0**	**520**	**0**	**0**	**0**	**460**	**2,095**	**0**	**0**	**2,250**	**410**
Average (6-hour peak)	**69**	**0**	**87**	**0**	**0**	**0**	**77**	**349**	**0**	**0**	**375**	**68**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$$

W =	78	78	0
		Veh	*Ped*

NOT Warranted

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	235	45	45	110	50	60
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	276	53	53	129	59	71
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			329		538	303
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			329		538	303
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		88	90
cM capacity (veh/h)			1230		482	737

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	329	53	129	129
Volume Left	0	53	0	59
Volume Right	53	0	0	71
cSH	1700	1230	1700	1061
Volume to Capacity	0.19	0.04	0.08	0.12
Queue Length 95th (m)	0.0	1.1	0.0	3.3
Control Delay (s)	0.0	8.1	0.0	11.8
Lane LOS		A		B
Approach Delay (s)	0.0	2.3		11.8
Approach LOS				B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	395	40	60	450	30	95
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	429	43	65	489	33	103
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			473		1071	451
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			473		1071	451
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		86	83
cM capacity (veh/h)			1089		230	608

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	473	65	489	136
Volume Left	0	65	0	33
Volume Right	43	0	0	103
cSH	1700	1089	1700	800
Volume to Capacity	0.28	0.06	0.29	0.17
Queue Length 95th (m)	0.0	1.5	0.0	4.9
Control Delay (s)	0.0	8.5	0.0	14.8
Lane LOS		A		B
Approach Delay (s)	0.0	1.0		14.8
Approach LOS				B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	245	66	67	115	61	71
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	288	78	79	135	72	84
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			366		620	327
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			366		620	327
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		83	88
cM capacity (veh/h)			1193		422	714

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	366	79	135	155
Volume Left	0	79	0	72
Volume Right	78	0	0	84
cSH	1700	1193	1700	913
Volume to Capacity	0.22	0.07	0.08	0.17
Queue Length 95th (m)	0.0	1.7	0.0	4.9
Control Delay (s)	0.0	8.2	0.0	12.8
Lane LOS		A		B
Approach Delay (s)	0.0	3.0		12.8
Approach LOS				B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	410	51	71	465	51	122
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	446	55	77	505	55	133
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			501		1133	473
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			501		1133	473
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		73	78
cM capacity (veh/h)			1063		208	591

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	501	77	505	188
Volume Left	0	77	0	55
Volume Right	55	0	0	133
cSH	1700	1063	1700	706
Volume to Capacity	0.29	0.07	0.30	0.27
Queue Length 95th (m)	0.0	1.9	0.0	8.6
Control Delay (s)	0.0	8.7	0.0	17.5
Lane LOS		A		C
Approach Delay (s)	0.0	1.1		17.5
Approach LOS				C

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	245	61	62	115	71	82
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	288	72	73	135	84	96
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			360		605	324
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			360		605	324
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		81	87
cM capacity (veh/h)			1199		433	717

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	360	73	135	180
Volume Left	0	73	0	84
Volume Right	72	0	0	96
cSH	1700	1199	1700	932
Volume to Capacity	0.21	0.06	0.08	0.19
Queue Length 95th (m)	0.0	1.6	0.0	5.7
Control Delay (s)	0.0	8.2	0.0	12.9
Lane LOS		A		B
Approach Delay (s)	0.0	2.9		12.9
Approach LOS				B

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	415	56	82	475	46	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	451	61	89	516	50	127
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			512		1176	482
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			512		1176	482
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		74	78
cM capacity (veh/h)			1053		193	585

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	512	89	516	177
Volume Left	0	89	0	50
Volume Right	61	0	0	127
cSH	1700	1053	1700	686
Volume to Capacity	0.30	0.08	0.30	0.26
Queue Length 95th (m)	0.0	2.2	0.0	8.2
Control Delay (s)	0.0	8.7	0.0	17.7
Lane LOS		A		C
Approach Delay (s)	0.0	1.3		17.7
Approach LOS				C

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	285	55	55	135	60	75
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	335	65	65	159	71	88
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			400		656	368
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			400		656	368
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		83	87
cM capacity (veh/h)			1159		406	678

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	400	65	159	159
Volume Left	0	65	0	71
Volume Right	65	0	0	88
cSH	1700	1159	1700	914
Volume to Capacity	0.24	0.06	0.09	0.17
Queue Length 95th (m)	0.0	1.4	0.0	5.0
Control Delay (s)	0.0	8.3	0.0	13.2
Lane LOS		A		B
Approach Delay (s)	0.0	2.4		13.2
Approach LOS				B

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	480	50	75	550	35	115
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	522	54	82	598	38	125
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			576		1310	549
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			576		1310	549
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		76	77
cM capacity (veh/h)			997		161	536

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	576	82	598	163
Volume Left	0	82	0	38
Volume Right	54	0	0	125
cSH	1700	997	1700	691
Volume to Capacity	0.34	0.08	0.35	0.24
Queue Length 95th (m)	0.0	2.1	0.0	7.3
Control Delay (s)	0.0	8.9	0.0	18.5
Lane LOS		A		C
Approach Delay (s)	0.0	1.1		18.5
Approach LOS				C

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	285	87	89	135	92	109
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	335	102	105	159	108	128
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			438		755	386
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			438		755	386
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		68	81
cM capacity (veh/h)			1122		341	661

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	438	105	159	236
Volume Left	0	105	0	108
Volume Right	102	0	0	128
cSH	1700	1122	1700	604
Volume to Capacity	0.26	0.09	0.09	0.39
Queue Length 95th (m)	0.0	2.5	0.0	14.8
Control Delay (s)	0.0	8.5	0.0	14.7
Lane LOS		A		B
Approach Delay (s)	0.0	3.4		14.7
Approach LOS				B

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	480	82	109	550	67	149
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	522	89	118	598	73	162
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			611		1401	566
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			611		1401	566
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		46	69
cM capacity (veh/h)			968		136	523

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	611	118	598	235
Volume Left	0	118	0	73
Volume Right	89	0	0	162
cSH	1700	968	1700	357
Volume to Capacity	0.36	0.12	0.35	0.66
Queue Length 95th (m)	0.0	3.3	0.0	35.7
Control Delay (s)	0.0	9.2	0.0	32.5
Lane LOS		A		D
Approach Delay (s)	0.0	1.5		32.5
Approach LOS				D

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		